# M334: Ethical Awareness and Social Responsibility in a Corporate/Team Context

## ***Discussion Notes***

All of the papers in this session took a macro-ethical perspective and focused on (a) strategies for increasing student motivation for studying ethics and (b) the structural conditions that both discourage and encourage ethical awareness and social responsibility in corporate contexts. Like several other sessions at this year’s conference, the speakers emphasized the importance of students learning to read/analyze the complex structures in which people act. Foreshadowing Deborah Johnson’s distinguished lecture, the presentations and discussion examined moral accountability as a social process, as an aspirational ideal, and a set of skills (as opposed to just being opinions). They also explored the connection between engineering ethics and social justice.

## *Possible Topics for Future Papers/Collaborations*

* What does it mean to take a “critical perspective” on corporate social responsibility (CSR)? How can engineering educators take a critical perspective without seeming cynical or adversarial to business or the engineering profession?
* What specific strategies can instructors use to provide students with the practical, analytical tools they need to *practice* ethical awareness and social responsibility in a team context? How do we think about practical skills in relation to aspirational values and analytical categories (reconcile aspirational pedagogy with the problem of breaking it all down so that students see how to operationalize aspirational values)?
* What steps can we take to ensure that CSR becomes an evaluation criterion for assessing the relative merits of specific engineering designs and innovations? **Two possible answers to this question:** (1) engage the NAE as partners in getting this to happen and (2) be more deliberate about bringing the Engineering Ethics Division and LEES into conversation with each other and with the engineering profession.
* How might we assess the long-term impact of interventions aimed at increasing ethical awareness and encouraging social responsibility? Leaving the feasibility of such assessment aside, to what extent are we as educators obligated to undertake it (as opposed to assessing performance in coursework and assuming it forecasts what graduates will do in the workplace)?
* How do we think about problem framing and problem definition as forms of stakeholder engagement? What specific instructional strategies can help engineering students think more creatively and expansively about the process of problem definition?
* How can we expand our knowledge of the behaviors that characterize teams and organizations that are more likely to hold each other accountable?
* How does the *history* of mindsets and problem *re*definition contribute to our understanding of how engineering decision-making processes can be adapted to incorporate social justice as an important value/goal?

# M434: Embedding Writing in Experiential Learning

## ***Discussion Notes***

There was only one published paper for this session, but it incorporated the experiences and perspectives of four different interventions that integrated technical writing into experiential learning of various forms (co-op experiences, design courses, collaboration with practitioners, and throughout an engineering curriculum). A common theme in all of these interventions is improving student motivation and the efficacy of writing instruction by focusing on the kinds of communication that are actually used in engineering workplaces and practice, including technical memos, proposals to justify a project or change in an organization, field observation memos, multi-modal communication, and oral presentation.

## *Possible Topics for Future Papers/Collaborations*

* How can instructors give adequate substance and structure to activities designed to improve communication ability when those activities are *not* the entirety of a course? Similarly, how do we hold students accountable for their performance on such activities (i.e., including the grade for communication assignments in the grade for a co-op experience or technical course)?
* How can we more precisely articulate what we mean when we say “embedded” and “experiential learning”? Do these terms communicate effectively with the practitioners we need to engage?
* What are the communication abilities that render engineering graduates “practice-ready”? How do we get adequate agreement among faculty about what constitutes good writing/effective communication? What are the most effective ways for engaging practitioners in defining what students need to know and be able to do?
* What are some effective ways of (1) providing students with experience in authentic writing/communication tasks? (2) developing assignments and rubrics that minimize the writing load for students and grading load for faculty while also helping students practice the skills and develop the abilities that will need in engineering practice?
* How do we understand and overcome student resistance to writing, including exploring how communication fits into engineering identity? What role might “near peers” play in this process?
* Should we continue to teach and require genres that are not practitioner based (such as lab reports) or try to develop alternatives that fulfill the same pedagogical goals as lab reports but also reflect workplace practices?
* What are the advantages and disadvantages of discipline-based instruction? How does discipline-based instruction differ from practitioner-based instruction?
* How can the kinds of resources that have been developed by Susan Conrad and her colleagues in the Civil Engineering Writing Project be adapted to and/or created for other engineering disciplines—or for engineering more generally?
* What are the most important myths about writing instruction that persist and stand in the way of scaling up embedded writing instruction?

