

# RESEARCH, INNOVATION, AND TALENT

**WORKING GROUP** 

March 25, 2020

# **OVERVIEW**

The state plan for higher education, **Where Opportunity Meets Innovation**, emphasizes the importance of cultivating research, innovation, and talent to deepen and recapture our role as a leader in the innovation economy and effectively prepare students for success after college. This is described in more detail in the plan within a vision for a student bill of rights. The fourth element states, "Every student in New Jersey should have the opportunity to work with an employer, conduct meaningful research supervised by a faculty member, or access some other form of experiential learning before graduation." The eighth element states, "Every student in New Jersey should have high-quality, career-relevant academic programs that will prepare them to succeed in the global economy." The plan further argues that Colleges and Universities drive innovation, they are centers of research and development for new industry clusters, birthplaces for new ideas and companies, and provide rich environments for start-ups and creativity. "Knowledge creation is a fundamental aspect of colleges and university activity that supports commercialization, drives innovation, and ultimately strengthens the state's economy as a whole."

In furtherance of making this vision a reality, the **Research, Innovation, and Talent Working Group** was charged creating stronger ties between businesses and higher education by promoting industry-academic partnerships, experiential learning opportunities, and programs to meet market needs. In particular, the group will be charged with:

- **1.** Identifying strategies and best practices to increase research, development, and commercialization activities by our state's research universities.
- **2.** Developing effective industry-academic research and workforce development partnerships that lead to more research and employment opportunities for students.
- **3.** Highlighting successful practices that expand the number of students, especially women and underrepresented minorities, who participate in research and obtain STEM degrees.
- 4. Determining effective methods for attracting and supporting diverse faculty and staff.

The group met six times in person from June 2019 through November 2019, where each meeting lasted for two hours each. Two chairs were appointed by Governor Phil Murphy to lead the working group, and they met regularly with OSHE and EDA staff in between meetings to further the work of the group. The larger working group broke up into four subgroups organized around each of the four charges stated above. Each subgroup met via conference call, in-person, and/or on-line meeting to further the work in between each of the plenary full working group sessions. Each subgroup first identified its final deliverable and created an action plan to reach that deliverable. The group was originally provided with an opening Power Point presentation provided by OSHE staff that provided a set of data/facts around each of the four charges in addition to handing out a full copy of the State Plan document to each member so that all members could have an initial starting point for discussion and deliberation around answering the charges. Each subgroup approached their work slightly differently but all ended up completing narrative deliverables that attempt to provide a resource for institutions and the State on how to further research, innovation, and talent development in the State of New Jersey and more specifically at its colleges and universities

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Thank you to the New Jersey Department of Labor and Workforce Development, the New Jersey Economic Development Authority and the New Jersey State Employment and Training Commission.

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- 4 Determining effective methods for attracting and supporting diverse faculty and staff.

# RESEARCH, INNOVATION, AND TALENT

## **WORKING GROUP DELIVERABLE**

The Research, Innovation, and Talent Working Group will focus on creating stronger ties between businesses and higher education by promoting industry-academic partnerships, experiential learning opportunities, and programs to meet market needs. In particular, the group will be charged with:



Identifying strategies and best practices to increase research, development, and commercialization activities by our state's research universities.



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Highlighting successful practices that expand the number of students, especially women and underrepresented minorities, who participate in research and obtain STEM degrees.

Determining effective methods for attracting and supporting diverse faculty and staff.

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### State and Statewide Institutional Strategies for Accelerating Research and Development, and Commercialization in New Jersey Universities

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### 1. Introduction

This sub-group's charge is to identify strategies and best practices to increase research, development, and commercialization activities in New Jersey universities. Faculty are a key engine of innovation, and support for exploratory research is an important mechanism for ensuring a steady pipeline of new ideas and potentially disruptive technologies. A broad spectrum of universities exists in New Jersey, and partnerships between research-intensive and less research-intensive institutions can be an effective mechanism for encouraging innovation and commercialization activities statewide.

Based on these realities, strategies are proposed for:

- university, industry and state support for research collaborations between faculty at research-intensive and less research-intensive universities;
- lowering barriers to inter-university dual-career hires and joint appointments, facilitated by the state's limited geographical footprint;
- university support for proof-of-concept funding;
- state policy reforms to increase research productivity and encourage commercialization;
- increasing universities' research productivity;
- establishing partnerships between research-intensive and less research-intensive universities;
- establishing state-wide collaboratives for sharing best practices in research administration.

### 2. Statewide Inter-University Research Collaborations

**2.1 Background.** Faculty members are engines of knowledge generation and innovation. Assistant professors at research universities<sup>§</sup> are typically awarded generous startup packages that enable them to jumpstart their research programs, in order for them to successfully earn tenure and promotion after six years. Startup packages usually include some release from teaching, discretionary funds to be used for research activities and support for travel, graduate student research assistant stipends, laboratory equipment and renovations, and summer salary. In the STEM fields, startup packages are very significant and have risen continuously for the past 30 years or so.

Institutions that are not research-intensive, such as predominantly teaching universities, as well as many universities with moderate research activity, are often unable to attract more competitive faculty because they cannot afford the high cost of faculty startup packages and compensation. Furthermore, faculty members in those universities are often expected to achieve significant performance in research, but are not necessarily given the means to succeed, because of high teaching loads, insufficient research infrastructure, as well as the lack of a research ecosystem including available collaborations with colleagues. Faculty research in universities that do not fall

<sup>&</sup>lt;sup>§</sup> The six research universities in New Jersey are Montclair State University; New Jersey Institute of Technology (NJIT); Princeton University; Rowan University; Rutgers, The State University; and Stevens Institute of Technology.

within the Very High Research Activity category (according to the <u>Carnegie classification</u>) frequently takes place in isolation and may not be adequately supported. Finally, assistant professors in research universities, while benefitting from substantive startup packages, rarely collaborate and interact with colleagues at other universities within the state. This represents an opportunity loss for all universities in the State of New Jersey.

In addition to startup packages, assistant professors are eligible for a number of national funding programs (e.g., the NSF CAREER) as well as internal university grants to which mid-career and senior faculty do not have access to. While well-established, senior faculty who are leaders in their fields are typically successful in attracting funds to support their research program, mid-career faculty often experience a comparative lack of funding opportunities. This may result in a lull in funding for them, which sometimes leads to discouragement and disconnection from research, possibly until retirement. Therefore, there is a need for funding opportunities aimed at mid-career faculty.

**2.2 Statewide Collaborative Research Initiative.** We recommend the establishment of a statewide competitive initiative to support junior and mid-career faculty (assistant and associate professors), with a special focus on those institutions that are not research intensive. The program should be aimed at supporting collaborations between at least two New Jersey universities, and each award would require the participation of at least one non-research-intensive university. Research-intensive universities can only participate in collaboration with at least one non-research-intensive institution.

Support for each successful collaborative project should include institutional, industrial and State contributions. Research-intensive institutions and industry will be expected to contribute through cost-sharing.

A good example of inter-university collaboration supported by a state is the <u>TeCK Fund</u> of the State of Ohio, which focuses on a pipeline of technologies in areas such as medical diagnostics, healthcare solutions, materials science, cybersecurity, and environmental design.

The State should not aim to replicate or duplicate existing federal programs in scope or size. We recommend funding on the order of \$100K-\$200K per grant per year, for a period of two years, which would provide seed funding for collaborative projects that build upon each partner institution's complementary expertise.

The involvement of industry, and its commitment in the form of cost-sharing, would be particularly desirable, and hence a criterion to be taken into account by review panels.

Interdisciplinary projects, which call for the complementary expertise of the partner institutions, would be especially welcome. Example research areas include STEM education, the life sciences and bioengineering, pharmaceutical engineering, artificial intelligence, data science, offshore wind, sustainability science and robotics.

Grant funding would be used by the partner universities to support undergraduate research students, and particularly the exchange of such students among universities; faculty travel and

exchanges; laboratory equipment; and graduate student support. One basic principle should be that the funding must benefit all university partners and the project as a whole rather than one particular university.

