Diversity in the College Classroom

a guidebook

Version I
May 2006

C I R T L

Center for the Integration of
Research, Teaching, and Learning

The Diversity in the College Classroom Course is a project of the Center for the Integration of Research, Teaching, and Learning (CIRTL). CIRTL is a National Science Foundation (NSF)-sponsored initiative committed to developing and supporting a learning community of Science, Technology, Engineering, and Mathematics (STEM) faculty, post-docs, graduate students and staff who are dedicated to implementing and advancing effective teaching practices for diverse student audiences. For more information, visit http://www.cirtl.net or e-mail info@cirtl.net.

CIRTL
1025 West Johnson Street, Suite 552
Madison, Wisconsin 53706
(608) 263-0630

This guidebook was written and compiled by Alice Pawley and Christine Pfund, with contributions from Jo Handelsman and Sarah Miller Lauffer. Edited by Heidi Williamson and Arla Dauscher.

Cover: A tiger swallowtail butterfly in the University of Wisconsin-Madison Arboretum's Curtis Prairie helps demonstrate the value of one definition of diversity important to our students: biodiversity. From http://photos.news.wisc.edu/view.php?id=432

Diversity in the College Classroom:
A guidebook

CENTER FOR THE INTEGRATION OF
RESEARCH, TEACHING, AND LEARNING

University of Wisconsin -Madison
Michigan State University
The Pennsylvania State University

C I R T L

Dear Colleague:

Those of our graduate students who choose to pursue academic careers may be doing research and teaching for more than 30 years. We know that your university has prepared your students to be superb researchers. We hope to assist you in preparing them to also be excellent teachers throughout their careers.

This guidebook stems from the work of a community of research-active faculty, graduate students, post-doctoral researchers, and academic staff in science, engineering, mathematics, and social sciences. We believe that the improvement of teaching and learning is a dynamic and ongoing process, just as is our disciplinary research. Our core idea is that improving our students' learning is a research problem to which each of us can effectively apply our research skills in an ongoing way. We see the goals of preparing our graduate students and post-docs to be skilled in research and in teaching as complementary, and as increasing the impact of a graduate education.

We are exploring these ideas by creating, implementing, and evaluating a program at the University of Wisconsin – Madison called the *Delta Program in Research, Teaching, and Learning*. This learning community comprises graduate courses, small-group facilitated discussions among graduate students through faculty, monthly dinners, teaching-as-research internships (both on and off campus), workshops in portfolio development and broader impact statements, and an overarching certificate program. (See www.delta.wisc.edu.)

Three core ideas form the foundation of both our learning objectives for participants and the overall design of our program: Teaching-as-Research, Learning Community, and Learning-through-Diversity. Very briefly, teaching-as-research uses research methods to advance teaching and learning through an ongoing process of discovery and change. Learning communities bring people together to share in their learning and discovery. Learning-through-diversity uses the rich array of backgrounds, skills and ideas in the community to enhance the learning of all.

We invite you to make use of this guidebook as best suits your needs. We provide complete programs that can be followed in detail if you wish. We anticipate that, in the spirit of all three core ideas, you will experiment and find new approaches to this work. We look forward to hearing your results so that we can continue the development of our programs and help others do the same.

On behalf of all of my colleagues, I wish you every success and look forward to hearing of your challenges and accomplishments!

Sincerely,

Robert D. Mathieu
Professor of Astronomy
Director, CIRTL
University of Wisconsin – Madison

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Section I: Introduction

A. Letter to instructors

Dear colleagues,

This guide for the CIRTL Diversity in the College Classroom course is intended to encourage you and support you in teaching a course that challenges science and engineering instructors to think about *diversity* differently.

In today's educational discourse, and particularly in STEM (Science, Technology, Engineering and Mathematics) and SBE (Social, Behavioral and Economic science) disciplines, the word *diversity* is used with different purposes. It is attached to the prefix *bio* to indicate the variety of organisms in a given environment. It is sprinkled throughout university recruiting materials to suggest that students of color should choose to attend a certain college. It is added to science and engineering grant applications to indicate that the Principal Investigator will do outreach to "underrepresented populations," namely women and people of color. In each context, a different slice of *diversity* is cut without acknowledging how one context might include certain ideas and exclude others.