# T434: Imagining and Reimagining Engineering Education as a Dynamic System

## ***Discussion Notes***

All of the papers in this session were concerned with the epistemic habits of engineers and the influence of sociocultural factors in both destabilizing and resisting change in engineering education. In differing ways, they highlighted the power that resides in systems and narratives, as opposed to particular people or institutions.

## *Possible Topics for Future Papers/Collaborations*

* What do we mean when we talk about “the epistemic habits of engineers”? What does this phrase capture that wasn’t emphasized or explicit in earlier discussions of engineering education? To what extent is it another name for issues LEES educators and researchers have dealt with for a long time?
* What do we mean when we talk about “the theory of narrative causality”?
* How might we translate these concepts so that they resonate with engineering students and faculty? To what extent does their use imply a critique of engineering? Are epistemic habits and narratives equally important in all disciplines (as opposed to distinctively important in engineering)?
* What is the connection between epistemic habits and stories/narratives? How can we use analysis of stories as a way of uncovering, critiquing, and changing epistemic habits? What are the differences between epistemic habits, narratives, and myths?
* How do we craft/find good stories and tell them effectively, both in our efforts as faculty to effect change in engineering education and to help engineers/engineering students communicate?
* What are the common themes and points of convergence in the narratives embodied in the landmark self-studies of engineering education? How do these themes and narratives differ from or resemble conceptions of engineering and engineering education among non-engineers?
* How does understanding that learning is situated in a complex web of social organization and historical contexts improve or otherwise change the learning process/educational enterprise?
* What are the most important shared narratives that constitute/shape engineering identity? What besides shared narratives shapes that identity?
* What is the relationship between metaphors and narratives in shaping our understanding of engineering, engineering education, and change management?
* What are the important similarities and differences in the understanding and delivery of instruction in (applied) mathematics versus LEES? How can an understanding of one of these dimensions of engineering education enhance our understanding of the role of non-engineering disciplinary knowledge in engineering education?

# T534: Imagining Others, Defining Self Through Consideration of Ethical and Social Implications

## ***Discussion Notes*** *(See also U434B and U534B)*

All of the papers in this session (a) dealt with the need for and challenges of integrating ethical and social considerations into engineering practice and education and (b) described research approaches that can be used to discover and articulate the mental models used by engineering students, faculty, and practitioners to locate their enterprises within larger social contexts.

## *Possible Topics for Future Papers/Collaborations*

* To what extent is the term “moral imagination” appropriate for describing the intellectual and social structures addressed in studies like the ones presented in this session? What accounts of (specific publications on) moral imagination are most suitable for applying the concept to engineering education and practice?
* What role do non-technical courses and expertise play in the development of engineering identity? How do the circumstances in which engineering students encounter non-technical content influence their understanding of the role of such content in engineering?
* How do we analyze structures of power and help our students learn to do it? How can we do that without giving students the impression that we are denigrating the engineering profession as a whole or questioning the sincerity of their motives in attempting to use the power of engineering/technology to benefit groups they perceive as in need of help?
* What are the defining features of the narrative of “engineer as hero”? Where is this narrative most evident? What are its consequences? How does this narrative relate to what we think of as the “narrative of victimization” as it is manifest in engineering identity and discourse?
* How does the concept of “disciplinary egocentrism” help us understand and articulate the challenges of cultivating humility and breaking down barriers such as “us/them,” “first-world/third world,” and “engineers/public”?
* How can we most effectively frame an ethical critique of service learning and highlight the fact that students are not the only stakeholders in service learning contexts? Specifically, how can we convey the idea that we shouldn’t “play with people’s lives” in the process of providing experiential service learning opportunities?
* What are the most effective strategies for connecting cross-cultural studies to service learning enterprises? In particular, how can reflection on the part of students be used to enhance the learning that comes from service learning? What is the relationship between classroom and experiential learning in this context?
* What distinctive role does a historical perspective play in promoting macro-ethical awareness among engineering faculty and students?