We recommend that the State establish and administer a bi-yearly proposal competition according to the above characteristics, and that winning proposals be evaluated and recommended by a statewide review panel. The competition should have clear requirements, including participation of assistant professors (who should be given priority) as well as associate professors, industrial participation, and the inclusion of non-research-intensive universities in every project. Each grant awarded by the State should be led by one university and should be jointly managed by the partner universities.

In addition to providing research funding, such collaborations would greatly benefit the faculty of non-research-intensive universities, by offering them an outlet for their research in the form of access to laboratories, students, and faculty at research universities, as well as intellectually meaningful interactions.

**2.3 Lowering Barriers to Inter-Institutional Dual-Career Hiring.** Identifying opportunities for faculty spouses and partners who are seeking career avenues both within and outside of academia is an increasingly common challenge facing universities when trying to attract new faculty members. The relatively small geographic size of, and diversity of universities in, New Jersey offer opportunities for addressing this challenge creatively.

Useful resources include the <u>Higher Education Recruitment Consortium</u> and its <u>regional</u> collaboratives, as well as <u>researchwithnj.com</u>.

Mutual awareness of institutional initiatives, needs and opportunities can greatly facilitate interinstitutional dual career hires. To this end, periodic meetings between career transition advisors from universities across the state should be encouraged.

For dual-career couples working at different institutions, flexible working arrangements (e.g., working remotely from a spouse's or partner's institution on an agreed-upon schedule) should be accommodated whenever job responsibilities permit. Parking, library, and computer account access and privileges should enable such flexible arrangements.

### 3. Proof-of-Concept Funding

In order for society to benefit fully from research conducted at universities, inventions must be developed into real-world products and applications. Universities should seek innovative ways to address the development gap between the early stage research and attractive, investment- and venture-grade opportunities. Proof-of-concept (or gap) funding aims at fostering and advancing the development of nascent technologies emanating from university labs into commercial development and, ultimately, the global marketplace. Additional proof-of-concept work, data collection, and/or prototyping can yield important information or further development that would make a technology more commercially attractive.

Universities should invest in proof-of-concept funding by providing competitive awards of the order of \$100K for one year to a handful of projects, in response to annual calls for proposals. Proposals should be judged by a committee including faculty and representatives from industry and from the venture capital communities.

We recommend the establishment of a yearly state-wide **Proof-of-Concept Funding Day**, with presentations by recent awardees, emphasizing successful transition from the lab to commercial development.

# 4. State Policy Reforms to Increase Research Productivity and Encourage Commercialization

**4.1** The basis for increasing research productivity lies in **leveling the playing field** with no preference shown to any university or researcher. This requires complete transparency within the system, so that every researcher has access to the same information. To do this, it is necessary that the state have **a common portal** similar to <u>Grants.gov</u>, which is a Federal initiative designed to improve government services to the public through an online web site that allows one to find and apply for federal grants. If all RFPs from the state were housed in a common platform, it would make it easier for a researcher at any institution to find the request for proposals. Currently in the state of New Jersey, each state entity has its own portal with no common guidelines for submission of proposals, budgeting or monitoring progress and accounting, resulting in inefficiencies both at the state level and institution level. The state of New York already does this with a common portal for listing of state research solicitations, grants submission and monitoring. New York State has also moved to an electronic system of approvals to minimize the use of paper (https://grantsmanagement.ny.gov).

**4.2** It is also imperative that the state agencies move to a completely **electronic format for submission and monitoring of grants** instead of some agencies still requiring varying number of printed paper copies. This creates confusion and results in a waste of resources.

**4.3** The state procurement process requires revision and modernization if research productivity is to improve. The state should review and make changes to the state procurement process for research-intensive institutions. The delay associated with the Business Registration Certificate (BRC) process has stifled research productivity and research equipment procurement.

**4.4 State led programs that are organized around a research focus area** that the state would like to be a leader in can serve as a mechanism to attract outstanding researchers to the state. An example of this is the <u>California Breast Cancer Research Program</u> (CBCRP), which is run by the Regents of the University of California system. Funding for the program was generated by increasing the tobacco tax by 2 cents per pack, with 45% of the revenue going to CBCRP.

**4.5** If we want to grow research at all our institutions, less-research-intensive institutions **need experienced human resources**. Many institutions do not have a single grants professional who knows how to apply for and manage funding. Often, research administration is managed by a finance professional or even a Dean, which does not allow for much research productivity.

Universities should make an investment in staff at some of the less research-intensive institutions, so that research can be undertaken.

**4.6** State colleges and universities need funds to **maintain state-of-the-art research facilities**, which will in turn attract research funds. New Jersey currently offers four revolving bond programs – Equipment Leasing Funds (ELF), Capital Improvement Fund (CIF), Higher Education Facilities Trust (HEFT) and the Higher Education Technology Infrastructure (HETI)—that may be used to develop and update university equipment and laboratories. As revolving loan programs, these grant programs are not required to go to voter referendum. Once capacity for new grants becomes available, the funds should be made available to these institutions to ensure the state's colleges and universities have high-quality facilities, this give institutions a competitive edge in attracting world-class faculty to conduct cutting-edge research here in New Jersey.

**4.7** The state should have a **central repository of patents filed at educational institutions**, making it easy for funders to find it. A good model to emulate would be what the state of Massachusetts does through the <u>Massachusetts Technology Transfer Center portal</u>.

**4.8** A means by which the state can attract world-class talent would be through **pitch competitions** similar to <u>Grand Challenges Canada</u>, which funds the best ideas with a sustainability component from around the world. Impact investment should be something the state is serious about, especially with Governor Murphy's push for a clean economy and tackling global climate change. This would attract the best and the brightest among NJ residents, as well as residents nationwide to relocate to a forward-looking state that is interested in tackling the grand challenges the nation is facing through forward-looking approaches that the younger generation is attracted to.

**4.9 Continue to encourage student entrepreneurs** at NJ institutions with state-wide convenings and competitions. UPitchNJ was established by the New Jersey Collegiate Entrepreneurship Consortium, a group of entrepreneurship education programs at four-year colleges and universities in New Jersey. Undergraduate student teams share their startup ideas and developments to compete for cash prizes and business services. Other states have similar events such as Maryland's Innov8MD, which organizes an annual state-wide conference.. Hosting such events and offering student entrepreneurs competitive award grants will not only spur a culture of innovation and creation at our state's colleges and universities, but create meaningful supports for concepts that turn into thriving business.

**4.10** As we grow our commercialization space, it is also important to keep in mind that not all populations have the same access to funds to startup their businesses. Women and people of color are severely underrepresented in receiving Venture Capital funds. The state should be cognizant of this through funding streams and policies statewide that would level the playing field. It would also be useful to have **additional mentoring and support for people of color and women** similar to Quebec, Canada's Femmessor program.<sup>1</sup>

### 5. Roadmap for Increasing Universities' Research Productivity Across the Board

<sup>&</sup>lt;sup>1</sup> http://femmessor.preprod.ciblesolutions.com/home

**5.1 Background.** Focusing on research is not a straightforward decision for a university. While the research enterprise can produce significant external revenues, it also generates both infrastructure and recurring costs that are substantial and may even exceed revenues. For instance, it requires recruiting faculty who are scholars in their field and who will earn higher salaries and teach less than faculty at teaching colleges; allocating space and costly equipment to laboratories; and attracting PhD students with expensive fellowships. Developing and sustaining research, becoming *research intensive*, requires a steady and substantive institutional commitment, in a budgetary environment that is subject to many worthy and legitimate needs and pressures.

Though an expensive proposition, being research intensive is a *sine qua non* condition for institutions, especially those with a substantial focus on STEM, to remain at the cutting edge of knowledge, recruit top faculty and therefore attract top graduate and undergraduate students and, in the end, be a leading university. Indeed, many highly ranked institutions with a significant STEM focus earn a substantial part their reputation and prestige from research preeminence. This is why it is so important for all New Jersey universities to develop their research capabilities and grow their research productivity, at least to an extent that is commensurate with their size, resources, and fields of study.

Steps that universities can take to grow their research infrastructure and increase research intensity are discussed below.

**5.2 Recruit and retain research active tenure-stream and non-tenure-stream faculty**, particularly in fields with significant external funding opportunities. The faculty are the bedrock of the research enterprise, and conducting high-quality research requires investing in high-quality faculty.

