

## **Diversity and Inclusion and Research Partnership Development: Can Seed Investments Really Help Promote Trans-Institutional Collaborations?**

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### **Abstract**

A major research institute within a large land-grant university seeks to foster collaborations between research faculty at the land-grant institution and faculty and students at Historically Black Colleges and Universities (HBCUs) and Minority Serving Institutions (MSIs). Not only is the intent to help initiate and foster these research collaborations, but to advise HBCUs/MSIs students of the myriad of opportunities available to them to include experiential learning opportunities, undergraduate and graduate laboratory access, summer research programs, available scholarships and exposure to the graduate programs offered. The research institute initiated a Diversity and Inclusion Seed Investment funding program. Starting in fiscal year 2017, \$203,480 was invested in 20 faculty to assist them with establishing and solidifying HBCU-MSI partnerships. Feedback has been continually collected to improve the program, now in its third year. In this paper, we first describe the original intent of the funding opportunity, how the opportunity has changed since its inception and how impactful this investment model has been. Preliminary findings will be presented, major criteria for funding will be explained, and outcome measures will be explored to assess the effectiveness of the program. Lastly, we present our plan for a more comprehensive assessment strategy, which moves beyond quantitative measures to investigate participants' experiences of inclusion.

### **1. Introduction**

Research centers and institutes within higher education institutions have grown with the decline in public funding and emerging new research priorities. Although these organizational entities vary significantly in terms of resources, structure, and mission, they usually provide some level of support for different research activities, in which collaboration is encouraged, internally or externally. Boardman and Corley [1] refer to research collaborations as one thing that research centers have in common. Seed grant programs are one of the strategies that research centers may maintain to provide faculty with funding opportunities to encourage research activities [2]. The Institute for Critical Technology and Applied Science (ICTAS) at Virginia Polytechnic Institute and State University (Virginia Tech) is one such center that offers seed funding.

ICTAS is one of the major research institutes at Virginia Tech, which was established in 2006 to support faculty and research groups in addressing high-impact and interdisciplinary research. Applying a spiral growth model, the institute started with a concept to provide limited funding to research teams that has led to several research centers today. In addition to several funding opportunities for the research groups and faculty, ICTAS provides an interdisciplinary graduate education ICTAS Doctoral Scholars Program that supports qualified incoming PhD students [3], [4].

A unique seed funding program, the ICTAS Diversity and Inclusion Seed Investment (D&I Investment), has been deployed at ICTAS since 2016. The program is one of the major ICTAS programs to build direct faculty-to-faculty research partnerships between faculty at Virginia Tech and faculty at Historically Black Colleges and Universities (HBCUs) and other minority-serving institutions (MSIs). Funds are awarded based on a peer review conducted by faculty with a vested interest in growing HBCU/MSI research partnerships at Virginia Tech, and the typical success rate is approximately 60%. Funds may be used for shared lab equipment and space, shared technologies, or traveling to present and further develop partnerships. In order to identify the programmatic impacts, the awardees are asked to submit a report at the end of the year and list various collaborative activities between Virginia Tech faculty and HBCUs/MSIs collaborators including grant proposals and publications applied for and received and total number of students funded.

There are several studies reporting the different collaborative activities and programs partnering with HBCUs/MSIs. These initiatives have aimed for different goals, such as enhancing undergraduate education to addressing underrepresentation of students in graduate programs and in particular STEM disciplines [5]-[7], and encouraging research collaboration [7]-[10]. Although the ICTAS initiative in fostering partnerships between Virginia Tech and HBCUs/MSIs may lead to different teaching collaborations and influence the enrollment of undergraduate students, our major focus of this paper is on research collaborations, as an overarching goal of the ICTAS D&I Investment. It should be noted that the terms partnership and collaboration are often used interchangeably. In this paper, we concentrate on the term collaboration, mainly because the predominance of “research collaboration” term in literature.

Our study is concerned with the evaluation of the D&I Investment and to explore potential avenues to develop research-based strategies for a more comprehensive assessment plan. In this paper, we first describe the development of the D&I funding program and the preliminary measures of success based on faculty self-reported data. Then, we review the concept of research collaboration, its measures, and what potential issues may arise in working relationships, informed by the literature. Finally, we will present our plan for a more comprehensive assessment strategy.