# U434B: Diversity and Inclusion: Concepts, Mental Models, and Interventions

## ***Discussion Notes*** *(See also U534A)*

The four papers in this session illuminated the variety and creativity of approaches to promoting diversity and inclusion in both the curricular and extracurricular experiences of undergraduate engineering students. The papers also problematized diversity and inclusion in a number of ways, including (1) the disparity between the intent and impact of diversity interventions, (2) the tension between exploring cultural differences in group work (for educational purposes) and minimizing differences to “get the work done,” and (3) the incompatibility between engineering faculty expertise and the requirements of preparing students to function well in diverse settings and promote inclusive practices.

## *Possible Topics for Future Papers/Collaborations*

* Given that engaged reflection is *essential* for students to optimize their learning from intercultural interactions and other diversity interventions, what are the most effective pedagogical strategies for getting students to engage in meaningful reflection? How can we structure reflection assignments so that they are optimally timed, efficient, and focused while still allowing space for individualized learning?
* How can we get beyond addressing the diversity challenge in terms of numbers (as important as that is) and create the intellectual and institutional spaces that allow for the expression of multiple viewpoints and perspectives?
* In what ways do notions of rigor create barriers to intercultural learning? Are these barriers more significant in highly selective institutions than elsewhere? What are the most effective strategies for helping engineering faculty recognize the unintended negative consequences of traditional notions of rigor?
* How does disciplinary egocentrism manifest itself in engineering education? Is disciplinary egocentrism more of a problem in engineering than in other disciplines in the sense that it creates a bigger obstacle to diversity and inclusion? How does intellectual diversity relate to demographic diversity?
* How does theater function as a space in which difficult subjects can be safely explored? What are the similarities between laboratories and theaters as educational spaces? How might the educational experience in laboratories be enhanced by exploiting the parallels between labs and theaters? For example, what are the equivalents of directors, script writers, and actors in laboratories?
* What conclusions can we draw from the relative frequency with which theater has been treated as a contributor to liberal education for engineers?
* How does playwriting facilitate the development of moral imagination, especially for engineering students? How does writing plays help (or hinder) the connection between writing and engineering identity?
* How can the imaginative activity of writing and performing plays help faculty and students in the necessary and difficult process of reimagining our engineering institutions, classes spaces, and research environments to create the room for different voics to speak and be heard?

# U434C: Learning Outcomes and Pedagogical Strategies: Problems of Alignment

## ***Discussion Notes***

The papers in this session explored the extent to which the articulated outcomes of engineering education align with the (1) design of courses and curricula, (2) the expertise of individual faculty members, and (3) the terms and educational theories we use to describe the education of young adults, including engineering students.

## *Possible Topics for Future Papers/Collaborations*

* The terminology used to describe the “non-technical” skills required for engineering practice is problematic and the language used by ABET does not align with the language employers use in job ads. What might we gain by having more consistency and alignment? What role should the LEES community play in developing more precise, consistent language in this area?
* How might further analysis of the skills in Table 6 of Graham and Porterfield’s paper help us understand the skills in relation to each other? For example, character and communication are large, hetereogeneous categories, each with many different features; and character is not a “skill.”
* How do the skills listed in Table 6 map on to (a) categories such as “ethical responsibilities/societal impacts of engineering (ESI)” and “sociotechnical systems thinking” or (b) similar lists for engineering leadership or technology entrepreneurship?
* Graham and Porterfield talk about the blind spots that managers have, “especially in areas where [they are] not strong” (“Discussion of Results”). How do these blind spots relate to disciplinary egocentrism? How do interdisciplinary collaborations of the type that Polmear *et al.* describe broaden vision/sharpen perception?
* What research do we have that delineates common pathways by which individual faculty and students become aware of their blind spots?
* What do we know about “knowledge hierarchies” in engineering education? How do they relate to “epistemic habits/cultures” and “engineering identity”? How do these hierarchies exacerbate alignment problems?
* What do we mean by “macro-ethics education”? How does it relate to ESI?
* Polmear *et al.* highlight the limitations of the conceptual framework of “best practices” as it applies to HSS/STS/LEES models for engineering education. To what extent has this finding been established in other publications? What additional work should be done to investigate these limitations?
* Like other sessions, this one emphasized the mismatch between the expertise of most engineering faculty and the requirements of preparing undergraduates to practice engineering. Should LEES focus on this disparity as a high priority research topic?
* Professors of practice often fill these gaps in areas such as engineering business and leadership. What might they offer with respect to ESI and social justice? What limitations might they have?