**5.3 Create a state-of-the-art ecosystem for research and for graduate education** that sets appropriate expectations and culture for faculty.

- Recognize research performance in the career progression of faculty.
- Establish faculty workloads by considering activity in teaching, research, and service.
- Invest in doctoral and research master's fellowships to attract excellent research graduate students, and graduate them on time.
- Ensure the university leadership champions the research and graduate agendas and develops a research culture.

**5.4 Ensure that the proper infrastructure and resources for research are available** to faculty, including for example:

- Ensure a best-in-class sponsored research office to support faculty needs, including the implementation of technology for proposal and award management.
- Allocate, renovate and equip sufficient space for research.
- Develop a doctoral program infrastructure to support research activity.

**5.5** Create incentives that encourage faculty to effectively manage and grow their research programs, including for example:

• Allocate discretionary funding to faculty in proportion to indirect costs generated by grants.

- Provide cost-sharing for tuition on research grants and/or incentives for graduating Ph.D. students on time.
- Define a cost-sharing policy that incentivizes large-scale grants and contracts
- Provide seed funding for large, multi-PI research projects.
- Create faculty research awards and recognition events

Taken together, these various steps can help shape a research-intensive environment at universities. Clearly, long-established research universities are in the position to make more significant advances in this area than predominantly teaching universities. However, as a whole, the group of New Jersey universities provides a powerful platform for the sharing of best practices and the coordination of research efforts, and the New Jersey universities that are less research-intensive will be important beneficiaries of these efforts.

One way in which predominantly teaching universities can increase their research presence and productivity is the recruitment of clusters of faculty across New Jersey institutions in emerging fields of research with high potential. The State of New Jersey could provide limited funding to support these research clusters: for example, to help cover the costs of research collaborations among institutions including travel and faculty exchanges and mini-sabbaticals, to set up and maintain common experimental laboratories, and to develop an efficient operation for the administration of these research clusters. One other effective way in which the State could boost the research presence of predominantly teaching institutions is the creation of an undergraduate research program, whereby students from teaching institutions intern at research universities during the summer, anchored by collaborating faculty at both types of institutions.

## 6. Partnerships Between Research-Intensive and Less-Research-Intensive Universities as an Effective Mechanism for Obtaining Funding

**6.1** The state-wide **central research portal** that is proposed in Section 4.1 could have built-in capability by which researchers who are interested in applying for an RFP can indicate that they are willing to collaborate with other institutions to address the research problem. To facilitate the collaboration, the State could provide some incentive funding or view such collaborative proposals more favorably. Unless there are funds tied to the idea, the collaborations will not happen. There could also be an award setup that recognizes outstanding statewide collaboration efforts. Collaborative funding is also discussed in Section 2.

**6.2** A statewide research day would be a suitable mechanism for bringing institutions together and celebrating research successes in the State. This could be the venue where research collaborations and research successes are highlighted and celebrated.

**6.3 Convening meetings of personnel who work in the research office** on different areas such as Compliance, Pre-Awards, Post-Awards, and Purchasing will allow for sharing of best practices and sharing of knowledge. This is discussed in detail in Section 7.

**6.4 Shared services between institutions that are in the same geographical area** could also be a suitable means of fostering partnership between research-intensive and less research-intensive institutions. This could be through shared human subject services, animal research facilities or

even grant services. It could be done on a fee basis so that the institution providing the services is compensated for the efforts.

**6.5 Joint research facilities** are one of the best mechanisms for fostering collaboration. The joint board building between Rutgers Camden, Rowan University and Cooper Hospital would be an example of several institutions being housed under one roof. It is hoped that this would result in enhanced collaboration between the various independent entities who share a common interest in health outcomes of patients.

### 7. Statewide Collaboration in Research Administration Functions

**7.1 Background.** Research administration is highly multidimensional, comprising, among other aspects, technology transfer, research development, corporate and foundation relations, human subjects research, animal research, pre- and post-award administration, research development, communications, and environmental health and safety. Given this inherent topical diversity, and the broad range of research intensity to be found across NJ universities, statewide coordination of research administration within a single umbrella organization is not desirable. Furthermore, the regulatory framework in key areas, such as human and animal research, falls within the province of federal agencies, which supersede state regulations.

Nevertheless, there is considerable scope for collaboration among research administrators and their staff from across all New Jersey universities <u>within each of the above areas</u>. Such collaboration could, ideally, take the form of area-specific annual meetings for sharing best practices, formulating consistent messaging, identifying common challenges, and "deep dives" into agreed-upon topics of common interest.

Possible topics for collaboration in major research administration areas are suggested below.

**7.2 Animal Research**. There are several important questions that would benefit from discussions between research administrators in this area:

- Desirability of establishing a single-IACUC of record for multi-institutional collaborations.
- Strategies for ensuring that animals will continue to be available as research subjects.
- State-level regulatory framework for sunshine laws on animal records.
- Appropriateness of current licensing practices for exotic/endangered species for animal research.
- Feasibility of a state-wide retirement sanctuary for non-human primates.
- Electronic management systems.

**7.3 Human Subjects Research**. Important questions that would benefit from discussions between research administrators in this area include:

- Is there a marketable component of social behavioral research? Are there opportunities for connecting social and behavioral researchers with state policy makers, venture capitalists and innovators?
- What are the effects of the NIH definition of "clinical trial" on reporting research results for social/behavioral research?

### 7.4 Conflict of Interest.

- Effect of concerns about inappropriate foreign influence on COI forms, disclosure practices and requirements.
- Handling of COI requirements for "key personnel" who are not listed as such on grant proposals.

**7.5 Technology Transfer**. In this particular area, networking, sharing of contacts and knowledge is deemed to be particularly valuable. Specific points of perennial interest include:

• Best practices in technology transfer, commercialization, and licensing.

**7.6 Corporate and Foundation Relations.** Regular meetings already take place involving the corporate and foundation teams at Princeton, Rutgers, NJIT and Rowan. The NJIT-Princeton-Rutgers collaboration in this area includes participation in numerous initiatives, including the New Jersey Big Data Alliance, ResearchWithNJ, the biomedical data science initiative, the New Jersey Academic Drug Discovery Consortium and the NIH funded CTSA grant. Informal information sharing also occurs on:

- Company interest areas and interactions
- Introduction and connections to companies and foundations
- Relationship management tools
- Document templates
- Best practices

Extending this dialogue across the larger possible number of New Jersey universities is to be encouraged.

**7.7 Communications.** There is considerable collaborative scope for communicating the impact of research funding on economic development. Princeton and Rutgers are members of <u>IRIS</u>, and it would be beneficial to develop a state-level message in addition to institutional communications.

**7.8 Miscellaneous.** Connecting and sharing <u>practices around drone usage/oversight</u><sup>2</sup>. At present, there is a lack of a strong community. It would be useful to have a conversation around higher education, public and industry usage.

<sup>&</sup>lt;sup>2</sup> https://drones.princeton.edu/

### CREATING PARTNERSHIPS FOR THE INNOVATION ECONOMY: SYNERGISTIC COLLABORATION BETWEEN HIGHER EDUCATION, INDUSTRY, AND STATE GOVERNMENT

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### Introduction:

Collaboration between higher education institutions<sup>1</sup> and industry partners drives innovation, fuels the economy, and employs thousands of graduating students. Such a collaboration is successful and sustainable over a long-period only when supported by state government's commitment to research and development, increasing support for commercialization, and investing in training an innovation-ready workforce.<sup>2</sup> New Jersey colleges and universities "are centers of research and development for new industry clusters, birthplaces for ideas and companies, and talent pipelines for start-ups and corporations."<sup>3</sup> The State's research-focused higher education institutions have increased patents issued by 38% since 2010, and have increased by nearly 50% the amount of space dedicated to innovation and incubator space.<sup>4</sup>

Much of this innovation, however, takes place within the silo of each of the State's research universities which form their own industry partnerships, as well as relationship with the State. What is required then is to develop a set of proposed functions to be performed by existing related entities (such as the newly reinstated Commission on Science, Innovation, and Technology) to increase the synergistic collaboration between higher education institutions, industry, and the state. And, to do so with a complementary emphasis on centralization, coordination, and advocacy.