This course is designed to act as a structured yet open space for STEM/SBE instructors to explore what applying the word *diversity* to their teaching might mean. We hope you are able use this manual to adapt and implement whatever aspects seem useful or helpful. We also encourage you to take some risks, decide to do some activities whose potential success you're unsure of.

The Diversity in the College Classroom course is composed of two sequential courses. The first course in the sequence, referred to as "DCC1," was worth one credit, was held for the first 7 weeks of the fall semester of 2005, and was largely based on readings, discussion, and a few assignments designed to be useful to participants' future careers as faculty members. The second course, "DCC2," was also worth one credit, and occurred directly after the completion of DCC1 in the fall 2005 semester, but was organized entirely around the development of projects, selected and implemented by the participants.

Throughout this manual, we describe both what "the instructors" thought as well as using the pronoun "we" to describe this. "We" are three plant pathologists and an industrial engineer who have varying levels of experience with teaching and with different aspects of "diversity" in university education (see our bios on p. 12). We feel personally invested in this course; as a result, we wanted to put ourselves in this manual, rather than write it in the impersonal third person. In addition, one of the major critiques of traditional science by feminist science scholars is that the practice of writing research papers, scientific reports, and presentations in the passive voice effectively disembodies the work for the reader/listener, allowing them to forget that people— who can be fallible, and who have their own set of socially-inscribed biases— carried out the research that is written about as completely objective. In this manual, please remember that four people developed and implemented this course, each with our own interests and biases undoubtedly present.

Good luck with your own adaptation; we hope you have fun, and are both encouraged and inspired by the experience of working with others interested in this topic.

Alice Pawley

B. Course description

Diversity in the College Classroom 1 (DCC1)

The purpose of this course was to explore what is known and theorized about the ways that diversity affects learning and to help educators develop practical classroom strategies that address diversity. The course was designed for STEM/SBE educators who are interested in considering diversity issues in their teaching. We examined how scientists and engineers define "diversity," and for what purposes, and discussed the ways different definitions of diversity might influence what and how we teach our scientific disciplines. We considered how our definition(s) might affect both *how* and *what* we teach.

Course objectives:
Our "course objectives" were that students would be able to construct:
- A personally meaningful definition of "diversity"
- Knowledge of some of the fundamental literature on diversity that pertains to science, engineering, and math
- A rationale for why they include the content they do in their teaching and an understanding of how the selection of this content is influenced by their definition of diversity
- A toolbox of tips and ideas on how they might address diversity in future courses they might teach
- A community of peers who are a resource for their teaching careers
- Knowledge of the theory and data one can use to support claims about the benefits and challenges of diversity in STEM/SBE education

Course structure:
DCC1 was the first of a two-credit sequence for the investigation of diversity in the college classroom, and was focused on reading the literature on diversity in STEM/SBE university-level teaching, with class time mainly dedicated to in-depth discussions.

This course followed four themes:
Foundation. Foundational knowledge on the topic of diversity and its particular application within STEM/SBE educational contexts. What do people mean when they use the word "diversity?" In what contexts is it used? What are some of your ideas about why it is used in these contexts?

Research on bias. Experimental and analytical work on bias, prejudice, and assumption. How do aspects of diversity affect the judgments we make about people and their work? This theme will form a basis for developing self-awareness and reflection on the biases and assumptions we bring to subsequent course material.

Ways of knowing, ways of learning. Theoretical work on diversity in education has often used the theme of "ways of knowing," to describe the different research traditions and cultural traditions that people use to make sense of their worlds. Experimental work examines "ways of learning"— practices that promote learning of diverse groups of people. How do we reconcile the ideas of these disciplines with the research on bias? How do we extrapolate from research showing group differences without imposing a new set of stereotypes and prejudices?