## **2. ICTAS D&I Investment: background and impact**

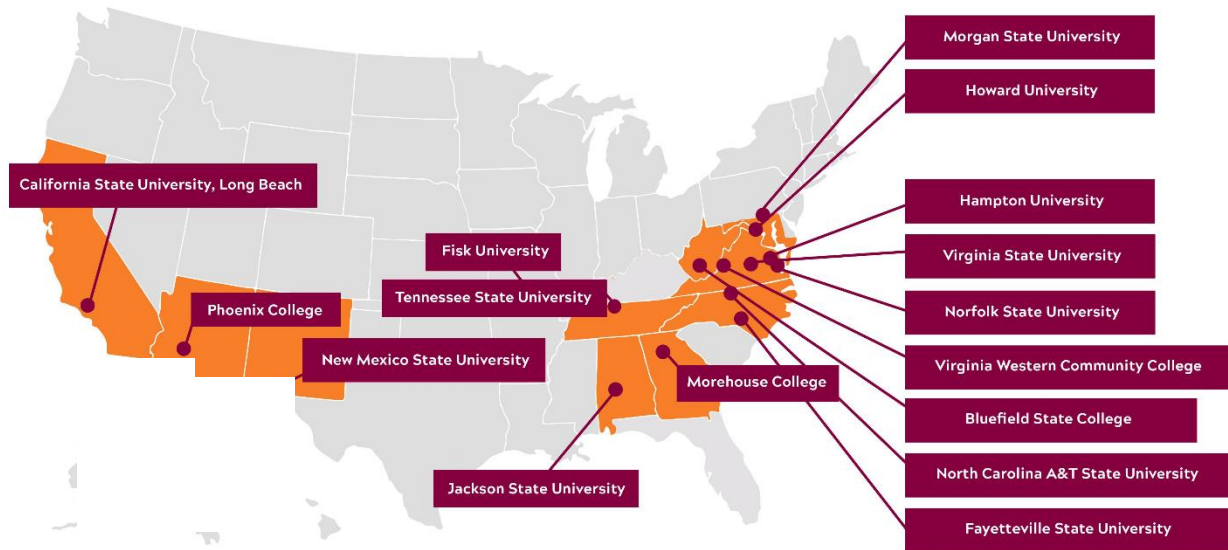
The concept of the D&I Investment was originally conceived by the Director of ICTAS and the Diversity and Inclusion Coordinator (2<sup>nd</sup> author on this paper). The motivation was to help Virginia Tech faculty in a small way to either begin, build, or continue their current relationships with the HBCUs/MSIs faculty. The intent was to help the faculty by providing resources for travel, joint publications, reciprocal visits to teach and guest lecture, and provide access to the Virginia Tech facilities to the HBCUs/MSIs faculty as well as exposing students to increased research and education opportunities at both institutions. The Director of ICTAS and the ICTAS

Diversity and Inclusion Coordinator believe it is important to shape a funding program to help faculty engage their counterparts in order to facilitate their collaborations and research relationships.

When asked to identify existing barriers to being able to collaborate with HBCUs/MSIs, Virginia Tech faculty identified the biggest factors as lack of funding to travel to collaborator's labs for experiments and lectures as well as a lack of resources to engage Virginia Tech and HBCUs/MSIs students in their research projects. In year 1 (2016-17), with an overall budget of \$203,480, 20 investments were awarded to 20 different Virginia Tech faculty to help their collaborative efforts with HBCUs/MSIs partners. Fourteen different HBCUs/MSIs were engaged through this seed investment effort on research projects ranging from additive manufacturing techniques of metallic parts to indoor radon levels in local homes.

