1 Overview

Nineteen people attended a workshop on the use of liberative pedagogies in engineering education August 4-7 on the campus of Smith College. The goal of the meeting was to gather together faculty experienced in using liberative pedagogies, primarily in the social sciences and humanities with faculty and students from science and engineering, to learn from each other and brainstorm ideas for bringing liberative pedagogies into engineering. The conference was well balanced with attendance from mechanical, civil, chemical, ceramic, and electrical areas of engineering as well as industrial design, physics, biology, women’s studies, film studies, Portuguese, education, global studies, and social work (See Appendix A for attendees list).

Participants came with a range of expectations about the workshop (See Appendix B). Several sought to learn more about engineering education, or engineering in general. Many were interested in the possibilities for forming a community to exchange ideas and offer support. Some had specific questions about teaching engineering, seeking concrete activities or assessment tools to bring back with them to support reform efforts in engineering education. Some were intrigued by specific issues related to liberative pedagogies, such as the role of service learning and issues of race and class in elite institutions, or the potential for engineering to utilize knowledge from “the many”. Some saw liberative pedagogies as a bridge between disciplines, upon which a real interdisciplinary dialogue might be built. Some were looking for inspiration, re-invigoration, etc.

1.1 Workshop Structure

The workshop was structured into plenary sessions, personal reflection sessions, and small group meetings (See Appendix C). The first two plenary sessions focused on (1) Introductions, icebreakers, and brainstorming exercise and (2) establishing a common understanding of liberative pedagogies, engineering/engineering education (see Appendix D).

The next plenary session launched a cycle of individual reflection, small group work, and plenary reporting by sharing experiences group members had using liberative pedagogies, with a focus on possibilities, benefits, and successes. Individuals were asked to reflect and then generate in their small group ideas for bringing liberative pedagogies into engineering education, with the following prompt questions to guide our thinking:

- What do Liberative Pedagogies mean to you?
- Why are they important?
- What do you think an Engineer should know?
- How are liberative pedagogies and engineering related? How can we connect them even more? Think of values, ethics and motivation.
After reporting out the small group ideas in plenary, the large group launched a second cycle of individual reflection, small group work, and plenary reporting by generating a list of potential obstacles to implementing liberative pedagogies. Individuals were asked to reflect again and then generate in small group and some creative ideas for overcoming these obstacles, with the following prompt questions to guide our thinking:

- What obstacles have you encountered with liberative pedagogies either in your classrooms or even conceptually?
- What do you think is/are the reason(s), if any, for such obstacles?
- What have you tried to do to address such difficulties?
- What else do you think could be tried? Think of ways to bridge the gap between the messiness of liberative pedagogies and the order and structure involved in the study of engineering.

Finally, the plenary group brainstormed some action items to take away from this meeting.

**1.2 Emergent Ideas**

The group developed some key ideas in each of the areas mentioned above:

- Potential implementation of liberative pedagogies in engineering education
- Ways to overcome obstacles to implementing liberative pedagogies in engineering education and in academe overall
- Action items for furthering the use of liberative pedagogies in engineering education and throughout academe, including some local plans at Smith and in the Five College area.

Additionally, the group spent significant time discussing the distinctive characteristics of liberative pedagogies in comparison with other strategies including learner-centered pedagogies and what the engineering education literature sometimes calls “engaged pedagogy,” which creates some confusion as the term “pedagogies of engagement” has applied to liberative pedagogies for some time.

**1.3 Report Structure**

The remainder of this report is structured around these emergent ideas. Section 2 presents the possibilities of liberative pedagogies in engineering education, including motivations for employing liberative pedagogies, past experiences with aspects of liberative pedagogies in difference classroom settings, and brainstorms for possible future implementation in engineering education. Section 3 presents obstacles to implementing liberative pedagogies fully and some strategies for addressing them. Section 4 presents specific action items emerging from the workshop, as well as self-reported outcomes and workshop evaluation results to date.

**2 Generating Possibilities**

One day of the workshop was dedicated to discussing the possibilities of liberative pedagogies by developing an understanding of what motivates us to use these pedagogies, reviewing past positive experiences with liberative pedagogies, and generating new ideas for bringing liberative pedagogies into engineering education.

**2.1 Why use liberative pedagogies?**
• **I have no choice** – Reality demands it. Being trained traditionally, then trying to do therapy with someone who is not Eurocentric/European will not work. Training social workers to be competent/excellent professionals requires teaching them to see beyond Eurocentric/individualistic tunnel vision.

• **This is how I was taught** – this is the expectation in my field

• **This is NOT how I was taught** – but it was the way I learned best. I learned a lot outside the classroom and I want to share the fun of learning with my students

• **It’s creative, never boring** – This creates new and better knowledge for me. The material makes me teach this way. Great sense of freedom for the teacher can also result as there is a sense of being able to teach in new and creative ways.

• **I’m not comfortable being the authority** – I didn’t want the spotlight – this is the way that works for me, a natural extension of my personality. I teach in a field where cultural differences are implicit. I was a shy person who went into teaching scared to death.

• **To make learning active** – cinema can be so passive. To suggest that people need to be active requires an active pedagogy.

• **Diversity** – teaching this way encourages a more diverse student body. Great promise in promoting a multiplicity of perspectives

• **Personal Values / Social consciousness** – I teach this way because I want to change the way things are done. We need to teach this way if things are going to change.

• **Students learn better** – able to see the big picture. Students take ownership of learning; more equipped to function at higher levels of critical learning, analysis, and problem-solving. Sense of pride by students in taking ownership of their leading rather than being force fed. Promotes in-depth analysis rather than regurgitation by students

• **Engineering will be better** –
  - A significant increase in interest in engineering and application to engineering schools
  - Better products, more relevant to a significantly greater diversity/numbers of consumers
  - More innovative engineering, advancement of the field
  - May shed light on clients’ different values, different realities, and, therefore, related different needs and demands from the field and expertise of engineering.

2.2 Experiences with Liberative Pedagogies

• **Changing one class can change the whole curriculum.** Changed intro bio course. Independent research projects without set outcomes. Work in groups of 3-4, do a research proposal, experiments, data analysis. Empowered students, gave them confidence about practice of science. The students start to ask about what they want to know and this carries over into other classes. Classes are never boring; students come up with new lines of inquiry and experiments. More time consuming to keep track of what is going on. Requires flexibility

• **Chemical Engineering sophomore level** – re-examined how classes were taught over several years. In the junior year students do an international project. More preparation started to be done for this project in previous classes in the curriculum. Largely white
students, 43% female. Talked with administrators who deal with racial/ethnic diversity and gender to come into class – didn’t work very well, but through trial and error we are doing curricular innovations around diversity issues.

- **Compassion practicum** – Use engineering to do something for someone other than yourself. Proposal, design, report. See that engineering is a life skills course. Used at all levels. Use standard engineering design methodology. Examples: indoor garden for a person with limited mobility, cleaning up parks, rivers.

- **School for Social Work** – Eurocentric and individualistic view of mental health does not serve all clients. School adopted anti-racism mission. Specific courses were offered to support mission. Initially everyone relied on the one course but eventually considerations for anti-racism mission carried over. Students demand this and teachers adapt, part of an ongoing process. Students from different backgrounds at different stages of identity development share a classroom. Instructor asks students on a weekly basis what has been helpful and what they want to hear – this is different for each class. Doing this involves all students and gives introverted students a chance to weigh in.

- **Appropriate technology** – course on technology in developing nations. Outline was offered, students shaped particulars of course. Students shared background and used the shop to build. Hard for students to agree on a project. Messy not to have a week by week curriculum. Groups of students lead class each week. Students decided what to learn. Challenging for teacher to motivate students to go to the next level. Hard to decide what needs to be done.

- **Gender and public policy** – Research on community organizations. Studied how Aetna was affecting community organizations in Hartford through downsizing. Took organizations’ questions and agreed to develop a knowledge of history and community to answer their questions. Members of community orgs who were shareholders in Aetna gave up their spots to students representing the organization’s in asking questions about presenting what it would mean for the community. Messy class, focused students, driven students. Students were part-time, working full time. 3/5 of the class reported getting promotions because of the skill development involved in completing the project. It helps to have someone else demand knowledge of us. Shifted the course – it meant that the readings on gender and public policy didn’t necessarily fit. Course became less mechanical, more organic.

