

## **Research Statement**

My research activities as a graduate student at North Carolina State University have been varied, as I have sought to gain a wide skillset and a broad experience in multiple topics. The overarching themes that emerge from my work also dovetail with my strengths as a human factors psychologist, specifically: 1) the study of people's beliefs about and behaviors with technology, primarily through the lens of mindsets; and 2) the study of the structure of people's knowledge, especially mental models, and applications of that study to educational contexts.

### **Mindsets of Technology Ability**

The predominant contribution from my research has been in the study of people's mindsets, i.e., their beliefs about the nature and origin of their abilities and attributes, particularly those relating to technology. Although widely studied in a variety of other domains—most notably, in intelligence—few studies prior to my work sought to understand how mindsets influence technology interactions. In a research project early in my graduate career, I adapted an instrument to measure mindsets of technology ability and developed an ecologically valid task to assess the former's relationship to the latter. We recruited more than 150 participants in an online study, finding even in this technologically-literate sample that people hold a range of beliefs about the fixedness or developability of technology ability, and that these beliefs are related to performance (Pybus & Gillan, 2015). We specifically measured response time, finding that people with fixed beliefs of technology ability took longer to click the target website element than did those with growth beliefs.

Because we recruited online in that initial study, we wanted to know if we had biased our sample to include a disproportionate number of people with growth mindsets of technology. We recruited more than 30 participants in person from a local flea market to attempt to determine the distribution of mindsets in a more normal sample. In partnership with other colleagues, we also recruited more than 90 older adults from assisted living communities to assess the distribution of mindsets in an older sample. In both studies, which are currently in preparation for publication, we found a similar pattern of results as in the online study. Furthermore, we found that participants in our flea market sample with growth mindsets of technology were more likely to use computers for a larger breadth of activities. Older adults with a growth mindset of technology ability also tended to score higher on measures of everyday cognition and locus of control.

In my master's thesis, we wanted to better understand the theoretical relationship of mindsets and performance. Finding some possible overlap between the self-regulation literature wherein mindsets are most commonly studied and the study of technology acceptance, we recruited more than 90 students to assess their mindsets (Pybus & Gillan, 2016). We measured the likelihood that participants would later use or adopt the websites used in the task from our original study. We found that mindsets were related to some—though not all—of the precursors to adoption, and that people with growth mindsets generally were more likely to use the websites.

We are currently analyzing the data for a related study wherein we tested the relationship of mindsets, which are most often associated with the learning of novel skills, and the adoption of a less familiar type of technology—wearable devices. In this study, we will also test competing measures of technology acceptance to further contribute to that body of work.

In my upcoming dissertation, I plan to further examine the theoretical operation of mindsets upon technological interaction. Heretofore, I have naturalistically assessed the distribution of people's mindsets of technology ability; in this study, I will use an intervention to shift people's mindsets, which has not only succeeded in other domains, but also strengthened its effects. I will use measures adapted from self-regulation literature to better understand the relationship of these processes to adoption. I will also seek to understand the effect of mindsets on perceptions about the system, particularly its usability and ease-of-use. If such an intervention is successful, I would like to adapt it for use in critical applications, such as medical devices for populations with technology-related challenges. I am also interested in exploring the suitability of implicit and explicit mindset interventions within the interface design of a system.

### **Mental Models and Education**

Another key contribution of my work has been in the study of mental models and their development. In one study, my colleagues and I were interested in the differences in mental model development among students from different majors who were enrolled in two human factors courses (Pybus, Welk, & Gillan, 2016). The two largest divisions were between psychology majors and engineering majors. We found that students from the two majors not only started out with qualitatively different PATHFINDER networks of the same terms, but even maintained noticeable differences after instruction. This work may help to explain differences in understanding and communication issues that emerge in multidisciplinary professional teams, and might suggest changes to be made to instructional design. My colleagues and I have published other work on human factors education. We developed a blog for an audience of videogame developers that sought to demonstrate the value of human factors methods and human-centered design using case studies as examples (Trowbridge, Pybus, Mudrick, & Taub, 2016).

We have furthermore assessed the mental models of international students enrolled in an introductory composition course before and after instruction. When analyses are complete, we will examine PATHFINDER networks and their statistical interrelationships to understand how students from different educational backgrounds understand the same sets of composition terms.

In the future, I intend to bridge the gap between these two overarching themes, studying how mindsets are related to the development of mental models of technological systems. In the aforementioned study on mindsets and the adoption of wearable devices, people's mental models were assessed using an open-ended response. If people with growth mindsets develop a different conceptual understanding of wearable devices than people with fixed mindsets, this may be related to some of the differences in performance as well. We may also be able to mitigate these differences with an intervention.