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I'm applying for funding for:
Fall 2014
Spring 2015

By submitting this application, I confirm that, if selected to receive a Chancellor's Award for Excellence in STEM Education, I will:

- ✓ Attend and be recognized at the annual Symposium on STEM Education (fall 2014).
- ✓ Give a brief introduction (~10-15 min) to my project at DBER in fall 2014.
- ✓ Actively engage in the CU-Boulder STEM education community by attending Chancellor's Fellow events.
- ✓ Present my work to the STEM education community by giving at least one DBER seminar, OR, if that is an impossibility, I will give a talk that the CU-Boulder STEM education community is invited to attend.
- ✓ Submit a 1000 to 3000-word report detailing the outcomes of the project at the end of the funding period.

Do I Belong Here? Uncovering Power Dynamics Among Students and Teachers in Sophomore Engineering Gateway Courses

Submitted by Janet Y. Tsai, Doctoral Student in Department of Mechanical Engineering
Advised by Dr. Daria Kotys-Schwartz, Instructor, Department of Mechanical Engineering
Collaborating with Dr. Daniel Knight, Researcher, Department of Mechanical Engineering

A. Goals and Objectives

The purpose of this study is to understand and identify the conventional, "taken-for-granted" cultural norms that permeate sophomore-level engineering required courses. Cultural norms can be thought of as expectations, beliefs, assumptions, stereotypes and other notions that students, instructors, TAs, and staff members consciously and subconsciously ascribe to and construct dynamically (Carspecken, 1996). Each class has different cultural norms, depending on the instructor, students, department, curriculum, textbook, and events that occur throughout a given semester. The challenge of this research is to identify salient cultural norms in a set of focal gateway engineering courses – determining how these norms are constructed, what actors or actions can change or reinforce a norm, and the *impact on students* who align with or oppose the normative environment.

The ultimate goal of this research is to identify connections between cultural norms, student and teachers, and power differentials; also to understand the conditions under which these dynamic connections are formed and changed. Analysis of power within the classroom follows the understanding and identification of cultural norms, as the norms are established and reproduced by those in power in accordance with their beliefs and desires. Meanwhile, the less powerful have less ability to adjust or alter a cultural norm and as a result have less input in creating and maintaining normative environments that are structurally recognized and valued (Eisenhart & Finkel, 1998; Tonso, 1996; Willis, 1977).

Focusing on cultural norms and power dynamics is a novel means to determine what is happening within the sophomore year of engineering that encourages some students to stay in engineering majors and others to leave. This study breaks from traditional engineering education research by incorporating methods from the learning sciences and observing the development of student culture ethnographically (Johri & Olds, 2011). Because engineering education occurs within the larger context of societal power differentials, it is necessary to study and understand these processes in order to give more engineering students better chances at success.

Research Questions:

1. How are cultural norms within engineering mathematics courses of the sophomore year constructed by students, instructors, and TAs? What is the impact of these cultural norms on different students: what is valued, celebrated, or considered incorrect or deviant?
2. How do power dynamics affect student and instructor actions within the fundamental mathematics requirements for engineering in the sophomore year?

B. Project Motivation

Details of Engineering Sophomore Year

While 82% of students return for the second year of engineering school at the University of Colorado (CU-Boulder) College of Engineering and Applied Science (CEAS), the overall percentage

returning for the third year drops to 69% (Figure 1, CU-Boulder freshmen retention and graduation rates, 2012).

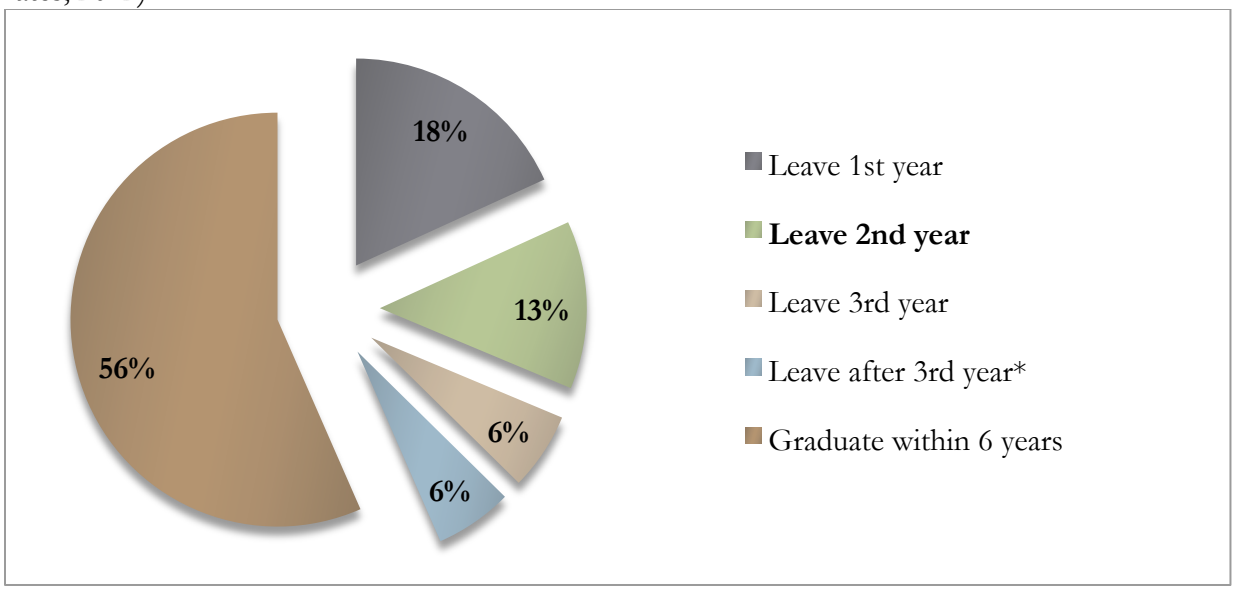

Figure 1: CU Boulder CEAS Graduation and Attrition Rates, Average Over Previous 10-years (* Leave after 3rd year or take greater than 7 years to graduate)

The sophomore year curriculum consists of the final math and science requirements for all engineering disciplines. Students who have difficulty with or fail a fundamental class during their first two years can seriously delay their graduation date or be discouraged from finishing the degree. Such experiences are known to dissuade students and have been correlated with early departure from engineering majors (e.g., Seymour & Hewitt, 1997).

Engineering educators have focused on curricular interventions to improve the first-year experience (e.g., Sheppard & Jenison, 2007). However, little attention has been given to understanding the environmental or structural barriers that engineering students face during the second year of their education, a year which represents considerable retention risk in engineering. The courses of the sophomore year mark the descent into "the valley of despair" as students are confronted with a seemingly endless march of technical requirements chained together with little wiggle room for electives or failure (Kotys-Schwartz, Knight, & Pawlas, 2010). The second year features gateway courses that eventually lead to the practice of engineering, courses that initiate students into greater levels of abstraction and analytical engineering problem solving. Consequently, we have chosen gateway courses endemic to the sophomore year as our main study sites for understanding cultural norms and power dynamics.

Importance of Math Prerequisite Gateways

All majors in the CEAS require at least four math classes: Calculus 1, Calculus 2, Calculus 3, and Differential Equations & Linear Algebra. As the naming scheme implies, the Calculus courses must be taken in sequential order with minimum passing grades determined by each department (Aerospace Engineering requires a C or higher, while a C- or higher is passing in most other engineering departments for a prerequisite course). Students with advanced math preparation may take Calc 3 or Diff Eq in their first year, while other first-year students begin with Pre-Calculus and/or choose to take a yearlong Calculus 1 course designed to allow more time for students to learn fundamental material. There is immense variety in how and when students proceed through the math sequence, though all engineering majors must pass through each course in order to

graduate. As evidenced by departmental curriculum flowcharts and course numbering, APPM2350: Calc 3 and APPM2360: Diff Eq are typically taken during sophomore year.

We focus on Calc 3 and Diff Eq because they match our desire to focus on the sophomore year, and because these two courses are the predominant prerequisites for subsequent major-specific technical courses across the CEAS. In the Mechanical Engineering curriculum, for example, Calc 3 is a prerequisite for one required course (Thermodynamics), while Diff Eq is a prerequisite for 4 required courses. In turn, these required courses then serve as prerequisites for the next level of technical coursework, eventually leading towards degree completion (see Figure 2). Consequently, difficulty with or failure in either Calc 3 or Diff Eq can severely impact a student's ability to progress into subsequent courses within their major, causing a compounding effect for students navigating the inflexible curriculum, opening the door to thoughts of attrition. In other words, the engineering curriculum is a rigid network that can only be traversed along officially acceptable prerequisite pathways. No deviations are allowed, as students must achieve passing grades in Calc 3 and Diff Eq before they can proceed towards graduation.

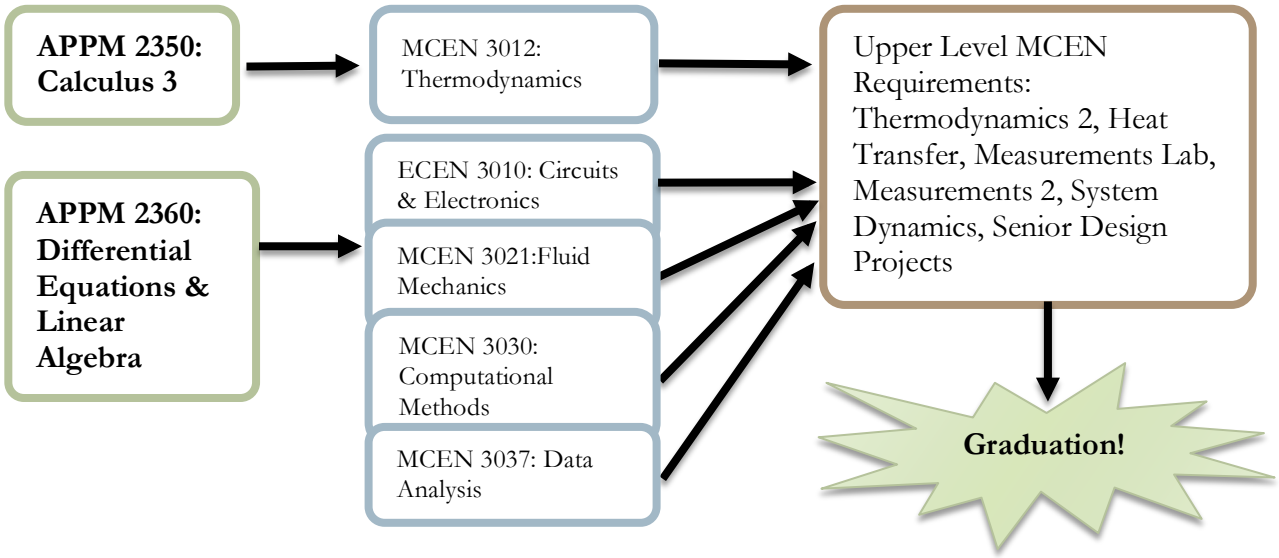

Figure 2: The Rigid Prerequisite Network of the Mechanical Engineering Curriculum

As enrollments in the CEAS are scheduled to grow (in some departments double) over the next few years, engineering educators must be proactive in supporting student survival through the attrition-heavy first and second years of undergraduate. While the first year has been rigorously studied in the engineering education literature, understanding the second year and the climates of gateway courses such as Calc 3 and Diff Eq is critical for understanding the experiences of our undergraduates and how we can best inspire them to remain in engineering.

Belonging as Predictor of Retention

Feelings of belonging, or fitting in with the culture and discipline of engineering, have been positively correlated with retention in engineering in a variety of studies including Seymour and Hewitt's landmark work *Talking About Leaving* (1997). Belonging has also been studied in the context of student identity formation, with previous research demonstrating that students who are able to forge an identity that belongs with the prevailing culture of their programs are more likely to remain in engineering while those who cannot are more likely to switch out of engineering majors (Stevens, O'Connor, & Garrison, 2005; Stevens, O'Connor, Garrison, Jocuns, & Amos, 2008). Recent case

studies of undergraduate engineers have demonstrated unique individuals who survive in engineering majors by adapting their identities to accommodate compromises between engineering cultural norms and the student's original identity (Danielak, B. A., Gupta, A., & Elby, 2014; Foor, Walden, & Trytten, 2007). Quantitative studies have also shown lack of belonging in engineering as a significant factor in a student's choice to leave engineering (Marra, Rodgers, Shen, & Bogue, 2012).

This study looks to fill the gap between survey-based research and case studies by looking at the environment surrounding the individual students, at how cultural norms are created in engineering against which students conform, adapt, or rebel. By identifying and understanding how engineering cultural norms are created, particularly in critical gateway courses, we have a fresh angle to study and investigate the relationship between feelings of belonging and student retention in engineering.

C. Conceptual Frameworks

This study has three intersecting conceptual frameworks that support and structure our research: Critical Ethnography, Cultural Analysis, and Actor-Network Theory. Critical Ethnography is described as both a theoretical orientation and a method, as the phrase represents both an epistemological stance and a methodology (Carspecken, 1996; Johri & Olds, 2011). We turn our attention to the former here, as details on the method of critical ethnography are explained in the Methodology section below. In the context of the learning sciences, a critical theoretical perspective is a specific approach to examining the underlying power structures of the status quo (Johri & Olds, 2011). Critical ethnographers look at *truth claims*, which are "assertion[s] that something is true or false, good or bad, correct or incorrect" (Carspecken, 1996, p.84). There are three types of truth claims: 1) objective, 2) subjective, and 3) normative-evaluative. *Objective* truth claims regard aspects of existence that can be observed by multiple people, while *subjective* truth claims are characterized by singular or privileged access to an internal state of being, feeling, or intention. The last category of *normative-evaluative* truth claims forms the arena of cultural norms, as these are truth claims that are indicative of "position-taking" with others, that "carry claims and assumptions about what is 'proper' that soon expand into cultural understandings about what is right, wrong, good, or bad" (Carspecken, p.85). Normative-evaluative truth claims are neither objective nor subjective, but contain serious implications for creating cultural norms regarding what's 'proper' in an engineering classroom, for example. We utilize this conceptual framework to identify normative-evaluative truth claims in the context of sophomore engineering gateway courses, looking to understand how cultural norms are constructed and the power structures that selectively enable some people to enforce and maintain these norms.