# U534A: Communicating Across Cultural and Epistemological Boundaries

## ***Discussion Notes*** *(See also U434B)*

The four papers in this session dealt with communication across several different kinds of boundaries: (1) between the disciplinary experience base of engineering and that of design, specifically human-centered design (HSD); (2) between engineering designers and the stakeholders the designed are supposed to benefit; (3) between engineering colleagues who *have* experienced various forms of marginalization in the workplace and those who have *not* experienced marginalization; and (4) between various engineering disciplines treating the same broad topic. The strongest unifying themes of the session, however, focused on the challenges of integrating social justice into the engineering curriculum and on the links between intellectual diversity and demographic diversity.

## *Possible Topics for Future Papers/Collaborations*

* As one of the papers indicated, “context is a tricky concept.” How can we be clearer about what we mean when we talk about the importance of context in engineering design? What strategies can we use for making the multifaceted and contingent nature of context apparent while still managing the complexity that heterogeneous, dynamic situations/systems entail?
* How can we bridge the gaps between problem framing/definition as understood in engineering fields and as conceptualized and taught in HCD, STS, and the humanities and social sciences (HSS) more generally (for example the distinction between iteration/experimentation as “wasted time” vs. “informed trial and error)?
* What do we know about the difference it makes when students (especially engineering students) *opt in* to non-technical or hybrid courses and programs in areas such as technology entrepreneurship, engineering leadership, engineering and public policy, or topics like HCD? Given the “requirements for all” orientation of engineering education, the *opt in* approach can be challenging to implement. How might we overcome those challenges, especially with respect to ABET?
* To what extent are the frictions between design thinking and engineering pervasive throughout non-technical and hybrid educational experiences?
* What are the similarities and differences between the research approaches referred to as “genealogical studies” and “the history of ideas”? Regardless of the terminology we use, how can we refine and strengthen these research methods and establish their validity within engineering education research generally?
* What underlying tendencies and factors contribute to the propensity for concepts such as “design thinking,” “empathy,” or “the T-shaped professional” to lose nuance and depth as they are integrated into engineering education?
* Conversely, what nuances of engineering epistemology and methodology tend to be lost on humanists and social sciences? How are individuals with technical backgrounds and an interest in topics like HCD and SJ particularly well-positioned to establish shared understanding across boundaries?
* How do diversity, empathy, and social justice resemble and differ from other “ethical” concerns such as accountability or avoiding conflicts of interest? More specifically, how do the discourses of the communities who deal with these issues in engineering education intersect and differ? How can we bring them into more productive conversation with each other?
* How can engineering education draw on the resources and concepts of other fields such as psychology, social work, and philosophy in helping student develop frameworks for action and virtues, especially as those relate to various forms of communication (for example, contextual listening, empathic communication, and sociocultural/technocultural systems thinking)?
* What are the challenges of developing systematic language for dealing with topics such as “design,” “empathy,” and “creativity”? What strategies can help overcome these challenges?
* In what ways are the boundary-crossing challenges treated in these papers manifestations of long-standing issues of “integration” in engineering education? How does it help to think of integration as an “epistemological” problem?
* How do the difficulties described in these papers and elsewhere resemble and differ from the “science wars” conversations of the 1990s as exemplified by authors such as Gross and Levitt (*Higher Superstition,* 1997) and Latour (numerous works)?
* Given their many, well-documented limitations, why do we continue to devote so much attention to engineering codes of ethics? What might be more effective strategies for achieving the goals of engineering ethics education? To what extent are the codes fundamentally antithetical to sociotechnical systems thinking?
* It is common for authors writing on the subjects treated in these papers to talk about the need to respond to the demands of an “increasingly complex and diverse society.” What critical questions should we be asking about this theme, which tends to go unquestioned? To what extent are we just more *aware of* the complexity and diversity of engineering workplaces and sociotechnical systems?
* To what extent are “culturally sustaining pedagogies” different from earlier attempts to break down silos and make connections between students’ lived experience and what they are taught in the engineering curriculum? How can STS and engineering studies contribute to the development and implementation of CSP at the college level?
* What evidence do we have that faculty use “disciplinary silos as a crutch to avoid engaging in unfamiliar material”? Does having such evidence really help in deconstructing disciplinary silos and dominant cultural perspectives?

