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## 2022 PTIE Conference Abstract

**Title:** A White Paper on Future NJIT Research for the New President of NJIT from the NJIT Faculty Senate Research Committee

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### **Abstract:**

The NJIT Faculty Senate Committee on Research, Scholarship, and Creative Academic Activities (Research Committee) drafted a white paper on recommendations for Future NJIT Research that represents the consensus of the Research Committee. It was approved unanimously by the Faculty Senate and sent to the new president of NJIT. There are three main sections 1) Faculty Governance - where we recommend a) decentralizing both authority and responsibility in support of increased innovation and productivity based on Transparency, Communication, and Equity and b) eliminating the disconnect between the Institute's vision and mission and the P&T process to strengthen interdisciplinary and cross-disciplinary research; 2) Graduate Students & Postdocs – where we recommend increasing the number of PhD students and postdoc researchers, and; 3) Resources – where we recommend enhancing and efficiently utilizing resources for research, including efficient allocation of space, TA lines, support staff, equipment, etc.

## **A White Paper on Future NJIT Research**

by the Committee on Research, Scholarship and Creative Academic Activity of the Faculty Senate and Invited Guests\*

New Jersey Institute of Technology is now firmly recognized as a leading Public Research University in the United States. With the primary goal of enhancing its global reputation and standing, the Committee on Research, Scholarship and Creative Academic Activity (CRSCAA) of the Faculty Senate at NJIT recommends several steps to the new NJIT administration. These recommendations are to prioritize reinvestment of the resources available to NJIT into its research enterprise, which when utilized in a collaborative manner across the departments and colleges, the CRSCAA expects will lead to a significant enhancement to the NJIT reputation and standing as an R1 institution. The Committee's suggestions are grouped into three thematic areas.

### **I. On Governance and NJIT Research**

Shared governance has been a tremendous success at NJIT as the institution has engaged more stakeholders in important issues driving NJIT forward. The CRSCAA would like to build on that success and strengthen the NJIT Research program by suggesting further reforms. The basis of any reforms will remain the requirement for open communication and transparent decision-making so that our joint efforts foster improved equity and outcomes.

To unleash greater productivity, encourage innovation and break down cultural and structural rigidities, the CRSCAA proposes that NJIT move away from a historically central allocation of resources and budgets to a more distributed model, where the deans and chairs have much more control of their budgets and resources including faculty and staff hiring. The additional authority would come with related responsibilities to manage enrollment and revenue which would encourage innovation and break down cultural and structural rigidities. This would mimic the changes seen in corporate settings that led to significant productivity improvements in the 1990s.

- a. CRSCAA recommends that NJIT develop a transparent policy for resource allocation and communicate it clearly to the faculty. This policy would be developed within schools by Deans with input from the departments and faculty and guidance from the Office of the Senior Vice President for Finance. NJIT, college, and departmental strategic plans should inform allocations of scarce resources, such as lab space, TA lines, and other unit allocations.
  - i. CRSCAA believes that incentives matter and proposes to improve the alignment of incentives to help achieve improved research and productivity outcomes. A unified NJIT policy for research, scholarly, and creative academic work that is consistent with faculty reward via merit, and promotion and tenure (P&T), will greatly facilitate this alignment. The CRSCAA hopes that the NJIT administration, faculty, and collective bargaining units will work toward these common goals to advance NJIT's standing.
- b. Interdisciplinary/multidisciplinary research efforts should be promoted and fostered at NJIT, with strong institutional support. While this goal is well articulated within NJIT Strategic Plan, there seems to be a disconnect between the Institute's vision and mission and the P&T process, which is more siloed. CRSCAA recommends revising the NJIT P&T guidelines to harmonize them with NJIT's vision and mission to improve the transparency of the P&T process.
  - i. Strengthening NJIT's interdisciplinary/multidisciplinary research will allow for the clustering of faculty on common themes, possibly within Institutes and Centers, and for the hiring of new faculty to strengthen existing NJIT research (consistent with College and Department Strategic Plans). Acquiring critical mass in key areas will make NJIT competitive in applying for large grants from funders such as DoD, NSF and NIH. Strong

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institution financial and logistical support is essential to get such initiatives off the ground. Best practices to initiate and develop Institutes and Centers should be explored.

