

Pedagogy in Interdisciplinary Higher Education: An Investigation of Faculty and Student Perspectives.

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Acknowledgements: This research was supported by the ASU IGERT in Urban Ecology program; NSF grant number: DGE 0504248. We thank student and instructor participants, our graduate student colleagues (including Ben Jewell who gave us advice on interviewing techniques), and Dr. Dave White who provided us with training on holding focus groups. Any opinions, findings and conclusions or recommendation expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation (NSF).

Interdisciplinary Higher Education is on the rise



Academic disciplines use disparate instructional strategies. Disciplinary-specific pedagogy is appealing because it can mimic methods and enforce paradigms to indoctrinate students to the discipline. Today, research and education are becoming increasingly interdisciplinary as scholars seek knowledge and solutions that lie between disciplinary boundaries. Many colleges and universities have begun to institutionalize interdisciplinarity to approach broader societal issues. **Interdisciplinary programs such as environmental studies or sustainability often include earth science as a key component.** At Arizona State University (ASU) interdisciplinarity is becoming institutionalized at many academic levels. **Understanding how pedagogy is influenced by shifting academic culture and how students and instructors perceive these changes is important for reflecting on institutional changes and designing interdisciplinary programs.**

Research Questions

1. Given ASU's emphasis on interdisciplinarity, do students and faculty share a **common conception of interdisciplinarity**?
2. To what degree are students, faculty and the academic institution experiencing **uncertainty** and in what ways?
3. Have faculty members of the New American University embraced interdisciplinarity? Are they still conducting **boundary work** to ensure their intellectual and disciplinary space?
4. Interdisciplinary education appears to emphasize **critical thinking skills** and **problem-centered learning** activities. What **challenges** does this present for instructors and students?



We conducted Interviews, Focus Groups, and Surveys

* In the spring 2009, we interviewed 20 ASU professors from the interdisciplinary Schools of Sustainability (SOS), Human Evolution and Social Change (SHESC), and Life Sciences (SOLS) who self-identified their upper level undergraduate classes as interdisciplinary.

* We administered a paper survey to the students from 10 of these classes and selected students for focus groups.

* The semi-structured interviews and focus groups were audio recorded, transcribed, and iteratively coded for analysis based upon four meta-themes: critical thinking, problem-based learning, uncertainty, and boundary work. Meta-themes were selected from a literature review and emergent topics.

Conceptions of Interdisciplinarity

When presented with a variety of definitions formed by their peers, **students** from focus groups generally preferred the following definition for interdisciplinarity:

"Bringing together experts in different fields to solve complex problems that span multiple fields of expertise"
-Student definition

Approximately 70% of student's surveyed had a well-informed conception of interdisciplinarity. However, there was some **skepticism** expressed with otherwise good definitions such as:

"Master of none; to me it means we learn enough about many things to be able to synthesize a problem and know where to go to get information, help, and support."
-Student definition

Some students had no clue, for example: "Self and peer disciplining" or "discipline that comes from within."

The vast majority of **faculty** had a very well-formed view of interdisciplinarity, probably best articulated in the following quote:

"...you have disciplines and disciplinary themes and methods. Then you have this kind of multidisciplinary where you might address a problem from different disciplinary perspectives, but you're not really collaborating. And then you have interdisciplinarity, where you actually work together with various scholars from different fields, but you're really collaborating so it's more this idea of coproduction of knowledge, which is again a notion from a different field, but where you would really create knowledge together and not just think about a way to synthesize already existing knowledge from different disciplines."
-Faculty member who went on to describe their preference for thinking beyond disciplines.

The majority of faculty and student conceptions of interdisciplinarity were quite compatible.

Student Surveys Reveal: Preferred Learning Activities, Motivation, and Suggest Learning Outcomes.

