Assessing the Impact of Cross-Disciplinary, Project-Focused, Action-Based Immersive Learning Experiences in Healthcare and Engineering

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1. Motivation

As medical practice becomes more specialized, few healthcare professionals have the perspective or training to take a systems-based approach to improve healthcare delivery. Conversely, engineers who *do* have a systems-based skills set rarely have the exposure to medical settings necessary to design clinically-feasible improvements fro healthcare delivery systems.

Cross-disciplinary collaboration is essential for leveraging potential benefits of systems-engineering tools to improve healthcare delivery.

Goal: To design a immersive program for students in healthcare and engineering fields to work together and complete real world projects in clinical settings.

1. Research Questions

1. Open-Ended Problem Solving

- How do students from engineering and healthcare fields differ in their views of and reactions to open-ended problem solving?

2. Multi-Disciplinary Teams

- What challenges do engineering and healthcare students face in multi-disciplinary team-based problem solving when immersed in a healthcare setting?

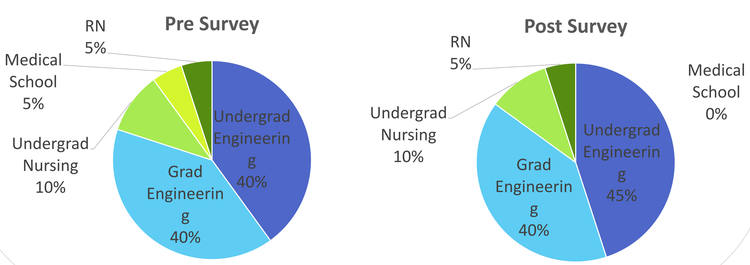
3. Bilingualism

- Can engineering and healthcare students develop "bilingualism" in language and culture through a year-long, cross-disciplinary collaboration?

2. Study Group

- 18-20 student s from clinical or engineering backgrounds

ACADEMIC BACKGROUND OF GROUP



3. Methods

Students collaborated in cross disciplinary teams working on healthcare engineering projects at the Center for Healthcare and Patient Safety (CHEPS).

Students are immersed in each other's language, culture and problem solving perspective during program (5/14- Present)

Students were given a "pre" survey (administered 7 weeks after start of the program) and a "post" survey (administered 18 weeks after start of the program) to assess the groups prior involvement in clinical and engineering fields, comfort , confidence and worry levels in respective fields, and development of bilingualism.

There were at least 10 different projects ongoing at any given time, with at least one clinical student in each project

3. Preliminary Results

Quantitative Survey Findings

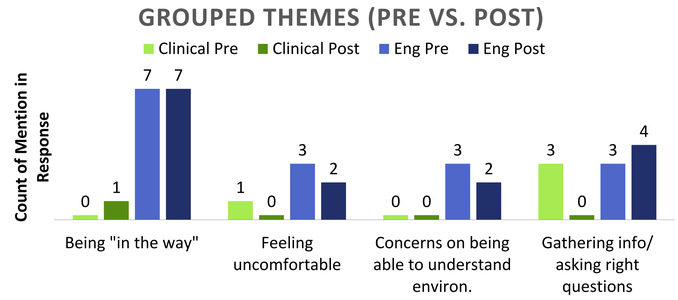
- 45% of students reported little to no exposure to clinical environment before the project commencement and 50% reported little to no exposure in the post survey results
- 20/20 students started and completed the pre survey. 20 respondents started and 18 completed the post survey.
- Survey questions were grouped by comfort, worry and confidence criteria. Below are respondents average scores. Scores of 1=Strongly Disagree ... 5=Strongly Agree

GROUPED SURVEY QUESTIONS
*IMPROVEMENTS IN BLUE

Rating the Students Level of:	Clinical		Engineering	
	Pre	Post	Pre	Post
Comfort in asking questions and taking notes in ***clinical*** environment	4.5	4.7	3.6	3.8
Worry about saying or doing the "wrong thing" in a ***patient care*** setting, and worry about being uncomfortable in a patient care setting	1.6	1.6	2.9	2.6
Worry about being perceived "silly" by a clinician or ***clinical*** student	1.5	1.5	2.5	2.3
Confidence around medical terminology, medical concepts related to my projects, and knowing what notes to take in a ***clinical*** environment	4.5	4.6	3.1	3.4
Comfort in asking technical questions and taking notes in an ***engineering*** environment	2.8	3.8	4.5	4.5
Worry about being perceived "silly" by an engineer or ***engineering*** student	3.3	2.3	2.7	1.8
Confidence around ***engineering*** terminology, industrial engineering concepts, and knowing what notes to take in an engineering environment	1.9	3.3	4.3	4.3

Qualitative Survey Findings

- When asked to list concerns that students would have observing in a clinical environment, we observed several themes in both surveys (horizontal axis) .



- Two responses from one particular clinical student

Question	Pre Survey Response	Post Survey Response
List 3 to 5 concerns that you have about observing in a clinica setting:	1. Making patients feel uncomfortable 2. Being a nuance to the people working 3. Not knowing what to take notes on	[...] I did have concerns earlier this year with question asking and whether or not it was appropriate, but ***working in the hospital this summer has led me to find that most docs and nurses are open and excited*** to help and answer your questions, even if they seem simple, unimportant, or unrelated.
Give two or three examples of ways you think healthcare engineers could improve patient care?	I think that they could improve patient care by looking at the processes that the patients go through and making them more efficient.	[...] healthcare engineers can improve healthcare because they really focus on the patient process and the flow of things in the hospital. The medical professions in the hospital are so focused on making the patient better diagnostically that I think that they may miss the other side things that patients have to go through that may not be needed or may be tough. Also, I think ***that healthcare engineers can change doctors and nurses ways of thinking and help integrate some engineering thoughts in the hospital***.

- A quote pulled from a student memo

"I have definitely noticed engineering students getting more comfortable with all of the abbreviations we use... It gets a lot easier when you write 'pt' 100 times instead of 'patient' "
–Nursing Student

4. Discussion and Future Work

- We note that levels of comfort increased, levels of worry decreased, and levels of confidence increased since program commencement.
- We plan to use survey results to foster an even more collaborative and supportive environment in future projects now that we see clear challenges faced by students
- We hope to expand our study group to include more clinical students.
- We will build upon the survey to include questions that better reflect the evolving bilingualism between students in these complex fields.