Action: where now from here? As teachers, we hold power. How does our understanding of diversity inform our use of that power? We study what others have done and brainstorm collectively and individually about ways to address diversity in our own teaching of science.

Diversity in the College Classroom 2 (DCC2)

This course is a continuation from DCC1. In this course, students developed projects in a rigorous, peer-reviewed context. These projects could have been based on the proposals developed in the "Action" section of DCC1 and could consist of instructional materials, course proposals or syllabi, grant proposals, instructional videos, Web sites, the diversity focus of a Delta internship proposal, or other projects focused around diversity in STEM/SBE teaching.

Course objectives:
During this course, students:
- Conceived of, developed, and presented a project on the topic of diversity in STEM/SBE
- Learned how to receive, benefit from, and give constructive peer-review criticism regarding issues of diversity
- Understood and learned to apply concepts of Teaching-as-Research, Scientific Teaching, Learning Community, and Learning-through-Diversity to their teaching

Other course objectives were co-constructed by the instructors and course participants during the first course meeting (DCC2 Week 1). These were written up by the instructors and circulated by the second class meeting.

C. The Three Pillars of CIRTL

The DCC course was designed as a collaboration of the Center for the Integration of Research, Teaching, and Learning (CIRTL, http://www.cirtl.net) and the Wisconsin Program for Scientific Teaching (WPST, http://scientificteaching.wisc.edu). CIRTL is constructed around what three intertwining core concepts (known throughout the program as "pillars"). Each is described in detail below, and will be invoked throughout this manual.
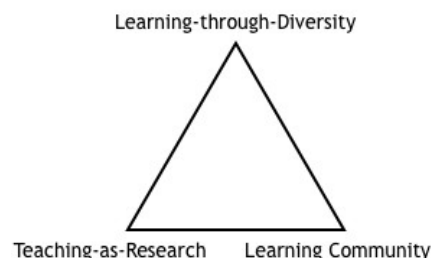
Learning-through-Diversity

The literacy and engagement of all students in science, technology, engineering, and mathematics is a priority goal for U.S. higher education. CIRTL seeks to contribute to this goal by enabling present and future STEM faculty to enhance the learning of all students whom they teach irrespective of, but not limited to, preferred learning styles, race, ethnicity and culture, gender, sexual orientation, disabilities, religion, age, or socioeconomic backgrounds.

CIRTL's contributions to diversity in STEM are founded on the principle that excellence and diversity are necessarily intertwined. Faculty and students bring an array of experiences, backgrounds, and skills to the teaching and learning process. Effective teaching capitalizes on these rich resources to the benefit of all, which we call "Learning-through-Diversity."

At the same time, CIRTL recognizes the reality that existing social and educational practices do not always promote equal success for all learners. Thus, creating equitable learning experiences and environments requires intentional and deliberate efforts on the part of present and future faculty. CIRTL is committed to developing a national STEM faculty who model and promote the equitable and respectful teaching and learning environments necessary for the success of learning-through-diversity.

To achieve these goals, CIRTL provides development experiences, programs, and resources that promote the abilities of present and future faculty to:

- Know the diverse backgrounds of their students and their implications for learning
- Identify curricular, teaching, and assessment practices that promote learning for all
- Draw upon the diversity of their students to enhance and enrich the learning of all
- Recognize existing inequities and promote an equitable, inclusive, and respectful climate for learning

These aims require specific attention of the practitioner to:

- *Practitioner-participant interactions*— such as inclusion and engagement of the ideas of all participants; respectful teaching behaviors; accessibility for all participants; mentoring of less experienced practitioners
- *Participant-participant interactions*— such as welcoming and respectful inclusion in collaborative work; respect for the ideas of all and recognition of their value; accessibility in activities that occur outside of the primary learning environment
- *Participant-content interactions*— such as how participants experience content; how content can be adapted and varied; and how exploring novel contexts for presentation can enrich the experience of participants and practitioners alike

Teaching-as-Research

The improvement of teaching and learning is a dynamic and ongoing process, just as is research in any STEM discipline. At the core of improving teaching and learning is the need to accurately determine what students have learned as a result of teaching practices. This is a research problem, to which STEM instructors can effectively apply their research skills and ways of knowing. In so doing, STEM instructors themselves become the agents for change in STEM teaching and learning.