# U534B: Design, Assessment, and Redesign of Writing Instruction for Engineers

## ***Discussion Notes***

The papers in this session all focused on two general themes in writing instruction for engineers: (1) curricular scaffolding / more connections to support writing development across curriculum, and (2) motivating students to put forth effort on writing tasks or in writing courses.

1. In a writing across the curriculum (WAC) approach, what are the challenges and merits of spreading writing throughout the curriculum? How can we appropriately increase the difficulty of the writing assignments as students progress through their technical curricula?
2. How does the context in which students encounter writing shape their perception of the role of writing in engineering? For example, if we “outsource” the teaching of technical writing to the English department, do we at least implicitly confirm the mistaken notion that engineers don’t write?
3. How do we better support improving writing within engineering courses and by engineering faculty? In particular, how can we help engineering faculty make use a scaffolded learning process based on principles such as (a) providing simple feedback on one item or skill at a time, (b) explaining how we expect students to use that skill in future assignments, (c) focusing on the quality of the writing and not just formatting, and (d) responding to writing effectively?
4. How can we help students understand how the writing process is similar in classrooms and workplaces? For example, (a) the differences between the editing process a student goes through on a single assignment versus the back and forth updating that would occur in the workplace and (b) peer review as part of the writing process.
5. What evidence-based practices from writing studies *generally* (as opposed to engineering writing studies) be used to enhance writing instruction for engineers?
6. How do rubrics convey/capture the relationship between the grading of content and writing quality? What strategies can help get students past the notion that the grading of content is objective while the grading of writing quality is subjective?
7. How can we help engineering students see the connection between writing and thinking, including the way that writing requires and develops critical thinking skills?
8. More specifically, how widely has H. A. Michaelson’s concept of incremental writing, which is based on the claim that “most writing about engineering development is creative effort, subtle but powerful” and that the insights an author gains through the process of writing are “a two-way bridge between the manuscript and the work”? *Note:* Michaelson was an editor for the *IBM Journal of Research and Development* and wrote *How to Write and Publish Engineering Papers and Reports* (ISI Press, several editions).
9. What research might we conduct to evaluate the validity of Michaelson’s claims?
10. How might we make better use of the research of Wolfe and others into instructional strategies that help students translate numbers into persuasive arguments? (*Journal of Business and Technical Communication*, 2011, for example)

# W134: Seeking Resilience and Learning to Thrive Through Engineering Education

## ***Discussion Notes***

All of the papers in this session were concerned with the human dimension of engineering education, or, put differently, recognizing that the students we are educating and the faculty charged with facilitating their education are human beings, *not* machines. They were not suggesting that challenging circumstances can or should be avoided, but, rather, that the growth that can result from dealing with challenges—and even trauma—requires purposeful action and a mindful approach.

## *Possible Topics for Future Papers/Collaborations*

* What evidence suggests that the packed curriculum of all engineering majors contributes in a significant or distinctive way to the stress that many (if not most) engineering students experience? If such evidence exists, what strategies might we employ to enact the cultural and other changes that will be required to alleviate the crowding?
* How do educators and researchers working in this field balance a respect for rigorous research methodologies with care for the human beings who are involved?
* How can we research and understand the differences between departments, programs, and institutions with respect to student experiences of belonging, stress, and coping?
* How can we more persuasively articulate the notion of thriving in the context of engineering education and practice?
* What are the real goals of efforts to decrease stress and increase students’ opportunities to grow through dealing with stress? Increased motivation, which we hope will lead to increased effort and increased success? Drawing a broader range of students into engineering? Finding alternatives to individual counseling? Others?
* How do we promote cultures in which students feel safe in expressing anxiety, stress, or distress?
* How do we as faculty model mindfulness in our classrooms and in our other interactions with students?
* How can we bridge the gap between student needs and faculty expertise and inclinations?
* How can we take what we learn from novel learning situations and apply it in conventional learning situations?
* How does the conversation on empathy relate to that on mindfulness?
* **One answer:** organize a workshop for next year’s Annual Conference to help faculty understand the research on the benefits of mindfulness, strategies for deploying the understanding that results from that research in the classroom, and expand their own comfort zones for dealing with the human dimensions of engineering education both inside and outside of classrooms? *We should start thinking sooner rather than later about how to do that.*

# W334B: Undergraduate Peer Educators: Mentoring, Observing, Learning

## ***Discussion Notes***

All of the papers in this session described and reported on the outcomes of instructional strategies in engineering education that incorporate undergraduates as peer educators. The subjects and contexts of instruction varied considerably (equity considerations in design teams, introduction to engineering, introduction to STS, mechanical engineering design, and chemical engineering labs); however, all four papers dealt in one way or another with attempts to integrate LEES topics and skills into engineering education.

