



**BIOMEDICAL
ENGINEERING**
UNIVERSITY OF MICHIGAN



HEALTH SYSTEM
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THE MEDICAL DEVICE SANDBOX: A Creative Learning Experience for Engineering Students and Medical Learners

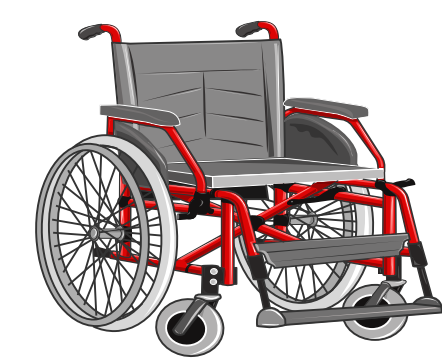
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PURPOSE

To promote interprofessional collaboration and learning between biomedical engineering (BME) students and medical learners that is **critical** to the *design, development, use, and commercialization* of safe and effective medical equipment.

OBJECTIVE

- Improved understanding of medical device uses
- Better ability to identify possible use errors and design flaws
- Effective prototyping of re-designs that address use error
- Stimulated creativity process and ability to innovate solution
- Enhanced understanding of clinical or technical perspectives
- More positive attitude towards interprofessional teams



METHODOLOGY

Course Timeline: 13 sessions in Fall 2015/Winter 2016 Semesters

Participant Demographics:

Engineering Students	Total number of participants (N = 50)	Medical Learners	Total number of participants (N = 30)
Undergraduate-Level	33	Medical Student	17
Graduate-Level	17	Medical Residents	13

Session Setup (Figure 1-3):

- 4-5 BME students
- 4-8 Medical Learners
- Faculty Member to facilitate session

1. Hands-on simulation of the use of two devices from the MDS device exercises list (Figure 1)
2. Discussion of confusion and use error associated with design following simulation
3. Brainstorming session of novel solutions with BME students and Medical Learners in mixed groups of 3-4 (Figure 2)
4. Presentation of redesigns and takeaway lessons (Figure 3)



Figure 4-6: Biomedical Engineering and Medical students performing usability tests of medical devices (AED shown below) and re-designing devices after identifying use error both on paper sketches and physical low-quality materials

PRELIMINARY FINDINGS

Survey findings*:

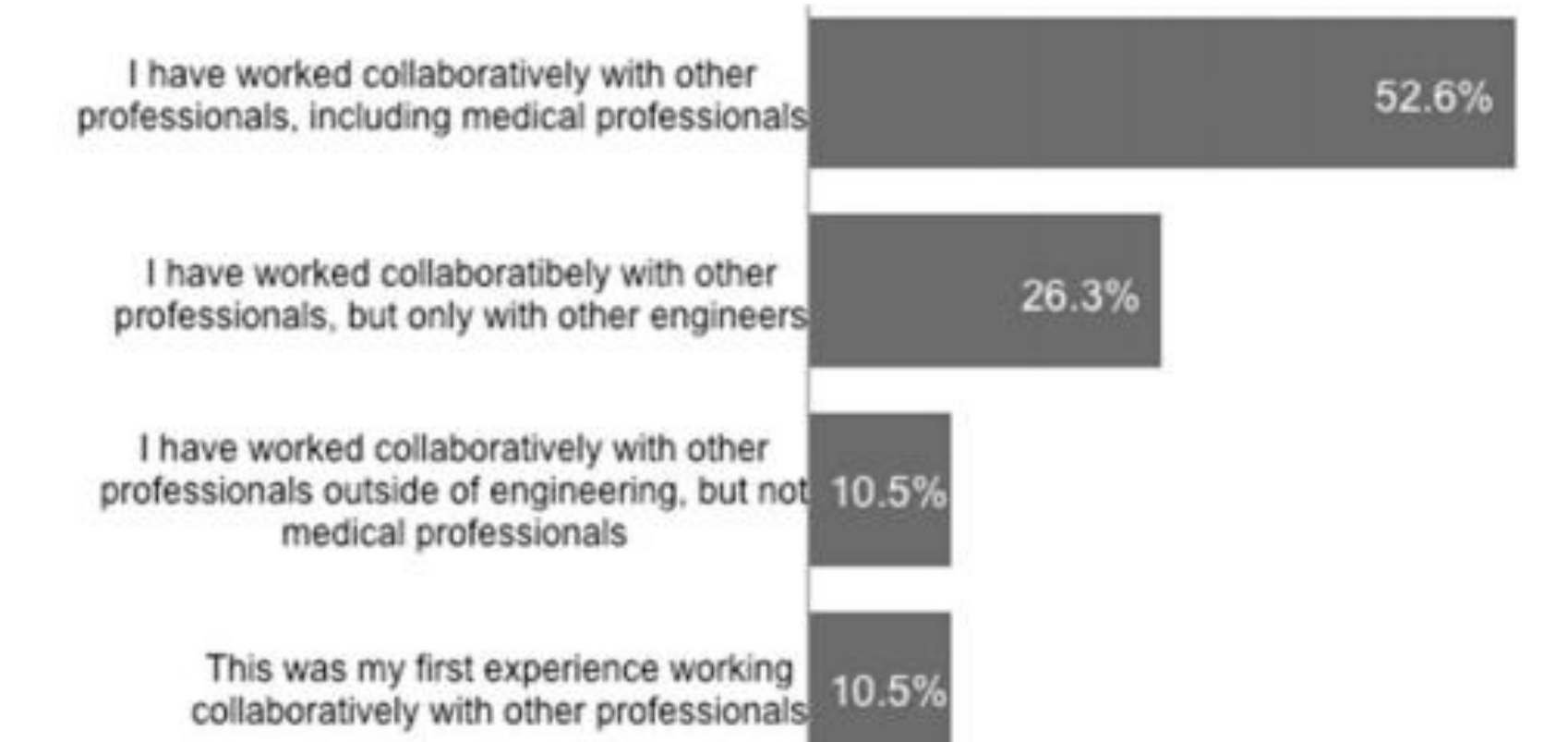
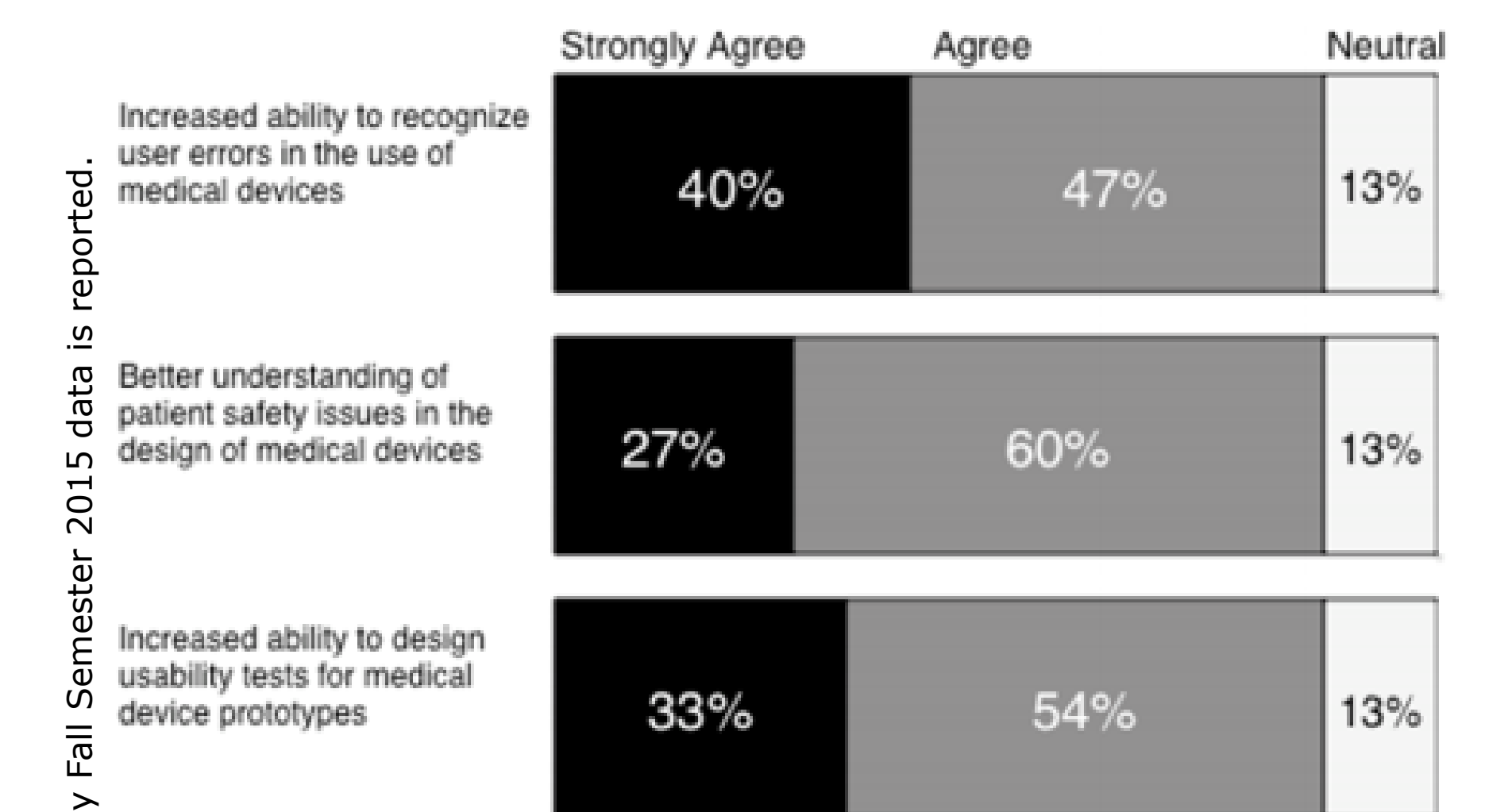


