

Coordinating Opportunistic Interdisciplinary Projects Across Single-Discipline Capstone Courses

C. D. D. Bowman, L. T. Elkins-Tanton, D. Bacalzo, P. Howell, D. McCarville, R. Meuth, E. J. Montgomery, A. Sanft, and M. Zhao, Arizona State University



Abstract

NASA's Psyche Asteroid Mission piloted interdisciplinary capstone projects with faculty and students from six disciplines in engineering, the arts, and communications. Findings include challenges particular to interdisciplinary projects carried out across single-discipline courses and a potentially-replicable approach of including project management students on teams to improve outcomes and increase real-world fidelity.

Introduction

- NASA's Psyche Mission, led by Arizona State University (ASU), is scheduled to launch in mid-2022 and arrive at the mostly-metal asteroid, (16) Psyche, in early 2026.
- Educational components include development of interdisciplinary capstone projects tied to the mission.
- Pilot projects at ASU involved six disciplines:
 - Computer science
 - Computer systems engineering
 - Engineering management
 - Graphic design
 - Industrial design
 - Public relations
- Capstone projects expand nationally starting in fall 2018.

Pilot Projects

1. Psyche mobile app development competition (5 teams)
2. Design of a system to image iron meteorite samples for analysis (2 teams)
3. Development of an image analysis algorithm for bulk chemical analysis of iron meteorite samples (2 teams)
4. Creation of a public relations plan to engage the public through the life of the mission (1 team)

Conclusions and Future Work

Critical components for opportunistic interdisciplinary capstone projects carried out across single-discipline capstone courses include communication, flexibility, and openness to continuous improvement among faculty and departments.

The lessons learned from this pilot (including the approach of assigning engineering management students as project managers), along with research on interdisciplinary capstones and ongoing evaluation of the program, will inform changes and improvements in preparation for expanding this effort nationally.



Graphic Design Showcase



Meteorite Imaging Rig team

Challenge	Solution
Project selection schedules differ (from 1st day of class to > 3 weeks into semester).	Work with faculty to develop and implement streamlined team and project selection/assignment processes.
Team members hail from multiple sections in large-enrollment courses, resulting in different instructors.	If possible, constrain teams to members from the same section and/or same TA.
Students from different majors have largely different course schedules.	Students self-organize meeting times, including after-hours. Provide call-in option for weekday meetings with sponsor.
Different majors do not have access to same buildings and facilities.	Short-term solution: faculty provide space in their own labs. <i>Systemic solution sought.</i>
Deliverables and requirements vary across capstones.	Include engineering management students to project manage and provide realistic experience.
Disciplines differ in terms of cultures, norms, and work habits.	Project management students enforce co-constructed team rules and work schedules.
Students have little experience working with other disciplines; may not value their contributions.	Project management students facilitate cross-discipline interactions, highlight contributions, and alert faculty to issues.
Course assessments are handled differently, at different times.	Augment with shared assessments. Conduct separate program-level assessment.



Mobile App team



Students in the Center for Meteorite Studies