Our second conceptual framework of Cultural Analysis builds on the concept of Critical Ethnography and expands in detail what it means to examine culture as the primary unit of analysis. In McDermott and Varenne's editorial *Reconstructing Culture in Education Research*, they distinguish cultural analyses from social or psychological studies in that they focus first on "collective constructions" instead of individual interaction (2006). Consider their statement, "When applied to schooling, a cultural analysis is less about who is going to succeed, and more about how institutions are built in which so many children can be declared failures" (2006, p.10). In line with this thinking, then, we are not interested in the personal or demographic details of individual students which enable them to pass exams and navigate the engineering curriculum, we are more concerned with how the curriculum was built in the first place, how a normative classroom environment is established that makes some students feel at home and others out of place. The cultural norms are the "collective constructions" of engineering that we seek to explicate, while simultaneously acknowledging that we as educational researchers are also part of this engineering culture and are jointly responsible for its state of being. We do not aspire to be isolated and purely objective

observers as we undertake ethnography in this study, instead this conceptual framework urges us to identify our biases and look beyond the stack of official recommendations and reports for the underlying cultural norms that have been assumed and unchallenged within engineering culture so far.

Our last conceptual framework, Actor-Network Theory or ANT, provides one means of looking past individual student characteristics to examine instead the normative processes wherein students become enrolled and act in networks that place them on distinct educational trajectories in space and time (Nespor, 1994). ANT describes learning as changes in the organization (both temporal and spatial) of actors and networks, thus this theory offers a useful framework for studying the typical organization of students and emergent power dynamics within the competitive environment of the second year of engineering school. In line with ANT, we seek to uncover and describe the "ongoing social activities" or cultural norms that shape actor-networks and learning among students (Nespor, 1994, p. 12). Actor-networks of engineering include non-human nodes like textbooks, homework sets, tutoring programs, computer labs, etc., and human nodes like professors, teaching assistants, and advisors that students interact with under specific conditions as prescribed by existing cultural norms and power dynamics. In this way, ANT offers a perspective of engineering school that is neither solely focused on existing structures or on individual agents, but instead examines the conditions that shape connections between them. We use ANT in this study with the intention of identifying these normative conditions and their results on student retention in engineering.

D. Prior Work

The current project was developed in reaction to an unsuccessful educational intervention deployed within a Mechanical Engineering sophomore gateway course of Fall 2012. The authors reconfigured a large 200 person lecture-based course by replacing one lecture period a week with a smaller active learning recitation section, team-taught by a Graduate Teaching Assistant and an undergraduate Learning Assistant. Active learning recitations (comparing two different active learning interventions) were held over the 16-week semester with the intention of increasing student engagement and confidence with the fundamental course material. Post-assessments including surveys and qualitative interviews revealed that students did not value the conceptual content of the recitations, even though the conceptual content directly aligned with the summative assessments (i.e., exams) in the course and was promoted by the course instructor (Tsai, J. Y., Kotys-Schwartz, D., & Hannigan, M., 2013). Student resistance to the authentic practice of engineering and their over-valuation of simplistic numerical problem solving as "real engineering" was a clue about the students' value structures. Investigating student belief structures lead to the question of what types of students were considered publicly "smart" in these courses, and were afforded academic power and respect by peers—those who were considered "good" engineers. This question, in turn, led to the formulation of the current research questions surrounding cultural norms and power dynamics within sophomore engineering courses. The following sections detail the methodology and preliminary findings of the follow on work to answer these new questions.

E. Methodology

Research Design

This study is entirely qualitative, as fitting for an exploratory study into the under-researched culture of gateway courses in the engineering sophomore year. We seek to understand the "how" and "why" behind individual student experiences that can only be uncovered through the collection and analysis of qualitative data. As is customary in qualitative research, data collection and analysis

occur in overlapping iterations, as emergent themes from early analysis have enabled the research team to adjust the parameters of data collection to better suit the evolving study's focus. The data collection and analysis process is presented here in a linear fashion for readability, but in reality the process is simultaneous and iterative. The CU Boulder Institutional Review Board (IRB) has approved these methods of data collection and analysis in Protocol #13-0459: Sophomore Engineering Students' Constructions of Status and Hierarchy.

Data collection for this study began ethnographically in Fall 2013 with the targeted observation of two lecture sections of APPM2350: Calculus 3 for Engineers throughout the duration of the semester. Fieldnotes documenting classroom events, interactions, and student behaviors were taken electronically in real-time by a member of the research team to establish a baseline primary record of each class. Course activities including recitations, review sessions, and an exam were also observed by a member of the research team with accompanying fieldnote record. Artifacts, including course syllabus, homework assignments and solutions, exams, projects, worksheets, textbook, etc. were collected for later analysis. In totality, over 95 hours of course activities were observed. At the end of the semester, semi-structured interviews were conducted with eight students enrolled in the course and one course instructor. These interviews were audio-recorded and later transcribed to text with personal identifiers removed for further analysis.

In Spring 2014, data collection continues with targeted ethnographic observation of three lecture sections of APPM2360: Differential Equations & Linear Algebra. Similar to the prior semester, observational fieldnotes are taken in each class meeting a researcher is present for, with 48 total hours of observations anticipated. Artifacts specific to this course are collected as well. We plan to do follow-up interviews with the 7 students still enrolled in engineering at the end of the spring semester, and interview at least 2 of the 3 instructors under observation following the conclusion of the semester. Additional interview subjects may be added to supplement student perspectives on these gateway mathematics courses. All interviews are semi-structured, audio-recorded, and cleaned of personal identifiers in the resulting transcripts.

Table 1: Data Collection Activities in Fall 2013 and Spring 2014

Semester	Course under Study	Course Activities Observed	Hours of Researcher Observation	Student Interviews	Instructor Interviews
Fall 2013	APPM 2350: Calculus 3	2 lecture sections (1 instructor); 1 recitation	95	8	1
Spring 2014 (anticipated)	APPM 2360: Differential Equations & Linear Algebra	3 lecture sections (3 instructors)	48	7	2

Qualitative Analysis Process

Data analysis of observational fieldnotes is based on Carspecken's method of *Reconstructive Analysis* (1996). In this method, researchers first identify passages of interest from the fieldnotes. The qualitative research team closely examines these fieldnote segments, mentally taking the place of each actor present in the scenario (teacher, students, observer) to identify the possible range of meanings one could take away from the event. The full range of possible meanings, or *reconstructions*,

are written down for each passage of interest to create *meaning fields*. Additional possible meanings based on temporal and local societal context are considered and similarly recorded with the set of meaning fields for a given passage in a process called *horizon analysis*. As Carspecken describes, the purpose of reconstructive analysis is four-fold:

> 1) to help researchers clarify the impressions of meaning they have received from their observations,
> 2) for peer checking, calibrating against the reconstructions of others,
> 3) for use as a structure in the final write-up,
> 4) to lay the groundwork for validity reconstructions and horizon analysis (p. 102).

We utilize reconstructions to discuss the meaning of classroom events across members of the research team, and to compare our perceptions of meaning with our interviewees in subsequent interviews. Reconstructions are also used to develop an emergent coding scheme, as the selected fieldnote passages are initially loosely coded and later compared with codes developed and based on interview transcripts, full observational fieldnotes, and our conceptual frameworks.

Coding, or categorizing, of qualitative data continues iteratively as different coding schemes are applied, revised, and re-attempted with interview transcripts, fieldnotes, and artifacts. Codes are tested with members of the research team and third-party qualitative researchers who are not involved with the project for validity checking. Coded data are used to illustrate various themes and group related concepts, leading to findings and further comparisons between themes and classes under study.

F. Preliminary Findings

Early analysis of the data indicates several emergent trends. First, the instructors of each course under observation are major power players who guide the cultural norms of the classroom, maintaining the frameworks within which students establish their own identities, feelings of belonging, and actor-networks. Each instructor appears to be in charge of their own classrooms, not only governing grades, homework assignments, projects, and exams, but also controlling how lecture periods flow, which students get their questions answered and which students get special attention. However, each instructor has different reasons and trajectories, which led to their current teaching assignments, and some feel more empowered than others to teach the subjects as they wish. Outside the flow of classroom events, the instructors may not have much power at the department or college level to enact structural changes to the curriculum or format of the course; they are swayed strongly by individual course traditions and math syllabi that have been unchanged for decades. While all instructors have exuded passion for the course content, they communicate it differently to their classrooms. Some use a mixture of objective content and subjective truth claims regarding how the material makes them *feel*, while others choose to focus on the *coolness* of the mathematics or the history behind a given equation or method. Still other instructors emphasize the simplicity of the required mathematics in comparison with what *real* mathematicians study, possibly implying that the coursework being taught is *trivial* and somehow *beneath* the instructor's intellect and mathematical skill. These differing instructional styles affect the development of cultural norms within the classroom, as different types of students are emboldened to speak up and participate while others lose interest, stop attending lectures, or just check out mentally and attend to their phones while sitting in lectures. Students who disengage from lectures and required classes may also experience the feeling that engineering is not for them, leading to a desire to change majors.

Consequently, a culturally acceptable form of banter, or casual communication between instructor and students, exists for each class and is different for each class, depending on the instructor and the students who choose to speak up. As observed in both large and small classrooms, both Calc 3 and Diff Eq, the majority of the speakers during class are men. Very few

women choose to ask questions or participate out loud during a lecture, while there are many men that do not hesitate to volunteer responses and opinions, even without being called on. This gendered discrepancy between question-askers and those who stay silent is not surprising to students or instructors, but is the default mode of operation, the cultural norm for these courses.

The majority of students who are silent during lectures find other ways to learn the material, complete homework assignments and projects, and study for exams. Some choose to follow stereotypical practices of good students like getting to class early, sitting in the front rows, and going to office hours for help, while others choose unorthodox strategies like playing games on their phones, not taking notes, and ignoring most lectures. The students who spend entire lecture periods on their phones are creating the cultural norm among their peers that this is a normal and expected behavior; they are sometimes posting in real-time to an online group about the class, homework assignment, or instructor and in this way exerting a nontraditional type of power to make their comments heard. Students text message and access social networks like Snapchat, Facebook, and Instagram on their smartphones during lectures and in this way have access to virtual communities and actor-networks that they feel comfortable with, potentially distracting themselves from a classroom environment whose norms are not welcoming and whose communication styles are not compatible. As students successfully create online spaces to share information, problem-solving approaches, and complaints, they encourage others students to check out their photos, captions, and comments, thus strengthening the cultural norm of frequent phone-checking and online activity being acceptable during a lecture.

These few examples of power dynamics and cultural norms presented here are the tip of the iceberg of what is happening within sophomore engineering gateway courses. As our data collection continues and analysis intensifies, we look to identify in greater detail the mechanisms by which these cultural norms are created and recreated over time, and the overall impact of the cultural norms on students. While we have identified several instances of instructor power within the classroom and informal student networks of power, we look for a greater scheme of power dynamics that affect the adoption and reification of cultural norms within these critical gateway courses.

G. Project Timeline

This proposal specifically requests funding to assist in the continuation of this important investigation. Preliminary findings have uncovered themes that could greatly impact the way that

Table 2: Proposed Research Activities Funded By the Chancellor's Graduate Award for Excellence in STEM Education

Summer 2014	Fall 2014	Spring 2015	Summer 2015
• Transcribe 2nd round of interviews with students and teachers • Continue reconstructive analysis • Begin coding of all data: interviews, observations, artifacts	• Follow-up interviews with selected students, instructors, administrators • Continue reconstructive analysis • Continue iterative coding process, relate codes to conceptual frameworks	• Finalize coding scheme • Share findings with interviewees, revise as needed • Complete data analysis • Report findings to CU Boulder engineering education and DBER audience	• Report findings to American Society for Engineering Education (ASEE) audience • Dissertation Defense

engineering educators view instruction during the sophomore year of engineering. Table 2 details the proposed activities that will be funded by the Center for STEM Learning (CSL) Chancellor's Graduate Award (CGA) for Excellence in STEM Education. Though past proposals funded by CSL aided in the early stages of innovative graduate research, approved funding will seed efforts that will continue beyond doctoral research into post-doctoral research and change the conversation about engineering retention at the national level.

Evaluation of Success

A successful project will result in the uncovering of cultural norms and linked power dynamics in sophomore level mathematics courses. Success can be evaluated in the context of our interviewees, students and instructors, if they agree and believe in our findings. As we seek to describe the "taken-for-granted" social forces present in undergraduate classes, our findings should not be shocking or foreign to those familiar with these settings; instead, our findings should resonate and cast typical sophomore experiences in a new light, with greater understanding of the social processes therein. A successful project will be well-received by both the local CU Boulder engineering education community, as well as the international academic engineering education community in terms of research presentations and publications, as we seek to situate our findings within the existing literature. Ultimately, a successful project will enable one member of our research team, Janet Tsai, to defend her dissertation, graduate and continue the work at a post-doctoral level.

H. Project Outcomes

Benefits for Mechanical Engineering

Mechanical Engineering (MCEN) is currently the largest department in the CEAS, with 802 enrolled undergraduates as of 2013 (Davis, 2014) and is projected to remain the largest department in the college through 2020, nearly doubling the undergraduate enrollment in a few short years (Davis, 2014). Unfortunately, with this explosive growth rate in enrollment, other resources (teaching and administrative staff) are slow to follow. Faced with these dramatic shifts and diminishing teacher to student ratios, MCEN is facing tremendous risk of student attrition, particularly with vulnerable populations.