- **Education graduate student insurrection demanding liberative pedagogies** – learned different tools for assessment. Mixed class – some were there for learning multiple research methods, some wanted to be told exactly how to assess programs – there was a racial/ethnic divide in this mix – international students were more interested in getting a manual for assessing programs – but everyone had to work together. Latino education initiative in Holyoke was their project – they assisted them in designing ways to measure what they were doing quantitatively and qualitatively. Issues of reciprocity with the community organization came up – there were cultural differences in communication, understanding mutual benefit – there were differences between the academic and
community org. schedule and expectations based on time constraints. Benefits – as
students brought method, the community become more empowered to address their
problems themselves – maybe not completely independent at end, but had more
knowledge and a sense they can learn for themselves.

• **Film studies** – everyone owns popular culture. In an introductory class everyone is
already fluent, so emphasize what people already know, classroom space matters – get
common terms to express knowledge that already exists. The syllabus is just a
representation – emphasize to students that there is more outside it. Here are the reasons
I’ve chosen these things, this is not a closed system. A syllabus is not a set of commands
for knowledge. They are tips of icebergs, shorthand notes. This is difficult with large
groups.

• **Variety of teaching and learning approaches** – role play, small groups, etc.

• **Student-Teacher relationship**

  o **Student perspective** – the day before the test, when we get to bring in questions
to professors, the dynamic changes. They are less prepared. We go off on
tangents. It’s a more level playing field, leads to more inquiry, encourages other
questions.

  o **Revealing more** – teachers don’t think students should know their “tricks” but
it’s important for teachers to share with students goals of class and underlying
principles to help the student relate to the professor. Students want to know what
teachers want. Knowing what the teacher wants affects how we respond.

  o **Student expectations** – either we expect teachers to lecture, or expect
discussions. Discussions should be encouraged. Teachers should talk about their
expectations, and expectations go both ways. Want students to understand process
and why learning is happening the way it is – students can’t participate when they
don’t know what’s going on. Students need to know what is expected. Sometimes
they need to hear that things are open-ended, or that faculty has no agenda, to take
a way the mystery and level the power differential.

  o **Work in progress** - It can be hard to figure out the teacher’s subterranean goals –
there are things that change with where we teach – at Smith I focus on how to get
students to talk about conflict rather than avoid it. How can conflict become a site
of production – sometimes I don’t have the answers and I’m still figuring out my
own pedagogy. So it’s hard to articulate or explain things I haven’t figured out

  o **Making conflict a learning tool** – conflict becomes productive when it doesn’t
just come down to pro and con – positions should not by binary. Try to re-
organize conflicts to this is understood. Should professor share their own opinion
on something or not? You can use colleagues who disagree with you to give
authority to other perspective, and illustrate that disagreements exist and these are
Some students will never believe that the content of your position is irrelevant, it’s the articulation and reasoning that matters and they think they will be punished for disagreeing…

- **Teachers are human** – show vulnerability – allow conflict to be, without judging it, show them a little of what makes you tick. It is trained out of professors to express the personal – it requires a mutual trust to share personal knowledge. Boundaries are important to maintain. Students hear teachers better in class when they know you outside of class. We have different comfort levels and many do not want to share opinions but a teacher can relate by asking questions about things you yourself don’t know… wonder with students.

- **Relationship** – how to engage student in the class? Ask them to share their anxieties, reasons for taking the class

**Engineering** – sometimes there IS a right and wrong answer. There is a lot of memorizing. How do you involve students in the process of learning when this is the case? => Let students make mistakes and learn from them – better than just telling them it’s wrong. Also, make students more responsible for the memorizing content, spend time asking questions about it/discussing it in class to reinforce key points – obviously a balance here.

### 2.3 Ideas for implementing liberative pedagogies in engineering education

The group’s ideas for implementing liberative pedagogies in engineering education fell into seven categories:

- **Requisite Abilities** and knowledge for a graduating engineer
- **Relationality** – Creating a classroom that encourages all voices requires a community of trust - building effective relationships in the classroom is therefore a key element of liberative pedagogies
- **Range of perspectives** – The goals of a multicultural education, critical thinking, and creating a classroom that incorporates all voices all rest on the presentation of a range of perspectives
- **Responsibility for Learning** – In order to truly shift the classroom power dynamic, student must become more responsible for their own learning.
- **Relating content to student realities** - Liberative pedagogies are fundamentally about students becoming authorities in the classroom, beginning with their own knowledge and life experience
- **Reflection and Reflective Action** – The single most important outcome of liberative pedagogies, and the one that sets it apart from other pedagogies, is that students will translate critical thinking into reflective action.
- **Realpolitik** – What are the practical political considerations for implementing liberative pedagogies in the academy and the classroom?
2.3.1 Requisite Abilities - What should an engineer know and do?
Participants discussed what engineers should know, and regenerated much of what is in the ABET accreditation criterion 3 (a-k) [list or cite] – generally, a knowledge of math, science, humanities background would be required, with the ideal of the “Renaissance engineer.” There were five distinct additions that the group proposed as essential to an engineer’s education and development:

- Engineers should know that science is not value free and be able to critically examine information in their work. Laws and facts exist, but sometimes conventions are presented as facts. Engineers must be able to contextualize information presented as truth, to be able to know when truth is not absolute (this is typically taught only in the narrow sense that certain principles only apply in particular cases (e.g., the ideal gas law)). The group discussed how teaching some history of engineering can help; for example, Count Rumford made essential contributions to the first law by questioning the scientific “fact” of his time that heat was a material substance.
- Engineers must have information literacy skills, to know what resources there are, where to find them, what they are useful for, and so on. They must be able to critically evaluate information.
- Engineers should know themselves. Ethics and social responsibility are taught, but ABET does not make mention of the need for engineers to understand their own values and how these can operate within the structures in which they choose to work.
- Engineers should have a sense of social justice as distinct from social responsibility. This, like ethics, crosses the line from knowledge into action, a key aspect of liberative pedagogies.
- Engineers should have multi-cultural competencies including knowledge, attitudes and skills (engineering and relational skills in being able to meet the demands of increasingly more global and diverse customers and realities)

2.3.2 Relationality
Liberative pedagogies are fundamentally about the student-teacher relationship, and student-student relationships. Discussion focused on community formation and group dynamics, especially dealing with conflict. The group wondered to what extent it is possible to build comfort as well as community in the classroom.

Community formation in classroom
To form a community of learners in the classroom, the professor needs to take initiative, set an example, make ground rules clear, and develop a rapport with each student. This is difficult to enact in large classes, and it can be difficult to communicate clear boundaries to students who might misinterpret individual intellectual attention. The classroom dynamic needs to be addressed as a whole, as well as interpersonal dynamics between students, or with the instructor. Receiving input at the end about what was confusing during a given class can help the professor hear from quieter students as well as assess where students are in their learning. Such input can be anonymous to increase the comfort level of students, but we all should be aware of how anonymity might affect relationships within the classroom.
Group work introduces another layer of community building concerns. Typically students enjoy group projects because of the work itself, but find the group dynamics difficult. Building in some learning about group dynamics can give students the tools they need to understand and address some of the group dynamics themselves. Building in time for students to debrief with each other and the instructor is important. Opportunities for self and peer assessment are essential; some felt this works best when peer reviews are filtered through the professor rather than coming directly from students – again, the potential impact on group dynamics and relationship building should be assessed in determining whether to act as such a filter. Finally, a neutral party, where available, can help students deal with group dynamics without involving the professor, which automatically raises concerns about assessment and evaluation. At some schools, the counseling center or human resources departments have made their resources available to address these concerns.

**Theater of the Oppressed** – Another way to address group dynamics, classroom dynamics, or interpersonal conflict is by using Augusto Boal’s theater techniques. Students can enact times when they felt silenced, or silenced someone else, or witnessed someone else being silenced. They create a freeze of the situation. Then other students can move the bodies to creatively think about how to transform the situation. This could be used effectively in help students work through interpersonal conflicts and group dynamics. Getting students out of their chair, and physically embodying some of what is going on in the class helps them look at their situation in a new way.

### 2.3.3 Range of perspectives
A fairly simple strategy for creating critical thinking and reflective action is to introduce a range of perspectives in the classroom. This questions the universality of what we think and encourages a critical perspective.