# Growth through synergistic partnerships between higher education institutions, industry, and the State's government:

There is a valuable and concrete opportunity for growth through synergistic partnerships driven toward the common goal of fueling the State's economy through research innovation and employing the richly diverse and skilled graduating students from all of the State's higher education institutions (i.e., from community colleges to private or public research universities). Synergistic partnerships should target increasing collaborations between:

- the State's research universities; plus,
- the State's many two- and four-year higher education institutions; plus,
- industry partners (e.g., particularly those which have received tax incentives for locating their sites within the State), plus,
- State government for its unique position to offer three-pronged support: (1) holistic data repository for higher education research and collaboration; (2) the sole ability to meaningfully incentivize businesses within the State (e.g., through tax incentives); and (3) supporting critical resource needs (e.g., start-up funds for collaborative work between the State's research universities and its two- and four-year institutions; as well as providing a structure for on-going partnerships).

<sup>&</sup>lt;sup>1</sup> To be understood broadly to include the State's leading research universities, its two- and four-year higher education institutions, whether public or private.

<sup>&</sup>lt;sup>2</sup> NJ HE State Plan, p. 37.

<sup>&</sup>lt;sup>3</sup> NJ HE State Plan, p. 10 (<u>https://www.state.nj.us/highereducation/documents/pdf/StateEducationplan.pdf</u>) <sup>4</sup> *Ibid.* 

Such a collaboration would maintain the individual relationships of each of the State's universities with their industry partners. These synergistic collaborations would add to or be additional to existing collaborations, but would strongly emphasize a holistic state-wide view of higher education to promote innovation and fuel the economy. The goal is not to duplicate roles yet initiate a formal and active <u>Technology Transfer Consortium</u>. This consortium should represent all universities in New Jersey. In addition this consortium should be formally organized and members should include representatives from all research universities, as well as state representatives (e.g. NJ EDA) *and* private sector.

The consortium would act to:

- Simplify access to current IP technology already present at our universities
- Provide easy access to research and collaboration for the private sector
- Provide tech transfer assistance to institutions that do not have a Technology Transfer Office
- Help the state to identify good areas for collaboration/"centers of excellence"
- Help inform state research & innovation funding allocations
- Provide concise feedback from industry sectors (e.g., pharma), funders, & academia to the state
- Identify, celebrate and promote success in commercialization.

It is time for New Jersey to showcase our <u>current</u> inventions, and celebrate and award our <u>current</u> star inventors. The consortium could organize and coordinate events with already existing trade organizations and focus on specific sectors). A yearly award and technology showcase summit could award the best students, faculty, inventors and companies in several categories.

### The supportive role of the State's government:

The State's Higher Education Plan recognizes this need. The Plan calls for the State to "take an active role in fostering connections between higher education and industry to develop partnerships for research commercialization and job and internship opportunities."<sup>5</sup> At the State level, this tripartite partnership is supported through <u>existing</u> state agencies working "to more strategically align higher education and economic development initiatives."<sup>6</sup> Through the work of several higher education institutions and various state actors, there are existing and well situated avenues to build upon:

Three are critical: First, the ChooseNJ and the ResearchwithNJ.com portal serve both an ideal and coordinated outreach effort on behalf of higher education institutions, as well as can provide a target for coordination on such outreach between the various higher education institutions in New Jersey. These portals have laid the foundation for future success and their mission should continue and be supported. The State's role in this can further be developed by continuing the involvement and support of the NJ Economic Development Authority (NJ EDA). The NJ EDA can be a source of information, structuring, and administration for financial support to be expressed through State-supported initiatives (e.g., the NJ Ignite Program which incentivizing

<sup>&</sup>lt;sup>5</sup> Id.

<sup>&</sup>lt;sup>6</sup> Id.

companies "that establish collaborative research partnerships" with higher education institutions). Such State support should also be aligned with the charges of the other working groups. For example, partnerships with women or minority-owned business enterprises should be incentivized.

# Models for synergistic partnerships between higher education institutions, industry, and state governments:

There are several good models for such a synergistic partnership. These models are located in states that are similar to New Jersey in their potential for bridging innovation at higher education institutions with a wide-range of industry. The key dissimilarity, in fact, is that these states began their synergistic collaboration decades earlier than New Jersey, and had steadfast state support. State-supported or state-included models at other states that New Jersey should explore are:

- MassTechCollaborative: <u>https://masstech.org</u>. Tripartite focus on innovation, technology, and health; additional support provided for talent development. (e.g., Fiscal Year 18 Report: <u>https://masstech.org/sites/mtc/files/documents/MassTech/FY18-ImpactReport.pdf</u>. p.2 of highlights mission and ability to act as state actor to promote innovation).
- The Georgia Research Alliance: <u>http://gra.org</u>. Collaboration between business and universities, includes tools such as: talent development, venture fund, and sharing core research facilities between universities. Their mission is best summarized in their own words: "GRA expands research capacity at universities, then seeds and shapes startup companies around inventions and discoveries."
- California iHubs: <u>http://www.business.ca.gov/Programs/Innovation-and-</u> <u>Entrepreneurship/iHub-Regions</u>. Regional alliances between government, industry, and higher education institutions. The CA iHubs were created by state-law but are not housed within state government. Their mission is to "improve[] the state's national and global competitiveness by stimulating partnerships, economic development, and job creation around specific research clusters throughout the state." Coordination and state government support is offered through California's economic development unit, acting in a similar manner as the New Jersey Economic Development Authority.
- California Alliance: <u>https://www.california-alliance.org/about</u>. Partnership between four California universities with the purpose to promote diversity by working "to ensure that underrepresented minority (URM) PhD graduate students and postdoctoral scholars from our alliance institutions aspire to and populate the ranks of the postdoctoral population, the faculty at competitive research and teaching institutions, the federally funded national laboratories, and scientific think tanks."
- NYSTAR: <u>https://esd.ny.gov/doing-business-ny/innovation-development-support</u>. Housed out of New York State's Empire State Development office, NYSTAR offers several programs throughout over 70 funded facilities (located at higher education institutions and industry) to offer "innovation development support resources, including financial incentives, to foster university collaboration, research[,] and innovation." Some key examples of programs that New Jersey should consider exploring: Faculty

Development & Technology Transfer Incentive Program, Matching Grant Leverage Program, and New York Manufacturing Extension Partnership.

### **Resources:**

These resources are grounded in scholarship and provide an excellent background and recommendations for developing policy in support of the recommendations of this working group. The resources cover both domestic as well international synergistic collaborations.

- The Triple Helix, University-Industry-Government Innovation and Entrepreneurship. H. Etzkowitz and C. Zhou. (Routledge, 2017) (<u>https://www.taylorfrancis.com/books/9781315620183</u> (e.g., Chapter 5: "The Optimum Role of Government)).
- Business Higher Education Forum, Creating Purposeful Partnerships (2019), <u>http://www.bhef.com/publications/creating-purposeful-partnerships</u> (e.g., p.11, 20 talking about also how these HE to business partnership bridge students to employees in fields demanded by the market (e.g., University of Maryland, College Park, and Northrop Grumman Corp., developing the nation's first honors program in cybersecurity (a field which employers believed to be the most difficult skill to hire for).
- Special Section on University-Industry Linkages: The Significance of Tacit Knowledge and the Role of Intermediaries. Ed. By F. Kodama, S. Yusuf, and K. Nabeshima. Research Policy (37) 8 (2008). Particularly relevant sections:
  - Building an Innovation Hub: A Case Study of the Transformation of University Roles in Regional Technological and Economic Development. p.1188-1204. J. Youtie and P. Shapira.
  - The Effectiveness of Subsidies Revisited: Accounting for Wage and Employment Effects in Business R&D. p.1403-12. G. Wolff and V. Reinthaler.

# RESEARCH, INNOVATION, AND TALENT

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Highlighting successful practices that expand the number of students, especially women and underrepresented minorities, who participate in research and obtain STEM degrees.

**→** 

Determining effective methods for attracting and supporting diverse faculty and staff.

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### March 25, 2020

### Higher Education Experiential Learning Platform Needs Assessment

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### **Executive Summary**

It is imperative that students are given increased exposure to career pathways and opportunities for experiential learning. Experiential learning is the process of learning through experience. The personal nature of experiential learning engages the students' emotions, as well as enhancing their knowledge and skills. As student engagement increases through these processes, learning accelerates and retention improves.