## *Possible Topics for Future Papers/Collaborations*

* What best practices have emerged for the selection, training, and roles of undergraduate peer educators? In particular, what an is optimal amount of time for peer educators to spend in regularly scheduled meetings that focus on their activities and the knowledge they need as peer educators?
* What differences in the implicit conception of the role are reflected in the various terms “undergraduate peer educator,” “learning assistant,” “near peer,” and “teaching assistant”? What value might there be in regularizing the terminology we use? How does the terminology of “aspirational peers” fit into the cluster of concepts associated with undergraduate peer educators?
* What do we know about the value of peer education systems for the students serving as peer educators, the students being served, and for the faculty and institutions who use peer educators? Where does the most learning take place (students *taking* the course, students *providing* support, faculty seeking to improve course design, etc.)? Does it matter whether the students involved are from highly selective as opposed to less selective schools?
* In what respects does the use of undergraduate peer educators empower students who might not otherwise feel empowered?
* How do engineering students develop the identity of “engineer as writer”? To what extent does the acquisition of that identity derive from the *kind of course* in which students receive instruction and practice in writing? What kinds of assignments bridge the engineer-writer gap? How can we use this knowledge to improve writing instruction?
* In the context of teamwork, what merit is there in evaluating teamwork in terms of “emergent systems” versus “individual accountability” and delegation of work”? Are these concepts necessarily in tension with each other? How do they relate to ideological assumptions about meritocracy and socio-technical duality? Are these ideas operating in peer education contexts other than teamwork? How might our answers to these questions shape the pedagogical instruction peer educators receive?
* Is the teaching of writing in engineering evolving toward an embedded model? What factors might hinder this evolution? What might be lost and gained if most or all writing instruction takes places in technical courses?

# W334C: Embedding Sociotechnical Systems Thinking I

## ***Discussion Notes*** *(See also W534C)*

The papers in this session all discussed approaches to integrating sociotechnical systems thinking (STST) into the engineering curriculum. The first two approached embedding of STST as a way to better prepare students for engineering practice. The third paper described and assessed the effect of integrating ethics instruction into an introductory course with the ultimate goal of increasing retention in engineering.

## *Possible Topics for Future Papers/Collaborations*

* If we accept define “embedding sociotechnical systems thinking in engineering” as “focusing on the interplay between relevant social and technical factors in the problem to be solved” as proposed by Leydens *et al.,* what are the most important lessons we have learned so far about efforts like those described in this session and session W534C? What challenges remain? What advantages and disadvantages does embedding offer the technical and non-technical faculty involved in such efforts?
* The efforts described in these papers involve collaborations between people in various engineering disciplines and in various HSS/LEES fields. What useful and reliable generalizations can we make about the composition of such teams? For example, are there combinations of disciplines or levels of courses that seem to work better than others? Does the stage of career of the faculty matter? Is an expert in education research essential?
* Do we have a comprehensive review of literature that establishes the value of embedding STST and suggests future directions for institutions that are thinking of embedding STST in their curricula? *If not,* LEES should organize the writing of such a review of literature.
* What effective strategies for assessing embedded STST have emerged? In what ways could the LEES community support the development and dissemination of such practices and instruments?
* How can we more precisely articulate what we mean by “habits of mind” as the concept applies to STST? How does the concept relate to other concepts such as “contextual thinking”? Should the LEES community attempt to standardize the terminology? If so, how would we go about it?
* How widely supported in the literature and shared among relevant stakeholders in engineering education is the idea that “the development of assessment instruments is a form of research in itself” (Leydens *et al.*)? Has the evidence been synthesized so that it can be used in decision making about curricula?
* To what extent has Downey’s problem definition and solution (PDS) model (2005) propagated through engineering education? Does it have important successors? If it has not been particularly influential, what might be done to extend its influence?
* What scholarly resources and theoretical frameworks do we have for thinking systematically about the “second-order effects. . .[and] indirect connections and consequences . . .associated with socio-technical complexity”? Which of these are likely to resonate with engineering students?