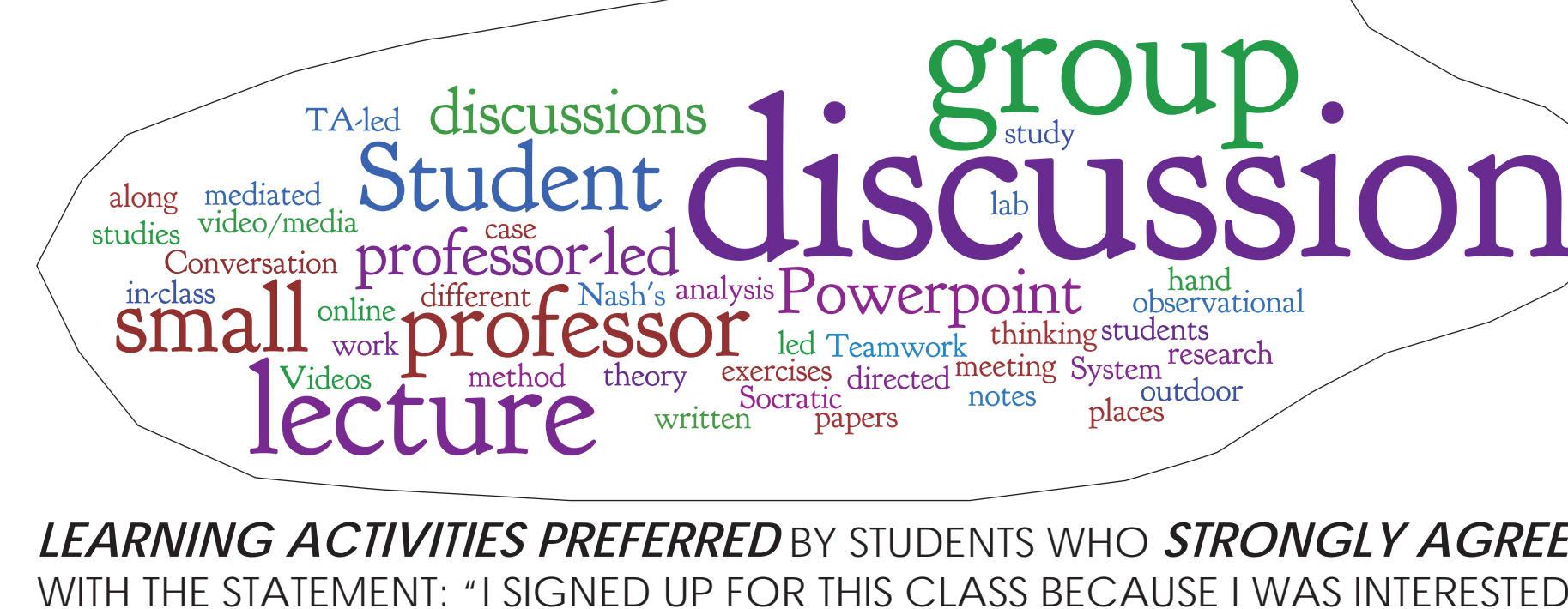
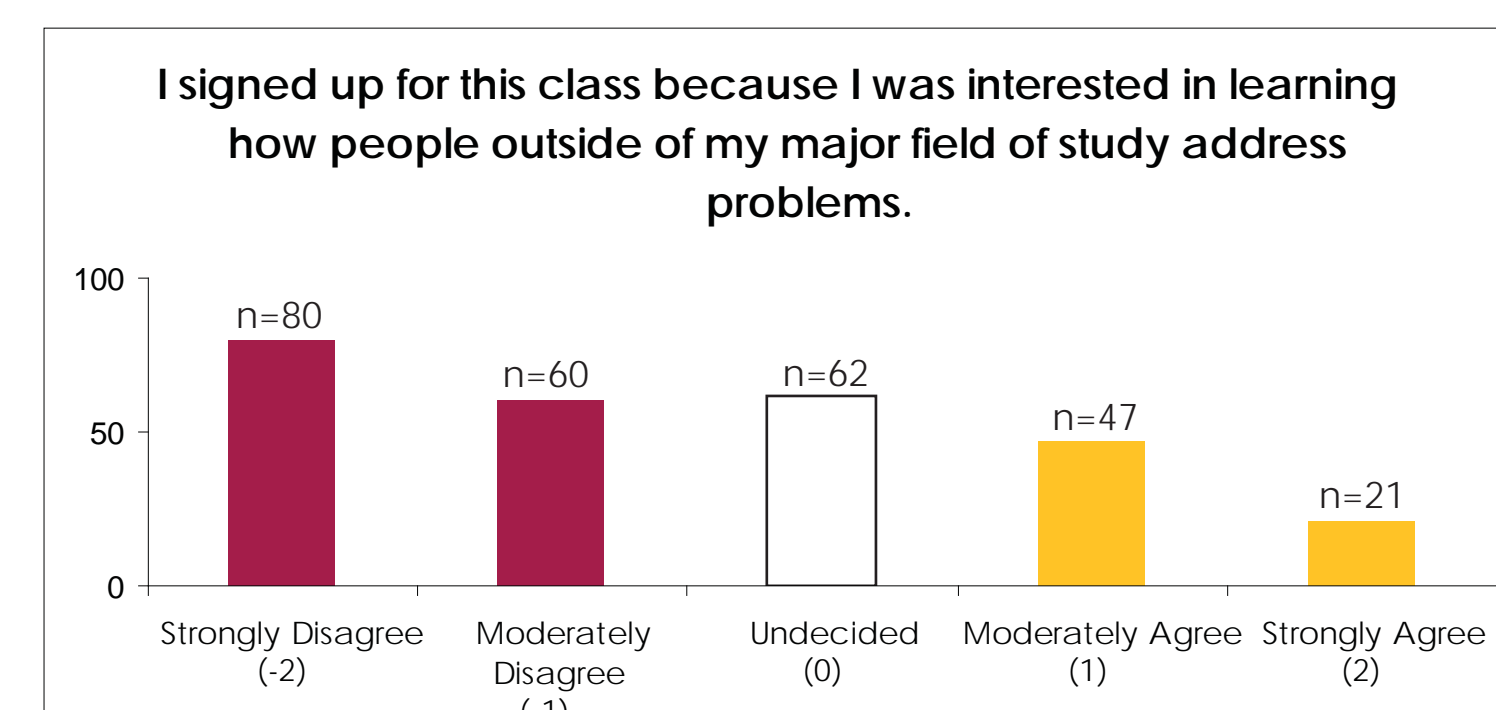
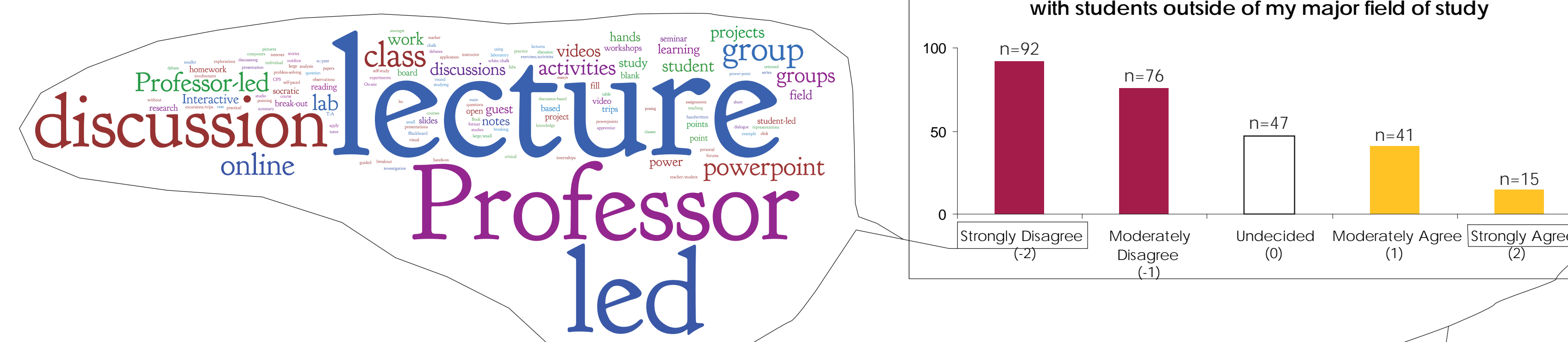
We surveyed 275 students from 10 courses in SOLS, SOS, and SHESC. Classes were upper level undergraduate courses and most students were juniors or seniors (229). Students represented a wide range of disciplinary and interdisciplinary backgrounds (See table below).