Career guidance and career pathways need increased public promotion and must be introduced at a younger age, in order for students to explore their potential career options. New Jersey needs to enhance and promote existing, as well as create new internship programs, job training opportunities, research & development opportunities and apprenticeship programs.

To do so, New Jersey must enhance collaboration and partnership efforts between and among Government agencies, employers, industry leaders, nonprofits, and educational institutions (high schools and higher education) to ensure the State is preparing its students for successful careers, as well as retaining the next generation workforce in New Jersey.

Over the past 5 years, numerous efforts have been underway statewide to address the need for experiential learning and the benefits experiential learning can provide to overall career preparedness. Some examples include; Career Pathways Task Force with SETC; Future Ready Schools; New Jersey Department of Labor and Workforce Development's Next Gen Sector Partnerships Academy, 65 by 25; Many Paths, One Future, NJSBA report; Educational Opportunities for the Non-College Bound Learner; NJBIA Post-Secondary Taskforce Report; Junior Achievement of NJ; Workplace and Career Readiness Pathways and Opportunity New Jersey.

In response to the research and significant input from stakeholders through these initiatives and beyond, one thing is clear: *There is a need for a platform upon which the relationships between academia and business can be easily made and connections to opportunities for experiential learning accessed.* 

As we learned through our research, the use of the right technology platform can enable this opportunity with efficiency and expediency. While sample platforms already exist in other states, New Jersey can model its platform after those that are recognized as good performing platforms, while also learning from some of the difficulties they have experienced.

As such, it is recommended that a New Jersey-focused experiential learning (i.e., internships, research and development opportunities, apprenticeships, co-ops, etc.) matchmaking site/platform be created.

### Introduction

The following information will assist in establishing the framework for a New Jersey-focused experimental learning matchmaking site. The site should include the following:

- Toolkits to educate students and employers on how to develop these relationships;
- Postings by employers who have available opportunities;
- An upload area for students to post their resumes and the type of opportunities they are looking for;
- Information sections for educators (faculty, counselors, advisors, administrators, boards) to infuse experiential learning concepts into curriculum; and
- Information for parents, guidance counselors and others who may be assisting students in their career planning.

While the development and funding of this site will take time beyond the work of this committee, the following outline is meant to frame the prototype. Further, NJBIA has been exploring the possibility of lifting such a platform at a regional level and their continued work may be of benefit to a final statewide product. It should be noted that members of the work group are receptive to continuing their collective work in order to be of assistance in moving this much-needed platform forward.

### **Taking Inventory to Develop the Platform**

The following three (3) state solutions were identified and evaluated:

- 1. Cal State Employer Internship Toolkit
- 2. North Carolina Apprenticeship Site
- 3. Texas Employer Pitch Pack

The working group conducted informational interviews with a set of questions to learn about the above three tools. Key takeaways from interviews included:

- Third party vendor(s) should be considered. While the three states interviewed started out somewhat differently, each eventually worked with a third party vendor during the implementation process. NJ should give consideration to working out the process with a professional group experienced in this work;
- Work scope, associated budget and funding source(s) should be clear as early as possible. States received either public funds or foundation monies to pursue their respective efforts. Understanding the potential scope and associated costs may make it easier for the buy-in of stakeholders and provide clarity for funding and development purposes. Similarly, design elements requested from funding sources should be clear and should ensure continued portal support, and;
- User testing by all stakeholders should be considered during the portal build. Challenges for the various user populations (e.g. students, schools, employers, educators) were noted.

Appendix A includes the full results of the interviews. The results of those interviews were then incorporated into the following SWOT analysis in order to inform the workgroup on the key issues of development, funding, content and sustainability.

### **SWOT Analysis**

Strengths	Weaknesses		
<ul> <li>Single interface for multiple stakeholders</li> <li>One location to access talent and opportunities</li> <li>Building more cohesive network within NJ</li> <li>Keeps talent from potentially leaving NJ</li> </ul>	<ul> <li>Ease of system (portal) use</li> <li>Not getting all stakeholders (e.g., employers) engaged early</li> <li>Limited 4-year college involvement</li> <li>Lack of commitment</li> </ul>		
<ul> <li>Opportunities</li> <li>Potential for NJ platform to be recognized nationally (appears to be significant opportunity for improvement)</li> <li>Potential grant funding - Federal, Gates</li> <li>Employer funding</li> <li>Early engagement of multiple stakeholders</li> <li>Identification core development/ implementation team and champions from all sectors</li> </ul>	<ul> <li>Threats</li> <li>Cost of system build and maintenance</li> <li>Getting employers engaged in portal</li> <li>Timely implementation of functional portal/platform</li> <li>Securing a single, long-term owner of the portal/platform</li> </ul>		

### Recommendations

- 1. Identify a small and nimble team(s) to develop tactical plan that will capture the core elements bulleted below.
- 2. Before beginning, further investigation is required to more thoroughly dissect the Cal State, North Carolina and Texas systems/platforms, as well as others (e.g., San Diego State University), including the process by which Federal funding and Gates Foundation funding was obtained and the timeframe in which it was obtained.
- 3. Investigate alternative potential funding sources to the ones above, e.g., contributions from State, academia and industry (employers).
- 4. Conduct thorough RFP process for an appropriate third party vendor.
- 5. Consider whether utilizing student team(s) from NJ Colleges/Universities under the guidance of expert industry advisors would be effective in order to carry out the implementation and/or next generation of one or multiple system activities with the potential for the students to obtain internship credit hours, mentorship/networking, etc.
  - <u>Portal content</u>

- Define required specifications for different site features including specific information on the positions available, tool kits, resources, etc.
  - Survey participating institutions and other stakeholders, i.e. business, for wants, needs and desires for the site
- Identify third party system provider(s) to assist with user-friendly interfaces and functions, along with ease of navigation
- Portal Plan for portal build, implementation and sustainability
  - Identify hosting/ownership of the platform/system
  - Identify the cost associated with the portal and its maintenance
  - Identify funding for the portal (e.g., grants versus employers versus state)
  - Portal implementation
    - Conduct 'Portal Pilot' study to test portal functionality before full implementation statewide
    - Evaluate feasibility/functionality of portal and correct, as needed, before marketing
  - Portal training/technical assistance plan
    - Develop training materials and/or program(s)
    - Deliver training materials and/or program(s)
    - Update training materials and/or program(s) as changes occur
  - Portal marketing plan
    - Develop strategic and tactical plans for promoting the system to all potential stakeholders
      - "Pitch pack", "what's in it for me" (WIIFM) and onboarding
    - Identify champions from state government, academia, private industry, nonprofits, trade associations to assist with outreach and promotion

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Determining effective methods for attracting and supporting diverse faculty and staff.

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March 25, 2020

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### Increasing the number of women and underrepresented minority students graduating with a STEM degree

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### Introduction

In order to fully grasp the different pathways, including onramps, and off-ramps that women and minority students move through in order to pursue a STEM degree, institutions must reflect on the data they collect and try to identify what the root causes are for low-numbers of underrepresented groups at graduation ("Nontraditional Career Preparation: Root Causes and Strategies | National Alliance for Partnerships in Equity" 2009). While there is a vast literature in the disciplines of student development, education, psychology, sociology, and other social sciences that have theorized why students do not persist through the pathway to the STEM degree, there are a number of best practices derived from evaluations and research on successful programs. In the following review, we provide some of the best practices that can be implemented at the institutional level to address issues observed in the data. These interventions are targeted toward the data benchmarking recommended in part one of this report and are organized by the different type of phenomena that can be seen in the data. A number of recent studies have recommended collecting these data in a standard format so that policymakers and higher education professionals can observe the progress being made toward diversity and equity goals (Perspectives: Strengthening The Effectiveness Of Minority-Serving Institutions, 2006; Hurtado et al. 2009).