Sophomore year in MCEN has been identified through internal and external ABET assessment measures to be a weak point in our curriculum. Understanding what educators can do in the coming years to support undergraduates through this critical and resource-low time can have direct impact on the retention rates of our students.

Benefits for the College of Engineering and Applied Science

Understanding the cultural norms of the specific sophomore level gateway courses under study and how these norms are constructed and develop over time is important for understanding why some students are currently leaving engineering and a crucial first step in eventually changing destructive norms. Being conscious of the encoded messages about proper behavior and communication in engineering can help educators concentrate on the true meanings and content they wish to transfer to students, not the unintentional social messages that may be received. A stated goal of the college is to "increase the diversity and excellence of our students, faculty, and staff" by 2020 (Engineering 2020: Vision for Excellence, n.d.). As the percent of underrepresented minority students and women in the CEAS has remained relatively stable over the last few decades, making a true change in the demographics of the college and its graduates will require novel approaches like this study in order to understand and improve the structural and environmental aspects of our fundamental courses.

Benefits for the University of Colorado Boulder

The benefits for our university include the potential to illustrate the methodology, theory, and trade-offs considered in this type of exploratory qualitative study for our Discipline-Based Education Research (DBER) community. In addition to engineering, other university departments may be interested in employing similar methods to uncover the cultural norms embedded in their critical courses. Underpinned by support from the Center for STEM Learning, this work can positively reform curricula in engineering with cascading impacts around the university. Finally, this paradigm-shifting work in engineering education provides a novel way to investigate improvements in student retention rates, thus contributing to CU-Boulder and CSL's strong reputation as a leader in STEM education research.

Personal Development Benefits – Janet Y. Tsai

This study, already in progress, represents the largest and most significant research effort I have yet attempted. While data collection and analysis are already underway to understand, ethnographically, the native culture of sophomore engineering, the study requires additional time to continue data analysis, formulate findings, and to write and defend my dissertation. With support from the CGA, I can focus more intently on the dissertation research, completing interviews, and comparing analyses with a greater set of interview subjects and researchers. As this study is novel in the field of engineering education, I continue to collaborate and learn from colleagues in the School of Education to inform my research. The CGA would enable further collaboration and learning so that this study can be vigorously grounded within the tradition of the Learning Sciences and Education research in addition to the engineering education literature, increasing the value of the work and broadening its appeal to other discipline-based education research.

I. Future Work

As this study continues data collection and analysis through at least one more year, we are considering extensions to the work for subsequent years to further expound on the existence and effects of cultural norms and power dynamics in undergraduate engineering. Postdoctoral funding will be sought for Janet Y. Tsai to extend this research beyond sophomore gateway courses in engineering to other critical points along an undergraduates' trajectory, including laboratory courses, technical requirements, and design courses. In the immediate future, however, the tasks of student and instructor interviews, transcription, and analysis of the data will consume the bulk of another research year. As planned, publication and dissemination of results within the Mechanical Engineering department, the CEAS, the DBER and CSL communities, the international Engineering Education community and the Learning Sciences research community will continue through 2014 and 2015.

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Curriculum Vitae – Janet Y. Tsai

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Research Interests

- Engineering education – initiatives to encourage more students, especially women, into the field of engineering. Understanding the dynamics of how novice engineers construct hierarchies of status and power and the implications of this hierarchy on student persistence through undergraduate schooling.

Education

Ph.D. Candidate	**Department of Mechanical Engineering, University of Colorado Boulder** Advisor: Dr. Daria A. Kotys-Schwartz GPA: 3.9/4.0	2015
M.S.	**Design Center Colorado, University of Colorado Boulder** Masters Design Project sponsored by Medtronic Navigation, Louisville CO GPA: 3.9/4.0	2010-12
B.S.	**Mechanical Engineering, F.W. Olin College of Engineering** Senior Capstone Project sponsored by Draper Laboratories, Cambridge MA GPA: 3.84/4.0	2002-06

Teaching Experience

- **Lead Graduate Teacher**, Mechanical Engineering — 2011-13
  Graduate Teacher Program, University of Colorado Boulder
- **Instructor**, Mechanical Engineering, CU Boulder — Fall 2012
  MCEN 5208, Introduction to Research
- **Novel Curriculum Developer**, Mechanical Engineering, CU Boulder — Fall 2012
  MCEN 2023, Statics and Structures
- **Teaching Assistant**, Mechanical Engineering, CU Boulder
  MCEN 3025, Component Design — Spring 2011
  MCEN 4026, Manufacturing Processes and Systems — Fall 2010
- **Robotics Instructor**, Springboard After School Programs — 2010
  LEGO Mindstorms, Ages 10-14

Grants and Fellowships

- National Science Foundation Graduate Research Fellowship, — 2011-14
  STEM Education and Learning Research – Engineering Education
- Olin College Inaugural Full-Tuition Scholarship — 2002-06

Professional and Research Experience

- **Research Assistant**, Your Own Undergraduate Research Experience at the University of Colorado Boulder (YOU'RE@CU) Program — 2010-13
  Principal Investigators: Dr. Beverly Louie and Dr. Virginia Ferguson

- **Educational Publishing Developer** 2009-10
  Sky Bridge Education, LLC – Boulder, CO
- **Systems Engineer**, Home Robots Division 2007-09
  iRobot Corporation – Bedford, MA
- **International Customer Support Engineer**, International Division 2008
  iRobot Corporation – Bedford, MA
- **Technical Manufacturing Liaison**, Asia Pacific Division 2006-07
  iRobot Corporation – Hong Kong SAR
- **Research Assistant**, Evaluating Effectiveness of Project-Based Learning on Retention of Women and Minority Students 2005-06
  Principal Investigators: Dr. Yevgeniya Zastavker and Dr. Mia Ong

Awards and Honors

- Most Attended Poster Award for "What's 'Proper' in Engineering? Exploring Cultural Norms in the Sophomore Engineering Curriculum," Graduate Engineering Annual Research and Recruitment Symposium (GEAR2S), Department of Mechanical Engineering, University of Colorado Boulder. Mar 2014
- Best Paper Award for "Learning Statics by Feeling: Effects of Everyday Examples on Confidence and Identity Development," Mechanics Division, American Society for Engineering Education (ASEE) Annual Conference and Exposition, Atlanta, GA. Jun 2013
- Best Paper Award for "Am I a Boss or a Coach? Graduate Students Mentoring Undergraduates in Research," Graduate Studies Division, American Society for Engineering Education (ASEE) Annual Conference and Exposition, Atlanta, GA. Jun 2013
- Best Aesthetics Award, "Active Learning at the University of Colorado Boulder," Graduate Teacher Program Poster Session, Boulder, CO. Apr 2013
- People's Choice Award, "Retention of Women and Minorities in Science, Technology, Engineering, and Mathematics (STEM) @CU," Graduate Teacher Program Poster Session, Boulder, CO. Apr 2012
- Kenneth Johnsen Student of the Month Award. Awarded by Department of Mechanical Engineering, University of Colorado Boulder. Oct 2011
- Dorothy Martin Doctoral Student Honorable Mention Award, University of Colorado Boulder Graduate School 2011
- Rock Award, iRobot Corporation 2007

Peer-Reviewed Conference Proceedings

1. **J. Y. Tsai**, D. Kotys-Schwartz, and M. Hannigan, "Learning Statics by Feeling: Effects of Everyday Examples on Confidence and Identity Development," in *Proceedings of the American Society for Engineering Education Annual Conference and Exposition*, Atlanta, GA, 2013.
2. **J. Y. Tsai**, D. Kotys-Schwartz, B. Louie, V. L. Ferguson, and A. N. Berg, "Am I a Boss or a Coach? Graduate Students Mentoring Undergraduates in Research," in *Proceedings of the American Society for*

Engineering Education Annual Conference and Exposition, Atlanta, GA, 2013.

3. A. N. Berg, **J. Y. Tsai**, V. L. Ferguson, and B. Louie, "What's trust go to do with it? Assessing a research-based mentoring program for novice engineers," in *Proceedings of the American Society for Engineering Education Annual Conference and Exposition*, Atlanta, GA, 2013.
4. **J. Y. Tsai**, D. A. Kotys-Schwartz, B. Louie, V. L. Ferguson, and A. N. Berg, "Graduate Students Mentoring Undergraduates in Research: Attitudes and Reflections about these Experiences," in *Proceedings of the American Society for Engineering Education Annual Conference and Exposition*, San Antonio, TX, 2012.
5. **J. Y. Tsai,** D. A. Kotys-Schwartz, B. Louie, V. L. Ferguson, and A. N. Berg, "Comparing Mentor and Mentee Perspectives in a Research-Based Undergraduate Mentoring Program," in *Proceedings of the American Society of Mechanical Engineers 2012 International Mechanical Engineering Congress & Exposition* (ASME IMECE), Houston TX, 2012.
6. **J. Y. Tsai**, D. A. Kotys-Schwartz, V. L. Ferguson, and B. Louie, "Assessing Efficacy of a New Research-Oriented Peer Mentoring Program: YOU'RE@CU," in P*roceedings of the American Society of Mechanical Engineers 2011 International Mechanical Congress & Exposition* (ASME IMECE), Denver, CO, 2011.

Book Chapters

1. **J. Y. Tsai,** "An Engineering Approach to Feminism," in in *Click: When We Knew We Were Feminists*, J. C. Sullivan and C. E. Martin, Eds. Seal Press, 2010.

Lectures and Presentations

Invited Lectures

1.	**J.Y. Tsai,** S. Black, L. Giangola (facilitator), "A conversation on 'Achieving Parity of the Sexes at the Undergraduate Level: A Study of Success'," Center for the Integration of Research, Teaching, and Learning (CIRTL) Reads Series, online.	5 Mar 2014
2.	**J.Y. Tsai,** "Test-Taking Workshop," Department of Mechanical Engineering, Undergraduate Program, University of Colorado Boulder.	4 Feb 2014
3.	**J.Y. Tsai,** "Update: Current Trends in Engineering Education," College of Engineering and Applied Science Graduate STEMinar Series, University of Colorado Boulder.	31 Oct 2013
4.	**J.Y. Tsai,** "Current Trends in Engineering Education," Department of Aerospace Engineering, Graduate Seminar Series, University of Colorado Boulder.	27 Feb 2013
5.	**J.Y. Tsai**, D.A. Kotys-Schwartz, B. Louie, V.L Ferguson, A. Berg, "Comparing Mentor and Mentee Perspectives in a Research-Based Undergraduate Mentoring Program," Engineering Education Research Group, University of Colorado Boulder.	22 Jan 2013
6.	**J.Y. Tsai**, D.A. Kotys-Schwartz, B. Louie, V.L Ferguson, A. Berg, "Comparing Mentor and Mentee Perspectives in a Research-Based Undergraduate Mentoring Program," Discipline-Based Educational Research (DBER) Seminar Series, University of Colorado Boulder.	4 Dec 2012
7.	**J.Y. Tsai** and J. Garland, "Grading Problems in STEM Disciplines,"	23 Aug 2012

Graduate Teacher Program Fall Intensive Conference, University of Colorado Boulder.

8. **J.Y. Tsai**, "Guidelines to Address Gender in Engineering Classrooms and Beyond." Graduate Teacher Program Monday Workshop Series, University of Colorado Boulder. — 27 Feb 2012

Oral Conference Presentations (presenter in bold)

9. **J. Y. Tsai**, D. Kotys-Schwartz, B. Louie, V. L. Ferguson, and A. N. Berg, "Am I a Boss or a Coach? Graduate Students Mentoring Undergraduates in Research," presented at the American Society for Engineering Education Annual Conference and Exposition, Atlanta, GA. — 25 Jun 2013
10. **J. Y. Tsai**, D. Kotys-Schwartz, and M. Hannigan, "Learning Statics by Feeling: Effects of Everyday Examples on Confidence and Identity Development," presented at the American Society for Engineering Education Annual Conference and Exposition, Atlanta, GA. — 24 Jun 2013
11. **J.Y. Tsai** and D.A. Kotys-Schwartz, "Status and the Roles of Students in Engineering: A Justification for Studying the Creation of Status Assignment in Freshman and Sophomore Year," presented at the American Society for Engineering Education Rocky Mountain Section Annual Conference, Pueblo, CO. — 28 Mar 2013
12. J. Y. Tsai, **D. A. Kotys-Schwartz,** and M. Hannigan, "A Body-based Approach to Teaching and Learning Engineering Statics," presented at the ASME 2012 International Mechanical Engineering Congress & Exposition, Houston, TX. — 13 Nov 2012
13. J. Y. Tsai, **D. A. Kotys-Schwartz,** B. Louie, V. L. Ferguson, and A. N. Berg, "Comparing Mentor and Mentee Perspectives in a Research-Based Undergraduate Mentoring Program," presented at the ASME 2012 International Mechanical Engineering Congress & Exposition, Houston, TX. — 13 Nov 2012
14. **A. N. Berg**, J.Y. Tsai, B. Louie, V.L. Ferguson, "The importance of trust in a research-based undergraduate mentoring program," presented at the University of New Mexico Mentoring Institute Conference, Albuquerque, NM. — 24 Oct 2012
15. **J. Y. Tsai**, D. A. Kotys-Schwartz, B. Louie, V. L. Ferguson, and A. N. Berg, "Graduate Students Mentoring Undergraduates in Research: Attitudes and Reflections about these Experiences," presented at the American Society for Engineering Education Annual Conference and Exposition, San Antonio, TX. — 11 Jun 2012
16. **J.Y. Tsai**, D.A. Kotys-Schwartz, M. Hannigan, "A Body-Based Approach to Teaching and Learning Engineering Statics," presented at the Graduate Engineering Annual Research and Recruitment Symposium (GEAR2S), Boulder, CO. — 8 Mar 2012
17. **J. Y. Tsai**, D. A. Kotys-Schwartz, V. L. Ferguson, and B. Louie, "Assessing Efficacy of a New Research-Oriented Peer Mentoring Program: YOU'RE@CU," presented at the ASME 2011 International Mechanical Congress & Exposition, Denver, CO. — 17 Nov 2011
18. **J. Y. Tsai**, "Perspectives on FIRST Robotics," presented at the Rocky — Mar 2010

Mountain Section Mini-Conference, Society of Women Engineers, Boulder, CO.

