

Mentoring for INnovative Design Solutions (MINDS) Program Integrates Key Design Considerations for Clinical Translation

Teresa Murray^{1,2}, Alicia Fernandez-Fernandez^{2,3}, Dominic Nathan², Jeffrey LaMack^{2,4}, Bhavit Vora², and Marcia Pool^{2,5}

¹Louisiana Tech University, Ruston, LA, ²Alpha Eta Mu Beta, Champaign, IL, ³Nova Southeastern University, Ft. Lauderdale, FL, ⁴Milwaukee School of Engineering, Milwaukee, WI, ⁵University of Illinois, Urbana, IL

Introduction: Biomedical engineers have created devices and technologies that have greatly improved human health and wellbeing. Our next generation of biomedical engineers will inherit this legacy and will likely develop devices and technologies with capabilities that we can scarcely imagine now. Currently, many promising designs never make it out of the lab or the classroom. The aim of the MINDS Scholars program is to teach biomedical engineering students how to integrate key considerations for translation/commercialization into the design process, so that the time and money invested in these designs will result in more devices and technologies that reach the patient.

Materials and Methods: This program was created and is run by Alpha Eta Mu Beta (AHMB), the International Biomedical Engineering Honor Society. Our goal in creating the Mentoring for INnovative Design Solutions (MINDS) Scholar Program was to use an active learning approach to teach students how to incorporate important design considerations for improving the translatability of device ideas to the clinic, for meaningful health benefits. Our key considerations included (i) market considerations for commercialization (unmet need, size of market reimbursement potential, etc.), (ii) regulatory strategy for obtaining approval to market a device, and (iii) evaluating design choices with respect to securing intellectual property protection. Furthermore, the students were required to describe the features, advantages and benefits of their innovation and compare it to existing products.

Participants were selected for the program based on a competitive, nationwide application process. Most 2016-17 MINDS Scholars were not AHMB members. Participants were assigned to teams and matched with mentors to achieve geographical diversity. We reasoned that having students work with teammates at different institutions, often across different time zones, would help them improve their communication, time management, and organizational skills. Our 2016-17 program began with a workshop during the BMES Annual meeting in Minneapolis, MN. There, students learned about the program and met with their team members and mentor to begin design ideation. For five months afterward, students met virtually, using video and teleconference calls to refine their designs and submit presentation materials. Additionally, we provided access to subject matter experts to help students evaluate design choices, especially with respect to the key design considerations.

Results and Discussion: We provided twenty BME students with the opportunity to collaborate and network with peers and mentors across the country for a 5-month period, while building necessary engineering design skills, including our three key considerations for commercialization that are not widely stressed in coursework projects. Project presentations covered each aspect of the project and the presentation styles were varied, ranging from a traditional written report to a full website.

Exit surveys of participants and their mentors for our 2016-2017 program show that students improved their knowledge and understanding of each of our key considerations, including marketing considerations, regulatory strategy, and intellectual property protection. Among the many other perceived advantages of the program and personal improvements were an ability to be part of collaborative projects between institutions and having tools to collaborate more successfully (75%), an ability to assess key product requirements (85%), and an ability to better articulate key features of a product (85%). Many participants also reported an impact on their career goals.

Conclusions: We achieved our aims of instilling a working ability to integrate market needs, regulatory considerations, and intellectual property strategy into the design process. In doing this, we also fostered an awareness of how biomedical devices and technologies can benefit society.

Results from our exit surveys and project reports are being used to revise our 2017-18 MINDS Scholars design program, including our MINDS Workshop during the BMES 2017 Annual Meeting in Phoenix, AZ.

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