### Successful Strategy #1: Revise gateway courses

Longitudinal studies of student persistence have identified different cultures and pedagogies in STEM introductory courses when compared to their humanities or social sciences counterparts (Estrada et al. 2016). Frequently, STEM introductory courses are referred to as "gateway courses" or "weed-out" courses intended to narrow the number of students that proceed to higher level courses. The assumption behind this kind of course sequencing is that only students that have been successful in introductory courses can be successful in the major. However, what is often not considered is that women and underrepresented students may not have received the same level of mentoring and prior academic exposure in relation to their more successful peers. These students often have the capacity for success in STEM but may feel discouraged because they feel they are struggling more than their peers.

Many colleges have had success with restructuring their first-year courses to ensure that promising students are placed in courses that are aimed in bringing underprepared and experienced students to the same level. For example, Harvey Mudd College in California increased the number of women declaring a major in Computer Science from 10% to 40% by changing the sequencing and structure of their introductory courses. According to their model, students without prior knowledge in programming were placed into a separate section from students with prior exposure. Researchers found that this helped to overcome issues around belonging that women often face in the computer science classroom and helped alleviate a

classroom environment where students with strong prior knowledge dominated the classroom (Alvarado, Dodds, and Libeskind-Hadas 2012; Corbett and Hill 2015).

Other programs have had success with redesigning the curriculum in introductory courses to provide a more engaging pedagogical experience. Integrating active learning pedagogies and providing more opportunity for discussion-based or peer-led team learning encourages students to engage in critical thinking. Other schools have reformulated laboratory curricula to engage research-based pedagogies that engage students in the discovery process where students engage in many of the same activities and thinking processes as scientists (Weaver, Russell, and Wink 2008). These interventions have found increasing interest in science, understanding the connection between science and everyday life, and seeing lab experiences as representative of real science experiences, and it has also shown a difference in the impact of laboratory experiences on future careers (Russell, Hancock, and McCullough 2007; Lopatto 2004).

### Successful Strategy #2: Provide cohort-based advising

As noted in our discussion of benchmarking and data, it is critical to identify potential STEM students when they first arrive on campus so that they receive appropriate support and advising. It is also critical to identify these students early so possible points of attrition can be identified in the STEM majors. Community colleges like UCC require students to declare a provisional major, making it easier to outline the pathway toward success. Universities and colleges may have a variety of programs that support women and minorities but students need to be connected to them as early as possible. Institutions should utilize a combination of technology and one-on-one meetings to provide guidance to students. Automated messages are used to connect students with important resources at the right time (Kalamkarian, Boynton, and Lopez 2018).

#### Successful Strategy #3: Professional development and support for faculty

In studies of Historically Black Colleges and Universities, researchers have consolidated some best practices that help minority students find success in STEM majors. A great deal of these best practices center around supporting the time and investment needed for faculty to develop lesson plans and student centered pedagogy. Institutions that have been successful in supporting minority students and women in STEM majors communicate to their faculty that teaching and developing pedagogy are a priority and provide ample time for faculty to develop these skills. Therefore, providing adequate resources for faculty to developing innovative and engaging lesson plans can help support women and minorities in STEM fields (Estrada et al. 2016; Gasman, Nguyen, and Commodore 2017).

### Scenario 1: Students declare major but do not persist to graduation

When controlling for academic preparation, underrepresented students are more likely to drop out of STEM majors than their White peers. Many of the strategies provided above can help support URM students persist, but additional programming is needed to support URM students. For example, Spelman College in Atlanta, Georgia whose students are women of color is the top producer of African-American women STEM undergraduates who go on to receive science doctorates since 2008. Spelman uses a freshman summer science program, research experiences, and faculty mentoring to retain students. Spellman found that by "encouraging students to realize their academic potential by embracing their ethnic and gender identity has resulted in more than 22% of graduates obtaining advanced STEM, medical, and allied health degrees" (Jackson and Winfield, 2014, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5008901/).

The Meyerhoff Scholars Program at the University of Maryland also includes a summer bridge program, building networks of peer support, tutoring, and personal advising (Summers and Hrabowski, 2006; Lee and Harmon, 2013). Using these elements the program reduced student isolation and low motivation that may result from unsupportive learning environments. They produced more than 1,000 STEM undergraduates since 1989, 209 of whom have received PhDs, and 70% of whom are from URM groups. These programs all help to retain talented URM students in STEM that might have otherwise declared a different major.

While research on the benefits of industry internships is limited, some research suggests that these experiences complement classroom learning (Thiry, Laursen, and Hunter 2011). Work experiences give students the real-world knowledge about careers and help to clarify future goals. Other research suggests that women and minority students struggle with developing identities as scientists and engineers because they often conflict with their identity as a woman or a minority (Ibarra 1999; Ibarra and Obodaru 2009). Therefore, having positive experiences as a STEM professional can help with managing these conflicting identities. However, the quality of these experiences is of importance. If students are not exposed to quality STEM careers they may lose interest in their major and abandon their career goals.

#### Scenario 2: Few diverse students arrive on campus intending to declare a STEM major

Many studies of K-12 students have found that when controlling for socioeconomic status, women and women of color are more interested in STEM than their male peers (Chen and Soldner 2013). However, many of these young people do not pursue STEM opportunities in higher education. Colleges can encourage underrepresented groups to pursue STEM at their institutions by providing summer programs and outreach opportunities where middle and high school students can engage with college campuses. These programs can also assist underrepresented minority students with personalized academic programs and support, and pre-training to prepare students for success.

Career and Technical Education (CTE) programs, offered at high schools and community colleges, provide credentials needed for STEM careers. Institutions of Higher Education benefit from partnering with STEM CTE programs and helping to develop the pipeline for students

entering STEM degree programs. CTE educational programs provide a career-focused perspective that may appeal to diverse students that prefer a real-world understanding of STEM skills and career pathways. These programs also collaborate with local Workforce Development Boards that ensure students are gaining the skills they need for jobs available locally. Jumping directly into STEM programs at a university or community college may be daunting for students who are interested in STEM content or careers but have never been formally mentored toward this goal. CTE's emphasis on hands-on training and real-world job skills gives students a sense of what the career pathway looks like, which may be more appealing to a diverse group of students who are unaware of the actual options available to them (Miller and Hayward 2006).

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### **Attracting and Supporting Diverse Faculty and Staff**

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The views expressed in this document belong to the Working Group and do not necessarily reflect the official policy of the State of New Jersey. The content provided is intended to serve as a resource to help develop strategies to increase support for students at New Jersey's colleges and is provided in good faith. Due to time constraints, the Working Group notes the information may not be comprehensive and readers should take into account context for how the deliverable is used as well as further research that may be available after publication.

### Introduction

Diversity is an essential component of any organization, whether it be higher education, industry, or government. Its benefits are multifold. When individuals with diverse backgrounds and varying points of view work together, creativity, problem solving, and innovation are significantly enhanced. Diversity enriches engagement and productivity in the working environment. Those in higher education are particularly aware of the importance of diversity because it influences the most critical factor of our mission: student success.

The importance of diversity is reflected in New Jersey's State Higher Education Plan—*Where Opportunity Meets Innovation, A Student-Centered Vision for New Jersey Higher Education*—which was released by Governor Murphy and Secretary of Higher Education of New Jersey, Zakiya Smith Ellis in 2019. The Plan outlines a student Bill of Rights for New Jersey's 78 institutions of higher education. It explicitly articulates the need for students to be educated from a set of faculty whose diversity is reflective of the students they teach. "College leaders across the state must increase their efforts to diversify faculty and staff to ensure these critical teachers are available for student access and support," the Plan states. It also outlines the disparity between New Jersey student and faculty demographics.

Almost all institutions of higher education list diversity as a core value of their mission. Colleges and universities recognize that the goal of preparing students for a global and pluralistic world can only be accomplished in a diverse and inclusive environment. Yet the faculty and staff of New Jersey's institutions have yet to mirror those of its students. Building a diverse community across students, staff, and faculty takes commitment and effort. It can only be accomplished *intentionally*.

Many tools and resources are available to help in this endeavor. The following provides *some* strategies and resources to help accomplish the goal of diversifying faculty and staff. Multiple campuses across the nation are struggling with these issues and most have developed plans unique to their campus. The examples presented here, while meant to be neither representative nor comprehensive, are presented as a toolkit from which institutions might chose to adopt appropriate strategies for their campus.

