Preliminary Student and Faculty Perceptions of Rotating Faculty Facilitators for Introductory Biomedical Engineering Problem-Based Learning

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BACKGROUND

- Problem based learning (PBL) is an effective teaching strategy, particularly for interdisciplinary fields such as biomedical engineering (BME) and medical education [1].
- Goal to develop and enhance problem-solving and teamwork skills early in undergraduate education.
- PBL requires a broad range of expertise and significant time investment by faculty for facilitation and feedback.
- Difficult to achieve with small instructional teams and large introductory student enrollments.

We hypothesize that rotating facilitators can be beneficial to the PBL experience.

Figure 1. Example photographs from in-class team meetings for students in BMES 2104 Introduction to BME

METHODS

- BMES 2104 Introduction to BME presents teams with two open-ended BME problems
- Two sections totaling 86 students (39 BME major, 47 BME minor/non-minor) organized into 20 teams
- 25 facilitators recruited from Biomedical Engineering, Veterinary Medicine, and School of Medicine (22 faculty, 3 graduate students)
- Facilitators were provided a summary of The Tutorial Process [2] and the problem and deliverable description
- Three to four facilitators participated per class period, with each facilitator visiting two to three different teams (Fig 2)

Class Day # 12	Dr. V	Dr. T	Dr. W	Dr. X
	Team 1	Team 6	Team 10	Team 7
	Team 2	Team 4	Team 3	Team 8
	Team 5	Team 9		

Class Day # 16	Dr. V	Dr. T	Dr. Y	Mr. Z
	Team 2	Team 4	Team 3	Team 8
	Team 5	Team 6	Team 9	Team 10
			Team 7	Team 1

Figure 2. Example facilitator schedule for two class periods

- Students and facilitators were recruited to participate in surveys on perceptions of the rotating facilitator model after the second problem. (study reviewed and approved by the Virginia Tech Institutional Review Board)

RESULTS

- 40% of facilitators and 36% of students completed surveys

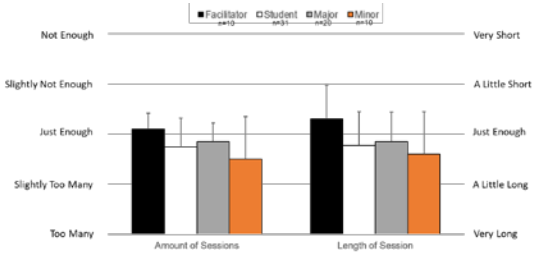

Figure 3*. Facilitator and student perceptions of amount of facilitator interaction

*data not shown for 1 student who was not a BME major nor a BME minor

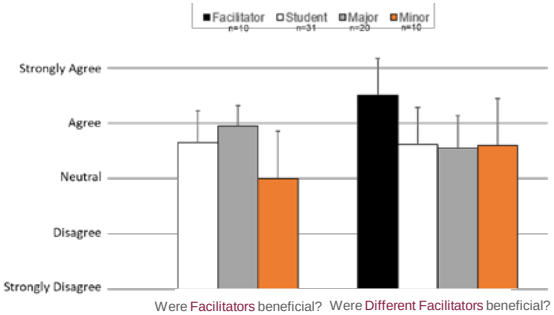

Figure 4*. Facilitator and student perceptions of facilitators & rotating facilitator model

*data not shown for 1 student who was not a BME major nor a BME minor

Example Problem and Deliverable Description

Your team has been recruited by a new non-profit foundation whose goal is to improve outcomes for patients suffering organ failures. The foundation has identified challenge areas (CA) towards the treatment of organ failure that the foundation would like to fund research in that together would provide significant advances to the field and patient care. ***Your research team is tasked to outline a major research direction in one of these challenge areas by preparing an overview of the state-of-the-art technology and develop a proposal for a novel advancement that could be pursued by the foundation.*** This proposal should include proposed experimental steps for experimental modelling and/or implementing this approach, as well as a mathematical model that helps inform your experimental design or clinical translation.

CA 1: Improving the function or availability of donor organs
CA 2: Supporting/improving the function of compromised organs *in situ* (e.g. dialysis or cell-based regeneration)
CA 3: Designing biomaterial approaches for tissue engineering organs
CA 4: Develop vascularization strategies for tissue engineering large organ constructs
CA 5: Validate 3D assembly/construction methods for tissue engineering heterogeneous organ structures

Table 1. Example deliverables for problem description

Assignment	Individual/Team	% Project Grade
Topic Statement and Model Ideas	Individual	5
Group Topic Statement & Proposed Model	Team	10
Preliminary Literature Search	Individual	10
Preliminary Model Validation	Team	20
Proposal Poster	Team	25
Peer Review of Posters	Individual	5
Written Proposal	Team	25
TOTAL		100%

CONCLUSION/DISCUSSION

- Both students and facilitators identified diversity in viewpoints and experiences a benefit of rotating facilitators
- Both also identified the impact of facilitator style on student experience and student expectations on facilitator experience. (i.e. preparedness and expectations of experience)
- Future work will aim to address student and facilitator expectations of the experience while maintaining positive facilitator perceptions of time investment

REFERENCES

1. Newstetter, W.C., Fostering integrative problem solving in biomedical engineering: The PBL approach. Annals of biomedical engineering, 2006. 34(2): p. 217-225.
2. Barrows, H.S., The tutorial process. 1988: Southern Illinois Univ.