CONSIDERING THE EDUCATIONAL BENEFITS OF A CUBESAT PROGRAM

Jeremy Straub
University of North Dakota

Samudra Haque
George Washington University
Facilitate problem/project-based learning, a form of experiential education

Shown effective in a variety of disciplines:
- computer science
- computer engineering
- electrical engineering
- mechanical engineering
- aerospace engineering
- management
- marketing

More details on background material can be found in Straub, J. and D. Whalen. 2013. An Assessment of Educational Benefits from the OpenOrbiter Space Program. Education Sciences, Vol. 3, No. 3.
PBL/EE has been shown to have a variety of benefits outside of learning the primary material, including:

- improved student self-image
- creativity
- motivation
- material understanding
- workforce preparation
- job placement
- academic program retention
- knowledge retention

CubeSats & Education

- CubeSats can be involved in educational activities in several ways, including:
  - course project
  - PBL-style course
  - independent or directed study
  - senior design / project requirement

Characterization of Benefits

- Benefits in several areas were characterized, including:
  - Technical skill enhancement
  - Spacecraft design skill enhancement
  - Excitement about space
  - Presentation skills enhancement
  - Presentation comfort enhancement

- Assessment was performed via surveys of student participants using a Likert-style scale.

This data was presented in Straub, J. and D. Whalen. 2013. An Assessment of Educational Benefits from the OpenOrbiter Space Program. Education Sciences, Vol. 3, No. 3.
As students are not necessarily expected to enjoy benefit in all areas we also looked at the average level of benefit for those showing improvement.

We also assessed attribution of benefit to participation (using a 9-point Likert-style scale) with 5 being neutral, 7 being agree and 9 being strongly agree.

This data was presented in Straub, J. and D. Whalen. 2013. An Assessment of Educational Benefits from the OpenOrbiter Space Program. Education Sciences, Vol. 3, No. 3.
We characterized the percentage of students reporting a benefit by undergraduate versus graduate student status.

The level of benefit enjoyed was also characterized by student level.

This data was presented in Straub, J. and D. Whalen. 2013. An Assessment of Educational Benefits from the OpenOrbiter Space Program. Education Sciences, Vol. 3, No. 3.
We also demonstrated, for graduate students, correlation between the time involved with the program and the level of benefit attained.

This was particularly strong when considering students’ area of study.

This data was presented in Straub, J., D. Whalen. 2014. Evaluation of the Educational Impact of Participation Time in a Small Spacecraft Development Program. Education Sciences, Vol. 4, No. 1.
Weaker correlation was also seen for team leads, both graduate and undergraduate.

The lack of strong correlation between undergraduate participation time and benefit attainment is still under study to see if it:
- Is a quirk of the data
- Indicative of a ‘plateau’ effect, given a certain amount of participation
- Due to some other non-assessed confounding factor
BRICSat-P
Ballastically Reinforced Communications Satellite
The mission of BRICSat-P is to successfully integrate a four channel electric propulsion system into a 1.5U CubeSat and perform maneuvers in orbit to fully demonstrate its capability and application for future CubeSat missions.

The program is fully funded and will launch in March 2015.
Project Overview

- 8 months
- 7 team members
- All undergraduate midshipmen
- No graduate program
- Testing and flight qualification at USNA Small Satellite Lab
Participation seems to have other benefits:

- Helping students identify areas of interest
- Driving career excitement
- Learning how to interact with those outside of their own discipline
- Learning professional skills / conduct
- Gaining presentation skills and comfort
  - This translates into comfort in similar situations like interviews, etc.
- Better understanding of scientific / engineering process
THANKS & ANY QUESTIONS?

Jeremy can be contacted @ jerey.straub@my.und.edu