Teaching-as-Research involves the deliberate, systematic, and reflective use of research methods to develop and implement teaching practices that advance the learning experiences and outcomes of students and teachers.

Participants in teaching-as-research apply a research approach to their teaching practice. Conceptual steps in the teaching-as-research process are:

1. Learning foundational knowledge (What is known about the teaching practice?)
2. Creating objectives for student learning (What do we want students to learn?)
3. Developing a hypothesis for practices to achieve the learning objectives (How can we help students succeed with the learning objectives?)
4. Defining measures of success (What evidence will we need to determine whether students have achieved learning objectives?)
5. Developing and implementing teaching practices within an experimental design (What will we do in and out of the classroom to enable students to achieve learning objectives?)
6. Collecting and analyzing data (How will we collect and analyze information to determine what students have learned?)
7. Reflecting, evaluating, and iterating (How will we use what we have learned to improve our teaching?)

The application of teaching-as-research is meant to lead STEM instructors to a continuous process of discovery and change throughout their careers.

Learning Community

Learning Communities bring people together for shared learning, discovery, and the generation of knowledge. Within a learning community (LC), all participants take responsibility for achieving the learning goals. Importantly, learning communities are the process by which individuals come together to achieve learning goals. These learning goals can be specific to individual courses and activities or can be those that guide an entire teaching and learning enterprise.

The following four core ideas are central to the learning community process:

Shared discovery and learning. Collaborative learning activities where participants share responsibility for the learning that takes place help the development of a learning community. Rather than relying on traditional "expert centered" lecture formats, practitioners should include collaborative learning techniques so learners can see their contribution to the learning goals.

Functional connections among learners. Learning communities develop when the interactions among learners are meaningful, functional and necessary for the accomplishment of the "work" within the courses or learning activities (rather than serving as "window dressing" or simply as "feel good" activities). Moreover, meaningful connections must extend throughout the entire learning community— for example, among students, post-docs, faculty, and staff— rather than simply among cohort- or role-related peers.

Connections to other related learning and life experiences. Learning communities flourish when implicit and explicit connections are made to experiences and activities beyond the course or program in which one participates. These connections help situate one's learning in a larger context by

solidifying one's place in the broader campus community of learners and life experiences. These connections decrease one's sense of curricular and personal isolation.

Inclusive learning environment. Learning communities succeed when the diverse backgrounds and experiences of learners are welcomed in such a way that they help inform the group's collective learning. Whenever possible, activities should be sought that help participants reach out and connect with others from backgrounds different from their own.

D. Course maintenance activities

Course recruiting

We advertised mainly through the program Web site and listserv. We also posted flyers at the program-related events and around our offices.

Advertising should include some or all of the following aspects:
- The audience you are intending to invite to participate
- The context and main goals of the course
- Who will be teaching the course
- How to register

Below is a PDF of the flyer we distributed for the fall implementation (some information is now out of date):

Below is the text we used to advertise on the listserv for the summer version of DCC1:

> Diversity in the College Classroom Course
>
> May 30 - June 11
> MTWTF, 9:30am - 12pm
>
> Instructors: Alice Pawley (Industrial and Systems Engineering) and Chris Pfund (Delta and WI Program for Scientific Teaching)
>
> This course is designed for graduate students, postdocs, academic staff, or faculty who have an interest in becoming better college instructors and in considering diversity issues in their current or future classroom practice. We will take a critical yet practical look at how we define "diversity" and for what purposes, and discuss the ways different definitions of diversity might influence what and how we teach our disciplinary topics. We will discuss the impact of biology and environment on the diversity of student learning and touch on the research on bias, prejudice, and stereotype threat. Finally, we will talk about different pedagogical ideas from multicultural and feminist pedagogical movements that can improve everyone's learning. Participants will have a chance to develop various products for use in their current or future teaching contexts.