Conference Poster Presentations (presenter in bold)

19. **J.Y. Tsai**, D. Kotys-Schwartz, D.W. Knight, "What's 'Proper' in Engineering? Exploring Cultural Norms in the Sophomore Engineering Curriculum," Graduate Engineering Annual Research and Recruitment Symposium (GEAR2S), Department of Mechanical Engineering, University of Colorado Boulder. — 6 March 2014
20. A. Berg, J.Y. Tsai, V.L. Ferguson, **B.Louie**, "What's trust got to do with it? Assessing a research-based mentoring program for novice engineers," American Society for Engineering Education Annual Conference and Exposition, T442 First Year Programs Poster Session. — 25 June 2013
21. **J. Y. Tsai,** D.A. Kotys-Schwartz, M. Hannigan, "Learning Statics by Feeling: Effects of Everyday Examples on Confidence and Identity Development," Science Education Initiative/Center for STEM Learning (CSL) End-of-Year Event. — 7 May 2013
22. **E.A. Hogan,** K. Kyburz, A.D. Monteblanco, C. Szczepanski, J.Y. Tsai, "Active Learning at the University of Colorado Boulder," Graduate Teacher Program Lead Capstone Event. — 5 April 2013
23. **J. Y. Tsai**, A. Berg, V.L. Ferguson, B. Louie, D.A. Kotys-Schwartz, "Assessing and Understanding the Your Own Undergraduate Research Experience at CU (YOU'RE@CU) Program," Graduate Engineering Annual Research and Recruitment Symposium. — 14 March 2013
24. **J. Y. Tsai**, A. Berg, V.L. Ferguson, B. Louie, D.A. Kotys-Schwartz, "YOU'RE@CU: Your Own Undergraduate Research Experience," Center for STEM Learning (CSL) Launch, University of Colorado Boulder. — 30 Sep 2012
25. **J. Y. Tsai**, A. Berg, V.L. Ferguson, B. Louie, D.A. Kotys-Schwartz, "An Introduction to YOU'RE@CU: Your Own Undergraduate Research Experience," Science Education Initiative/Center for STEM Learning (CSL) End-of-Year Event. — 9 May 2012
26. **S. Pang,** J.Y. Tsai, N. Wakefield, S. Waggy, A. Wong, "Retention of Women and Minorities in Science, Technology, Engineering, and Mathematics (STEM) @CU," Graduate Teacher Program Lead Capstone Event. — 6 April 2012

Outreach and Service Activities

- Mentor, Boulder High School Landsharks For Inspiration and Recognition of Science and Technology (FIRST) Robotics Competition Team 1157 — 2010-present
- Coordinator, Gender and Engineering Seminar at the University of Colorado Boulder, College of Engineering and Applied Science — 2011

Affiliations/Memberships

- American Society for Engineering Education (ASEE), Student Member 2011-present
- American Society of Mechanical Engineers (ASME), Student Member 2011-present

Relevant Press

- "Keeping the Hope Alive as a Woman in Engineering", Engineer Girl Website, National Science Foundation (http://www.engineergirl.org/GetThere/HowtoGetThere/16862.aspx) Fall 2013

Student's Full Name
Janet Tsai

Adviser's Full Name
Daria Kotys-Schwartz

Adviser's Home Department
Mechanical Engineering

Adviser's Email Address
daria.kotys@colorado.edu

By submitting this application, I confirm that, if my advisee is selected to receive a Chancellor's Award for Excellence in STEM Education, I will:

- ✓ Attain a GRA salary match (25% during the academic year, and 50% during the summer) from my own funding sources or from my department.
- ✓ Attend the annual Symposium on STEM Education (fall 2014).
- ✓ Actively engage in the CU-Boulder STEM education community by attending the weekly DBER Seminar Series when possible.

University of Colorado **Boulder**
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March 31, 2014

Dear Center for STEM Learning Review Committee:

I am writing in support of Janet Tsai's proposal for a Center for STEM Learning (CSL) Chancellor's Graduate Award (CGA) for Excellence in STEM Education. I first met Janet in the fall of 2009, when she inquired about a doctorate in Mechanical Engineering with a dissertation focus in engineering education. Janet is one of the best PhD students that has entered the Department of Mechanical Engineering (ME) at the University of Colorado Boulder! She is an extraordinary individual who possesses a unique blend of passion, professionalism, hands-on aptitude, and critical thinking propensity.

Current and Future Contributions to Engineering Education: Janet truly embodies the spirit of the Chancellor's Graduate Award for Excellence in STEM Education. She has dedicated herself to developing initiatives and curricular innovations that challenge the "chilly" climate faced by women in engineering, and is dedicated to providing an inclusive environment for all engineers.

At the University of Colorado all first year graduate students in mechanical engineering are required to take the two-semester Introduction to Research course. As part of the class, students have the opportunity to work with a faculty advisor on an eight-month research project. Janet was assigned to work with the newly founded YOURE@CU project (seed funded by the CSL)—a program designed to link graduate engineers with 1st and 2nd year women and underrepresented minority (URM) undergraduate engineers through quality research projects. Janet was tasked with assessing the program goals through quantitative and qualitative methods. Janet worked with the YOURE@CU Directors to facilitate the creation and refinement of project goals, established an assessment plan, developed and deployed surveys, obtained IRB approval and utilized the literature to identify best practices to be implemented in the program. What is stunning is that after the course requirements were complete, Janet continued to work with the YOUR@CU Directors—assessing and reforming the program structure for two subsequent years. She has identified program characteristics that are essential for mentoring programs aimed at retaining women and URM's in engineering, resulting in three conference proceedings publications (including a best paper award) and five technical presentations.

As Janet's advisor, I was thoroughly impressed when she approached me with her Body-Based Approach to teaching and learning statics. Her proposed research work had the potential to change the way that Engineering Statics is taught. Engineering Statics is a required course at more than 300 engineering schools across the country. Students typically take Engineering Statics at the beginning of their sophomore year, and the course represents the first in a scripted pathway of engineering core courses. In a traditional Engineering Statics book, three-quarters of examples shown are largely airplanes, rockets, machine tools, mechanisms, and men: the ratio of men to women as pictured in a typical text is over 10:1, with, in one exemplar, only six women displayed over 600

pages. The Body-Based Approach was aimed at actively engaging students in Engineering on Statics. The purpose of the intervention was to teach abstract phenomenon by allowing students to physically feel the consequence of "theory" on their own body. Janet's core focus was to create an environment that could engage a diverse engineering community—a conundrum that plagues engineering and has left researchers striving for ways to attract and retain women and underrepresented students. Recent results have indicated that the Body-Based intervention may not influence student attitudes, professional role confidence and engineering identity in the manner that was hypothesized. However, the conversations that surrounded the student resistance to these authentic engineering examples has lead Janet down a new path to exploring a cutting-edge theoretical system for the purpose of uncovering norms in the classroom—where a hierarchy may be generated and upheld by the intellectual elite and then culturally reproduced. This current investigation of under researched sophomore engineering classes has the potential, if funded, for a substantial contribution to the field, and is starting to uncover structures that are keeping some women in engineering and forcing others out of the profession.

Yours Sincerely,

Daria Kotys-Schwartz, Ph.D.
Mechanical Engineering Instructor
Design Center Colorado Director of Undergraduate Programs
Center for STEM Learning Founding Fellow

Mentoring – Janet Y. Tsai

Mentoring for Janet Tsai will continue within the same structure that she has had for the last four years. Each week, I conduct hour-long meetings with Janet to review logistical questions, conference abstracts and papers, and review research results. Dr. Daniel Knight, an educational psychologist working within the College of Engineering and Applied Science for the past thirteen years, also attends Janet's weekly meeting to discuss her ethnographic research results. Janet has also received frequent mentoring from Dr. Margaret Eisenhart and Dr. Kevin O'Connor from the School of Education. Dr. Eisenhart is an esteemed scholar in qualitative research and has taught Janet in two School of Education courses. Dr. O'Connor boasts 20 years of ethnographic research background and has taught Janet in one School of Education course. Their mentorship has been invaluable in assisting Janet in establishing her theoretical framework for her current research. Janet has also pursued mentoring from engineering education experts at other institutions, such as Dr. Alice Pawley. Dr. Pawley's work centers on qualitative research in feminist engineering and provides Janet a lens into feminist theory and how it may inform her engineering education work.

Larger communities that also serve as fertile grounds for mentoring include the College of Engineering and Applied Science Engineering Education Research Group and the American Society of Engineering Education (ASEE) Educational Research and Methods (ERM) Division.

Inclusion of Results in Dissertation Work

In the Department of Mechanical Engineering (ME) a precedent has been established for dissertation work involving engineering education content. Graduate students in mechanical engineering who have completed the required technical course requirements, passed the ME

Preliminary Exams and established a Dissertation Committee with three ME faculty are free to pursue a dissertation with an engineering education focus. Janet Tsai's dissertation committee has already been determined, with participation from three ME faculty and two faculty from the University of Colorado School of Education (Dr. Margaret Eisenhart and Dr. Kevin O'Connor). All of Janet's prior work, current work and proposed educational research work will be published within her dissertation.

Matching Funds

In fall 2014, Janet Tsai's NSF Graduate Research Fellowship will conclude and alternative funding through research grants is not available. The Department of Mechanical Engineering has committed to support 25% during the 2014-2015 academic year. In spring 2015, Janet will be eligible to apply for summer 2015 funding through the Department of Mechanical Engineering.

Personal Development Benefits – Daria Kotys-Schwartz

The research work proposed by Janet Tsai represents a shift within my own research focus. For ten years my research in engineering education has centered on the affects of curricular interventions and the resulting longitudinal impacts. Within the last few years, I have become interested in the implications of formal and informal socialization practices on engineering students during their undergraduate years—how students, over time, *became* engineers, or how some never realize their becoming and become victims of a war of attrition. Janet's research provides an opportunity for me to pursue developing interests and delve deeper into an under investigated space in engineering education and also reflect on how my own teaching practices may inadvertently be creating a culture where some students do not feel they belong.

Benefits for the Department of Mechanical Engineering

With mechanical engineering student enrollment increasing from ~600 to ~1300 within two years time (2012-2014), we find ourselves at a crossroads; we can either improve our undergraduate experience and graduate more mechanical engineers, or face a seriously disappointing alternative in which high enrollments are matched with high attrition.

It is critical that the Department of Mechanical Engineering and the College of Engineering and Applied Science undertake studies, like the one proposed by Janet Tsai, to understand the climates in our rapidly expanding undergraduate engineering required courses, especially in the competitive world of sophomore engineering. Currently, little attention is given to the instructional staffing and resulting student socialization of the sophomore year and the potential benefits and consequences of instructional assignments. Are we unconsciously adding to the attrition epidemic in engineering?

This project has immense potential for elucidating assumptions and the "taken-for-granted" conventional social currents of our engineering college, so that we can be informed in the future in designing classroom experiences to align with our strategic plan for growing more engineers and supporting authentic diversity within the field. To inform our colleagues, we plan to disseminate findings in MCEN first, then see what can be translated into action and recommendations for other engineering departments.

Benefits for the University of Colorado

The research methodology being employed by Janet Tsai for this work has the potential to uncover institutional structures that may serve as barriers to student success in engineering. Though we do not assume that results from this study can be generalized to other disciplines, we do anticipate that

the results will encourage and foster a critical dialogue at the university level that will inspire others to investigate and uncover detrimental organizational frameworks within their own departments.

As the University of Colorado continues to position itself nationally as a leader in STEM education, one key to establishing this reputation is groundbreaking research coming from each of the STEM disciplines. We posit that we must go beyond looking at reformed curriculum and challenge the cultural status quo within each disparate organization on campus that allows for the reproduction of unconsciously damaging behavior—this research is the first step in this direction.