Figure 7: Experience on interdisciplinary teams of participating engineering students.

	Disagree	Neutral	Agree	Perceived Change (Average out of 5)	Min	Max
Realistic expectations of medical professionals	0.00%	6.25%	93.75%	3.41	2	4
Preference working in interdisciplinary settings	0.00%	11.76%	88.24%	3.94	3	5
Perceived value of medical professionals' contributions	0.00%	0.00%	100.00%	3.94	3	5
Ability to listen to other's contributions	0.00%	6.25%	93.75%	3.88	3	5

Table 1: Descriptive statistics of students' responses regarding abilities and attitudes towards collaborative interdisciplinary work after participating in MDS



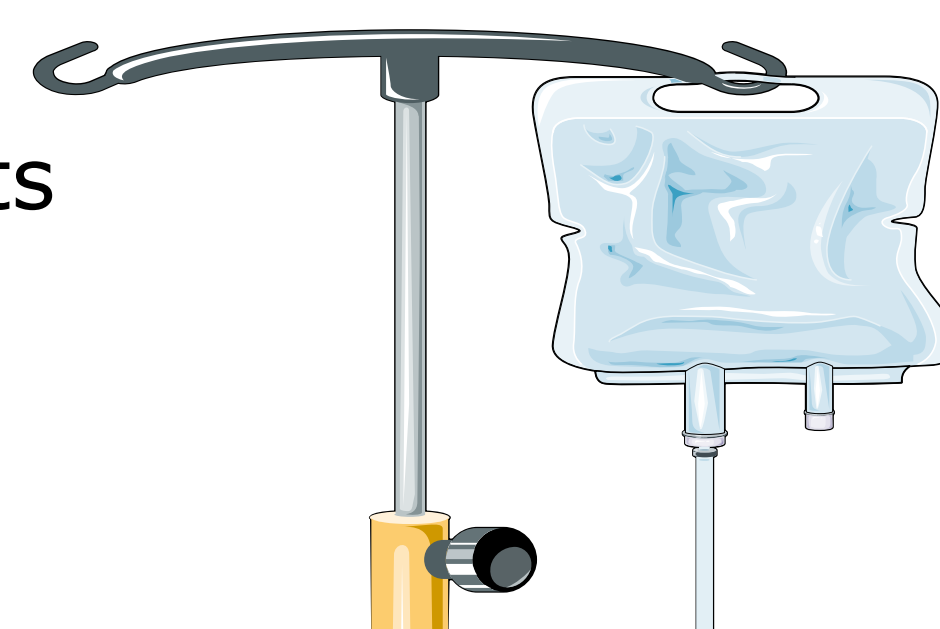
*Only Fall Semester 2015 data is reported.
Figure 8: Students' perceived gains in ability and understanding of medical device design factors.

NEXT STEPS

Preliminary Data on student perceptions and experiences indicate that MDS is a promising program. This pilot study will lead into a larger study that will more rigorously assess student's learning outcomes. Next steps include post-student surveys, evaluations of students' creative process using the AAC&U VALUE rubric on creativity, and a comparative analysis of students' interdisciplinary attitudes by comparing those who participate in MDS versus to those who have not.

Qualitative Assessment of Experience

- Retrospective survey
- Focus Group with 11 participants



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