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Mending the Gap: An Intentional Focus on Integrating Underrepresented Minority and Deaf/Hard-of-Hearing Students into the Research Culture (Experience)

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Mending the Gap: An Intentional Focus on Integrating Underrepresented Minority and Deaf/Hard-of-Hearing Students into the Research Culture (Experience)

Getting URM and D/HH students to engage in research activities

On the surface it might seem easy to get Underrepresented Minority (URM) and Deaf/Hard-of-Hearing (D/HH) students to want to engage in research projects, but the challenge can often be more daunting than one would expect. External forces play a significant role in the recruitment and engagement of these students. To assume that individuals from these two populations will naturally take up involvement in research is largely a false assumption. Students from URM and D/HH backgrounds can arrive to college feeling different and insecure because of preconceived notions about their capabilities, and conscious and unconscious biases continue to plague these groups, potentially compounding their concerns. They can require time to integrate into the cultural environment that is often significantly different from what they left at home. This can be daunting because college starts on a fast pace. The "sink or swim" mindset can be immediately felt by URM and D/HH students— meaning many of them do not want to extend themselves too far outside of their comfort zone. Therefore, an additional challenge can exist to increase the confidence of students from these groups such that they do not shy away from unique and beneficial opportunities like research.

Successfully engaging URM and D/HH students in research opportunities is critical for the development of core skills needed to pursue advanced scientific opportunities (both in pursuing advanced degrees and obtaining quality work experiences). For example, many graduate programs seek undergraduate students who have some research experience in order for admission to their programs. Lacking the core research skills places these individuals at a significant disadvantage when compared to non-URM and non-D/HH individuals [1]. Therefore, strategies must be implemented in order to offset the imbalance URM and D/HH students face during their college careers.

There is a gap in the attainment of baccalaureate and advanced degrees by individuals from underrepresented groups [2-3]. As it relates to D/HH individuals, the percentage of those within the D/HH population who obtain a graduate degree is less than half that compared to the overall rate within the hearing population [4]. And it is believed that these numbers are even further negatively skewed within the STEM fields. Studies have shown that students from underrepresented groups can show greater gains from the undergraduate research experience than their peers [5]. This can lead to the students making better decisions related to their careers and graduate school. Though we currently have a relatively small sample size, we are proud of the number of URM and D/HH students that we have served and their post-research experience successes.

Paramount among the strategies used for mending the stated gaps is the need to focus on mentoring, with a specific emphasis on increased awareness of opportunities that extend beyond the classroom. We have a unique campus on which we have a number of URM and D/HH students engaged in research across all disciplines. Here, we share some of our observations and strategies that we use at Rochester Institute of Technology (RIT) and the National Technical Institute for the Deaf (NTID) (Rochester, NY) for recruiting students into research and making sure that the experiences are fruitful and beneficial to the students.

Capturing the imagination and creativity of URM and D/HH students

The first step towards integrating URM and D/HH students into the research environment starts with the Principal Investigator (PI)/mentor understanding himself/herself. Yes, this engagement starts by understanding who we are as individuals in order to find a point to start a mutual professional relationship with the students. Beginning a research relationship with a full-on blitz of research knowledge rarely accomplishes this task because these students need to develop a level of trust with their research mentor/advisor. This means that they often want to know that you are interested in understanding who they are as people. We have often said that it is important to convince (not just attempt to convince, but *actually convince*) students that faculty care about them and their academic and future successes. While this may sound cliché, it is actually more non-obvious because we, as scientist, are often fully engrossed with the research and our expectations tend to not be aligned fully with students who have little to no experience doing research. Many URM and D/HH students come from backgrounds where access to adequate science laboratories may not have existed. We see that many of the public schools in low income communities cannot afford to provide the level of training in science that other more affluent communities are able to provide to their schools. Likewise, there can be a shortage of instructors of D/HH students who are experts in scientific/engineering disciplines.

So, how can we capture the imagination and creativity of URM and D/HH students such they get excited about wanting to do research? The first thing we need to is slow down and look at the big picture. Why is your research exciting? Why should anyone be excited about the work? These are questions that we are professionally accustomed to asking ourselves when developing proposals or engaging in conversations with potential funding agencies. Turn those questions back on themselves and re-frame them from the students' perspective. What can a URM or D/HH student bring to the research that will (i) make them feel a part of the project, and (ii) allow them to open up their imagination to drive the project in a direction you least expect? No one said there was one right or formulaic way to approach a research question. Empowering URM and D/HH students to use creativity and imagination when getting to know them will start the process of establishing a bond of trust. Further, we have often said that great things happen in a research group when thinkers from diverse backgrounds brainstorm ideas and strategies. Students need to be convinced that they are a valued member of the research team and understand that they are not going to be taken advantage of just to get data/results. Students

from underrepresented groups can be very sensitive to this fact due to upbringing and current social trends. As such, a PI must use care in the initial interactions to ensure URM and D/HH students do not immediately close you off because they do not sense a trust that can be established.

The second, and probably the most important, thing we must do is grow the relationship between us and URM and D/HH students. A one-off interaction can mean very little to this population of student because of the perception that they can have of being less than others. If they give you their trust, grow it. Start the process of coaching these individuals and establishing a mentoring relationship that extends far beyond their graduation. This takes time and patience on the PI's part. While we have a lot happening on a daily basis, we must find the time to grow these critical relationships to ensure this particular demographic remains engaged in the scientific research. Students who are underrepresented see everything we do— and they form an opinion based on our actions day in and day out. Building a solid connection with even just one of these students can open the door to a world that contains ideas that can move the research forward such that it is rewarding for both the student and the PI. In other words, the relationship must always be held as a reciprocal working relationship.