Current and Pending Support

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Daria Kotys-Schwartz	Other agencies (including NSF) to which this proposal has been/will be submitted: None

Support: Current X Pending Submission Planned in Near Future *Transfer of Support

Project/Proposal Title: (Consultant) Sustainable Energy and Aeronautical Engineering Program

Source of Support: US Department of Education: FIPSE P116M100008

Total Award Amount: $248,543 Total Award Period Covered: 8/1/10-7/31/13

Location of Project: Florida State University

Person-Months Per Year Committed to the Project. Cal: 0.15 Acad: 0 Sumr: 0.0

Investigator: Daria Kotys-Schwartz	Other agencies (including NSF) to which this proposal has been/will be submitted: None

Support: Current X Pending Submission Planned in Near Future *Transfer of Support

Project/Proposal Title: Inclusive Excellence to Bolster Diversity – A System of Capacity-Building Pathways To and Through Engineering

Source of Support: NSF EEC-1160264

Total Award Amount: $541,197 Total Award Period Covered: 9/1/12-8/31/15

Location of Project: University of Colorado, Boulder

Person-Months Per Year Committed to the Project. Cal: 0 Acad: 0 Sumr: 0.75

Investigator: Daria Kotys-Schwartz	Other agencies (including NSF) to which this proposal has been/will be submitted: None

Support: Current X Pending Submission Planned in Near Future *Transfer of Support

Project/Proposal Title: (Consultant) Collaborative Research: Assessing the Spectrum of International Undergraduate Engineering Educational Experiences

Source of Support: NSF EEC-1160404

Total Award Amount: $467,814 Total Award Period Covered: 1/1/12-12/31/14

Location of Project: University of Pittsburgh, University of Tulsa, University of Southern California

Person-Months Per Year Committed to the Project. Cal: 0.42 Acad: 0 Sumr: 0

Cal 2/3: 0.14

Investigator: Daria Kotys-Schwartz	Other agencies (including NSF) to which this proposal has been/will be submitted: None

Support: Current X Pending Submission Planned in Near Future *Transfer of Support

Project/Proposal Title: Routes to Sustainability for Natural Gas Development and Water and Air Resources in the Rocky Mountain Region

Source of Support: NSF CBET-1240584

Total Award Amount: $11,999,328 Total Award Period Covered: 9/24/12-8/31/15

Location of Project: University of Colorado, Boulder

Person-Months Per Year Committed to the Project. Cal : 0 Acad: 0 Sumr: 1.0

Investigator: Daria Kotys-Schwartz	Other agencies (including NSF) to which this proposal has been/will be submitted: None

Support: Current X Pending Submission Planned in Near Future *Transfer of Support

Project/Proposal Title: REESE: Learning Ethnographies of New Engineers: A New Approach to Understanding the Transition from School to Work

Source of Support: NSF DRL-1252372

Total Award Amount: $1,499,871 Total Award Period Covered: 1/1/13-12/31/15

Location of Project: University of Colorado Boulder

Person-Months Per Year Committed to the Project. Cal: 0.0 Acad: 0 Sumr: 1.0

Investigator: Daria Kotys-Schwartz	Other agencies (including NSF) to which this proposal has been/will be submitted: None

Support: Current X Pending Submission Planned in Near Future *Transfer of Support

Project/Proposal Title: EAGER: Cognitive Ethnographies of Engineering Design

Source of Support: NSF CMMI-1355599

Total Award Amount: $188,726 Total Award Period Covered: 9/1/13-8/31/14

Location of Project: University of Colorado Boulder

Person-Months Per Year Committed to the Project. Cal: 0.0 Acad: 0.0 Sumr: 0.0

Investigator: Daria Kotys-Schwartz	Other agencies (including NSF) to which this proposal has been/will be submitted: None

Support: Current Pending X Submission Planned in Near Future *Transfer of Support

Project/Proposal Title: PRIME: Rubrics for the Evaluation of Ethics and Sustainability in Engineering Design Reports

Source of Support: NSF

Total Award Amount: $250,000 Total Award Period Covered: 1/1/15-12/31/16

Location of Project: University of Colorado Boulder

Person-Months Per Year Committed to the Project. Cal: 0.0 Acad: 0.0 Sumr: 0.25

DARIA A. KOTYS-SCHWARTZ

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Website:
www.colorado.edu/mechanical/people/faculty/kotys-schwartz

RESEARCH INTERESTS

Design learning in engineering, with focus on: engineering learning mechanisms**,** engineering epistemologies, and engineering diversity and inclusiveness.

EDUCATION

University of Colorado, Boulder, CO 2001-2007
Ph.D. Mechanical Engineering, University of Colorado at Boulder
Dissertation: "Evaluation of the Impact of Interactivity on Student Performance and Attitudes in Engineering."
Advisor: Lawrence E. Carlson

The Ohio State University, Columbus, OH 1998-2001
M.S. Mechanical Engineering, The Ohio State University
Thesis: "Improving Plastic Gear Accuracy Through Gas-Assisted Injection Molding."

The Ohio State University, Columbus, OH 1992-1998
B.S. Mechanical Engineering, The Ohio State University

TEACHING EXPERIENCE

6/2007 – Present *Instructor*
Mechanical Engineering, University of Colorado, Boulder, CO

8/2004 – 5/2007 *Graduate Part Time Instructor*
Mechanical Engineering, University of Colorado, Boulder, CO

6/2002 – 5/2005 *NSF Graduate Teaching Fellow*
Integrated Teaching and Learning Laboratory, University of Colorado, Boulder, CO

9/2002 – 5/2004 *Instructor – Women's Manufacturing Workshop*
Integrated Teaching and Learning Laboratory, University of Colorado, Boulder, CO

6/2002 – 7/2004 *Instructor – Introduction to Engineering*
Pre-Collegiate Development Program and University of Colorado Upward Bound, University of Colorado, Boulder, CO

1/2002 – 6/2002	*Substitute Teacher – K-12 Math and Science* Denver Public Schools, Denver, CO
9/2000 – 12/2001	*Instructor – Introduction to Parametric Design* Mechanical Engineering and Industrial Engineering, The Ohio State University, Columbus, OH
9/2000 – 12/2001	*Graduate Teaching Assistant – Introduction to Engineering* Industrial Engineering, The Ohio State University, Columbus, OH

PROFESSIONAL AND RESEARCH EXPERIENCE

6/2012 – Present	*Director – Design Center Colorado* Mechanical Engineering, University of Colorado, Boulder, CO
6/2008 – Present	*Faculty Director – CMU-CU Mechanical Engineering Partnership Program* Mechanical Engineering, University of Colorado, Boulder, CO
8/2005 – 6/2007	*Research Assistant* Mechanical Engineering, University of Colorado, Boulder, CO
9/1999 – 12/2001	*Research Assistant* Gear Dynamics and Gear Noise Research Laboratory and Integral Attachment Program The Ohio State University, Columbus, OH
6/1998 – 9/1999	*Advanced Manufacturing Engineer* Copeland Corporation, Sidney, OH
6/1996 – 3/1997	*Advanced Manufacturing Engineer and Consultant Intern* Copeland Corporation, Sidney, OH
2/1994 – 6/1996	*Undergraduate Research Assistant* Center for Automotive Research The Ohio State University, Columbus, OH

AWARDS AND HONORS

2013	Boulder Faculty Assembly Faculty Recognition Award. Boulder Faculty Assembly; University of Colorado
2013	Department of Mechanical Engineering Outstanding Service Award; Mechanical Engineering; University of Colorado
2012	National Residence Hall Honorary: Institution Faculty/Staff of the Month, University of Colorado
2011	John & Mercedes Peebles Innovation in Education Award; College of Engineering and Applied Sciences; University of Colorado
2009	Marinum Smith Teaching Award; Alumni Association; University of Colorado
2008	Department of Mechanical Engineering Outstanding Undergraduate Educator Award; Mechanical Engineering; University of Colorado
2007	Charles Hutchinson Memorial Teaching Award; College of Engineering and Applied Sciences; University of Colorado

2007	Outstanding Ph.D. Dissertation Award; Mechanical Engineering; University of Colorado
2006	ERM Faculty Apprentice Grant; American Society of Engineering Education; Educational Research Methods Division
2005-2007	Best Lecturer Award; American Society of Mechanical Engineers; Mechanical Engineering; University of Colorado
2005	Brown/ Ricketts/Udick Grant; American Association of University Women
2005	Multicultural Engineering Program Faculty Appreciation Award; College of Engineering and Applied Sciences; University of Colorado
2004-2005	Graduate Part-Time Instructor Teaching Excellence Award; Graduate School; University of Colorado
2004	CU Leadership, Excellence, Achievement, and Diversity Alliance (LEAD) Faculty Appreciation Award; University of Colorado
2004	Residence Hall Teaching Award; University of Colorado
2004	Sullivan-Carlson Innovation in Teaching Award; College of Engineering and Applied Sciences; University of Colorado
2002-2005	Doctoral Fellowship, National Science Foundation Graduate Teaching Fellow
2001	Women In Engineering Leadership Award, College of Engineering; The Ohio State University
1995	Industrial Advisory Board Minority Scholarship, The Center for Automotive Research; The Ohio State University
1994	Scarlet and Gray Academic Scholarship; The Ohio State University

PUBLICATIONS

Refereed Journal Articles

1. Kotys-Schwartz, D.A. and Carlson, L.E. "Evaluation of the Impact of Interactivity on Student Performance and Attitudes in Engineering." *Journal of Engineering Education*. October 2007.

Refereed Conference Proceedings

1. Lauff, C., Kotys-Schwartz, D., O'Connor, K., Rentschler, M., "Cognitive Ethnographies of Engineering Design" *Proceedings, 2014 Frontiers in Education Conference*, Madrid, Spain. Abstract Accepted.
2. Tsai, J§., Kotys-Schwartz, D., Knight, D., "The Powerful Construction of Norms Within Sophomore Engineering" *Proceedings, 2014 Frontiers in Education Conference*, Madrid, Spain. Abstract Accepted.
3. Lauff, C., O'Connor, K., Kotys-Schwartz, D., Rentschler, M., "Undergraduate to Professional Engineering Design: A Disconnected Trajectory?" *Proceedings, American Society for Engineering Education Zone IV Conference*, Long Beach, CA. Paper Submitted.

4. Levonisova, S., Huang, S., Streiner, S., Cunningham, S., Ragusa, G., Besterfield-Sacre, M., Shuman, L., Matherly, C., Kotys-Schwartz, D., "Moving Toward a Research Informed Conceptual Model of Engineering Global Preparedness" *Proceedings, American Society for Engineering Education 2014 Annual Conference & Exposition*, Indianapolis, IN. Paper Submitted.

5. Streiner, S., Cunningham, S., Levonisova, S., Huang, S., Matherly, C., Besterfield-Sacre, M., Shuman, L., Ragusa, G., Kotys-Schwartz, D., "Exploring Engineering Education in Broader Context: A Framework of Engineering Global Preparedness" *Proceedings, American Society for Engineering Education 2014 Annual Conference & Exposition*, Indianapolis, IN.

6. Kotys-Schwartz, D., Knight, D., Daly, S. Yilmaz, S., "Evaluating the Implementation of Design Heuristic Cards in a Industry Sponsored Capstone Design Course" *Proceedings, American Society for Engineering Education 2014 Annual Conference & Exposition*, Indianapolis, IN.

7. Knight, D., Kotys-Schwartz, D., "Once Again Around the Double Triangle: A Multi-Rater Assessment of Capstone Design Skills" *Proceedings, 2013 Frontiers in Education Conference*, Oklahoma City, Oklahoma.

8. Kotys-Schwartz, D. and Shih, C., "Global Confidence: Student Outcomes from an International Capstone Design Experiences" *Proceedings, American Society for Engineering Education 2013 Annual Conference & Exposition*, Atlanta, GA.

9. Knight, D., Sullivan, J., Kotys-Schwartz, D., Myers, B., Louie, B.,"The Impact of Inclusive Excellence Programs on First Year Engineering Identity Development in Underrepresented Populations" *Proceedings, American Society for Engineering Education 2013 Annual Conference & Exposition*, Atlanta, GA.

10. Cooper, L.§, Kotys-Schwartz, D., "Designing the Design Experience: Identifying Factors of Student Motivation in Project-Based Learning and Project-Based Service-Learning" *Proceedings, American Society for Engineering Education 2013 Annual Conference & Exposition*, Atlanta, GA. *Best of Design in Engineering Education Division*

11. Tsai, J§., Kotys-Schwartz, D., Louie, B., Ferguson, G., Berg, A.,"Am I a Boss or a Coach? Graduate Students Mentoring Undergraduates in Research" *Proceedings, American Society for Engineering Education 2013 Annual Conference & Exposition*, Atlanta, GA. *Best Student Paper – Graduate Studies Division*

12. Tsai, J§., Kotys-Schwartz, D., Hannigan, M., "Learning Statics by Feeling: Effects of Everyday Examples on Confidence and Identity Development" *Proceedings, American Society for Engineering Education 2013 Annual Conference & Exposition*, Atlanta, GA. *Best Paper – Mechanics Division*

13. Cooper, L.§, Kotys-Schwartz, D., "Using Random Forests to Identify Factors of Student Motivation in a Project-Based Learning Course" *Proceedings, ASME 2012 International Mechanical Engineering Congress & Expo (IMECE)*, Houston, TX.

14. Tsai, J§., Kotys-Schwartz, D., Ferguson, G., Louie, B. "Comparing Mentor and Mentee Perspectives in a Research-Based Undergraduate Mentoring Program" *Proceedings, ASME 2012 International Mechanical Engineering Congress & Expo (IMECE)*, Houston, TX.

15. Tsai, J§., Kotys-Schwartz, D., Ferguson, G., Louie, B. "Graduate Students Mentoring Undergraduates in Research: Attitudes and Reflections about These Experiences" *Proceedings, American Society for Engineering Education 2012 Annual Conference & Exposition*, San Antonio, TX.

16. Tsai, J.§, Kotys-Schwartz, D., Ferguson, G., Louie, B. "Assessing Efficacy of a New Research-Oriented Peer Mentoring Program: YOUR@CU" *Proceedings, ASME 2011 International Mechanical Engineering Congress & Expo (IMECE)*, Denver, CO.

17. Rockenbaugh, L.§, Kotys-Schwartz, D., Reamon, D. "Project-Based Service-Learning and Student Motivation" *Proceedings, ASME 2011 International Mechanical Engineering Congress & Expo (IMECE)*, Denver, CO.

18. Kotys-Schwartz, D., Besterfield-Sacre, M., Shuman, L. "Informal Learning in Engineering Education: Where we are and Where we need to go" *Proceedings, 2011 Frontiers in Education Conference*, Rapid City, SD.

19. Rockenbaugh, L.§ and Kotys-Schwartz, D. "Project-Based Service Learning and Student Motivation" *Proceedings, American Society for Engineering Education 2011 Annual Conference & Exposition*, Vancouver, BC, Canada.

20. Trivett, A., Kotys-Schwartz, D., Cyrus, P., "Comparison of Engineering Student Self-confidence in Their Abilities at Two Universities" *Proceedings, American Society for Engineering Education 2011 Annual Conference & Exposition*, Vancouver, BC, Canada.