- **Change the implicit values** – by introducing a new values system, it calls attention to the current values operating in the field. For example, what might engineers do if peace making instead of profit making were the goal?
- **Introducing community based projects** where engineering intersects with social justice in interesting ways. For example, to locate a project where engineering has been viewed as an impediment to social justice by the community. What kinds of interventions could be stages by engineers seeking to work toward social justice instead?
- **Asking students to get outside an able-bodied, first-world, white male boundary** that often contains so much of engineering can be effective. It can be problematic to do this in a class of predominately able bodied first world white males, but is nevertheless like to be instructive.
- **Asking engineers to place themselves in an ongoing social conflict** (e.g., genocide in Sudan), to ask what role engineers are currently playing, and what engineers might be able to do to change the situation.
- **International Perspectives** - We suggest a Language Across the Curriculum component to all engineering courses whereby students must look at international perspectives by actually reading foreign newspapers, etc.
- **Spectrum** - To allow students to place themselves on a spectrum in relation to an issue – perhaps even to do this physically, to illustrate that it doesn’t have to be so binary – then
ask students on the ends of the spectrum to articulate their reasons for their position, and allow all students to move as their feelings and opinions shift during the discussion. This could work, for example, in an ethics case study where values such as honesty and loyalty come in conflict.

- **Context** - When talking about laws/facts, focus not just on what we know, but on how we know it …what were the political, social and economic stakes that influenced the focus, discovery and phrasing, etc. Enables engineers to think more creatively – they won’t assume absolutely “that’s impossible because it violates X thing that I’ve been taught” (but will take into consideration the history of previous findings to avoid wasting time…)

- **What else?** Asking “what else did you learn” on tests allows students to present what they value in their learning so far, and allows students to decide what’s important rather than assuming the teacher is the sole arbiter of this.

- Making other cultures a part of problems on problem sets (this is no more contrived than current problems that reduce much of what is learned into simplistic ideals detached from reality). Multidisciplinary problems coordinated across disciplines are perhaps the best way to do this.

- **Reductionism vs. Abstraction** – One non-engineering attendee was using a coffee stirrer and noted it had different structural properties when compared with popsicle sticks. This spurred a conversation with an engineering student about statics and dynamics. The student noted that a jet, or some other complex structure, is analyzed as lots and lots of popsicle sticks. This led the non-engineer to wonder about abstraction as different from reductionism. Is it possible to present abstractions in the classroom without being reductionist? Can a jet be something other than lots and lots of popsicle sticks?

### 2.3.4 Responsibility of Students for learning

Many of the strategies discussed in other sections of this report increase student responsibility for learning. The group discussed some additional ways to do this. Student responsibility for learning can be a key confidence builder, as students develop independent learning skills and reap benefits based entirely on their own work.

Student-designed problems – For many students, the joy of engineering lies in figuring out how things work. Can they create a problem set from a question they have about how something works, relating theory to practice? This needs to be done with some support, giving students criteria for evaluation. It is important to design evaluation so that students are not subject to unrealistic expectations – it is difficult to write problems for material one is still learning. The goal is for students to develop ownership of the concepts, not to produce perfect problems the instructor can use on exams, etc. Students could exchange problems with other students, so that they get extra practice.

Giving students more choice in class. Students often pick closed book, closed notes, in class exams because they get it done quicker, and they think it’s easier – but the reality is that these problems typically involve a “short cut” – if you see it you can do the problem, if you can’t your grade suffers – probably not the best measure of what a student has learned. If students knew this would they choose differently?
Students read first and are held responsible. Very few engineering students come prepared to class having read the textbook – it is the first thing on the list to go under a stressed schedule. The problem is how to give students the credit they deserve for being prepared and hold them accountable for doing the reading. One way to do this would be to make it fun, reinforcing key concepts through a “jeopardy” style game.

Finally, encouraging students to pursue their own independent ideas and questions can increase their responsibility for learning. This can be done through a course project, or in a smaller way through student reflections on the questions that arise for them that they are interested to pursue.

2.3.5 Relating content to students’ lives and realities

Relating course content to students’ lives is a prerequisite for developing students’ authority in the classroom and giving them voice. Some strategies for this include:

- Students could examine events in history or pop culture and examine the thermodynamics present – Mrs. O’Leary’s cow, the wicked witch of the west melting, Michael Jackson’s hair catching on fire, etc.
- Students could be asked “What act of engineering have you done outside of class?”
- “Pimp my Fridge” (after the MTV show “Pimp my Ride”) - in which engineering students take an old fridge and redesign it to be more energy efficient, ergonomically useful, etc.
- Fluids students were asked to use their knowledge in creating a work of art.
- A pre-assessment can help instructors know what knowledges students bring with them to class.
- **Inductive rather than deductive teaching** – Begin with what students know from their experience, and allow students to infer the law from experience. Typically laws are taught first, then examples brought as illustrations of principle. Instructors could enact this fairly easily by simply presenting examples first, then going back in their notes to the principles. Defamiliarize Laws – Students are often taught laws in a way that is separate from their experience, and they have trouble relating abstractions such as the Second Law of Thermodynamics to life events that are really quite familiar. Students know a cup of coffee cools when left out at room temperature, but they don’t often internalize this as related to thermodynamics. Making this connection by beginning with student experience will create a deeper understanding of the subject and build students’ confidence.
- **Film and Film Studies** – The use of film presents a medium with which students are familiar, and provides a common understanding of a situation. Suggestions included Mosquito Coast, Erin Brockovich, A Civil Action, Office Space, Fast Cheap and Out of Control, various science fiction films. Ultimately engineers would have their own analysis from an engineer’s perspective that would be very valuable within film studies. Students could take a cultural studies approach to engineering – read or watch popular renderings of “engineering moments” to consider how do we consume engineering? And what could be engineering’s
response? Students could analyze representations of engineers/engineering in media, then make movies or other visual representations of engineering to transform what is presented.

- **Cultural studies** – Cultural studies courses often think about production; for example, they begin with a Nike shoe and work backwards until they connect to a rubber plantation in Malaysia… but engineering is much more focused on production that cultural studies. What if you took a basic engineering system – for example, in a thermodynamics class, ask student what they could do with an internal combustion engine or a diesel engine, outside of the conventional uses… where is it used? How is it used? What values does it produce? How do the objects hail us? How do we know what to do with them, how are we connected to them? This could open an interesting discussion of Rudolf Diesel’s intentionality of design with social implications in mind.

### 2.3.6 Reflection and Reflective Action

- **Short response papers** – these can encourage student reflection. They can be tied to students leading discussion. The instructor responds to the papers with detailed comments that engage student thought.

- **Liberative assessment tool** – The NSF grant has been funding the development of a liberative assessment tool, which was discussed briefly in the group. The tool uses a blog or journal to allow students to reflect on their own learning and follow specific lines of inquiry of personal interest throughout the course. The focus is on helping students reflect on their learning and translate it into independent pursuit of knowledge.

- **Teaching ethics** – Liberative pedagogies can be brought to bear in teaching engineering ethics. It is certainly the case that ethics cannot be taught in a way that separates from students’ personal lives and experiences. Ethics are something we all produce - they are contextual and social. Some specific ideas around teaching ethics included a creative brainstorm around designing the unethical engineering project, or giving students (in a mass and energy balances or process engineering class) limited pieces of a large project to work on. They only see their part, and do not discover until some time later that they are building a glorious death machine that brings about asphyxiation by ice cream.

- **Liberative Aspects of Global Studies projects at WPI** – The group discussed WPI’s 35-year commitment to a project-based curriculum, in which students participate in 3 projects – a traditional senior capstone engineering project, a humanities project in the first two years, and a junior interdisciplinary project at the intersection of science/technology and culture/society. These must be outside the major, and most are international. Each project is the equivalent of 3 courses on the quarter system. Students work for a sponsor, usually a nonprofit agency, coming in as preprofessionals, with concrete recommendations and next steps at the end of 8 weeks. WPI participants asked, how can you bring some of the great things students experience in the global studies program into the classroom, or
make the classroom more congruous with the global and project-based experiences students have? One option WPI is pursuing is to present cases within the classroom that are not American but international/global to prepare students for international work. Time was cited as a constraint.

- **Local projects** – There are many opportunities for engineering to be of use in communities. Most experiences in the group were with urban communities. The Compassion Practicum discussed above could be slightly modified with the requirement that you do something for someone/some group you don't know or usually contact.

