

## Increasing the Broader Impact of the Clemson Makerspace

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### Extended Abstract

The Clemson University Makerspace is directed by an advisory team of faculty and staff, but it is governed and operated by a student organization. The space contains 3D printers, laser cutters, and other traditional STEM related equipment, as well as sewing and embroidery machines, vinyl cutters, and button makers. Student government provides a critical source of operating funds, so a key objective of the space is to empower students of all disciplines to create tangible artifacts and develop innovative ideas by collaboration across disciplines. To reach this objective, a Creative Inquiry team was formed to develop strategies to expand the broader impact of the Makerspace. A Creative Inquiry (CI) is a one to three credit hour, cross disciplinary, undergraduate research course led by a faculty member.

The CI first collected Makerspace usage data on machine certifications and visits to determine user demographics. As expected, our initial results showed low usage by non-STEM majors, and observations of student perceptions indicate that fear and uncertainty are major factors that discourage use despite genuine interest they may have. So, the primary objective of the research team evolved to promoting a welcoming environment to all demographics, by focusing on lowering the barrier of entry to non-technical fields. The team identified several keys to broaden usage, such as encouraging faculty to collaborate with the Makerspace, improving existing training procedures, and creating ways to inform new users about the Makerspace.

A case study was conducted to evaluate the effectiveness of partnering with a faculty member outside of STEM in increasing diversity in the makerspace. So, The School of Nursing was selected to create a project and lesson plan requiring use of the Makerspace to develop critical thinking and problem solving skills for students in a first-year nursing course. During the course project, the nursing students researched common problems faced by practicing health care professionals, designed potential solutions, and then prototyped their ideas using Makerspace equipment. The Nursing project has been in place for three semesters with 60-120 students each semester. Results from the study indicated that improving training would lower the barrier to entry for the target demographics. So, the Makerspace is incorporating media content, videos, and demonstration artifacts to supplement the, "blocks of text" style information that was previously used. Additionally, observational data suggested an interactive website with tutorials and examples would be more welcoming to apprehensive students.

Through the case study, the space has engaged approximately 200 new users, and surveys from the course revealed that the nursing students would be more likely to use the space in future projects. These students were a key component to the increase in visits to the Makerspace by non-STEM majors from under 5% in Fall 2016 to 25% in Fall 2017.

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