ASSESSMENT OF EDUCATIONAL EXPECTATIONS, OUTCOMES AND BENEFITS FROM SMALL SATELLITE PROGRAM PARTICIPATION

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OVERVIEW

• This paper begins to characterize the educational outcomes that can be produced from student participation in a small spacecraft development program.

• We asked students what benefits they expected to receive from program participation and we asked them, at the end of the semester, what benefits they had received.

• We also characterized student performance through the use of post-participation Likert-like scale questions and the use of a widely-used questionnaire for assessing student research participation outcomes.

• We compare benefit expectation and attainment, characterize the level of benefits received across multiple types of participation and assess the effect of program participation on subject-specific learning.

• We also discuss plans to expand this study to a wider-scale analysis of the impact of small spacecraft participation.
A BRIEF OVERVIEW OF THE OPENORBITER PROGRAM

- The OpenOrbiter Small Spacecraft Development Initiative (OSSDI) was launched in 2012 as an offshoot of a thematically-similar precursor program.

- OpenOrbiter seeks to develop and demonstrate the efficacy of the Open Prototype for Educational Nanosats (OPEN) designs²⁵.

- OPEN aims to develop a framework for CubeSat development allowing universities and others to create spacecraft with a parts cost of $5,000 or less²⁶.

- Student participation in OOSDI is through participation on topic-specific teams.

- Each team has a student team leader and a faculty mentor.

- Students have participated in a variety of contexts, including for academic credit (course project, senior design), extracurricular enrichment and as paid workers.
EXPECTATIONS

• Student participants were asked what types of benefits they expected from program participation. They were asked to identify what areas they would like to receive benefit in from a list including:

Knowledge about spacecraft design
Knowledge about structured design processes
Knowledge about a particular technical topic
Knowledge about project management
Knowledge about time management
Leadership experience
Improving technical skills
Improving time management skills
Experience working with those from other Disciplines
Understanding of how my discipline relates to others
Learn other discipline’s technical details/terminology

Real-world project experience
Item for resume
Improved presentation skills
Inclusion as author on technical paper
Experience working on a large group project
Experience with a structured design process
Experience related to a particular technical topic
Project management experience
Time management experience
Improving leadership skills
Improving project management skills
Improved chance of being hired in desired field
Ability to present at professional conference
Ability to present at professional conference
Recognition in the university community
BENEFITS SOUGHT BY PARTICIPANTS

Number Expecting Benefit:

- Know About SC Design
- Know about Struct...
- Know about Tech Topic
- Know about PM
- Leadership Exp
- Imp Time Mgt Skills
- Exp Other Disciplines
- Real World Prj Exp
- Item for Resume
- Imp Pres Skills
- Inclusion as Author
- Exp Large Group
- Exp Structured Design
- Exp Tech Topic
- Prj Mgt Exp
- Time Mgmt Exp
- Imp Leadership Skills
- Imp Prj Mgt Skills
- Und Discipline Relate
- Learn Other Disc
- Imp Chance Hired
- Imp Self Confidence
- Ability to Present at...
- Recognition in Univ
REASONS FOR PARTICIPATING

- Excitement about Space
- Friends Participating
- Course Requirement
- Resume Benefit
- Faculty Member

Percent Indicating

BS/BA
Graduate
EXPECTED & RECEIVED BENEFITS

[Graph showing the comparison between expected and received benefits across various categories such as Knowledge about Structured Design, Knowledge about Technical Topics, Leadership Experience, Impressive Time Management Skills, etc.]

- **Expected**
- **Received**
TOP BENEFITS EXPECTED & RECEIVED

- Received
- Expected
PERCENTAGE IMPROVING, IMPROVEMENT AMOUNT
IMPROVEMENT BY STATUS (UNDERGRADUATES)
GAIN (URSSA)

2.1 Confidence in my ability to contribute to science.
2.2 Comfort in discussing scientific concepts with others.
2.3 Comfort in working collaboratively with others.
2.4 Confidence in my ability to do well in future science courses.
2.5 Ability to work independently.
2.6 Developing patience with the slow pace of research.
THANKS & ANY QUESTIONS
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• See the associated paper for source information for many of the figures (when from prior work).
REFERENCES

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