The Creation and Impact of Corporate Mentorship on Student-Led Satellite Projects

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US Educational Challenges

- The US faces a series of economic and educational challenges
- *Rise Against the Gathering Storm Report:*
  - Released by Congress in early 2006
  - An economic assessment of the US in STEM* related fields
  - States that “technological building blocks critical to our economic leadership are eroding at a time when many other nations are gathering strength”
  - Attributes partial cause on the US educational System
  - Calls for funding incentives and engineering projects to ensure that the US is the “most attractive setting in which to study and perform research”
- Small Satellites
  - The Small Satellite industry has a responsibility to foster student development in STEM related fields by providing real-world, hands on opportunities.

* Science, Technology, Engineering, and Math
Current Trends

Average Age of NASA Employees at Three Separate Periods

- NASA funding for education is eroding at a time when young engineers are a small percentage of the industry

- NASA Education Funding:
  - FY04: ~170 Million
  - FY08: ~146 Million
  - FY12: 123 Million (projected)

- Student involvement projects have been scaled back:
  - Shuttle GAS program
  - Sounding rocket opportunities

Is NASA to Blame?
- No: NASA is being asked to do too much with the resources allocated by congress

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2-NASA Budget FY04, NASA Budget Request FY09
Solution – Corporate Mentorship

- The Colorado Space Grant Consortium links student spacecraft teams with corporate mentors
- Connections are established at the very beginning of projects

Results show:
- Improved technical quality of student projects
- Job satisfaction for students, mentors, and educators
- Increased excitement for students, educators and mentors

Poti Doukas, Instar Engineering Solutions

Dan Hall, First RF Corporation
The DANDE Case Study

Setup:

- DANDE is a 2-year UN5 satellite project with unique engineering challenges
- Mentorship was integrated into the mission design process during the proposal and phase A developmental stages
- Each subsystem is paired with at least one industry mentor
- Periodic contact with mentors is tracked

Results:

- System requirements and mission objectives were solid from day 1
- Improved competence of the engineering design team
- High fidelity satellite design
- Flowdown of knowledge to other student projects
- DANDE currently has 20 tracked mentors

Vibration Test at Ball Aerospace, Boulder CO
The DANDE – SpaceDev Relationship

- SpaceDev (Starsys)
  - Entrepreneurial space systems company
  - Designs and manufactures space system mechanisms and actuators
  - Offices are located near CU-Boulder

- Relationship established during proposal stage
  - SpaceDev engineers met with students on a monthly basis
  - An agreement was established to provide mechanisms for the DANDE mission
  - The DANDE mission will be establishing flight heritage for the mechanism design

Bryan Helgesen, AJ Hoyt, SpaceDev Corporation
Mentorship benefits to Students

Mentors:

• Help set achievable goals
  • Requirements!

• Provide expert help in difficult domains

• Provide exposure to effective, real-world working practices

• Keep students on schedule with deadlines and deliverables

• Are a source of career support and advice

• Inspire students to pursue space-related careers

Barry Rayhill, Ball Aerospace
Benefits to Corporate Mentors

Working with students provides:

- Exposure to future employees
- Opportunities for product testing (TRL improvement)
- Increased morale and professional development
- Corporate networking
- Availability of student testing opportunities
- An opportunity to give back to the community and next generation
Lessons learned at COSGC

• Integrate mentorship from the beginning of a project
  • Mentors are more likely to help with later problems if they had a say in the original design
  • Early buy-in builds long-term commitment to a project

• Students are understandably forgetful
  • Educators should facilitate the search for mentors and monitor the student-mentor relationships.
  • Have you called your mentor lately?

• Students should take their mentor’s advice to heart
  • Ignoring advice or modifying instructions can sour a student-mentor relationship

• Mentors are busy people
  • Meet on their schedule wherever possible
  • Have a single point of contact for each mentor to avoid repeated questions
How to get involved

EDUCATORS:

• Look for mentors for your projects
  • Network – talk to local engineering firms, alumni, friends-of-friends
  • Go to the top
  • Ask for expertise, not money
• Facilitate the student-mentor relationship
  • Manage the search for mentors
  • Manage the initial contact
  • Monitor the periodic contacts
  • Provide support (lunches, etc.)

MENTORS:

• Look for student programs in need
  • Check with national programs: Space Grant, Cubesat, FIRST, University Nanosat Competition, etc.
  • Check with your alma mater and local schools
• Offer your specific expertise
• Get your workplace involved
The Care (and Feeding) of Mentors: Tips for students

- Involve mentors from the beginning of a project
  - Mentors don’t like to be called in at the last minute, especially when they could have made a difference earlier
- Respect their time
  - Mentors are volunteering their valuable time; keep meetings and communications efficient
- Maintain periodic contact
  - Keep them involved and up-to-date with formal and informal reviews (lunches work well)
- Do your homework
  - Don’t expect your mentor to do your work, show up knowing as much as you can
- Listen closely
  - If your mentor tells you to do something, it’s probably for a good reason
- Thank them
  - A letter to them (and their boss), plaques, lunches, etc. are always appreciated

Bryan Helgesen, SpaceDev Corporation
Herding Cats: Tips for Mentors

• Push your students
  • Don’t be afraid to make schedules, assign tasks, and hold your students accountable

• Be honest with them
  • If a design appears risky, be sure to inform your students of that, and explain why

• Give students the big picture
  • Tell students how their work fits into the rest of the system, especially business aspects

• Help cultivate character and good engineering practices
  • Be a role model of honesty, self-discipline, hard work, and teamwork.

Tim Flaherty, LASP
Conclusion

- The Small Satellite industry has a responsibility to foster student development in STEM related fields by providing real-world, hands-on opportunities.
- The next generation of engineers needs to be trained now.
- NASA has less money available for education.
- Individuals and Corporations can step up to the plate.
- Everybody: students, mentors, the industry, wins!

Get involved!

Much more is in our paper (SSC08-XII-5)

Feel free to contact us with questions and comments.