Figure 1: Former RIT Chemical Engineering student Garry Clarke working in a research laboratory. Garry is currently working in industry.

<u>Integrating URM and D/HH students in research: What has worked?</u>

We have found that it is important to get to know the students and strategically coach and mentor the students while teaching them, in a stepwise manner, how research works. As previously mentioned, this requires care and patience. Students have different learning styles, and the fact that some students may not get the idea immediately should not be viewed as a negative. In some respects, any student who might learn at a slower pace may be able to pick up on things others did not notice. Designing projects that have achievable checkpoints helps students progress through the research and helps to prevent them from getting frustrated or lost in the project, or withdrawing from the activity altogether. Effective communication between the PI and student leads to a more positive, inclusive environment that translates into a more rewarding experience.

Helping URM and D/HH students see the value of the research experience also involves proactive involvement in dissemination of their research. For example, at RIT/NTID, we have an annual symposium where undergraduate students from across campus can present their

Figure 2: Deaf/Hard-of-Hearing research student, Amie Sankoh, at a professional conference where she presented the results of her research completed at RIT/NTID. Ms. Sankoh has since entered a Ph.D. program in Biochemistry, Cellular and Molecular Biology.

research to faculty, staff, and students at all levels. Formats include both oral and poster presentations. This undergraduate research symposium is a hallmark of the undergraduate research experience. Both URM and D/HH students are able to walk away with a higher level of confidence in their capabilities after receiving encouragement from people outside of their research group. RIT/NTID also puts on a successful undergraduate student research symposium, and because of unique communication circumstances, we also have an annual research symposium specifically for the D/HH students. Inspiration strikes students as they present and take ownership of their work, and we find they want to have deeper engagement in the research efforts. At this point, they are often full vested in the research program and it is our responsibility to continue challenging them with more complex problems. Again, while the level of difficulty increases, we ensure they are able to achieve specific milestones such that they can see an ending to the work. Of course, the pinnacle of the student research dissemination process is publication of the research work or presentations at external national conferences. While underrepresented students having the opportunity to attend and observe all that occurs at a professional conference is invaluable, the act of traveling can be exhilarating in of itself (and many students have not been afforded the opportunity to travel to such destinations in the past).

To support the financial costs of engaging URM and D/HH students in research, we have taken advantage of several mechanisms. Internally, RIT/NTID provides support for URM and D/HH students to take part in research with small grants that support the acquisition of supplies or travel to conferences. Beyond internal grants, accessing external funding sources is also important to grow the research efforts. RIT/NTID has grants from NIH, NSF, Howard Hughes Medical Institute, and Camille & Henry Dreyfus Foundation to specifically support URM and D/HH students in research projects. Each of these support mechanisms has helped this group make tremendous strides in boosting their self-confidence, feel a sense of community, increase the likelihood that they pursue graduate degrees, and assist them in becoming more encultured into their professional fields.

Challenges of the Effort

No approach is ever perfect. Our experiences are no exception. There have been challenges faced that require intentional effort to overcome. Currently, the critical mass of faculty needed

to fully realize a self-sustaining process is not there. Full buy-in from all faculty members is needed to prevent a small subset of individuals from shouldering the burden of mentoring URM and D/HH students. This is not easy. Faculty members, especially those on tenure-track, already have a set of outcomes they are required to meet. While engaging URM and D/HH students would enhance the portfolio of any faculty member, there no set standards that require such an outcome. Therefore, faculty members must choose wisely if the risk will generate the desired results. This reality goes hand-in-hand with struggles to reach this population of students. As previously mentioned, many students from the URM and D/HH population may not naturally go to a professor and ask them about their research initiatives. We find that more effort must be given on the faculty's part to reach this group and properly engage them in the research. Third, time is a critical factor. It does take a significant amount of time to actively engage URM and D/HH students. With the pace of an academic semester (or quarter), the start-up can take up a significant amount of to the point that not a lot of production in research results is attained. This leads back to faculty asking if the time is worth the effort. There must be a sense that the return on investment is ever-present before faculty commit to undertaking research with URM and D/HH students. Finally, we do not currently have a mechanism for tracking students to determine if the approach we are taking is successful. While the hope is that we engage URM and D/HH students in research for possibly pursuing advanced degrees (or employment), tracking this metric is not always easy. This can be complicated by the fact that some students may only do one or two semesters of research, then move on to other interests. Therefore, we are not able to know if these students end up pursuing an advanced degree because of their specific experience in our research or for other reasons. A more rigid methodology is needed to standardize such an assessment.

Summary

Particularly in STEM fields, groups of students are largely underrepresented in higher education degree programs and in the workforce. Students from URM and D/HH backgrounds are no exception. However, we have witnesses great rewards from working with these remarkable students and have seen them flourish in the research environment. And through perseverance and continued encouragement from the faculty mentor, students often achieve a level of success where the work they complete is featured in a publication or conference presentation. This reward leads students to engage on a deeper level and ask questions pertaining to being successful in graduate school— which helps to combat the "leaking pipeline" for these groups of students in obtaining graduate degrees and entering quality careers. And in effect, students who do participate in research programs like ours and move on to obtain higher degrees or exciting jobs encourage other underrepresented students to engage in research activities— bringing the initiative full circle. A good general resource for encouraging underrepresented students into undergraduate research is found in the literature [6] and some of our best practices for involving students who are D/HH in research can be found in the articles [7] and [8].

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