21. Zarske, M., Rockenbaugh, L.§, Kotys-Schwartz, D., Reamon, D., "Engineering for American Communities: Engaging engineering students in multidisciplinary altruistic engineering design project" *Proceedings, American Society for Engineering Education 2011 Annual Conference & Exposition*, Vancouver, BC, Canada.

22. Knight, D., Kotys-Schwartz, D., and Pawlas, G. "Triangulation: An Effective Assessment Tool for Capstone Design Program Evaluation?" *Proceedings, 2010 Capstone Design Conference*, Boulder, CO. June 2010.

23. Kotys-Schwartz, D., Knight, D. and Pawlas, G. "First-Year and Capstone Design Projects: Is the Bookend Curriculum Approach Effective for Skill Gain?" *Proceedings, 2010 American Society for Engineering Education Annual Conference & Exposition*, Louisville, KY. June 2010.

24. Eisenhart, M. and Kotys-Schwartz, D. "The Meaning of Interest in Engineering" *Proceedings, 2010 American Educational Research Association*, Denver, CO. April 2010.

25. Margolis, J.§, Kotys-Schwartz, D., Knight, D. "The Post-Graduation Attrition of Engineering Students: An Exploratory Study on Influential Career Choice Factors" *Proceedings, ASME 2009 International Mechanical Engineering Congress & Expo (IMCE)*, Lake Buena Vista, Florida. November 2009.

26. Kotys-Schwartz, D., Knight, D. and Pawlas, G. "From First Year Engineering Projects to Senior Capstone Design: What Skills Are Our Students Gaining?" *Proceedings, ASME 2009 International Mechanical Engineering Congress & Expo (IMCE)*, Lake Buena Vista, Florida. November 2009.

27. Eisenhart, M., Morris, T., Kotys-Schwartz, D. "Empty Choice: Can Girls Want Engineering If They Don't Know What It Is?" *Proceedings, 2009 American Educational Research Association*, San Diego, CA. April 2009.

28. Kotys-Schwartz, D., Knight, D. "From First Year Projects to Senior Capstone Design. What Skills are Really Gained?" *Proceedings, 2008 Frontiers in Education Annual Conference*, Saratoga Springs, NY. October 2008.

29. Kotys-Schwartz, D.A. and Carlson, L.E. "Evaluation of the Impact of Interactivity on Student Performance and Attitudes in Engineering." *Proceedings, First International Conference on Research in Engineering Education*, Honolulu, HI. June 2007.

30. Kotys-Schwartz, D.A., Carlson, L.E. and Reamon, D. "Systematic Integration of Concept Inventories in Mechanical Engineering." *Proceedings, 2006 American Society for Engineering Education Annual Conference & Exposition*, Chicago, IL. Session 3430.

31. Kotys-Schwartz, D.A. and Carlson, L.E. "Manufacturing Processes and Systems: Quantitative Evaluation of the Impact of Interactivity on Student Performance." *Proceedings, 2006 American Society for Engineering Education Annual Conference & Exposition*, Chicago, IL. Session 3166.

32. Zarske, M.S., Kotys-Schwartz, D.A., Sullivan, J.F. and Yowell, J.L. "Creative Engineering: Helping Ninth-Grade Students Discover Engineering." *Proceedings, 2005 American Society for Engineering Education Annual Conference & Exposition*, Portland, OR. Session 2610.

33. Kotys-Schwartz, D.A. and Zarske, M.S. "Graduate Student Personal Experiences: Improving Collegiate Teaching through K-12 Outreach." *Proceedings, 2005 American Society for Engineering Education Annual Conference & Exposition*, Portland, OR. Session 3455.

Published Curriculum

1. Kotys-Schwarz, D., "Stress Strain Diagrams." LearnChemE (Engineering Screencasts). 2012. YourTube and iTunes U. <www.youtube.com/user/LearnChemE> , <www.itunes.apple.com/us/institution/university-of-colorado-boulder.

2. Kotys-Schwarz, D., "Elastic Properties of Metals." LearnChemE (Engineering Screencasts). 2012. YourTube and iTunes U. <www.youtube.com/user/LearnChemE> , <www.itunes.apple.com/us/institution/university-of-colorado-boulder.

3. Kotys-Schwarz, D., "Engineering Stress Strain." LearnChemE (Engineering Screencasts). 2012. YourTube and iTunes U. <www.youtube.com/user/LearnChemE> , <www.itunes.apple.com/us/institution/university-of-colorado-boulder.

4. Kotys-Schwarz, D., "Dislocation and Plastic Deformation." LearnChemE (Engineering Screencasts). 2012. YourTube and iTunes U. <www.youtube.com/user/LearnChemE> , <www.itunes.apple.com/us/institution/university-of-colorado-boulder.

5. Kotys-Schwarz, D., "Recrystallization." LearnChemE (Engineering Screencasts). 2012. YourTube and iTunes U. <www.youtube.com/user/LearnChemE> , <www.itunes.apple.com/us/institution/university-of-colorado-boulder.

6. Kay, B., Kotys-Schwartz, D.A., Yowell, J.L., Zarske M.S. "Curricular Unit: Mixtures and Solutions." TeachEngineering. 2006. NSF - NSDL. 1 Mar. 2006 <www.teachengineering.com>.

7. Kolenbrander, A., Kotys-Schwartz, D.A., Yowell, J.L., Mach, N., Zarske M.S., Carlson, D.W. "Curricular Unit: Air Pollution Activities." TeachEngineering. 2004. NSF - NSDL. 23 Mar. 2005 <www.teachengineering.com>.

8. Kotys-Schwartz, D.A., Hill, J., Yakacki, C., Zarske M.S., Yowell, J.L. "Curricular Unit: Mission to Mars." TeachEngineering. 2004. NSF - NSDL. 23 Mar. 2005 <www.teachengineering.com>.

9. Kotys-Schwartz, D.A., Zamora Thompson, X., Friedrichsen, J., Zarske M.S., Carlson, D.W. "Curricular Unit: Put a Spark In It! - Electricity." TeachEngineering. 2004. NSF - NSDL. 23 Mar. 2005 <www.teachengineering.com>.

Manuscripts In Review / In Preparation

1. Kotys-Schwartz, D., Besterfield-Sacre, M., Shuman, L. "Informal Learning in Engineering Education: Where we are and Where we need to go," US-China Education Review. In Preparation, 2013.
2. Kotys-Schwartz, D., Knight, D. "Assessing the Professional Skills in Three Dimensions" International Journal of Engineering Education. In Preparation, 2013.

LECTURES AND PRESENTATIONS

Invited Presentations

1. "Unpacking the Engineering Practices", *Colorado Science Education Network*. West Minster, Colorado. October 22, 2012.
2. "You Can Do Research on That?" TIGER Workshop. *University of Colorado, TIGER Seminar Series*. Boulder, CO. September 27, 2012.
3. "Maintaining Individuality: Preserving Your 'Youness' in Engineering Industry" Andrews Hall Industry Night Keynote. *University of Colorado, Andrews Hall Industry Night Seminar Series*. Boulder, CO. April 5, 2012.
4. "First-Year and Capstone Design Projects: Is the Bookend Curriculum Approach Effective for Skill Gain?" *2010 ASEE Engineering Design Graphics Division Midyear Conference*. Houghton, MI. October 4, 2010.
5. "First Year Engineering Projects - My Favorite Class", *Purdue University - School of Engineering Education Seminar Series*. West Lafayette, Indiana. September 25, 2008.
6. "Because Dreams Need Doing" MESA Mark Keynote. *Colorado Math Engineering Science Achievement (MESA) Mark State Conference*. Boulder, CO. September 8, 2007.
7. "A University Perspective: Future Needs in Mechanical Engineering", *Forum - Energy Issues and Technology Developments for ASME Nuclear Codes and Standards*, Boulder, CO. September 18, 2007.
8. Kotys-Schwartz, D., "Improving Plastic Gear Accuracy Through Gas-Assisted Injection Molding", *Gear Dynamics and Gear Noise Research Laboratory Sponsors Meeting*. Columbus, Ohio. 2000.
9. Kotys-Schwartz, D., "Improving Plastic Gear Accuracy Through Gas-Assisted Injection Molding", *Gear Dynamics and Gear Noise Research Laboratory Sponsors Meeting*. Columbus, Ohio. 2001.

Refereed Conference Presentations

1. Tsai, J§., Kotys-Schwartz, D., "The Power of Networks as an Engineering Sophomore" *Proceedings, International Conference of the Learning Sciences*, Boulder, CO. Extended Abstract Submitted.
2. Lauff, C., Weidler-Lewis, J., O'Connor, K., Kotys-Schwartz, D., Rentschler, M., "Cognitive Ethnographies of Heterogeneous Engineering Design?" *Proceedings, International Conference of the Learning Sciences*, Boulder, CO. Extended Abstract Submitted.

3. Kotys-Schwartz, D., Knight, D. and Rentschler, M., "Design Center Colorado: Fostering Meaningful Partnerships Between Students Industry and Government Agencies" *Proceedings, American Society of Engineering Education Rocky Mountain Section Conference.* Pueblo, CO. March 2013.

4. Kotys-Schwartz, D., Zarske, M., Sullivan, J., Louie, B., Luftig, J., O'Connor, K., "Inclusive Excellence to Bolster Diversity: A System of Pathways To and Through Engineering Capacity-Building" *Proceedings, American Society of Engineering Education Rocky Mountain Section Conference.* Pueblo, CO. March 2013.

5. Tsai, J., Kotys-Schwartz, D., "Status and Roles of Students in Engineering: A Justification for Studying the Creation of Status Assignments in Freshman and Sophomore Year" *Proceedings, American Society of Engineering Education Rocky Mountain Section Conference.* Pueblo, CO. March 2013.

6. Kotys-Schwartz, D., Knight, D. and Pawlas, G., "The Utility of the Double Triangle as an Assessment Tool for Investigating Skill Development in Capstone Design Courses" *Proceedings, American Society International Mechanical Engineering Congress and Exposition (ASME IMECE).* Houston, TX. November 2012.

7. Kotys-Schwartz, D., Nicodemus, G. and Falconer, J., "Incorporating Screencasts Into Mechanical Engineering" *Proceedings, American Society International Mechanical Engineering Congress and Exposition (ASME IMECE).* Houston, TX. November 2012.

8. Kotys-Schwartz, D., Besterfield-Sacre, M., Shuman, L., "Informal Learning in Engineering Education: Opportunities and Potential Outcomes for Mechanical Engineering Students" *Proceedings, American Society International Mechanical Engineering Congress and Exposition (ASME IMECE).* Houston, TX. November 2012.

9. Tsai, J§., Kotys-Schwartz, D., Hannigan, M., "A Body-Based Approach to Teaching and Learning Engineering Statics" *Proceedings, American Society International Mechanical Engineering Congress and Exposition (ASME IMECE).* Houston, TX. November 2012.

10. Kotys-Schwartz, D., "Oral Discourse Focused on Conceptual Development: An Exploration into Implementation in Mechanical Engineering." *Proceedings, American Society International Mechanical Engineering Congress and Exposition (ASME IMECE).* Lake Buena Vista, Fl. November 2009.

Refereed Conference and Symposium Posters

1. Knight, D., Polmear, M., and Kotys-Schwartz, D., "Skills Building in Design Spaces at the Design Center Colorado" *University of Colorado Center for STEM Learning Symposium.* Boulder, CO. November 2013.

2. J., Gordon, Canney, N., and Kotys-Schwartz, D., Hannigan, M., Mickelson, A., Gateau, Y., "Hands-On Learning in a Haitian Sustainable Energy Course: Improving Attitudes" *University of Colorado Center for STEM Learning Symposium.* Boulder, CO. November 2013.

TEACHING

Courses

Advanced Product Design: MCEN 5228

• Developed material to teach team dynamics, ergonomics, aesthetics, and design for manufacturing in product design. Course size: 20 to 40 students.

• Co-teaching course with Anthony Pigliacampo, Dr. Derek Reamon, Dr. Mark Rentschler, Dr. Gary Pawlas, Dr. Jack Zable.

Component Design: MCEN 3025

• Developed materials to teach fundamental machine design concepts to junior level mechanical engineers. Utilizing in class workshops, in class activities, example parts and short videos to illustrate technical concepts. Created semester-long project and professional training sessions to prepare students for project-based learning. Course size: 110 to 160 students.

Freshman Design Projects: GEEN 1400

• Developed material to teach semester hands-on, team-based interdisciplinary design course for entry-level engineering students. Created two design projects for teams to practice professional and technical skill objectives. Professional skills objectives include: knowledge of engineering as a career, communication skills and teamwork skills. The technical skill learning objectives emphasize fundamental engineering methodologies and design process skills. Course format includes lecture and studio time. Course size: 35 students.

Graduate Design Projects: MCEN 5228

• Two semester (Fall and Spring) course series where the faculty advisor monitors progress, and mentors teams on technical and professional skills for industry sponsored design projects. Course size: one student team per an advisor, 5 students per a team.

Introduction to Mechanical Engineering: MCEN 1000

• Developed material to teach mechanical engineering as a career, professional and ethical expectations for engineers, and contemporary issues in mechanical engineering. Created two-week hands-on machining lab. Course size: 100 to 130 students.

Manufacturing Processes and Systems: MCEN 4026

• Developed hands-on course material to teach the material processing, quality control and world class manufacturing to senior level mechanical engineers. Created in class activities, three case studies and a final project to culminate course. Course size: 110 to 160 students.

Material Science: MCEN 2024

• Developed summer offering of course with 5 hours of lecture time per a week. Course was transformed from a purely lecture based format, to a highly interactive pedagogical framework. Course size: 30 students.

Senior Projects: MCEN 4045 (Fall) and 4085 (Spring)

• Coordinating 28 industry/organization/government-sponsored design projects, 20 Faculty Advisors and 28 Industry Mentors. Developed curriculum to teach professional skills (i.e., project management, communication, conflict resolution, etc.) to senior level mechanical engineering students. Co-developed workshop model teaching to replace traditional lecture mode. Two semester (Fall and Spring) course series where the Faculty Advisors monitor progress, and mentors teams on technical and professional skills. Course size: 150-175 students.

