Advancing Women at NJIT through Collaborative Research Networks  
New Jersey Institute of Technology ADVANCE Program (Award # 0547427)  
ACCOMPLISHMENT-BASED RENEWAL PROPOSAL

Intellectual Merit: “To know who we are, we must understand how we are connected,” write Christakis and Fowler in their 2009 book on the power of social networks. This observation is true of organizations as well as individuals. Universities and corporations are not merely buildings and balance sheets; they are “relational entities”—webs of interaction and perception whose complex structure is largely invisible to the people embedded in them (O’Reilly 1991). Organizational networks are “transformational engines” (Ibarra 2005). They supply the social capital that powers career success, allowing young professionals to convert their human capital into status. Network structure drives institutional change as well, facilitating (or retarding) innovation—maintaining (or altering) norms, including norms of gender and race. Understanding network dynamics is especially important for women in technological organizations, who can easily spend their entire careers on the periphery, far from the flow of information at the core.

In 2006, NJIT ADVANCE began a project designed to acquire a deeper understanding of STEM research networks and to use that knowledge to create positional advantages for NJIT women faculty, diminishing their potential isolation and increasing their information access. In this proposal we highlight our accomplishments, in particular 1) our construction of an interactive database containing over 7200 NJIT faculty publications; and 2) our success in using statistical modeling and visual mapping of this data to analyze gender patterns in network centrality, establishing correlations between collaboration, network structure, productivity, retention, and career advancement. Our innovative research demonstrates that social network analysis can be used effectively to measure the impact of isolation on women’s careers. The statistically significant correlation we have established between increase in network centrality and female faculty retention means that we have now the ability to picture career landscapes in meaningful ways—and the ability to predict, in real time, who will advance in academia and who is in danger of dropping out.

In the years four and five of our project, we propose to use this knowledge to create additional leverage for change, at NJIT and at ADVANCE institutions across the country. In particular, we propose to develop, deploy, and assess two career advancement tools, as part of a new approach to faculty mentoring: 1) a Research Partner Finding Tool that will make it easier for women faculty to identify potential interdisciplinary collaborators; and 2) a Faculty Research Network Mapping Tool that will allow individuals and departments to take meaningful snapshots of professional networks as they develop over time. This approach will help to increase institutional transparency, making visible the hidden connections (or lack thereof) that describe far better than aggregate data do the shape of the cultural space in which women faculty live out their careers. We believe that our network mapping tool will be especially effective in creating leverage for change a) by giving junior faculty access to the kind of aerial view of the organizational landscape normally available only to strategically positioned “boundary spanners”—a kind of GPS System for Career Management; b) by giving administrators a more effective means of identifying problematic characteristics of the units they manage; and c) by bringing added value to the task of program assessment, allowing us to track changes in organizational structure over time.

Broader Impacts: The work we propose to accomplishment in years four and five of our project will provide new knowledge, tools, and strategies that universities across the country can use to support best practices in mentoring. The ability to visualize individual networks in dynamic organizational context has the potential to transform the ways in which women STEM faculty assess and manage their careers. It has the ability to transform programmatic assessment as well. As we have begun to demonstrate, bibliometric data—more and more easily accessible on a national/global scale—is a valid proxy for real-world faculty networks. Drawing on such bibliometric data, in the future NSF ADVANCE and the local programs it supports will be able to use social network analysis to track changes in organizational “health,” to identify emerging leaders or isolated backwaters, or to compare the relative advancement of men and women. In combination with metrics such as the NSF 12, the ability to map changes in faculty networks over time provides a powerful holistic method of “seeing” institutional transformation as it unfolds.