Course Web site

We used a course Web site to distribute the syllabus, required readings (in PDF form— this would need to be modified if there are participants with limited vision), content decisions handouts, class make-up assignments submitted by participants, additional readings that might be of interest, and so on. We posted announcements on the site reminding participants of upcoming assignments and when there was new content to be viewed. We also uploaded a calendar of events that might be of interest to participants.

We had hoped that participants would engage in the online discussion forums we had created around each topic, but there was little use of this venue. We think that given a more structured organization of the overall discussion forum this might have been different. We liked the idea of an online forum because that could give participants who missed class or who participate less in class a chance to contribute to the overall discussion through a different mode.

Course listserv

The course listserv was an e-mail address linked to all participants and instructors' official university e-mail addresses. The instructors sent out announcements of upcoming events, news stories of relevance, and follow-up responses to questions asked in class to this listserv. We encouraged participants to send to the listserv also— some sent e-mail questions to their classmates or advance preparation instructions for their Reading Assessments. After the end of the course, participants in the Fall 2005 course indicated they wanted to retain the listserv and it has since served as a tool that can connect the participants with each other.

Class snacks

Although it could have become a large time or money sink, we decided to bring a snack to each class. We used food as it is used by different communities across the world as a tool to help develop relationships among people. In DCC1, the instructors brought snack; in DCC2, we encouraged participants to sign up if they were able and bring some kind of snack to class.

However, please note several potential complications. First, many people have dietary restrictions, whether due to their religion, their ethics, or their allergies. It is important to find these restrictions out ahead of time, particularly if participants are bringing snacks. Second, some religions require people to fast (such as during Ramadan, a holy week in Islam that has different dates every year). In a

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course about diversity, we think it is important to respect these observances, so this might mean the group skipping snacks while some participants are observing a fast.

Instructor meetings and journal

With four course instructors participating in the implementation of this class, communication between class meetings was extremely important. We began the semester with weekly meetings, but as the semester got busier and busier, we relied more on the development and circulation of "class plans," essentially a timed schedule of who was doing what at what time, and what materials were going to be needed. In addition, the presence of multiple instructors at each class allowed for plenty of opportunity for peer review. To take advantage of this, and to make sure we were being responsive to participants' needs despite the more distributed responsibilities of running class, two instructors took copious notes during each class both on the content and participants' responses and comments. This observation-based journal is frequently referred to in the "assessment" sections of the week-to-week plans (Section III), as the instructors used this qualitative data in their planning of subsequent classes, and in determining how to improve a given activity or class for the next iteration of the course.

E. Course personnel

We were lucky enough to have many people interested in the topic of diversity in STEM/SBE teaching involved in this course. Much of the content of each week's "mini-lecture" (approximately 20-30 minutes of lecture per week) came from the instructors' personal interests and knowledge base in the topic of the week. Some of this will be incorporated into this manual; however, we also think that future instructors should incorporate their own interests into these pieces, or (perhaps better) develop different activities or discussion topics based on participant interest and experience.

The following people were involved in the first implementation of this course:

Alice Pawley is a dissertator in the Dept. of Industrial and Systems Engineering at the University of Wisconsin-Madison. She holds a B.Eng (Chemical Engineering- Distinction) from McGill University, and a M.S. (Industrial Engineering) from the University of Wisconsin-Madison. Alice's research spans organizational design, science and technology studies, and women's studies; her current doctoral work focuses on how engineering faculty members describe the boundaries of engineering and considering the consequences these boundaries have for influencing who decides to become an engineer. She currently works in the Center for the Integration of Research, Teaching, and Learning as an instructor with the Delta Program in Research, Teaching, and Learning. She initiated the DCC course, helped develop and assess it, and acted as co-instructor in DCC1 and DCC2 (Fall 2005) and a 2-week summer version.