Advising (since June 2007)

Ph.D. Students - Current

Lauren Cooper, Ph.D. Candidate in Mechanical Engineering
(Fall 2009 – Present).
"Project-Based Service Learning and Student Motivation"

Janet Tsai, Ph.D. Candidate in Mechanical Engineering
(Fall 2010 – Present).
Dissertation title TBD.

M.S. Thesis Students - Completed

James Margolis, M.S. in Mechanical Engineering, May, 2008
"The attrition of Engineering Graduates: An Exploratory Study on Influential Career Choice Factors."

B.S. Independent Study Students

• Andrew Bornstein: "Single Cylinder Engine Modification with Conjugate Cam," Spring 2011 and Fall 2011.

• Brian Rafferty: "Single Cylinder Engine Modification with Conjugate Cam," Spring 2011 and Fall 2011.

• Austin Schipper: "The Shell Eco-Marathon Car at the University of Colorado," Spring 2011.

• Andrew Wertz: "Creating ORALS for Engineering Statics," Fall 2010.

• Matthew Cavalier: "Independent Spring, Mass and Damper System Study," Fall 2010.

• Josh Rust: "Development of Electrocardiogram Module: An Introduction to Engineering and its Role in Diagnostic Medicine," Summer 2010.

• Tristina DeWitt: "Oral Discourse Focused on Conceptual Development – Mechanical Engineering Statics Pilot," Fall 2009.

• Zachary Gremillion: “Design and Optimization of Vacuum Chamber Tooling,” Fall 2009.

• Erin Booth: “Oral Discourse Focused on Conceptual Development – Mechanical Engineering Statics Pilot,” Spring 2009.

• Eric Kelso: “Oral Discourse Focused on Conceptual Development – Mechanical Engineering Component Design Pilot,” Spring 2009.

• Duncan Kochhar-Lindgren: “Engine Simulation with Ricardo WAVE,” Spring 2009.

• Erik Larson: “Design of a CNC Gantry Router,” Spring 2009.

• Scott McMahan: “Design and Fabrication of Ultra Low Cost Electro Polishing Unit,’’ Spring 2009.

• James Neeley: “Design and Fabrication of Bluetooth Game Controller,’’ Spring 2009.

• Grant Boney: “Vehicle Dynamics for FSAE Applications,’’ Fall 2008.

• Nicholas Gilman: “Advanced Machining – CAD/CAM Theory and Application,” Fall 2008.

• Bridget Lipman: “Advanced Machining – CAD/CAM Theory and Application,” Fall 2008.

• Brady Reece: “Engineering Education – Learning Theory and Hands-on Curriculum Development,” Fall 2008.

• Mark Shamburg-Donohue: Design and Manufacturing of Disc Drag Approach to Classic Fly Fishing Reel,” Fall 2008.

• Katherine Gustafson: “Life Cycle Analysis of Plastic Grocery Sack,” Spring 2008.

• Christopher Jaeger: “Data Acquisition for FSAE: A Practical Approach to the MoTeC ADL2,” Spring 2008.

• Alan Kempner: “Design and Fabrication of Rising Rate Linkage on a Full Suspension Mountain Bike,” Spring 2008.

• Bradley Krough: “The Future Impact of Hydrogen Engines on the Auto Market,” Spring 2008.

• Bradford Peagler: “Engineering Education – Learning Theory and Hands-on Curriculum Development,” Spring 2008.

• Vincent Powell: “Advanced Machining Practices: Design and Development of a Downhill Mountain Bike Frame,” Spring 2008.

• Douglas Schafer: “Advanced Machining Practices: Design and Development of a Downhill Mountain Bike Frame,” Spring 2008.

• Molly Selting: “Material Selection Theory and Mechanical Engineering,” Fall 2007.

• Melissa Rougeaux: Engineering Education. Fall 2007.

•Danny Robertson: "Advanced Machining- CAD/CAM Theory and Application Through MasterCAM Applications," Fall 2007.

• Colin Schipper: "Advanced Welding – Best Practices and Strength Analysis of Feed Rate and Bevel Factors," Fall 2007.

• Isabela Alai Saez De Ibarra: "Advanced Machining – Fly Fish Reel CNC Project," Fall 2007.

• Peter Zawistowski: "Design and Manufacture of Yeti Bicycles Deflection Test Fixture," Fall 2007.

B.S. Research Students

• Lecia Finney (MCEN)
- Undergraduate Research Opportunities Program (UROP), Spring 2008.

• Jared Leidich (MCEN)
- Undergraduate Research Opportunities Program (UROP), Spring 2008.

• Maxwell Peevey (MCEN)
- Undergraduate Research Opportunities Program (UROP), Spring 2007.

• Bryce Bingham (MCEN)
- Undergraduate Research Opportunities Program (UROP), Spring 2007.

Other Research Students

• Patricia Chavez, Denver School of Science and Techology, Senior Project Advisor: Solar Powered Belt Buckle (Fall 2008 – Spring 2009).

• Alex Scherbl, Chris Torres, Jay Wellman, Denver School of Science and Techology, Senior Project Advisor: Solar Powered Vehicle (Fall 2007 – Spring 2008).

• University of Colorado User Interface Design Project Sponsor, Project: I/UCPC Integrated Evaluation project (Fall 2007).

Advising Committees (since June 2007)

Ph.D. Committees

• Abigail Watrous, Ph.D. Candidate in Civil Engineering (Fall 2007– Summer 2012).

M.S. Thesis Committees

• Audrey Earnshaw, M.S. in Mechanical Engineering, August 2009.

• Joel Bettner, M.S. in Mechanical Engineering, August 2007.

Outreach Activities

2010	High School Honors Institute (HSHI) Instructor, University of Colorado. Developed new curriculum based on Design for the Other 90% and instructed hands-on sessions for two days.
2010	Engineering Sampler Presenter, University of Colorado. Developed and presented interactive mechanical engineering information session for 100 visiting students and parents.
2009-Present	Senior Design Project Evaluator. Denver School of Science and Techology.
2008	Centaurus High School Recruitment Day, ME Department Presenter, University of Colorado. Conducted transmission lab for 50 sophomore students.
2007	Discover Engineering Days, ME Department Presenter, University of Colorado.
2007	Guest speaker for Harrison High School MESA Program in Colorado Springs. Developed Introduction to Biomedical Engineering presentation and hands-on heart-valve activity.
2006-2007	Female Recruits Exploring Engineering (FREE) – Denver School of Science and Technology. Conducted engineering workshops once a month.
2006-2007	Female Recruits Exploring Engineering (FREE) – Lincoln High School, Conducted engineering workshops once a month for students.
2006	High School Honors Institute (HSHI) Instructor, University of Colorado. Coordinated two-day event for ME Department. Developed new curriculum based on flow visualization, robotic design and shape memory polymers.
2006-2007	Colorado MESA Mark, ME Department Presenter, University of Colorado.
2005 and 2007	Explore CU Engineering Day, ME Department Panel Representative, University of Colorado.
2004	Expanding Your Horizons, ME Department Presenter, University of Colorado.

Faculty Development

2010	NSF Exploring How People Learn Workshop (3 day workshop)
2008	NSF Cyberinfrastructure in Engineering Education Workshop (3 day workshop)
2006	FTEP Summer Classroom Learning Assessment Institute (4 day workshop)
2006	Faculty Teaching Excellence Program (FTEP) Teaching in a Nutshell: Strategies to Enhance Student Learning (2 day workshop)

SERVICE

Department of Mechanical Engineering

2012 – Present Design Center (DC) Colorado Director of Undergraduate Programs, University of Colorado Department of Mechanical Engineering.

- Responsibilities include: recruiting and soliciting projects for the Senior Projects course, communicating and interacting with industrial sponsors to ensure their retention, writing proposals to leverage the DC Colorado funds to provide improvements to the Department of Mechanical Engineering. Overseeing the Project and Financial Coordinator, Durning Undergraduate Laboratory and the Durning Laboratory Coordinator.

2012 – 2013 ME Undergraduate Advisor Search Committee Chair, University of Colorado Department of Mechanical Engineering.

- Initiated request to proceed with hiring, development of ME Undergraduate Advisor job description and postings.
- Served as primary point of contact for CU Human Resources and 124 applicants. Established protocol for reviewing faculty candidate applications, coordinated phone interview and in-person interview questions. Organized phone interviews and on-site interviews. Conducted references checks and provided final recommendation for hire to ME Department Chair.

2012 ME Project and Financial Coordinator Search Committee Chair, University of Colorado Department of Mechanical Engineering.

- Initiated request to proceed with hiring, development of ME Project and Financial Coordinator job description and postings.
- Served as primary point of contact for CU Human Resources and applicants. Established protocol for reviewing faculty candidate applications, coordinated phone interview and in-person interview questions. Organized phone interviews and on-site interviews. Conducted references checks and provided final recommendation for hire to ME Department Chair.

2010 – 2012 CMU-CU Partnership Program Faculty Search Committee Chair, University of Colorado Department of Mechanical Engineering.

- Initiated request to proceed with hiring, development of Instructor job description and postings.
- Establish protocol for reviewing faculty candidate applications for MSC-CU Partnership Program Instructor position. Organize letter of reference requests, and phone interviews. Host Instructor candidates, conduct on-site interviews and provide final recommendation for hire.

2008 – 2013 Colorado Mesa College – University of Colorado Mechanical Engineering Partnership Program Faculty Director.

- Responsibilities include: curriculum transfer, detailing admission guidelines, ABET alignment, facility and equipment oversight, serving on

faculty search committees, student orientation, assisting with fundraising activities and student recruiting.

2008 – present Undergraduate Committee, University of Colorado Department of Mechanical Engineering.

- Yearly responsibilities include: conducting focus groups, conducting task forces, writing task force reports and determining ABET Outcomes tables.
- Preparing for the ABET 2011 visit responsibilities include: participation in ABET Outcomes retreat, participation in ABET Objective and achievement retreat, and writing four program outcomes sections for self study report.

2008 – 2009 CMU-CU Partnership Program Faculty Search Committee, University of Colorado Department of Mechanical Engineering.

- Reviewed faculty candidate applications for MSC-CU Partnership Program Director, hosted several Director candidates, conducted interviews, and contributed to departmental discussion on the merits of each candidate.

2007 – present Graduate Design Track Committee, University of Colorado Department of Mechanical Engineering.

- Participate in weekly committee meetings to complete the following activities: creation of Design Track strategic plan, revision of Graduate Design Projects course, revision of Advanced Product Design course, implementation of admission requirements for Design Track, fundraising for Design Track resources, project determination and solicitation.

2007 – present Senior Design Assessment Team, University of Colorado Department of Mechanical Engineering.

- Weekly meetings with Design Center Assessment Specialist. The goal of the team is to assess the ability of the Senior Design course to meet course objectives and ME Department Program Objectives.

2007 – 2009 Formula Society of Automotive Engineers co-Advisor, University of Colorado Department of Mechanical Engineering.

- Oversaw all FSAE activities, including: vehicle design and analysis, technical presentations, technical reports, and fundraising. Traveled with team to yearly competition in Jackson, Michigan.

2007 – 2008 Shell EcoMarathon Vehicle Advisor, University of Colorado Department of Mechanical Engineering.

- Advised EcoMarathon team on all technical and professional activities, including: vehicle design and analysis, technical presentations, technical reports, and fundraising.

2007 – 2009 Society of Automotive Engineers Student Chapter Advisor, University of Colorado Department of Mechanical Engineering.

- Advised undergraduate students on student chapter activities.

2006 – 2008 American Society of Mechanical Engineering Student Chapter Advisor, University of Colorado Department of Mechanical Engineering.

- Advised undergraduate students on student chapter activities. Oversaw chapter funding.

2006 – 2013 Co-op Coordinator, University of Colorado Department of Mechanical Engineering.

- Advise undergraduate mechanical engineering students on College of Engineering co-op policies and procedures, perform resume reviews, and job search advice.
- Serve as point of contact for industry recruiters who would like to start co-op program with CU-Boulder and employ mechanical engineering students.

2005 – 2009 Undergraduate Concept Inventory Administration Coordinator, University of Colorado Department of Mechanical Engineering.

- Coordinated pre- and post-Concept Inventory exams in seven mechanical engineering undergraduate courses. Developed testing protocol, conducted exam scanning and analysis.

College of Engineering and Applied Sciences Service

2009 – 2012 Learning Assistant Program, College of Engineering and Applied Sciences.

- Lead effort with Associated Dean of Education in Engineering, Integrated Teaching and Learning Laboratory Co-Director, and the School of Education to facilitate the adoption of the Learning Assistants program in the College of Engineering.

2009 – 2012 Engineers for American Communities (EFAC) Faculty Advisor, College of Engineering and Applied Sciences.

- Advise a multidisciplinary engineering student organization whose mission is to perform entrepreneurial engineering design work to create affordable living innovations for people in need in local communities.
- Guide undergraduate and graduate students on design activities, funding, client identification and client relationships.

2009 Service Learning Action Committee, College of Engineering and Applied Sciences.

- Assisted with development of white paper—*Strategic Initiative in Service Learning*. Participated in inter-disciplinary discussions regarding strategic planning for Service Learning within the College of Engineering and Applied Sciences.

2009 Professional Learning Action Committee, College of Engineering and Applied Sciences.

- Assisted with development of white paper—*Final Report of the Professional Learning Action Committee*. Participated in inter-disciplinary discussions regarding strategic planning for Professional Learning within the College of Engineering and Applied Sciences.

2006 – 2012 Co-op Committee, College of Engineering and Applied Sciences.