### 2.3.7 Realpolitik

Implementing liberative pedagogies requires engagement with the political realities in departments and institutions. The group’s ideas included:

- **Adapt to your context** – WPI attendees noted the likely differences between typical WPI and typical Smith student (as well as typical WPI faculty vs. Smith faculty), which affects how material is received. How can we match students’ cognitive/emotional development? What are students ready for? What are teachers/students ready to do? Start slow… give confidence in themselves, in teacher, in process to make the transition smooth for students.

- **Incremental Approaches** - A lot of liberative techniques are similar to learner-centered or project-based approaches. Many faculty would recognize much of what they already do as liberative. How can we find small ways to infuse more liberative pedagogies into what people are already doing? How can we create some continuity between our courses and the rest of our curriculum by working with our colleagues who don’t currently use these pedagogies? What is the difference between what many of us are doing now and liberative pedagogies?

- **Dual use of power** – One group member described a “jujitsu” of one’s own role, in which power is used in some ways that aren’t always about sharing power or empowering others, but reach the ultimate goal of more level power relationships in the classroom. This is necessary for a number of reasons, not the least of which is the context in which most of us work is a conventional institution with top-down structures, tenure, accreditation boards, and a grade-based assessment system.

### 3 Overcoming Obstacles

#### 3.1 Institutional Culture

Institutional culture can get in the way of liberative pedagogies in a number of ways.

- **Recognition for faculty** – The excellent results of liberative pedagogies and the extra time, effort, and thoughtfulness faculty bring to this endeavor is not factored in to tenure and promotion decisions. On the contrary, faculty across disciplines are often discouraged from doing liberative pedagogies, on the basis that they come across as less serious about research, or as dilettantes, or as political.
• Working with departments and colleges to write new criteria for tenure and promotion, or tailor criteria individually to make room for liberative pedagogies
• Educate administration about value of pedagogies and time required
• Network with supportive senior faculty/support junior faculty, so that they can get tenure without losing value system, then be the senior colleagues that are needed in the future
• Teach students about liberative pedagogies, so that they see it as part of the canon. Share power with students so they can demand change too
• Develop a comfort level with our own power – senior faculty in particular can do a lot to make it easier for junior colleagues. One participant expressed a sense of hypocrisy for not being willing to forego the power game entirely especially if it (status, etc.) can be used to further the cause. The group discussed this at some length, with some recognizing a need to be realistic about the system in which one works in order to subvert, while others felt that remaining true to Freirian ideals might be more important. This is the classic debate in any struggle for change, where some work inside the system, others outside it. We recognize the need for both.
• Stay willing and able to leave, and help others do the same. This enables faculty to be bold and take the necessary risks

• Distortion/misunderstanding/sabotage of liberative pedagogies – many institutions do not have leadership that understand liberative pedagogies, let alone support them. They are often mischaracterized, intentionally or not, as soft, left, or political.
  • Promote liberative pedagogies and its positive results. Make it visible and not stereotypable. [see assessment section below for discussion on how to gather these results]
  • Take advantage of institutional opportunities – For example, at Smith there is a well-funded initiative for interdisciplinary projects. If Smith hosted an institute on liberative pedagogies it would be an excellent opportunity to make the administration aware of what they are, what they entail, and what their benefits are. This is a high-profile way to gain legitimacy and recognition.
  • Be persuasive…. Speak the language and bring in others who are supportive, who can be persuaded

• Mission of the university/college (and how engineering fits in) – even alternative colleges don’t necessarily support LP… transformation/conscientization is not necessarily there.
  • Structural change is needed at some institutions. At Smith for example, change is needed to make decision-making more democratic. Faculty need to take back their power in governance and also create avenues for meaningful involvement of students and staff in College decisions
  • Getting administrators on board? Where has admin bought in? St. Kate’s…

• Corporate university – prioritizing short term goals over long term benefits.
  Market/profit motive – The rising importance of the market in education raises particular challenges for liberative pedagogies, which see critical thinking and reflective action as
the goal of education, not making money – and which see students as participants and colleagues, not customers, not products, and not means for creating a research product.

- Let’s not demonize the corporate, but understand the system in which we are operating today
- Balance between knowledge and process [?]
- Teach the reality of the American Dream – idea of pulling one’s self up by one’s bootstraps is promoted, yet policies are developed to squash the poor. Education system is for the elite class to make sure they don’t take the step of acting on what they learn in a progressive way. How has engineering been a part of this, and how has it resisted it? History of GI Bill giving (mostly white) working class men access to a professional degree in 4 years makes engineering different from liberal arts education.
- Help students understand praxis = think+do.
- Liberative pedagogies themselves will counteract this… just continue to do what we do.

3.2 Student Resistance

- Expectations and conditioning about roles and responsibilities in the classroom based on high school, life experiences
  - Be clear about expectations up front. – Phrasing is important. Explain reasons for doing things differently
  - Students put so much pressure on themselves, perfectionist tendencies. Students need to be able to let something go – how can we allow for this in our classes?
  - Let experienced students lead in explaining how the process works, possibly in TA role
  - Professor sets example of how students relate in community

- Shyness/Introversion - based in feeling like novices, or in cultural/situational dimensions
  - Get students out of chair to counteract resistance
  - Community formation in classroom
    - Circle arrangement to reinforce flat power structure, engagement as community of scholars
    - Icebreakers for fun and to break down formal barriers
    - Professor takes initiative, models behavior
    - Sets out ground rules
    - Professors develop individual rapport with students

- Aversion to risk, uncertainty, lack of clarity, lack of structure, trying something new
  - Start slow and build confidence in process, build relationships to counter resistance
  - Use peer reviews (qualitative!), communication about process in class – here’s what we’re doing and why
  - Group work tips: responsibility for self and others in team and in classroom – Use team contracts to get buy in with process, Rotate responsibility in groups with clear expectations, rotate group membership where possible. Have students sign off officially on their projects, pick students to do section of oral presentation for which they were not primarily responsible, to ensure they are on top of
everything, and communicating well. Use counseling center if available to work on group dynamics without fear of professor’s evaluation. Peer evaluation of student work includes qualitative description of what each person contributed.

- Grade focus/culture of praise - Fear of mistakes, negative competition where one or two people (pretend to) get stuff quickly. Prioritizing short term goals (grades) over long term benefits (learning, personal transformation). Tendency to “game the system,” take advantage of freedoms in classroom without taking responsibility, or to play faculty politics in a toolish way to support their own agendas. Expectations of students are communicated as requirements, which have a punitive aspect and affects how faculty relate to students.

  - Notion of value – liberative pedagogies are related to value, the professor must value it in a transparent way. How the teacher talks, assignment choices, etc. all have to fit together
  - Introduce multiple ways of evaluating or even interacting with students generally to take focus off grades - use response readings with thoughtful comments; ask “what else have you learned?” as a graded question on tests; responding qualitatively to student work and engaging with them as scholars can take anxiety away.
  - Normalize mistakes - ask students to re-analyze work; choose a place where they made a lot of mistakes. Make mistakes a learning opportunity – show why failure is kind of the point. Especially in engineering!
  - Demonstrate to students beforehand what they know and don’t know – dealing with the “know it all” student -- in groups, not graded
  - Shift focus to learning - fill out an anonymous report at end of class – what they didn’t understand and turn it in, so professor can bring up the issues (note: anonymity should be used sparingly for liberative pedagogies – mostly students should have a voice that they are free to own. In this case anonymity is used to counteract competitive forces and allow students who remain afraid to speak for whatever reason to communicate with the professor. This is not ideal, but necessary given the way the current system is set up with requirements and grades.)
  - Raise expectations of and hopes for students in a way that clarifies values, e.g., critical thinking, reflective learning that internalizes subject matter, etc. Reduce emphasis on requirements where possible, and make it about hopes and expectations.

- Consumer model – I’m paying for your expertise. Add to corporate nature of university and we get expectations of learning what corporate America wants and how to succeed in it. What they need to get a job

  - Be clear about why the consumer model does not foster student learning or independence – short term benefit of professor feeding student knowledge forfeits long term gain of student being able to think and learn on their own
  - Help students gain perspective outside of this – praxis!
Help them see how critical thinking and reflective action are particularly critical in a corporate (or really any work) environment, where they will need to be able to reflect critically in order to keep their own sense of values intact.

- Students may not be ready (in a personal development way) to do what is asked
  - Start slow, gauge where students are, give them some decision-making power about this
  - Misconception that students are at an equal level when they teach – they don’t have the same level of teaching skills – students don’t become accomplished teachers overnight and should not be expected to do this. Same goes for writing problems. Be careful about what the goals are of each of these exercises – otherwise they will not build confidence nor reinforce student authority!