Year 2 (2017-18) of this seed program came with a few changes as a result of faculty feedback. The number of awards decreased from 20 to 15. In an effort to make this funding program richer and to increase awareness of this funding to not only Virginia Tech faculty, but their HBCU-MSI partner institutions, the funding was awarded in two rounds. Round 1 would fund 10 proposals for research collaborations with a \$100,000 total budget (\$10,000 per proposal). Round 2 would fund 5 proposals with the recommendation that both the Virginia Tech faculty and their HBCU-MSI research collaborators to attend and present posters that current year's HBCU/MSI Research Summit. The HBCU/MSI Research Summit is a collaborative effort between Virginia Tech and HBCUs/MSIs organized by the Virginia Tech Graduate School that offers an opportunity for faculty and students to engage in discussion to initiate and plan research partnerships, summer research opportunities, and other teaching and research collaborations. In addition, students invited from various HBCUs/MSIs explore different graduate programs at Virginia Tech [11]. Five posters were presented at the October 2018 Summit which was attended by over 200 students and faculty from HBCUs/MSIs.

Ten different HBCUs/MSIs were engaged in the second year, including two new partnerships with Fayetteville State University and Jackson State University. ICTAS is currently in its third year of the D&I Investment. Figure 1 presents the HBCUs/MSIs engaged in the program in the last two years. The program has the same award structure this current fiscal year as last year. One difference to the funding model this year is faculty are informed outright that if they accept the funding, they are expected to participate in the HBCU/MSI Research Summit poster session in October 2019.



**Figure 1. D&I Investment Partners**

## 2.1 Preliminary measures of success

In order to capture the impact of the D&I Investment to date, we reviewed the self-reported data received from Virginia Tech faculty in last two years (2016-2018). It is worth noting that the faculty who received award represents 4 different colleges at Virginia Tech; and four faculty who were awarded funding in year 2 were multi-year awardees. Table 1 presents the list of the departments faculty are affiliated with and the number of awards received within the last two years.

### Year 1

In the first year, 31 students, including 10 students from HBCUs/MSIs, were directly supported and involved in the program. The major activities students were engaged in included research experience, class and conference presentation, and field trips. One significant outcome of this collaboration was enrolling three students from collaborating HBCUs in graduate programs at Virginia Tech. As a result of the initial ICTAS investment of \$203,480, 5 of the 20 faculty at Virginia Tech were able to secure over \$1.8M in funding.

### Year 2

In the second year, 37 students, including 17 students from HBCUs/MSIs were supported. As a result of the collaborations made in the second year, 6 proposals, over \$5.5 M, have been submitted to funding agencies. As of spring 2019, it is still early to tell how beneficial the year 2 funding has been in terms of Return on Investment (ROI) identification, as the decisions for most of the proposals have not been made.

**Table 1.** Virginia Tech departments involved with the D&I Investment

<b>Department (College)</b>	<b>Number of Awards</b>
Aerospace and Ocean Engineering (COE)	1
Biochemistry (COS)	1
Biological Systems Engineering (CALs)	2
Biomedical Engineering and Mechanics (COE)	4
Center for Enhancement of Engineering Diversity (COE)	1
Chemistry (COS)	1
Chemical Engineering (COE)	3
Civil and Environmental Engineering (COE)	4
Electrical and Computer Engineering (COE)	1
Engineering Education (COE)	2
Food Science and Technology (CALs)	1
ICTAS	1
Industrial and Systems Engineering (COE)	1
Macromolecules Innovation Institute	2
Materials Science and Engineering (COE)	1
Mathematics (COS)	1
Mechanical Engineering (COE)	3
Physics (COS)	2
Population Health Sciences (CVM)	2
Statistics (COS)	1

CALs: College of Agriculture and Life Sciences, COE: College of Engineering,  
COS: College of Science, CVM: College of Veterinary Medicine

### **3. Research collaborations**

In one of the highly cited works on research collaboration, Katz and Martin [12] question the implicit assumption of taking the meaning of research collaboration as granted and emphasize its conceptual ambiguity. They propose some criteria to distinguish who collaborators are in terms of researchers' contribution, authorship, and responsibility for different steps or elements of the research. Nevertheless, the term "research collaboration" is often operationalized and perceived using co-authorship [12], [13]. To measure collaboration, the researcher would need to analyze co-authorship of published papers. Katz and Martin [12] argue that there is a difference between collaboration and co-authorship; and co-authorship is not beyond a partial indicator of collaboration. So then the question is how can we assess collaboration? In other words: what evidences should be examined?