- c. CRSCAA recommends the creation of the position of an Ombudsman to address questions/concerns of research faculty. This will strengthen NJIT's ability to address questions relating to equity and fairness and will encourage continuous improvement in NJIT's research policies.

## **II. On Graduate Students/Postdocs and NJIT Research**

Over the past several years NJIT has recruited outstanding new faculty members (around 180 faculty in the last five years) who are generating state-of-the-art research. Graduate students, especially PhD students, and postdocs are the backbone of a productive research enterprise in the US. These PhD students and postdocs contribute to the success of newly hired faculty, the retention and growth of existing faculty, and strengthen overall NJIT research activities. Since not all departments/schools at NJIT grant PhDs, some of the following points would not be applicable to those units. There are two types of graduate students that offer different challenges and opportunities to the NJIT research enterprise: MS and PhD students. NJIT should consider MS students as candidates for PhD admission. Hence, the CRSCAA recommends the following reforms.

- a. It is imperative that NJIT explore ways to increase the number of current PhD students. Doctoral students are essential to modern research in most disciplines: they provide the bulk of preliminary data to apply for external funding and they receive essential training for their future success in their own careers.
  - i. A comparative study based on similar (peer) institutions to NJIT (see Note 1) shows that these institutions produced higher numbers of PhD students than NJIT with similar or even lower research budgets. This demonstrates the need for NJIT to increase the number of PhD students to sustain its quality of research and its R1 status. The number of graduating PhD students at NJIT has recently increased; however, the number of graduates from NJIT PhD programs remains below that of peer and aspirational peer institutions.
  - ii. While accepted based on their prior credentials, the suitability of PhD candidates is primarily assessed by passing their qualifying exams (QE). Until then they have limited research productivity and significantly constrain the financial resources of a grant. NJIT should consider increasing research support in the form of TAs, GA lines, and additional scholarships to a minimum of one line per faculty in each department (see Note 2), and every hire should include a new fully supported line. CRSCAA emphasizes that external RA funding for students before their QE is a poor long-term investment as they may not effectively support the research that successful external funding requires. Furthermore, some agencies explicitly prohibit the use of grant funds for this purpose.
  - iii. To improve the quality of admitted PhD students, competitive academic programs and admission packages are essential. The NJIT TA stipends and benefits are below some of NJIT's peer institutions and R1 institutions nationally (see Note 3). This makes recruiting good students hard, with all the negative consequences for productivity and success that follow. In order to continue to attract top quality students, departments need to consistently offer rigorous and high quality doctoral level courses even at the risk of low enrollment.
- b. A policy to encourage an increase in the RA/TA ratio across NJIT's PhD programs is necessary. This will require substantial initial investment (such as described in II.a) when compared with NJIT's peer and aspirational peer institutions. A significant number of NJIT's research-active faculty are new hires. It takes time before they are able to obtain sufficient funds to continually support RAs. Also, it is important to recognize that the RA/TA ratio is

*significantly* different across disciplines at the national level, and that NJIT should expect a low RA/TA ratio initially. CRSCAA believes that initial investments in TA lines will lead to externally funded RA lines in the future.

- i. To encourage faculty to support doctoral RA lines, consider a TA match in lieu of the current policy of course release for fully funded RAs.
  - ii. MS students do not contribute substantially to research, but they are a very promising pool of candidates for NJIT's PhD programs. Importantly, they can rapidly be moved into RA lines and thus improve the RA/TA ratio.
- c. Post-doctoral scholars are integral contributors to research productivity at R1 institutions. NJIT should support departmental post-doctoral scholar positions fully funded by NJIT on the lines of NJIT's peers (see RPI, GA Tech, for example). Post-doctoral scholars are efficient scientists with wider capabilities than graduate students; they can also mentor graduate students directly, leaving the PIs space and time for grant writing. NJIT currently charges 52.5% in fringe benefits and the same in overhead for a post-doctoral scholar. Therefore, it requires over \$150K in grant funding for one post-doctoral scholar per year. This makes the cost of hiring post-doctoral scholars prohibitive, and it would be beneficial to lower the fringe benefit cost for the post-doctoral scholars.