- Student workload – engineering students have a notoriously packed work schedule.
  - More work may be less stressful if it is less regimented, but with enough structure so students understand when it ends
  - Decreasing the workload is a good idea. There are many opportunities in engineering education to cut out time-consuming exercises that have little educational benefit. By selecting the exercises with the largest value-added in terms of learning and clearest benefits to students. Students will feel better about the work they are doing if they can see why.
  - Introducing more flexibility in work, so students can select how to spend their time and tailor work to suit their individual interests. The full implementation of this might be a portfolio system where students demonstrate they have met the outcomes of a course, as linked to ABET outcomes, etc.
  - Hacker [cite] writes about the work culture in engineering as “the sublimation of bodily needs to the power of the test.” How can engineering become pleasurable? Identity plays a role in this. Liberal arts classes are pleasurable in their own right because they help students explore who they are. Can engineering do this?
  - Persistence/work ethic is a key trait of engineers; it’s what they are hired for. Can this be taught in other ways? Perhaps using Boal?

3.3 Engineering-specific

- ABET accreditation – while in many ways liberative pedagogies represent an excellent way to deliver much of the ABET criterion 3 elements, most schools remain in the old bean-counting system, which is not very compatible with liberative pedagogies. Debates over content/coverage vs. process arise here.
  - Need to change who visits – criteria 2000 was a good start, but…
  - Addition of social justice? The cause in this case is a radical redefinition of the infamous ABET Criterion 3a-k to include the following learning objectives:
    Engineering ought to include making peace with Mother Earth.
    Engineering ought to include an emphasis on pursuing peace among all peoples.
    Engineering ought to include an emphasis on pursuing social justice.
- Engineering reform is driven by profits – can the new entrepreneurship focus fit or does it conflict?
Present some alternatives: What would a collective model of entrepreneurship look like? Are there positive models of how engineering is done in other economies and other cultures that are not profit-driven?

- Students are taught “The things you do wrong are going to kill people” creating a sense of fear of responsibility. (The cynic would assure them that in fact, it’s the things they do *right* that will kill people…)
  - Present positive examples of reflective action in engineering practice.
  - Competence is an important ethical value for engineers to hold. Demonstrate how engineers can work together to do things right. Demonstrate how critical thinking and teamwork are both essential aspects of this.

- There is a culture of technology that is intentionally mystifying that we have to work against to support students bringing their own authority into the classroom
  - De-mystify by encouraging students to bring their knowledge and experience into the classroom
  - Create common experiences that de-mystify things unfamiliar to everyone in the class, including the professor – connecting with a community project could reinforce this more, as engineering is democratized in a wider way.

- Engineering establishment may be especially resistant to change, based on high values placed on order, competency, efficiency, productivity, and unwillingness to examine links to militarism and materialism. Also time, energy and money required for pedagogies don’t fit with value of efficiency.
  - Some models for this – make connections for groups who are change agents - Project kaleidoscope – STEM education, interdisciplinary Jeanie Narum - Faculty for the 21st century, leadership workshops, etc. – connect with what’s in place - Who has similar goals? Lincoln commission – money to double number of students who go abroad (STEM) - AAC&U – Association of American Colleges and Universities - “center for popular engineering” – democratizing science – science shops

3.4 Resistance from Colleagues

Resistance from colleagues is likely based in unfamiliarity with liberative pedagogies, fears about many issues discussed elsewhere here (e.g., content coverage vs. process, fear of losing control/not being the expert, fear of extra work). They may share some of the same misconceptions as administrators including liberative pedagogies as soft, left, political, etc. Obtaining colleague support is especially important for the success of liberative pedagogies because student responsibility for learning and the links to critical thinking and reflective action need to be made throughout one’s education. If it is not pervasive, its effect is diminished.

- Teach colleagues about liberative pedagogies without necessarily alienating them
- Let people get curious about your classroom and its successes
- Engage in interdisciplinary work with colleagues to create community and persuade them to engage with the work. Example: the Institute for Science and Interdisciplinary Studies at Hampshire College put scientists, social scientists and communities together to tackle difficult problems such as cleaning up hazardous waste dumping grounds which dot military bases throughout the country. This helped colleagues to see how science is not value free…The next step is to help
colleagues to buy into teaching (and fully recognizing, dealing with the implications of) this notion that science and engineering are not value free. This will require a new way of knowing, a new science to be developed. Now bad effects are integrated within the old notion of science, often referred to as side or secondary effects of the politics and interests hidden behind "value Free" rubrics when in fact they are primary, direct results. In the new science and technology, we must make explicit that it is no more value free than the old science. It has been shown that putting science together with social conscience makes better science.

3.5 Philosophical/Intellectual

- Assessment - What does learning mean? How do we evaluate students - do they know something well, do they remember? If we can show that they are learning better – but what does that mean, how do we document it? How do you put it in a way that’s convincing… challenge expectations about what learning is – hard to document, quantify in a way that is convincing – need to challenge the bean counting
  - Assess means as well as ends – are students thinking critically and acting reflectively
  - Examine the process, how do students become an engineer? What kind of engineer to they become?
  - What is this process of liberation students are engaged in? How do they define liberation for themselves in the engineering context?
  - Possible assessment strategies –
    - discourse analysis
    - self-directed learning style –
    - intensive senior survey, describe what they learned from each class
    - Compare a school that uses lib ped with one that doesn’t
    - Pre and post testing on a consequential question to measure achievement of objectives (not content based, but skill based)
    - Faculty identify how they meet the characteristics of an LP classroom per hooks in their classes
    - See if students notice where ethics or context are missing from other classes
    - Lateral and longitudinal studies using a control group approach: one group will receive engineering education as it is now, the second group will experience a liberative pedagogy.
    - We can look at performance on standardized tests like the FE and PE.
    - Endowments/alumni giving
    - Career choices – where is the reflective action? Where do students work? Who benefits? What does their work produce?
    - Narratives – students help legitimize what we do – an empowered student is the best evidence, students who demand liberative pedagogies from their other professors, students who think critically and act reflectively in their lives. Capture students’ post-liberative class thinking critically and acting reflectively – for example noticing missing context or ethics in a class.
Need to show why liberative pedagogies as a process really help students learn content better. Some think it’s useful as an additional tool to bring social awareness, but it actually motivates students to learn content better. So we want to measure how reflection relates to relevance, relates to motivation, relates to learning…Reflective aspect of ethics, links between the two

Packaging is important – can it be packaged in a way that it would be widely adopted yet still remain faithful to the core principles?

Need to challenge conventional assessment, bean counting – expectations about what learning is…

- Co-opting/Losing consciousness – We have to remember what makes LP distinctive. If we mis-identify participatory, problem-based, learner-centered etc. pedagogy without the political consciousness as liberative, it can be co-opted in ways that are not liberative at all. We must be clear that this is about values, not politics - knowledge is not politically neutral – as educators we respond with our values and heart to a situation that is already politicized, and we teach are students to think critically about this and respond with their own values
  - Student centered is not necessarily reflective, could just be about choices
  - Corporate models of learner-centered education want to achieve what the old philosophy of filling an empty vessel aimed at and not want people to put their actions at the service of their ideas

3.6 Logistical
- Class size – liberative pedagogies are easier to implement in small classes, but there are strategies for larger classes.
  - Base communities – facilitators from outside the major?
  - Introduce variability in evaluation using Parliamentary system – take a %age of votes from students choosing take home vs. other tests. Grade against each community of users in large enough classes.

- Time – liberative pedagogies are time-intensive, but there are some ways to address these constraints on faculty.
  - Reward faculty for the extra time required
  - Staff classes appropriately. Community-based classes in particular require logistical and administrative support that are not typically available. Offices of community-based learning are essential to support this work.

  Professional development required – especially for engineering professors seeking to make the transition to liberative pedagogies, some training is required to explain what these pedagogies are and to create the consciousness required to enact them in one’s classes.
    - Support from deans and department chairs for this type of development is important.