- Participated in discussions on co-op policies, student requirements, and student training. Assisted in creation of co-op student handbook, co-op company handbook, participating company assessment, and student participant assessment.

University of Colorado

2009 – present University of Colorado Center for STEM Learning, Project Management Team.

- One of nine members assisting in the management of Chancellor Philip DiStefano's (PI) NSF I3: Towards an Institute for STEM education.
- Responsibilities include: program assessment, annual symposium planning and implementations, review and selection of Chancellor's Awards for Excellence in STEM Education, writing of NSF annual report, fundraising, policy work, planning for University of Colorado Center for STEM Education.

2009 – 2012 University of Colorado Boulder Faculty Assembly (BFA), Instructor Representative.

- Work with other BFA members, departmental faculty, college-level groups and key CU-Boulder administrators on University of Colorado policy recommendations and changes.

2009–2012 University of Colorado Boulder Faculty Assembly (BFA), Faculty Affairs Committee

- Address faculty matters, including: faculty responsibilities and rights in teaching, research, and service.

Professional Service

Symposium Organizing and Editorial Duties for Symposium Proceedings

"4th Annual Symposium on STEM Education: Celebrating the Launch of the Center for STEM Learning." University of Colorado Integrating STEM (iSTEM) 2012 Symposium. Co-organizer with N. Finkelstein, K. Kidder, M. V. Otero.

"Integration of Disciplines; 3rd Annual Symposium on STEM Education." University of Colorado Integrating STEM (iSTEM) 2011 Symposium. Co-organizer with N. Finkelstein, K. Kidder, M. Klymkowsky, V. Otero, D. Reamon, E. Stade.

"Celebrate Excellence: 2nd Annual Symposium on STEM Education." University of Colorado Integrating STEM (iSTEM) 2010 Symposium. Co-organizer with N. Finkelstein, K. Kidder, M. Klymkowsky, V. Otero, D. Reamon, E. Stade.

"Science, Technology, Engineering and Math (STEM) Education Symposium." University of Colorado Integrating STEM (iSTEM) 2009 Symposium. Co-organizer with J. Brown, N. Finkelstein, M. Klymkowsky, V. Otero, D. Reamon, E. Stade.

"Forum – Energy Issues and Technology Developments for ASME Nuclear Codes and Standards," 2007 ASME Board on Nuclear Codes and Standards Annual Meeting. Co-Chair with K. Balkey.

Session Chair

Session Chair, *American Society International Mechanical Engineering Congress and Exposition* (ASME IMECE). Session: 5-5-6.

Session Moderator, 2012 *American Society of Engineering Education Annual Conference & Exposition*. Session: ERM Session - Research Informing Teaching Practice I.

Session Moderator, *American Society of Engineering Education Annual Conference & Exposition*. June 2010. Session: 2425.

Co-Organizer. *ASME 2009 International Mechanical Engineering Congress & Expo (IMCE)*, Lake Buena Vista, Florida. Session: Engineering Outreach and Retention Issues in Mechanical Engineering Education. November 2009.

Professional Society Committees / Involvement

- Secretary/Treasurer, American Society of Engineering Education (ASEE) Educational Research Methods (ERM) Division (2010-Present)
- Co-Chair, American Society of Engineering Education (ASEE) Educational Research Methods (ERM) Division Nominating Committee (2008)
- Invited Panel Member, ASME Mechanical Engineering Education Conference (2008)
- Reviewer, American Society of Engineering Education (ASEE) Educational Research Methods (ERM) Division Apprentice Faculty Grant, (2007 and 2011)
- Division workshop proposal reviewer for Society of Engineering Education (ASEE) Annual Conference, Education Research Methods Division (ERM). (2012)

Professional Review - Proposals

- Two National Science Foundation Proposal Review Panels in 2007 and 2009.

Professional Review – Peer-reviewed Publications

- Advances in Engineering Education
- American Society for Engineering Education – Design in Engineering Education Division Annual Conference, Abstracts and Full Papers

- American Society for Engineering Education – Educational Research Methods Division Annual Conference, Abstracts and Full Papers
- American Society for Engineering Education – Mechanical Engineering Division Annual Conference, Abstracts and Full Papers
- American Society for Mechanical Engineering Conference Annual Conference, Abstracts and Full Papers
- IEEE and American Society for Engineering Education Frontiers in Education Conference Abstracts and Full Papers
- International Conference on Research in Engineering Education, Full Papers
- Journal of Engineering Education

Society Memberships

- Member, American Society of Engineering Education (ASEE)
- Member, American Society of Mechanical Engineers (ASME)
- Member, Society of Automotive Engineers (SAE)
- Member, Pi Tau Sigma National Mechanical Engineering Honor Society

FUNDING

Pending Proposals

Pending Colorado Department of Transportation, FY 2014 FTA Section 5304 Project Application, $40,000, 01/01/13-12/31/15, Daria Kotys-Schwarz (PI), Carl Lawrence (co-PIs).

Funded Grants Since 2006

2013 National Science Foundation, EAGER: Cognitive Ethnographies of Engineering Design, $188,726, 09/01/13-8/31/14, Mark Rentschler (PI), Daria Kotys-Schwartz, Kevin O'Connor (co-PIs).

2013 National Science Foundation, MRI Acquisition: An Integrated Platform for Combined Multi-Scale Mechanical and Chemical Analysis to Inform Functional Materials Design, $434,112, 09/01/13-8/31/14, Virginia Ferguson (PI), Christopher Bowman, Steven George, Daria Kotys-Schwartz, Richard Noble (co-PIs).

2013 National Science Foundation, Learning Ethnographies of New Engineers: A New Approach to Understanding the Transition from School to Work, $1,499,871, 09/01/13-8/31/16, Reed Stevens (PI), Margaret Eisenhart, Daria Kotys-Schwartz, Kevin O'Connor, William Penuel (co-PIs).

2013 Ball Foundation, "Integrated Sustainability-focused Engineering Design Projects and BOLD Diversity Scholarships," $127,000. Proposal Cycle: 2013-2014, Jacquelyn Sullivan (PI), Penny Axelrad, Daria Kotys-Schwartz, Melinda Seevers (co-PI).

2013 Engineering Excellence Fund Major. University of Colorado at Boulder. "College of Engineering and Applied Science Welding Curriculum." $4,110. Spring 2013, B.Fuoss (Student), D. Kotys-Schwartz and M. Rentschler (Faculty).

2013 Engineering Excellence Fund Major. University of Colorado at Boulder. "Graduate Design Program MakerBot and Computing." $6,842. Spring 2013, M. Rentschler and D. Kotys-Schwartz (Faculty).

2012 National Science Foundation, "Routes to Sustainability for Natural Gas Development and Water and Air Resources in the Rocky Mountain Region," $11,999,328, 9/24/12-9/23/17, Joseph Ryan (PI), Patrick Bourgeron, Michael Hannigan, Patricia Limerick, Mark Williams (co-PIs), Daria Kotys-Schwartz (Senior Personnel).

2011 National Science Foundation, "Inclusive Excellence to Bolster Diversity: A System of Capacity-Building Pathways To and Through Engineering," $535,510, 9/01/12-8/31/15, Jacquelyn Sullivan (PI), Daria Kotys-Schwartz, Beverly Louie, Kevin O'Connor, Stephanie Rivale (co-PIs).

2011 National Science Foundation Graduate Research Fellowship for Janet Tsai, "Body-Based Approach to Teaching and Learning Statics," $90,000 (No PI Salary), 06/2011 – 05/2014. Daria Kotys-Schwartz (Principal Advisor).

2010 Halliburton Scholarships: Increasing the Pathway to Mechanical Engineering University of Colorado Mechanical Engineering Partnership, $20,000. Proposal Cycle: 2010-2011, Lindsey Lebowitz (PI), D. Kotys-Schwartz (co-PI).

2010 Engineering Excellence Fund Minor, "Materials Modeling Software for the enhancement of our Materials Science Curriculum," $999. Fall 2010 Conrad Stoldt (PI), Yifu Ding, Virginia Ferguson Alan Greenberg, Daria Kotys-Schwartz (co-PIs).

2010 Engineering Excellence Fund Minor, "Engineering for American Communities," $2000. Spring 2010. Lauren Cooper (PI), Daria Kotys-Schwartz, Derek Reamon, Malinda Zarske (co-PIs).

2010 Department of Education FIPSE Program, "Sustainable Energy and Aeronautical Engineering," $177,341: 8/1/10-7/31/13, Chiang Shih (PI), Jonathan Cloos, Juan Carlos Ordonez, Necesio Gomes Costa, Maristela Gomez da Silva (co-PIs), Kotys-Schwartz (External Evaluator).

2009 Engineering Excellence Fund Major. University of Colorado at Boulder. "CNC Router, $8,000. E. Larson (PI), D. Kotys-Schwartz (Co-PI).

2009 National Science Foundation, "Collaborative Research: ciHUB A Virtual Community to Support Research, Development and Dissemination of Concept Inventories," $754,667, 09/15/09-07/31/11, Teri Reed-Rhoads

(PI), P.K. Imbrie, Johannes Strobel (co-PIs), Kotys-Schwartz (Advisor Board Member).

2008 National Science Foundation, "CCLI: Phase 2-Colorado-Momentum" $400,000, 9/1/08-9/1/10, Mary Nelson (PI), James Curry, Anne Dougherty, Harvey Segur (co-PIs), Kotys-Schwartz (Senior Personnel).

2008 National Science Foundation, "One Day's Pay - Educating K-16 Engineers to Create Affordable Innovations," $498,613, 9/1/08-9/1/11, Derek Reamon (PI), Daria Kotys-Schwartz, Brian Argrow, Sullivan (co-PIs).

2008 Engineering Excellence Fund Major. University of Colorado at Boulder. "CU Formula SAE Proposal." $12,244. Spring 2008, M.Burns (Student), D. Kotys-Schwartz and D. Reamon (Advisors).

2008 Engineering Excellence Fund Major. University of Colorado at Boulder. "2007-08 Shell Ecomarathon." $10,000. Spring 2008, J. Connor (Student), D. Kotys-Schwartz (Advisor).

2007 Department of Education FIPSE Program, "U.S. – Brazil Partnership in Sustainability and Innovative Design," $211,459: 10/1/07-10/30/12, Larry Shuman (PI), Kristine Lalley, Leandro Palermo, Daniel Moore, Maristela Gomez da Silva (co-PIs), Kotys-Schwartz (External Evaluator).

2007 National Science Foundation, "Collaborative Research: Improving Engineering Students' Learning Strategies Through Models and Modeling," $728,875: 9/1/07-8/30/11, Larry Shuman (PI), Mary Besterfield-Sacre, Renee Clark (co-PIs), Kotys-Schwartz (External Evaluator).

2007 National Science Foundation, "Workshop on Cyberinfrastructure and Engineering Education," $64,987, 9/1/07-2/28/09, Jeffrey E. Froyd (PI), Daria Kotys-Schwartz, Maura J. Borrego, Tamara J. Moore (co-PIs).

2006 National Science Foundation, "Potential Recruits in Engineering: A Longitudinal Study of Diverse Academically-able Young Women's Views of Engineering as a Career," $235,533, 8/15/06-8/15/09, Margaret Eisenhart (PI), Kotys-Schwartz (Researcher).

Declined Proposals

University of Colorado Seed Grant, "Lifewide Learning in Becoming and Engineer," $49,576, 9/01/12-8/31/13, Kevin O'Connor (PI) Daria Kotys-Schwartz (Collaborator).

National Science Foundation, "PRISM - Digital Explorations," $3,000,000 08/01/10-07/30/15, Jim Curry (PI), Daria Kotys-Schwartz, Mary Kraus, JoAnn Silverstein (co-PIs).

Engineering Excellence Fund Major, "2008-2009 CU Formula SAE Proposal," $10,000, Spring 2009, J. Ortmann (Student), D. Kotys-Schwartz and D. Reamon (Advisors).

National Science Foundation, "IGERT: Air Quality Science and Decision-Making in the Face of Global Change," Jana Milford (PI), Lisa Dilling, Greg Frost, Shelly Miller, Rainer Volkam (co-PIs); Michael Hannigan, Daven Henze, Jose Jimenez, Daria Kotys-Schwartz, Jill Litt, Jennifer Peel, Roger Pielke (Senior Personnel); pre-proposal declined.

National Science Foundation, “IGERT: Air Quality Science, Engineering, and Decision Making,” Jana Milford (PI), Michael Hannigan, Shelly Miller (co-PIs); Daria Kotys-Schwartz, Daven Henze, Jose Jimenez, Jill Litt, Jennifer Peel, Roger Pielke, Rainer Volkame (Senior Personnel); pre-proposal declined.

NSF, Engineering Research Center for Energy Systems with New Architectures and Materials, $13,157,575, 8/1/ 2008 - 7/31/2013, Rishi Raj (PI), Martin Dunn, Daria Kotys-Schwartz, Diana Lados, Manuel Laguan, Kurt Maute, See Hee Lee, Carl Koval, Ron Loehman, Arup Kanti Maji, Ronggui Yang (co-PIs).

National Science Foundation, “CCLI: Phase 2-Colorado-Momentum” $4.7M, 7/1/11-6/30/16, Mary Nelson (PI), James Curry, Anne Dougherty, Harvey Segur (co-PIs), Kotys-Schwartz (Senior Personnel).

National Science Foundation, “Contextual Research-Empirical – Learning Ethnographies of New Engineers: A New Approach to Understanding the Transition from School to Work,” $580,156, 07/1/11-06/30/14, Kevin O'Connor (PI), Daria Kotys-Schwartz (co-PI).

National Science Foundation, “Collaborative Research: Assessing the Spectrum of International Undergraduate Engineering Educational Experiences,” $523,012, 07/1/11-06/30/14, Mary Besterfield-Sacre, Cheryl Matherly, Gisele Ragusa (co-PIs), Kotys-Schwartz (External Evaluator).