Dr. Christine Pfund is co-Director of the Wisconsin Program for Scientific Teaching and Associate Director of the Delta Program in Research, Teaching, and Learning. Chris received a Ph.D. in Cell and Molecular Biology from University of Wisconsin-Madison for her work on molecular chaperones in yeast. She then completed three years of post-doctoral research in Plant Pathology, studying how plants defend themselves against pathogen attack. While pursuing her research goals, Chris has been strongly committed to teaching and learning. She has co-taught an inquiry-based science course for non-majors, titled, "Plants, Parasites, and People," and has taken a leading role in many science outreach activities. As co-director of the Wisconsin Program for Scientific Teaching she has helped develop, implement, and disseminate a mentor training seminar. As associate director of Delta, she has helped to develop and support a teaching and learning community for graduate students, post-doctoral researchers, academic staff, and faculty aimed at helping current and future faculty succeed in the changing landscape of science, engineering, and math higher education. She helped develop and assess DCC, and acted as co-instructor in DCC1 and DCC2 (Fall 2005) and a 2-week summer version.

Sarah Miller Lauffer is the co-director for the HHMI-funded Wisconsin Program for Scientific Teaching and is involved in the National Academies Summer Institute on Undergraduate Education in Biology. For her work in developing and teaching at the Summer Institute, Sarah was named a National Academies Education Mentor in the Life Sciences in 2004. Sarah is a co-author of Entering Mentoring: A Seminar to Train a New Generation of Scientists. Her graduate work investigated how plant defense genes affect microbial communities affiliated with the rhizosphere. She helped develop and assess DCC1 (Fall 2005).

Dr. Jo Handelsman is the Howard Hughes Medical Institute Professor of Plant Pathology at the University of Wisconsin-Madison. Her research focuses on the genetic and functional diversity of microorganisms in soil, on roots, and in insect gut communities. In addition to her passion for understanding the secret lives of bacteria, Dr. Handelsman is dedicated to improving science education and the advancement of women in research universities. She is Director of the Wisconsin Program for Scientific Teaching, funded through the Howard Hughes Medical Institute Professor's Program, co-Director of the National Academies Summer Institute for Undergraduate Education in Biology, and co-Director of the Women in Science and Engineering Leadership Institute (WISELI), at the University of Wisconsin-Madison. She helped develop and assess DCC and acted as co-instructor in DCC1 (Fall 2005).

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Section II: Course structure

A. Course philosophy

Like the 3 pillars of CIRTL, the DCC course had three overlapping concepts that structured our teaching practice. However, we did not articulate these concepts as such until writing this manual because we were not aware of how important they were to the implementation until we contemplated trying to tell others about it. Without these concepts, we feel the course would have been hypocritical: a "do as we say, not as we do" problem endemic in so much STEM teaching already (as outlined in Handelsman et al., 2004). In this section, we outline these three values and provide examples of how to integrate them to your teaching, as well as some assessment data that suggests their effectiveness.
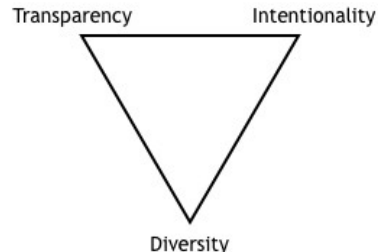
Diversity

It might be redundant to say, in a course on diversity, that we wanted to value diversity. We tried to do this through several deliberate activities, including:

- Valuing individuals' personal experiences
- Highlighting participants' voices
- Recognizing the variety of learning preferences and choices

This particular focus on diversity stems from feminist critiques of science, particularly the work of Dorothy Smith (1987) and Angela Calabrese Barton (1998). Smith, a feminist sociologist, argued in the 1980s and 1990s that sociological theory didn't seem to be able to be applied to actual people, that she as a single mother and newly minted PhD could not see herself and her work patterns in the theories of work of academic sociologists. She argued for a sociology that could explain the "everyday/every night" experiences of everyday people— particularly of women, whose work was largely overlooked by academic sociologists of that period. For Smith, the actual experiences of people formed data that acted both as a methodology for developing theory and as a critical check for theory. We tried to keep this in mind when teaching this course: our students have data to bring to the topic of diversity in the form of their experiences, and that theories about diversity, about people with diverse backgrounds in science and in university contexts are needed to both challenge and encompass our participants' experiences.