3.7 Individual
Implementing liberative pedagogies is an extraordinary task that demands much of the individual. First, individuals have to battle a number of issues including

- The cult of the expert and our own sense of shame or embarrassment for not knowing something or making mistakes. We must learn to share power with students and give up some control.
- We must take on an increased workload in providing structure in a more open classroom, facilitating student relationships, addressing student resistance, guiding collaborative work, managing project based work, etc.
- We face a series of choices that must be balanced, between content and process, satisfying conventional vs. alternative goals, short term goals vs. long term benefits – e.g., the prospects of getting tenure or promotion vs. being an active part of students’ life transformations.

Facing these additional challenges in the context of a lack of professional support can create a sense of alienation and lack of community, especially within engineering where liberative pedagogies are more rare (although this happens in all parts of academe). This can lead to disillusionment and frustration, or cynicism and despair.

- Form support networks.
- Remember that liberation is a process. There is a progression of change, and a cyclical dynamic of power and resistance. It will always be necessary to struggle against oppression - liberation is never complete, it is ongoing.
- Change recognition structure so that successes are duly celebrated and rewarded. We need countable measures of the joys of liberative pedagogies
- Pedagogy of the heart (Parker Palmer) – a different paradigm for education, this is tied in with personal integrity, being faithful and truthful to one's values beyond a need to share power. Very compatible with liberative pedagogies, and perhaps already integrated in some cases (e.g., bell hooks seems to talk about this).

4 Outcomes and Evaluation

4.1 Action Items

1. Distribute report (this document)
2. Distribute contact sheet (emailed to all participants)
3. Publish
4. Egr and social justice at the FIE in October
5. Students encouraging less resistance
6. Continuing conversations, d-list etc.
7. Augusto Boal visit 5 colleges
8. Raise consciousness at Smith and in the 5 colleges. 2-3 sessions including dialogue with non-LP folks, and college leadership
9. Reconvene Paulo Freire discussion group – Peter Park (contacted)
10. Network, especially the junior faculty
11. D’Ambrosio – ethnomath, ethnoengineering?
12. Kahn Project?
13. Follow effects of conference, narratives
4.2 Further questions to explore or posed during meeting

1. What is the appropriate balance between liberative pedagogies and other methods in engineering? What might liberative pedagogies be especially well suited for, and where does it not fit well? In particular, can one reconcile the largely corporate and military contexts of engineering with liberative pedagogies?

2. How does one balance process vs. content, or process vs. outcome? Should we trade off some content, if so what? How do we determine what is essential? How does this fit or not fit with ABET requirements?

3. How are liberative pedagogies best promote within the academy and within engineering in particular? Should we repackage it? If so, how? Can we “market” it without losing the integrity of the method?

4. What does it mean to think critically in an engineering context? How does this differ from other contexts?

5. How can we make clear the differences between liberative pedagogies and other learner-centered pedagogies used in engineering, including active learning, problem-based learning, “pedagogies of engagement” etc.

6. How can we reach people who would be open to liberative pedagogies but whose consciousness has not yet been raised? How can an interdisciplinary institute like ISIS help build a community around this, and around new ways of knowing in engineering?

7. What other ways can the powerful but marginal & small community of established tenured Engineering professors help the LP agenda?

8. What does/would a fully operationalized liberative pedagogies classroom look like?

4.3 Self-Reported Outcomes

At the end of the workshop, participants were asked to reflect and share what they were able to take away from the meeting.

- Learned more about what Donna Did
- Learned more about pedagogy in general and what people are thinking about. Learned not just what students are learning, and how, and what people are learning for, but I learned about how to make people more comfortable expressing these ideas
- I understand that liberative pedagogies are more than learner centered
- Intellectual stimulation of being around non-engineers
- I’m able to rethink my game plan. Learned what I needed to know to do liberative pedagogies, particularly the difference between what we’ve done and what we think we’re trying to do. Know where we’re going.
- Learned about myself
• Learned there’s more to learn. It helped me understand the pre-engineering program and how to help with that. Interesting ideas, re-motivated to look at classes and curriculum one more time, ideas for women’s studies class this fall
• Learned about education, new pedagogy
• I understand how liberative pedagogies were used in the classes I’ve taken, and I’m pleased to see how alternative methods are almost the norm at Smith.
• Got some specific ideas for my classes next semester, enjoyed intersection of non-engineering and engineering practices. Learned the difference between engineering and industrial design. Enjoyed student participation
• More challenging than I thought to bring liberative pedagogies into engineering - thought it would be easy to plunk it down into egr classes – feels more challenged to come up with ways of making it work
• Learned what engineers did. Inspired a lot of questions. Invigorating to think about implementing liberative pedagogies systematically across disciplines and across friendship networks. Makes me think about what could women’s studies do to make it more pervasive in the major.
• Ideas for assessment
• gift of it was learning about engineering culture and culture of teaching engineering – new paradigm for thinking about my own teaching – aspirations for engineering are instructive and illuminating for use in film studies. Students have been great teachers, learned much from all
• More ideas, more information about what’s out there. International student concern about western egrs going into 3rd world without an understanding of how it works, and needs – nice to know there are others concerned about this too.
• Found out more about Smith program, understand more about what Donna does – new ideas for teaching and reconnection to some of the theory he was exposed to many years ago, ideas of how to implement. Grateful to leadership.

4.4 Evaluation
A written conference evaluation was given to all participants (detailed results in Appendix E).

Additional follow-up evaluation was solicited with participants in December 2005 to see if or how they have used what they learned at the conference in their ongoing work. One participant responded, reflecting on how the workshop impacted her teaching:

'One of the most concrete examples of how the Liberative Pedagogies workshop inspired me was in helping me structure a new Topics course I was teaching this Fall (entitled Contemporary Cityscapes: Mapping Brazilian Culture onto an Urban Grid). The smaller workshop sessions encouraged me to think of ways to incorporate more fully the students' participation in the course. This grew directly out of the input the students in the workshop had for us faculty participants, as well as from the strategies we shared within the larger workshop group.

'Because POR220 was a course in Portuguese that dealt with heavy-duty issues concerning urban-based problems in Brazil, I decided to ask students to pick a city they knew well (anywhere in the world) to be the subject of their final project. This final project incorporated essays the students wrote during the course of the semester, both on personal experiences as well
as research they conducted throughout the semester. This final project was also the focus of their individual student presentations at the end of the term. In this way, individual students felt that they had something to contribute concretely to the class. Knowledge got distributed more evenly and democratically that way. Students learned from each other and I learned from them. I felt that this format was in keeping with some of Paulo Freire's mandates, and was also a way of making the course center on various learning experiences rather than just my own.'

Acknowledgments
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## Appendix A: Participant List

<table>
<thead>
<tr>
<th>Name</th>
<th>College</th>
<th>Field</th>
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<tbody>
<tr>
<td>Alysssa Tham</td>
<td>Smith College</td>
<td>Engineering Student</td>
</tr>
<tr>
<td>Netty Nina</td>
<td>Smith College</td>
<td>Engineering Student</td>
</tr>
<tr>
<td>Andrea Fiumefreddo</td>
<td>Smith College</td>
<td>Engineering Student</td>
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<tr>
<td>Marguerite Harrison</td>
<td>Smith College</td>
<td>Portuguese</td>
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<td>George Catalano</td>
<td>Binghamton University</td>
<td>Mechanical Engineering</td>
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<td>Alan Bloomgarden</td>
<td>Smith College</td>
<td>Education</td>
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<td>Alex Keller</td>
<td>Smith College</td>
<td>Film Studies</td>
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<tr>
<td>David Dibiasio</td>
<td>WPI</td>
<td>Chemical Engineering</td>
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<tr>
<td>Cindy Norton</td>
<td>College of St. Catherine</td>
<td>Biology</td>
</tr>
<tr>
<td>Lisa Armstrong</td>
<td>Smith College</td>
<td>Women’s Studies</td>
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<tr>
<td>Donna Cohn</td>
<td>Hampshire</td>
<td>Industrial Design</td>
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<tr>
<td>Natalie Mello</td>
<td>WPI</td>
<td>Global Studies</td>
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<tr>
<td>Judy Cardell</td>
<td>Smith College</td>
<td>Electrical Engineering</td>
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<tr>
<td>Glenn Ellis</td>
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<td>Civil Engineering/</td>
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<td>Herb Bernstein</td>
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<td>Lionel Claris</td>
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<td>Donna Riley</td>
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<tr>
<td>Ida Ngambeki</td>
<td>Smith College</td>
<td>Engineering Student</td>
</tr>
<tr>
<td>Linda Jones</td>
<td>Smith College</td>
<td>Ceramic Engineering</td>
</tr>
</tbody>
</table>
Appendix B: Participant Expectations