Most students did not sign up for these interdisciplinary classes with the purpose of learning about or working with students outside of their major field of study. Nearly 2/3 of students stated that the class was required for their degree program. Interestingly, ~70% of students said they had taken a previous interdisciplinary course.

Learning Activities

Students with interdisciplinary leaning answers to survey questions appear to prefer inquiry based learning activities rather than professor led lectures, which was the preferred learning activity of those students who answered survey questions with non interdisciplinary leaning language.

LEARNING ACTIVITIES PREFERRED BY STUDENTS WHO **STRONGLY DISAGREED** WITH THE STATEMENT: "I SIGNED UP FOR THIS CLASS BECAUSE I WAS INTERESTED IN WORKING WITH STUDENTS FROM OUTSIDE OF MY MAJOR FIELD OF STUDY."



Learning Outcomes?

This class uses different teaching styles than others I've taken.	This is an interdisciplinary course.	I signed up for this course because I was interested in working with students outside of my major field of study.	I signed up for this class because I was interested in learning how people outside of my major field of study address problems.	This course has changed the way I think about problems.	This course has challenged my previously held views.	School or Academic Focus (n =)
0.1	1.0	-0.7	-0.5	0.5	0.5	Average (275)
0.1	0.9	-0.9	-0.7	0.8	1.1	DBL Major (18)
0.5	0.8	-0.9	-0.4	1.0	1.0	SOS (58)
-0.8	1.1	-0.9	-0.8	0.1	0.2	SHESC (38)
0.4	0.9	0.0	0.2	0.4	0.5	Humanities (12)
0.4	1.1	-0.6	-0.4	0.5	0.4	SOLS (98)
-0.1	1.1	-0.6	-0.6	0.1	0.3	Other Sciences (28)
0.0	1.0	-0.8	-0.2	-0.2	-0.5	Engineers (5)
-0.3	-0.2	-0.6	-0.9	0.5	0.8	Business/ Econ (10)

Positive numbers represent the average student agreement with the statement. Numbers greater than 1.0 suggest that most students strongly agreed with the statement. Negative numbers represent the average disagreement with the statement. The data is sorted by academic units (SOS = School of Sustainability, SHESC = School of Human Evolution and Social Change, SOLS = School of Life Sciences). Colors indicate that the average is above or below the an answer of uncertainty (0) by a value greater than the 95% confidence level (statistically significant < p < 0.05; yellow for agreement and red for disagreement).