REPORT

• Where Opportunity Meets Innovation: A Student-Centered Vision for New Jersey Higher Education. State of New Jersey, Office of the Secretary of Higher Education. February 2019

### 1. New Jersey IHE Diversity Profiles

New Jersey is a diverse, ethnically rich state. Notably, it is home to the second largest Jewish (after New York), Muslim (after Michigan), and Cuban (after Florida) populations in the country. Among its richness, New Jersey is home to significant Peruvian, Portuguese, Brazilian American, Hispanic, Arab, African-American, Chinese and Italian American populations. New Jersey's students are equally diverse. Among its half-million college students, 56% identify as a racial or ethnic minority.

How do New Jersey institutions of higher education reflect this diversity? Whereas the student enrollment and, to a lesser degree, staff demographics are becoming accurate reflections of the state, faculty at these same institutions are less diverse than the state demographics and these figures have been more challenging to change.

	State of NJ Demographics	NJ Student Demographics	NJ Staff Demographics	NJ Faculty Demographics
White	55%	44%	54%	63%
Black/ African American	13%	13%	16%	7%
Hispanic or Latinx	20%	19%	11%	5%
Asian	10%	9%	7%	11%
Other	2%	15%	12%	14%
Source	US Census Bureau, American Communities Survey (ACS) 5-year estimates, 2017	IPEDS Fall Enrollment Survey 2008-2017	IPEDS HR Staff Survey 2017	IPEDS HR Staff Survey 2017

Changing the makeup of the professoriate and the staff remains one of the most pressing challenges in higher education. But doing so is critical because it influences the success of our students. When classroom faculty mirror classroom students, better outcomes—student engagement, retention, and completion—result. Change in the makeup of faculty will not occur spontaneously; universities and colleges are designed for incremental, deliberative change. Change will require intentional and continuous effort.

Several tools are available, almost exclusively for faculty diversity. However, while tools specifically for staff diversity are rarely mentioned, the general principles apply. Here we will look at pipelines to increase the diversity pool, recruitment and search practices, and retention practices.

### 1.1. Resources

### DATA

• IPEDS AND CENSUS DATA (complied by OSHE).

### 2. Pipelines Strategies for Diversification of Faculty & Staff

Many institutions of higher education have adopted pipeline strategies to diversify their students, staff, and faculty. Pipelines act as conduits; they seek to funnel individuals into training programs that lead to degrees and careers. In higher education, pipeline programs are often created to enhance these conduits and may intervene at any point in the educational path. Programs might connect students from desired high schools to enroll as undergraduates; they might move post-docs into faculty positions.

Pipeline programs recognize that diversity in any particular discipline exists and seeks to channel that diversity to career outcomes (e.g., STEM careers or the professoriate). Pipeline programs recognize the ways that we, on the other hand, unintentionally filter out this diversity by inappropriate use of selection criteria and the influence of implicit biases. For example, traditional methods of evaluating intellectual potential, such as standardized testing, fail to provide parity to all who are being evaluated.

Looking beyond criteria such as GPAs or GRE scores, pipeline programs recognize potential along multiple dimensions. They value criteria such as grit and determination.

The pipeline analogy is apropos because, like literal pipelines, they may serve as a bridge, they might spring a leak, or they may simply be broken. Pipelines should be appropriately analyzed. For example, the STEM pipeline is leaky. While equal percentages of underrepresented minorities (URM) and non-URM undergraduates declare themselves as STEM majors, disparity exists with career outcomes. While 24% of STEM undergraduates are composed of underrepresented minorities, only 10% of doctoral degree holders have STEM careers (academic or industrial). As a result, pipeline programs are created to 'plug the leaks.' Bridge programs (e.g., to the Doctorate or to the Professoriate) are common. Typically, these programs provide intensive hands-on mentoring, curricular remediation, professional development, and personal coaching (on topics such as imposter syndrome) as required program components for their participants to obtain their goal. However, if these components are not leading to their expected goals, leaders should examine the program for leaks or breaks.

Pipelines do not exist in isolation of other diversity efforts. While other methods are helpful and needed—for example, providing fellowships to diverse graduate students—these methods reach students who have already succeeded overcoming the hurdle of graduate school admission. Pipelines can help bring more students to the admission pool. Pipeline programs not only prepare individuals for the next step, (e.g., graduate school), but the programs keep the long-term goal (e.g., professoriate) front and center.

### 2.1. Resources

### HANDBOOKS & DOCUMENTS

• President's Diversity Pipeline Initiative. 2017 – 2018 Summary Report. University of California

### ARTICLES

- University pipeline programs offer viable approach to faculty recruitment. Kelley Taylor. INSIGHT into Diversity, October 25, 2017
- Building a Diverse pipeline for future faculty. ACM Associated Colleges of the Midwest, November 2018



### EXAMPLE: Fisk Vanderbilt Master's to PhD Bridge Program

The Fisk-Vanderbilt Master's to Ph.D. Bridge Program exists to improve the demographic representation in the Science, Technology, Engineering, and Mathematics (STEM) fields. Students earn a master's degree at Fisk in a STEM field, such as physics, biology or chemistry. Along the way, they receive research experience and dedicated mentoring. They then receive assistance in applying to the PhD program at Vanderbilt, or elsewhere.

Students receive tuition & fees, monthly stipend and mentoring support.

A Tool Kit for Practitioners is available freely to the public on their website:

### http://fisk-vanderbilt-bridge.org

The Bridge program has done extensive consulting with other programs looking to replicate their success including serving as part of the Architect's council that advises the APS Minority Bridge Program.

### 3. Recruitment / Searches

Decades of national, state, and institutional initiatives to promote diversification of faculty and staff at colleges and universities have produced, at best, limited progress. Most institutions have focused on faculty and developed their own approach towards solving this critical problem. These approaches typically rely on a set of standard tools, none of which is more important than the will and effort to create real change. Best practices in recruiting diverse faculty and staff involve the committed effort of participants to ensure a broad outreach to potential applicants, a fair evaluation of the candidates, and accurate presentation of the position and climate for the candidate's assessment.

### 3.1. Forming a diverse search committee

Both the composition of the search committee and its charge will influence the outcome of the search. Best practices encourage these factors to be considered deliberately and early. Ideally, the committee is diverse itself; it should be composed of individuals diverse along gender, ethnic, and disciplinary expertise lines, producing a committee with individuals who can bring unique points of view to the task. The committee should be charged with creating a diverse applicant pool, with employing equitable search practices, and with explicitly identifying outstanding women and underrepresented minority candidates. Diverse candidates should be given the opportunity to impress faculty with face to face (*e.g.*, Skype) interviews, and research has demonstrated that implicit bias is reduced when more than one female or minority candidate is interviewed. The committee should use criteria-based evaluation methods to equitably assess candidates. The committee should come to consensus about the criteria (e.g., five to ten explicitly identified criteria) prior to evaluating applicants. Interview questions should be standardized prior to the search.

### 3.2. Implicit Bias Training

A challenge any university or college faces in attempting to diversify its faculty is that of educating its existing faculty and staff that diversity is an essential component of advancing the institution and that it enhances its academic mission. Recognizing how implicit biases impede the goal of diversification is key to producing equitable search practices.

Implicit bias refers to the attitudes or stereotypes that affect our understanding, actions, and decisions in an unconscious manner. When our implicit biases are recognized, we can make better, more informed decisions. Faculty are often more receptive to these lessons if they come from respected senior colleagues. They could otherwise dismiss or be unreceptive to such training as an unnecessary administrative mandate. Empirical evidence of implicit bias and effective examples of training at other institutions are helpful. Ample examples of practical tips on evaluating letters of recommendation or interviewing applicants are available.

Faculty may assume that the best and brightest will naturally rise to the top, a "we only hire the best" outlook. This strategy inherently neglects that we are not innately equipped to evaluate those different from ourselves. Our default is to use our internal standards as the standard of excellence, not recognizing that our standard may be skewed by our own internal bias, misconceptions, and invalid assumptions.