Energy
Ideas
Learn more about engineering education
Learning from others
Community forum, support
Specific activities in & out of class
Assessment of student learning
Enslavement of oppressor, service learning in elite institutions, issues of race and class in education
Inspiration
Class size
Engineering utilizing knowledge from the many
Pedagogies as bridge between disciplines
Collaborating with people who are in different fields and have the same interests
Dialogue
Helping others, share experiences with LP
Re-invigorate personal knowledge of LP
Curiosity about engineering
Seeing how liberative pedagogies and engineering can go together
Encouraging reform in engineering
Appendix C: Workshop Schedule

SCHEDULE
LIBERATIVE PEDAGOGIES IN ENGINEERING EDUCATION
AUGUST 4-7, 2005

Thursday, August 4
1:00- 4:00 pm  Drop-in gathering for registration and light refreshments
Dewey Common Room
Dinner (on your own)
7:00-9:00 pm  Introductions and goals/expectations

Friday, August 5
8:00-9:00 am  Breakfast available
9:00-10:30  Large Group discussion – what we understand liberative pedagogies to be
what we understand engineering to be
10:30-11:00am Break
11:00-12:30pm Experience with Liberative Pedagogies I: Benefits
12:30-1:30  Lunch
1:30-2:30  Reflection time – brainstorm ways to bring liberative pedagogies into engineering using
provided questions as a guide
2:30-3:00 Refreshments
3:00-5:00 Small Groups – Brainstorm together and draft ideas using provided questions as a guide

Your evening is free, but you may choose to spend some time reflecting or writing up thoughts.

Saturday, August 6
8:00-9:00 am  Breakfast available
9:00-10:30  Large Group discussion – reports from small groups
10:30-11:00am Break
11:00-12:30pm Experience with Liberative Pedagogies II: Overcoming obstacles, making tradeoffs
12:30-1:30  Lunch
1:30-2:30  Reflection time – brainstorm ways to creatively address obstacles, or find win-win
solutions to problems identified in morning session, using provided questions as a guide
2:30-3:00 Refreshments
3:00-5:00 Small Groups – Brainstorm together and draft ideas using provided questions as a guide

Your evening is free, but you may choose to spend some time reflecting or writing up thoughts.

Sunday, August 7
8:00-9:00 am  Breakfast available
9:00-10:30  Large Group discussion – reports from small groups
10:30-11:00am Break
11:00-12:30pm Wrap up and conference evaluation
12:30  Adjourn
Appendix D: Notes from Initial Plenary Sessions

**Icebreaker/Brainstorm: What Liberative Pedagogies are Not**

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<th>Oppressive</th>
<th>Boring</th>
<th>Capital driven</th>
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<tbody>
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<td>Objective</td>
<td>Comfortable</td>
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<tr>
<td>Teacher centered</td>
<td>Easy</td>
<td>Myopic</td>
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<tr>
<td>Chalk and talk</td>
<td>Mono-disciplinary</td>
<td>Limited</td>
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<td>Gender-biased</td>
<td>utility/applicability</td>
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<td>Value free</td>
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<tr>
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<td>Disempowering</td>
<td>Race blind</td>
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<tr>
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<td>Colonial</td>
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<tr>
<td>Rote</td>
<td>Asleep at the wheel</td>
<td>Uneasy with uncertainty</td>
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<tr>
<td>Predictable</td>
<td>Non-interpretive</td>
<td>Lacking paradox</td>
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<td>Orderly</td>
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<tr>
<td>Empirical</td>
<td>Monocultural</td>
<td>Un-innovative</td>
</tr>
<tr>
<td>Easily assessed</td>
<td>Individualistic</td>
<td>Unintentional</td>
</tr>
<tr>
<td>Quantifiable</td>
<td>Competitive</td>
<td>Assessment - based (in a bad bean-counting way)</td>
</tr>
<tr>
<td>Military biased</td>
<td>Egocentric</td>
<td></td>
</tr>
<tr>
<td>Corporate biased</td>
<td>Non-dialogical</td>
<td></td>
</tr>
<tr>
<td>Multiple choice</td>
<td>Bureaucratic</td>
<td>Monotonous</td>
</tr>
</tbody>
</table>

**What do we understand liberative pedagogies to be?**

Empowering
Power shift
Collective enterprise
Process-oriented
Collaborative
Multiplicity of perspectives and approaches
Foreign to engineering education
Interactive
Risky
Encouraging to diversity
Queer in the absolutely broadest sense of the term (non-normative)
Innovative
Pluralistic
Rebellious
Relational
Historicized (not ahistorical, historically conscious, self-situated)
What does it mean to be liberative? Liberated from what?
From the expert-learner dichotomy – everyone’s a learner
  Values the experience of the student not just the teacher
  Student is also a source of knowledge, and a citizen, and a conduit for other knowledges

From being seen as “just a student” or “just faculty”
  Shift what we mean by student – whole student – student as an entirety

From limits based on disciplinary context - the context is not the limit of the context – inviting in other ways of thinking, inherently interdisciplinary

From exclusionary practices and marginalization of voices, knowledge, perspectives

You aren’t just liberated from, you can be liberated to … Liberated to what?

To transforming structures in academe and outside – does it just liberate us in the university? What does it transform outside the university?

To inviting participation of all students

To critical thinking

To pleasure – of dialogic way of communicating knowledge, opening the box of the classroom

To embodiment, celebration of corporeal pleasures, getting away from denying the body

To reflective action

Political
controversial
Responsibility for learning
Ethics and social responsibility
Releases pressure on faculty member for having to know everything/be expert
Builds a different relationship to students – friendship based on ideas, more rewarding
interactive
break out of traditional knowledge
The “I don’t know” becomes “why haven’t we asked” – and creates opportunity to find out why… inquiry is not tangential, it’s just another line of investigation. – structure is supple, needs to be played with when someone wants to know something
A space for new questions, energizing, relevant
Like jazz – should be able to improvise
flexible
Breaks out of passivity,
Passivity has a place
Not end driven
Harder to know what’s important to know, when more knowledge is made important
Questions why we need to know
Multi-directional
Makes room for diversity
Allows pursuit of different interests
Creates applicability
Challenging to be adaptable while keeping the big picture
Student’s goal is to do well on test – wants to only follow one direction…
Being intentional while adapting to differences that are there
Losing the fear
Motivation – how to motivate students – what motivates that faculty member? What motivates the student? Grades? Or something else? Process is important – how you get to the end product.
Change in number of paradigms, expectations of students, roles and responsibilities of teacher, of process, etc.

How does it mesh with engineering, where certain basic things need to be conveyed.
Want to establish curiosity about unconventional ways to apply the facts… it’s not bad to present information in a clear way.
Engineering faculty would be challenged if not threatened by the idea of going off somewhere else – how to convince people in engineering that they can explore the less risky aspects of liberative pedagogies
Scary
Process based
Change in expectations from students, and roles and responsibilities in classroom threatening
Collaborative within the department – you can take more risks in some areas than others – unless there is an understanding about the whole curriculum
Egr ed is based on a military model – have to change entire eng ed establishment
Need institutional recognition of the methods and their problems
Need to show the pitfall so memorization
Need to change establishment, create institution-wide recognition
Need to recognize pitfalls of LP
Pick textbooks students understand, make students responsible for material
Demonstrate success using traditional testing
Keep critical stuff in mind
Teaches students how to learn
Makes students responsible for material (pick texts students understand)
Brings to layers to learning in the classroom – community, relationships, interactions
Creates community
How do we keep LP and still get content across?
Why assume that we wouldn’t cover the content? Maybe it would be better for content to cover by following student questions and interests – value different learning styles, backgrounds, investments…
Liberative pedagogies – can they be outcome based? – still have to get there – start by doing your own thing and make it clear that students are still getting the outcomes.

Values students

Different learning styles and backgrounds

How to make an outcome discernible to an assessment board? Do you still have to go back through the traditional testing model? Teaching them to pass.

Need to do it differently to make sure critical knowledge is covered

Assessment – non-traditional structures and traditional gate-keeping – FEE – multiple choice ethics… elec. Grid blackouts are a matter of social responsibility.

What is the purpose of introducing lib ped into engineering edu? Valuing diversity, it’s sound educational practice

Are there additive outcomes? Transformative model?