Barton, when a professor at Teacher's College in New York, also taught general chemistry in a community college context where her students were usually adults trying to complete their General Education Degree (GED, a high school equivalent). As a scientist, feminist, and adult educator facing a class of students, many of whom had been discouraged from learning science earlier in their lives, she felt that teaching chemistry in this context both required a complete rethinking of the traditional introductory chemistry curricula and provided the intellectual space and opportunity to do such a thing. She rethought the order of traditional content and the examples and demonstrations. For example, rather than demonstrating the relationship between the temperature and volume of a gas with Erlenmeyer flasks, rubber tubes, balloons and Bunsen burners, she asked her students to try and find instances of this temperature-volume relationship in their daily lives. Students came back the next class and told stories of boiling pasta in a pot on the stove and pumping up hot car tires— stories that came from their everyday lives. In this simply transformed activity, all the students had something to contribute rather than just listening to the instructor, all the voices of students were actually heard during a class, and with the diversity of examples they had each chosen to bring, students had a better understanding of the temperature-volume gas relationship that formed the content of this course. We tried to provide similar kinds of opportunities to highlight students' voices and experiences and to allow them to make choices about what and how they wanted to contribute to the discussion and learning of everyone else.

Transparency

One of the critiques of "normal science" is that standard research practices— such as writing in the passive voice, or using prefabricated research kits— suggest objectivity while hiding the personal motives, beliefs, or purposes of the people doing the research itself. Writing in the passive voice encourages readers to forget that an actual *person* had to inject 50 mL of solution or anesthetize an animal or prepare a slide, which also allows the reader to overlook the possibility of mistakes or biases sneaking into the protocol.

This can be the case in other areas too, like writing a course manual or teaching a course. By framing teaching in the passive voice or third person, we could remove ourselves from your view. We could refer to "the instructors," people who never misspeak, make mistakes, or misjudge things.

As neither of these are the case nor our intent, we have tried to be as *transparent* as possible about our decisions, intentions, and mistakes, both in the teaching of DCC and the writing of this manual. In DCC, we explained to participants what our reasoning was behind reading selection, content (through our "content decisions handout": see p. 74 for a description), course activities and assignments, and so on.

Intentionality

One of the more powerful ideas of the liberatory education movement of the 1960s was that educational institutions (K-12 schools, universities, etc.) instructed students in more than the official curriculum of school boards. In particular, schools socialized students into certain ways of being and knowing— in other words, how one must behave in school or general society, how one learns things (through reading texts, listening to experts, and then reporting what one read or heard on exams), what kind of knowledge is valuable and valued (European history, science as done by professional males in white coats, literature in English from a certain time period) and so on. This was called the "hidden curriculum" (Jackson, 1968) and has formed the basis of much research on schools and education since then. For example, Jean Anyon did a series of studies in the early 1980s that looked at schools that taught students of different socioeconomic classes. In one (1980), she analyzed how they were taught math, how their classroom environments were constructed, how teachers interacted with the students, and how the students articulated how they "knew" things. She concluded that there were vast differences in these and other dimensions, and that they varied along class lines based on what was assumed to constitute each group of students' future work path, from menial physical labor for working class students, to how to "twist" the rules for the managerial class students.

In teaching DCC, we tried to be intentional in how we decided to teach what we did. We wanted to make sure that what participants were learning was along the same lines as what we intended them to learn. We tried to question what curriculum might be "hidden" in our context, and make explicitly reasoned decisions for doing things one way rather than another. While we don't know what hidden curriculum our decisions still undoubtedly outlined, we think that making intentionality part of the teaching decision process is important.

B. Course themes

DCC1

This reading-oriented part of the course followed four themes that have emerged from the literature on diversity:

Foundation

Foundational knowledge on the topic of diversity and its particular application within STEM/SBE educational contexts. What do people mean when they use the word "diversity?" In what contexts is it used? What are some of participants' ideas about why it is used in these contexts?