### **III. On Physical Resources, Support Staff and NJIT research**

NJIT has made substantial investments in new construction, renovation of existing laboratories, and equipment to support research activities. However, the CRSCAA identified several areas needing improvement.

- a. Existing laboratory space use must be evaluated on a regular basis at the Departmental/College level to provide input to Deans, Chairs, and Administrators on how space can be better utilized for research.
- b. As an urban campus with limited opportunities for expanding the campus footprint, NJIT should explore the use of nearby off-campus locations that can accommodate NJIT's expanding research activities. Other R1 institutions (see Note 4) have off-campus locations for research activities.
- c. New equipment is often purchased when a new faculty member is hired or when the institution receives research instrumentation grants. In order to extend the useful life of such equipment and enhance the productivity of NJIT researchers, NJIT should explore financial models that can provide institutional support for researchers to service, maintain, and upgrade equipment.
- d. Increase hiring of support staff for research as needed. This could include lab technicians, equipment specialists, and other researchers (who may also provide teaching support).
- e. Where practical, and with the permission of the purchaser, locate new major equipment acquired to NJIT common locations such as at York Center, Microelectronic Center, MakerSpace, Lochness, etc., with guaranteed use for those who purchased the equipment, and per fee use for others.
- f. Centrally located equipment should have extended warranty and service contracts, as well as appropriate training of new users and staff, to avoid their early demise. Funds need to be allocated to replace obsolete equipment.

## Resources and Backup

- The Advantages of a Decentralized Organizational Structure, <https://smallbusiness.chron.com/advantages-decentralized-organizational-structure-603.html>
- How to build a Decentralized Organization, <https://www.indeed.com/career-advice/career-development/how-to-build-decentralized-organization>
- Allocative Efficiency, <https://www.sciencedirect.com/topics/economics-econometrics-and-finance/allocative-efficiency>
- Efficient Allocation of Resources (Koopmans – Nobel Prize Winner), <https://www.jstor.org/stable/1907467>
- Innovation, Entrepreneurship, Promotion and Tenure (Science), <https://www.science.org/stoken/author-tokens/ST-31/full>
- What is Interdisciplinary Research (NSF), [https://www.nsf.gov/od/oia/additional\\_resources/interdisciplinary\\_research/definition.jsp](https://www.nsf.gov/od/oia/additional_resources/interdisciplinary_research/definition.jsp) and [https://www.nsf.gov/od/oia/additional\\_resources/interdisciplinary\\_research/](https://www.nsf.gov/od/oia/additional_resources/interdisciplinary_research/)
- Why Interdisciplinary Research Matters (Nature), <https://www.nature.com/articles/525305a>

## Notes

1. Study of research budgets and PhD graduation. In 2021 the Georgia Institute of Technology, Rensselaer Polytechnic Institute, Stevens Institute of Technology, The University of Texas at Arlington, and Virginia Polytechnic Institute and State University produced an average of 265 PhDs per year as compared to 54 for NJIT. Specifically, with \$150M in annual research expenditure, NJIT produced 54 students, while Stevens Institute of Technology generated the same number of PhDs with an annual research expenditure of \$50M. Georgia Tech, with external research funding of \$140.5M graduated 527 PhDs.
2. NJIT has hired 180 new faculty members over the last 5 years at a cost over \$750K to \$1.5M per faculty in startup and laboratory renovation costs. This is nearly 40-50% of NJIT's current faculty and an even higher percentage of research active faculty. The number of doctoral students including the teaching assistantship lines have not increased proportionally over the same period. This has put tremendous pressure on research active faculty to sustain their research as they are unable to recruit doctoral students for their research. This has affected both existing faculty as well as new hires.
3. NJIT's TA stipends are \$25,500 for the academic year and \$28,500 when summer support is included. As a geographically similar public R1 institution, Rutgers University TA stipends are [published](#) at \$30,162 for academic year appointments and \$33,999 for calendar year appointments.
4. As an example, the University of Texas at Austin is an urban campus with [research sites](#) located across the city and state.