If collaboration is seen as social processes with the objective of producing knowledge, co-authorship is one of the many possible outcomes, such as technology development and patenting [14]. Several studies moved beyond co-authorship and used the concept of scientific and technical human capital (S&T human capital) [15] as a model to study research collaboration [1], [16], [17]. S&T human capital is defined as the sum of individual's knowledge, skills, resources, and her professional linkages and networks [15]. With such a model, the concept of collaboration may go beyond the state of individual partnership and include the entire research team or even

the research field. However, even these approaches are not often concerned with the quality of collaboration and relationships between individuals.

Indeed the nature of collaboration cannot be explored unless we go beyond the quantitative measures of collaboration to examine the process in addition to outcome. Kraut, et al. [18] emphasize the importance of communication and personal relationships in research collaboration; "...establishment and maintenance of personal relationship is the glue that holds together the pieces of a collaborative research effort" [18, p. 53]. The importance of interaction, relationship, and building trust in partnership and collaboration have been reported both at institutional [19], [20] and individual levels [21]. This is even more important if we consider collaboration between individuals from different institutions, which might have different missions and cultures. Duffield, et al. [19] argue that higher education institutions, in general, are not designed and structured to collaborate with one another due to differences in their identities and missions. In connection with the context of our study, the difference of teaching and research priorities, reward structure, and more importantly the historical background of race and privilege, deficit models of relationships between minority-majority institutions need to be rejected [22].

#### **4. Revisiting the objectives: towards a more comprehensive assessment strategy**

In order to improve upon our current assessment plan, we decided to develop a more comprehensive assessment strategy, which intended to lead to a PhD dissertation. First, we plan to collect data on proposals and publications more systematically to examine whether the researchers have decided to write their work jointly or separately. Second, in connection with the overarching goal of the D&I Investment, there is an expectation to develop a robust partnership. There is ambiguity in the term "robust partnership", in that it can be defined in terms of the outcomes, duration, quality or combination of them for a particular collaboration. Taking into account the importance of quality of collaboration and in particular the relationships between individuals, we have decided to incorporate qualitative methodology into the evaluation process. To explore individuals' experiences with research collaboration, we apply a case study method. A case study is exploration of a bounded system or systems (cases) in specific time and place [23]. Yin [24] described case study as a preferred method for in-depth description of a social phenomenon which is used for "how" and "why" questions for understanding a phenomenon. Our intent is looking at individuals' experiences with inclusion in collaboration, compare and contrast across collaborative pairs, and explore factors that might explain a connection between relationship and research collaborations. Individual interviews with research collaborative pairs will be conducted. We plan to use Martin Buber's "I-Thou" relational philosophy [25] as one possible lens to interpret the findings of this study. Through the I-Thou framework we seek to observe indicators consistent with Buber's hypothesis that as people seek to foster relations of mutual regard they do so by opening their imagination and understanding to another person as more complex than empirical and observable features (i.e., physical features such as skin color, height, linguistic dialect, cultural markers, etc.). Buber's approach is particularly useful due to

the “both/and” approach in which individuals build relations by considering *both* the external observable features *and* the imagined complexities of another person, versus one or the other. This blend of observational and imaginal considerations, Buber contends, forms the basis for individuals to humanize themselves while treating others as substantially complex.

## **5. Summary**

In this paper, we discussed the D&I Investment Program developed at ICTAS, Virginia Tech. We believe that research and education are enhanced in richness and perspective when there is a diversity of thought, so the program is intended to help Virginia Tech faculty to increase collaborations with their HBCUs/MSIs collaborators. The investment program has changed each year as lessons are learned and feedback is received from participants. Changes include incorporating outcomes of these research partnerships into the larger HBCU/MSI Research Summit held at Virginia Tech every fall (poster session participation), exposing HBCUs/MSIs students to the opportunities for research, REU programs at Virginia Tech and assisting faculty with administrative and logistic assistance to bring their research partners to Virginia Tech during the HBCU/MSI Research Summit for further discussions on collaborative opportunities. We presented some preliminary data describing the impact of the program. Informed by the literature on the conception and measures of research collaboration and taking into account the importance of relationships, we have decided to develop a more comprehensive assessment strategy in which we can explore the researchers’ experiences with collaboration. We expect this continuing project to shed light on the factors that affect quality of collaboration.

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