Too Late or Just in Time? Industry Partner Networking and Professional Development Opportunities for Capstone Students

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Overview

The NASA Psyche mission includes an ongoing Student Collaborations program focused on engaging undergraduates from all disciplines at scale. The largest effort involves sponsorship of capstone projects at universities nationwide. To date, this program has worked with 1,122 undergraduate seniors at 15 universities during their senior capstone courses across a range of disciplinary and interdisciplinary projects[1,2]. Unlike corporate industry sponsors that may have a mechanism to offer specific jobs to individual students following completion of a project, the mission does not have a pipeline for direct employment. Instead, the mission's sponsorship of 50-60 project teams per year includes supplementary professional development opportunities for participants: 1) NASA and industry speakers and networking opportunities, 2) targeted scientific and technical guidance, and 3) one-on-one discussions, employment guidance, references and letters of recommendation, and alumni connections[3]. Because the mission's role is as an industry sponsor, these offerings all occur outside the participants' regular capstone courses (and grading structure) and are not required of the participants nor offered for extra credit. With many competing demands on seniors' time[4,5], only a subset of the participants actually take part, even though participant feedback consistently shows that students want more interaction with industry professionals and opportunities for networking[2]. This abstract addresses the conference topics of *expectations* (sponsor, faculty, and students), *industry relationships*, and *student issues*. We report on the professional development opportunities offered, the levels of student participation (and lack thereof), and discussion of potential improvements, some of which may be undertaken by industry sponsors independently, but others that will require integrated efforts between industry sponsors and the university capstone courses and faculty.

Speakers and Networking

Each year, the mission program coordinators arrange for dozens of 30-minute videoconference sessions with Psyche mission team members and other professionals from NASA and related industries. These are selected to cover the range of disciplines and projects in the program (from STEM fields to communication, the arts, administration, project management, and finance) and are recorded for students to view later as needed. The opportunity to engage with professionals from multiple mission partners (NASA, the Jet Propulsion Laboratory, Maxar, and educational and governmental institutions) provides a tailored source of relevant skills, knowledge, and career advice, as well as professional connections, for the participants who choose to attend (or watch the recordings later). Unlike in a class or during an internship, however, the mission is unable to provide extra credit or a stipend to attend, making it difficult for students to prioritize the opportunity. In the fall semester of 2020, for example, there were 30 speakers, attended by between 3 and 14 students each (out of almost 300). While the professionals who interact with the students who attend (or answer questions via email after the fact) have reported they find them engaged, the number of students participating would potentially be much higher if extra credit (or some other similar incentive) could be offered in partnership between the industry sponsor and the capstone instructor[6].

Scientific and Technical Advisors

In addition to the mission-related speakers, scientific and technical advisors provide targeted feedback on capstone team projects through emailed questions, document reviews, and attending individual team meetings as appropriate to

provide advice on progress, answer questions "just in time", and clarify deliverables. Student teams are encouraged to request feedback or meeting attendance as often as needed though, again, only a subset of teams do so. Efforts are underway to make this a regular occurrence for all teams, as those who do take advantage of this access to professional expertise report experiencing meaningful engagement outside the regular senior design structure.

One-on-One Discussions, Job References and Letters of Recommendation, and Alumni Connections

To better understand the status and needs of the student participants, the mission program coordinator offers 15-minute one-on-one meetings to all participants. In the 2020-2021 academic year, 212 of 297 participants (~70%) chose to sign up. The meetings are structured as "ice breakers" around questions about what the student hopes to get out of capstone, what worries they have, what previous experience of any kind they have (relevant or not), and what they are hoping to do after graduation. This opportunity to learn more about each student individually has allowed the mission to tailor resources and activities to align with student needs (and prepare to act as job references or write letters of recommendation) and has also highlighted a worrying gap between those who are knowledgeable and prepared (through academic preparation, jobs, clubs, or projects) to be competitive in the job market and those who are not. In these meetings the students are pointed to relevant resources, reassured that their concerns are shared by their peers (and can be overcome), and encouraged to think strategically about using capstone to their advantage in job applications and interviews. Unfortunately, particularly for the underprepared students, such recommendations partway into senior year may be too late to be overly helpful or even actionable.

Additionally, all participants are encouraged to interact with each other during and beyond capstone. They are included in a shared communication platform (Slack) during their time with the mission and invited to join an alumni listserv and private LinkedIn where the program posts job opportunities and helps alumni make connections. Students are encouraged to see the other capstone students (present and past) as their future contacts and are reminded that in their professional futures, collaboration and cross-disciplinary teamwork will be encouraged and expected[3]. Lack of participation in recent online networking events with Psyche program alumni at companies such as Amazon, General Dynamics, and Northrop Grumman, however, suggest that there is a disconnect between students' reported expectations of program offerings and whether they make time to participate when opportunities are made available.

Next Steps

The mission program adjusts and expands its offerings annually based on feedback from participants. Routinely, however, what participants say they want and need (networking opportunities, professional development, access to industry expert feedback) is not reflected in the numbers who participate in those opportunities. In the future, large-scale industry sponsors like the Psyche mission may need to find ways to provide more traditional, course-based "incentives", such as extra credit, to help students prioritize the opportunities they say they want and need. Additionally, just-in-time offerings such as drop-in "office hours" with professionals, required iterative review by outside experts (separate from or in concert with the university capstone courses), and working to establish a clearer pipeline for employment, such as reaching out to students at partner universities in their junior year about summer internships which could lead to post-graduation positions, could assist both industry sponsors and university capstone courses reach the shared goal of helping senior capstone students prepare to transition successfully to the workforce.

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