Just accomplish previous existing goals and then make sure students feel perspectives are valued? Tradeoffs with limited time?

Maybe you give up some content goals to achieve open-ended, free-ranging dialogue to attain value of diversity and liberation in the classroom?

Wrench – how do you look at liberative pedagogies in the context of elitist institutions, institutions that are corporatizing, cutting back, downsizing, etc.

How to make learners feel more included, etc. but also allows for identification of other things that engineering needs to attend to that haven’t been attended to because of historical domination of people in power.

What do we understand engineering / engineering education to be?

Science of how things work

Problem-solving

Pragmatism

Quantification

How to build things

How to test things

Dealing with materials

Predicting how something will behave before building

Knowing what to build

How to make life better

Understanding the mechanics of everyday life

Taming nature and overcoming natural processes/control of nature

Invention and discovery – reduction vs. creativity

Search for rules

Focused expertise

Knowing how to LOOK

Satisfy needs of society

Taking crazy ideas and making them work

Explaining why things can’t work

Working with real constraints and criteria
Socially responsible and ethically aware engineers – social consequences
Learning the design process and how to solve problems, taking into account things that
your solution affects – environment etc.
Design process is itself a big part of engineering, learning how to take advantage of your
creativity to advance technology
Engineering is reductive, what’s the right way
More focused expertise in the science of what’s happening – more eclectic, less expertise
Cousin taught how to clean a river (Housatonic) – being an efficient problem solver is not
always a marketable skill
Efficiency, efficient problem solving
Engineers know how, but aren’t always at a decision making level
Stereotype is that engineers follow orders, listen to others
Insular, lack collaborative process
Individuals who have learned how to look, take in information
Satisfying some need for a client or constituency
Profession – code of conduct, set of ethics, values-based

Management skills – “soft?” need a better word

Why do we need LP in egr ed?
We have a lot of problems that need engineers…
Can’t be solved by continuing to train engineers in the old way
They have to ask why?
Add women and stir results in assimilation
Liberative pedagogies creates a shift

Characteristics of Egr Ed
Ethics are taught
Lecturing
Social responsibility?
Environment?
Content driven
Physics, chem., math, bio
Apply to materials, etc.
Learn to use materials in design
Apply design to society
Problem sets
Long nights – working culture
Conference Evaluation Results (N=14)

~ Liberative Pedagogies in Engineering Education
Conference Evaluation ~

Please tell us how satisfied or dissatisfied you were with the following:

1) How satisfied were you with the conference materials provided?
2) Overall, how satisfied were you with the facilitators?

<table>
<thead>
<tr>
<th></th>
<th>Very Dissatisfied (1)</th>
<th>Dissatisfied (2)</th>
<th>Neutral (3)</th>
<th>Satisfied (4)</th>
<th>Very Satisfied (5)</th>
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<tbody>
<tr>
<td>1 (Mean= 4.43)</td>
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<td></td>
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<td>6</td>
<td></td>
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<tr>
<td>2 (Mean= 4.64)</td>
<td></td>
<td></td>
<td>5</td>
<td>9</td>
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</table>

3) Did you feel the length of conference sessions were too long, just about right, or too short?

<table>
<thead>
<tr>
<th></th>
<th>Too long</th>
<th>Too Short</th>
<th>just about right</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>12</td>
</tr>
</tbody>
</table>

Please tell us how much you agree or disagree with the following statements.

4) The content of conference sessions was appropriate and informative.
5) The conference was well organized.
6) Conference staff were helpful and courteous.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Neutral (3)</th>
<th>Agree (4)</th>
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</thead>
<tbody>
<tr>
<td>4 (Mean= 4.57)</td>
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<td>8</td>
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<tr>
<td>5 (Mean=4.69)</td>
<td></td>
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<td></td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>6 (Mean=5.00)</td>
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<td></td>
<td></td>
<td></td>
<td>13</td>
</tr>
</tbody>
</table>

7) What session(s) was/were most beneficial to you? In what ways?

- Liked variety
- Large groups were stimulating
- Small groups were necessary
- Final actions and overcoming barriers
- Assessing alternatives
- Each session was a unit and small group discussions were invaluable
• First group discussion was instructive
• Discussing benefits and difficulties of LP was beneficial
• Understanding what LP is
• Sessions were energizing and full of helpful information
• Small group discussions allowed talk about details
• Enjoyed brainstorming about what LP was not

8) What kinds of sessions would you like to see included at a future conference on Liberative Pedagogies in Engineering Education?

• Sessions focusing on practical techniques
• In guise of glossary have a session on concepts of LP
• Trial class on some engineering topic
• More problem solving
• Demonstration of specific example in class
• More accounts of LP in action and how it has changed people and institutions
• Talk about what engineering professors have already attempted
• Where LP sparked from, who supports it

9) Would you attend more “Liberative Pedagogies Conferences” if there were more?

<table>
<thead>
<tr>
<th>Yes</th>
<th>Maybe</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Yes – dialogue is enriching and stimulating  
maybe – time is an issue  
-hope to get help and help others  
-relevant philosophical stance  
-to learn more about LP  
-to rethink and re-examine old ideas  
-opens one up to new thinking

10) What is the single most important thing that you learned as a result of attending this conference?

• People getting together have the power to effect change
• Learning more about LP
• Made some contacts
• Pay close attention to and constantly re-examine my assumptions, values, practice and teaching
• That we still have a long way to go
• I can go further with ethical and social issues
• Got new ideas for classes
• The difference between learner centered and LP
• About engineering teaching and culture
• Understanding engineering education from students perspective
• The effort that people are putting into helping students
• Struggles that come with trying promote new pedagogy

11) What did you like most about the conference?

• The people
• Stimulating conversation
• Discussions were enlightening and insightful
• Small group talks generated great ideas
• Hearing concrete examples of LP
• The importance of student input
• Attendance from outside engineering
• Interaction across disciplines
• Hearing about challenges, successes and failures
• Leadership without heavy control
• Simplicity of agenda

12) What did you like least about the conference?

• Did students feel underrepresented?
• Impossibility of making real alliances/ concrete outcomes for a programmatic approach to reforming engineering
• Not sure about the effectiveness of student participation
• Time consuming
• Not enough engineers present
• Poor ventilation, room layout
• Long small group sessions
• Total length
• Serve food in a different room
• Content felt too abstract at times
• Some people were more verbose than others
• Hard to keep track of what some people were saying
• The weather
• Would have liked a wider variety of topics

13) How would you rate this conference compared to other conferences of this type that you have attended?

• Small but good to focus on a specific topic
• Top 1%
• Great learning experience
• Well organised and interesting
• I can’t in any useful way
• Most successful conference of this size
• Very good-having experienced non-engineers was of great value
• Number of people was nice, enabled one to get to know individuals and get new perspective
• Very intellectually stimulating
• Excellent, spurred self-reflection
• Nearly the best in 27 yrs of experience
• Only conference of this type I’ve attended

14) In what ways could this conference be improved?

• Hard to think of anything that would improve it
• More national representation
• Venue, would be great at the national engineering conference
• More schools represented
• Shorter sessions, switch small group members, fewer tasks for small groups
• Add sessions on designing a curriculum for a humanities course
• Have required and recommended reading list
• An extra day to allow people to work in more than one small group
• Follow up activities
• More engineers, someone from ABET
• More comfortable chairs
• More insightful committed people

How would you rate the following items?

15) The conference facilitated knowledge sharing among participants
16) I found new contacts and opportunities for future collaboration
17) I learned material that will be helpful to me in better performing my job responsibilities

<table>
<thead>
<tr>
<th></th>
<th>Poor (1)</th>
<th>Fair (2)</th>
<th>Good (3)</th>
<th>Very good (4)</th>
<th>Excellent (5)</th>
</tr>
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<tbody>
<tr>
<td>15 (Mean= 4.5)</td>
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</tr>
<tr>
<td>17 (Mean= 4.3)</td>
<td>2</td>
<td>4</td>
<td></td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

18) Did you have fun?

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>At times</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

Sometimes discussion was tedious and repetitive

19) Overall satisfaction rating: (Mean = 4.7)
<table>
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</tbody>
</table>

20) Any additional comments?

- Need more facilitators
- Thank you to the organizers
- Thank you Donna you are a source of inspiration, I look forward to helping you in anyway I can
- Great job to those involved
- Well done all
- We should consider possible collaboration, research, assessment. It is critical to continue to include non-engineers