Most students agreed that the course they were enrolled in was interdisciplinary. However, not everyone thought that the teaching styles were different than other classes. Students admitted that they did not necessarily enroll in the course to learn about or work with people from outside of their major. However, **most students stated that the course had changed the way they think about problems and challenged their previously held views.** Therefore one might assume that many of the students had significant learning outcomes, probably in the areas of critical thinking and problem solving approaches. These data also suggests there may be some differences by academic focus.

Critical Thinking and Problem-based Learning Activities: Uncertainty and Challenges for Undergraduate Students



Some students are unsure where to turn for answers because **there are often no text books** associated with interdisciplinary courses and there are not always expert opinions to turn to. "It is challenging not knowing what will be expected from the test or exam. I wonder if I am studying the right way or right stuff. All I have is my notes." -paraphrase focus group

Students would like to know professors' opinions on some issues, but many also articulated that **interdisciplinary training is breaking away from right answers and focusing more on critical thinking and the process of forming solutions.** "This class is teaching skills for how to approach problems." -paraphrase, focus group

Some students have a difficult time learning to think critically and moving beyond disciplinary ways of thinking in terms of what constitutes evidence, facts, etc. This may have to do with academic comfort levels: in interdisciplinary environments they are not sure about the disciplinary epistemologies.

Naturally, students are also worried about grades and many of the students we talked to expressed that with interdisciplinary courses: **"grades are based on our ability to articulate different sides of an argument rather than reciting facts."** (paraphrase, focus group)

Goals and Challenges for Faculty

Faculty stated that Interdisciplinary courses tend to be **problem-centered** because the world's problems are interdisciplinary and we need to give students tools to understand and solve them.

"The world doesn't give you a problem wrapped in a discipline. The current economic meltdown, for example, that's not a disciplinary problem. . . and particularly when it gets complicated and complex and ethically challenging, people need to be able to work outside of the boundaries that they've been taught. And we don't do that. And the fun of it is the fact that hopefully I've helped some people do that." -Faculty member

"One important aspect was normative capacity, normative competence. And this is not, we shouldn't confound this with advocacy. I don't want to have my students be blind advocates for ideological causes but having the competence, thinking in a good and critical way about preferences and values and principles and goals and all these issues that are guiding our actions, our political activities, our economic activities. I want them to be able to do this."
- Faculty member articulating the importance of interdisciplinary education and the critical thinking and problem solving skills which characterize these types of courses.

A significant point of concern for faculty is trying to help students form **a balance of depth and breadth** of knowledge as they try to embed their lessons in real world issues. Interestingly, student were more focused upon the goal of learning how to **synthesize** information.

"We're asking them to problem solve and think synthetically and to draw on information they've gotten from other courses. Well, how do I know how much information they [have] even gotten from other courses?" - Faculty member frustrated by a lack of cohesiveness of interdisciplinary programs because there is not necessarily a common body of knowledge.

Institutional and Academic Boundary Work



"I try to persuade students that these boundaries are just artificial things that are put there so they can be categorized. You're told you are an X, your major is X and that isn't necessarily any meaningful thing at all."
-Faculty member who is trying to move beyond disciplinary boundaries

"Well, I've heard of cases of people who actually got washed out of their PhD program because they didn't have enough of a solid background in their discipline, so, and then that stems back to the faculty and how they evaluate students and the programs." -Faculty member concerned that **academic boundaries** are standing in the way of students who want to participate in interdisciplinary knowledge production.

"It's unclear to me - you can not use this against me - whether the departments are really sure how to evaluate what I really do. And how what I do is important both for science and the university. If they put their money where their mouth is, and say this is what we hired you to do - it's going to be great."
-Faculty member who is excited about interdisciplinary research, but **worried about the tenure structure.**

Summary: Boundary work is ongoing within these academic programs and at the institutional level and there is significant uncertainty on the part of students and faculty. However, it appears that students, faculty, and schools have a common goal to refocus research and education towards solving complex problems with societal relevance. Additionally, it appears that there may be students with learning styles that are more likely to be drawn to the collaborative and synthetic activities of interdisciplinary classes. What does this mean for interdisciplinary educators?