# W434: Maps, Metaphors, Tweets, and Drafts

## ***Discussion Notes***

The papers in this session all focused on making *implicit* aspects of learning and communication *explicit*, both to improve communication and to increase awareness of the relationship between representation/communication and learning. The genres that the papers dealt with varied widely (concept maps, product pitches/demonstrations, metaphors, and design proposals), but all were concerned with the social, cognitive, and transactional dimensions of communication.

## *Possible Topics for Future Papers/Collaborations*

* What factors motivate engineering educators with expertise in technical disciplines to gain expertise in and become engaged in helping students develop their communication abilities? What benefits accrue to both instructors and students when this happens?
* In what ways is classical rhetoric particularly suited to supporting instruction in professional engineering communication? What makes it challenging to use in engineering contexts? What strategies are helpful in overcoming the barriers of time and vocabulary that separate today’s engineering students from classical rhetoricians?
* How do the technologies used in representation and expression relate to the genres that students and faculty use to communicate? In what ways do the technologies and genres reflect the historical circumstances in which they emerge? Shape human behavior and social practices?
* How can we think more productively about the role of disruption/ destabilization in educational practice? How can we help our students recognize and articulate the potential benefits of disruption/destabilization? What strategies can mitigate the sense students may have that pedagogical strategies aimed at disruption and destabilization are hostile either to them personally or to the engineering profession as a whole?
* In what ways are metaphors audience-dependent? How can students become more adept at recognizing the ways that metaphors both include and exclude particular audiences? How do metaphors facilitate creativity? What strategies can help students create and think critically about metaphors?
* What strategies are most effective for helping students learn how to communicate with mixed audiences and cope with situations where it is difficult to precisely identify the relevant characteristics of the audience for a particular communication?
* When we talk about faculty with expertise in technical communication being “embedded” in engineering curricula are we simply talking about instruction that is more responsive to the contexts of engineering practice, or something beyond that? Is embedding a growing phenomenon in engineering education? Considering all of the stakeholders involved, what circumstances are conducive to its success?

# W534: Embedding Sociotechnical Systems Thinking II

## ***Discussion Notes***

All of the papers in this session discussed the integration and application of diverse areas of expertise and experience to create high-impact learning opportunities for students but also required the faculty involved to grow, learn, and get out of their comfort zones.

## *Possible Topics for Future Papers/Collaborations*

* What are the challenges and benefits of engaging in inter-/cross-disciplinary partnerships for faculty and students? In particular, if you are a faculty member who wishes to find a collaborator in another discipline at your own institution, how do you “find someone who will talk to you” and work with you? How can we assess the benefits of such collaborations for faculty?
* What are the distinctive traits of the kinds of individuals who succeed in interdisciplinary collaboration? More specifically, what distinguishes engineering faculty who engage in such collaborations? What makes for a good partnership?
* What assessment data support the benefits of such integrations for students? What criteria do we use to assess both the short- and long-term benefits of such experiences?
* What role does reflection play in optimizing student learning and providing input for course refinement and improvement? What specific features of reflection assignments seem to elicit the best results from students?
* In cases where a single faculty member integrates diverse kinds of expertise, what circumstances of experiences provide the foundation for developing expertise beyond one’s core expertise? How can faculty who are interested in broadening their experience/expertise identify opportunities for doing so?
* What role might ASEE play in promoting the broadening of individual expertise and the development of successful interdisciplinary collaborations?
* What analytical frameworks are useful for thinking about sociotechnical systems? How might those be applied in interdisciplinary integrations?
* What evidence supports the assertion that “understanding history makes you a better engineer”?
* What reasons are there to think that contextualized/applied history might be an important part of the future of history as a discipline? What resources are currently available for developing courses on contextualized/applied history topics? What are the obstacles to creating such courses? How do we balance celebration and critique in such courses?
* In what specific ways does study abroad promote critical thinking? How can we assess whether study abroad does in fact promote critical thinking? Is there any particular value in study abroad for engineering students (as opposed to other students)?
* What particular value is there for engineering students to understand the various ways that diplomacy and STEM are connected? What are the challenges of making those connections?