### 3.3. Crafting the position description

An effective tool that can assist in creating the most diverse pool of applicants is to define the job position in the widest and most inclusive terms possible. The committee should decide by consensus specific requirements of the position; however, overly specific disciplinary requirements in the job ad will be counterproductive to attracting a culturally and academically diverse faculty. Beyond emphasizing a department's strengths in scholarship and teaching, the ad should provide assurance of the institution's and the unit's commitment to diversity and inclusion. A prosaic reliance on an institution's templated equal opportunity statement accomplishes little.

### 3.4. The Campus visit

Ideally, the campus visit demonstrates to the candidate a welcoming climate and provides assurance that the institution and the department provide an inclusive environment where the candidate could thrive. Committee members should be prepared to answer candidate questions about climate and institutional values. Resources for new faculty may be emphasized. As well, an opportunity for candidates to interact with individuals who do not have input in the hiring decision may provide the candidate the freedom to ask sensitive questions, such as work/life balance.

### 3.5. Avoiding Backfire

The committee should remember that candidates wish to be evaluated on the basis on their scholarly and academic credentials. It is not only counterproductive but also ill-mannered to provide a candidate from a traditionally underrepresented group with any references, sublet or overt, that they are being valued over other candidates because of characteristics such as their gender or ethnicity. Candidates are aware of who they are. Committee members should focus comments on scholarship, contribution, and potential.

### 3.6. Resources

### HANDBOOKS & DOCUMENTS

- Best Practices in Recruiting and Retaining Under-represented U.S. Minority Faculty. A Handbook. University of Minnesota.
- Strategies for Successfully Recruiting a Diverse Faculty, Virginia Commonwealth University.
- Handbook for Faculty Searches and Hiring. Advance. University of Michigan
- Faculty Search and Selection Guidelines, Hiring for Inclusive Excellence. New Jersey Institute of Technology. 2016.
- Instilling Equity and Inclusion in Departmental Practices. Guiding Faculty Recruitment and Retention. Educational Advisory Board. 2017.
- Best Practices for Faculty searches. University of Washington. Feb 2016.
- Best Practices: Recruiting & Retaining Faculty and Staff of Color, Western Washington University
- Fixing hiring practices to increase faculty diversity. Closing the gap in diversity between an institution's student body and its faculty. The Hechinger Report. June 2019.

### ARTICLES

- Advice to deans, department heads and search committees for recruiting diverse faculty. *Inside Higher Ed* July 19, 2018
- Inclusive Excellence Toolkit. Jesús Treviño, Thomas Walker, Johanna Leyba. <u>www.du.edu/cme</u> March 2009.

### TOOLKITS

- STEM Diversity and Broadening Participation Resources for Faculty. <u>www.pathwaytoscience.org</u> 2018.
- Diversifying the Faculty: A Guidebook for Search Committees. Checklist of Best Practices. University of Washington.



### EXAMPLE: The University of Michigan Advance Program

The ADVANCE program at the University of Michigan is a central resource that supports the institution's campus-wide efforts to produce a diverse faculty body.

It originated from an NSF ADVANCE grant that was focused on institutional transformation with respect to women faculty in science and engineering fields and has expanded to address necessary institutional changes to support the needs of a diverse faculty in all fields.

The ADVANCE program focusses on four elements relevant to the success of a diverse faculty: recruitment, retention, climate, and leadership development.

Many of the developed strategies are relevant to postdoctoral fellows, students, and staff.

Resources are freely available on their website:

advance.umich.edu

### 4. Retention

It is imperative that after the effort of recruiting faculty from traditionally underrepresented groups to an institution, these individuals are not lost. Retention is an institutional responsibility that requires continuous and vigorous effort. Losing a faculty member to misunderstanding, to an undesirable campus climate, or to unfair evaluation is avoidable. Candidates are recruited to lift the university; not realizing the full potential of that individual's contribution to a preventable reason is a sadly missed opportunity.

### 4.1. Mentoring

Mentoring is important for development of all junior faculty, but no more so than for faculty who face additional hurdles predisposed by their gender or ethnicity. Holistic, salutary mentoring is essential for improving retention rates of women and underrepresented minorities and for reinforcing a respectful, positive work environment. At best, mentoring programs help to provide junior faculty members with direction, purpose, and confidence. These programs serve to integrate new faculty into their new department; the programs provide transparency for their path forward.

All first-year faculty should be provided with a mentor committee. Providing a team of mentors, rather than the traditional senior-junior pairing, better establishes the faculty member with a balanced, informed network. Mentors, which may be junior faculty, senior faculty, and/or administrators, should be selected for their areas of guidance and be provided with defined mentoring roles outlining specific goals. These charges can mitigate reliance on personality fit. Both mentors and the mentee should understand their responsibilities.

### 4.2. Reappointment, tenure, and promotion

The Reappointment, Tenure, and Promotion process must be transparent to both junior faculty and to those who will evaluate them. Universities and colleges typically communicate formal requirements in written departmental or college documents. However, faculty know there are both written and unwritten expectations. Junior faculty may not understand institutional, college, and departmental standards or expectations for tenure, nor should they be expected to.

Junior faculty must then be provided with the opportunities to achieve these expectations. Examples might include seed funding grants, professional development opportunities such as writing, teamwork, or communication skills, or leadership opportunities, such as important university committees. Finally, those who evaluate progress towards tenure should be made aware of their own implicit biases or unrealistic expectations. The university or college as well can attempt to identify its own blind spots by collecting data on the institution's disparities in tenure rates across gender or ethnicity.

### 4.3. Cultural climate

An institution's cultural climate, the space in which all faculty live on a daily basis, cannot be underestimated as a key component of retention. Building an inclusive environment in which all individuals feel accepted, safe, and comfortable is essential to retaining faculty from traditionally underrepresented groups. Climate assessment is a first step that any unit can use to evaluate the "inclusiveness" of their environment. Multiple climate assessment instruments are available (refer to Safe and Inclusive Learning Environment Working Groups Climate Survey's deliverable for more resoruces). Focus groups may also be helpful in identifying strengths and weaknesses. Additionally, campus-wide diversity initiatives, such as cultural competency or implicit bias training not only help towards creating an inclusive environment but, when paired with an institutional diversity statement, documents the institution's commitment to all faculty, staff, and students.

### 4.4. Exit survey

Lastly, if faculty are lost, it is important to assess why. A voluntary exit survey can help to capture valuable information related to climate and diversity services that can help to direct the institution's ongoing efforts.

### 4.5. Resources

HANDBOOKS & DOCUMENTS

- Best Practices in Recruiting and Retaining Under-represented U.S. Minority Faculty. A Handbook. University of Minnesota.
- Best Practices: Recruiting & Retaining Faculty and Staff of Color, Western Washington University
- Guide to Best Practices in Faculty Retention. Columbia University, Office of the Provost. November 2018
- Instilling Equity and Inclusion in Departmental Practices. Guiding Faculty Recruitment and Retention. Educational Advisory Board. 2017

### 5. Other Resources

### 5.1. New Jersey Educational Opportunity Fund

A major component of creating pipelines in the state of New Jersey will capitalize on the New Jersey <u>Educational Opportunity Fund</u> (EOF). EOF provides financial assistance and support services (e.g. counseling, tutoring, and developmental course work) to students from educationally and economically disadvantaged backgrounds who attend participating institutions of higher education in the State of New Jersey.

EOF is a campus-based program. A majority of New Jersey's Colleges and Universities participate in the Fund. Each campus program is responsible for student recruitment, selection, program services, and its own specific criteria for EOF admission and program participation.

### 5.2. Professional organizations for Diversity Officers

**National Association of Diversity Officers in Higher Education (NADOHE).** The NADOHE describes its mission as "the preeminent voice for diversity officers in higher education by supporting our collective efforts to lead our institutions toward the attainment of the following goals:

- Produce and disseminate empirical evidence through research to inform diversity initiatives
- Identify and circulate exemplary practices
- Provide professional development for current and aspiring diversity officers
- Inform and influence national and local policies
- Create and foster networking opportunities"

NADOHE website: <a href="https://www.nadohe.org/">https://www.nadohe.org/</a>

**Liberal Arts Diversity Officers (LADO) consortium**. The Liberal Arts Diversity Officers (LADO) consortium describes its mission as "promotes best practices and innovative strategies in the areas of diversity, equity and inclusion in higher education."

LADO website: <u>http://liberalartsdiversity.org/</u>