Research on bias

Experimental and analytical work on bias, prejudice, and assumption. How do aspects of diversity affect the judgments do we make about people and their work? This theme formed a basis for developing self-awareness and reflection on the biases and assumptions we bring to subsequent course material.

Ways of knowing, ways of learning

Theoretical work on diversity in education has often used the theme of "ways of knowing," to describe the different research traditions and cultural traditions that people use to make sense of their worlds. Experimental work examines "ways of learning"— practices that promote learning of diverse groups of people. How do we reconcile the ideas of these disciplines with the research on bias? How do we extrapolate from research showing group differences without imposing a new set of stereotypes and prejudices?

Action: where now from here?

As teachers, and as scientists and engineers, we hold power. How does our developing understanding of diversity inform our use of that power? We studied what others have done and brainstormed collectively and individually about ways to address diversity in our own teaching of the physical, natural, and social sciences, engineering, and mathematics.

DCC2

This project-oriented part of the course focused on two themes based on the classroom research literature:

Alignment

One of the things that participants (and instructors too!) found extremely challenging was the idea that course learning objectives should be measurable and that course assessment activities (exams, papers, student evaluations) should accurately evaluate course learning objectives. Many participants are shocked to find that traditional assessment techniques tend *not* to assess learning goals, but instead are incorporated into course design because of convenience, tradition, or the expectations of others. We constantly encouraged participants to focus on what they wanted their project's learning objectives to be and align their assessment strategies to with those objectives to determine whether their objectives could be met.

Rigorous teaching research

Through our working with participants in other CIRTL courses and offerings, we have learned that many scientists (whether social, natural, or physical), engineers, mathematicians, and so on, believe that they cannot do rigorous research in their classrooms, that only educational

researchers can do this. While formal education research indeed sets a high bar, CIRTL researchers (Connolly et al., 2005) have argued that there are more attainable ways that STEM/SBE practitioners can study their classrooms in ways that can both improve their future practice and inform others engaged in similar pursuits.

This other level of research is called by a variety of names, including classroom research, classroom assessment, action research, classroom action research, research-led teaching, scholarship of teaching (or scholarship of teaching and learning, "SoTL"), scientific teaching, and even teaching-as-research. What is common to each of these terms is the systematic reflection and analysis of one's own teaching practice. Scientists and engineers (whether focused on the physical, natural or social sciences) are trained in the application of research methods to their disciplinary areas; we encouraged them to train their analytical gaze on applying the same kind of questioning to their teaching through the idea of teaching-as-research.

C. Course schedule and assignments

DCC1 schedule

Week Date	Topic	Readings	Assignment due
Foundation			
1	Diversity defined	No reading	Teaching statement-1st draft
2	Value of diversity	McLeod, Lobel and Cox 1996 Nemeth 1985 Chan 2001 Sands 2001	
3	Unconscious bias, prejudice, and stereotype threat	Steele & Aronson 1995 Steinpreis, Anders & Ritzke 1999	Classroom Observation: 1st classroom observation and reflection OR Syllabus Development: Modified syllabus from a course taught in your discipline
Ways of Knowing, Ways of Learning…			
4	Ways of learning: Biology, practice, and environment	Angier & Chang, 2005 DeHaan 2005	

5	Race, gender, and pedagogy	Little Soldier 1989
		Choice of:
		    Knapp & Woolverton 1995
		    Irvine & York 1995
			Classroom Observation: 2nd classroom observation and reflection
			OR
			Syllabus development: Modified syllabus from a course taught in your discipline

6	Multicultural and feminist pedagogy	Banks 1995 Calabrese Barton 1998 (ch. 2)	Teaching statement-2nd draft
Action: where to from here?			

7	Participant action plans	Riley 2003
		Choice of:
		    Middlecamp 2006
		    Blair, Ma and Lenton 2001
			Action plan

Post-course			Course evaluation

Description of DCC1 assignments

Reading Assessment

Participants were expected to do all of the readings for each class session. For each class session, one team of students was assigned the job of developing a "reading assessment" that we will all do at the beginning of class. The reading assessment could be a quiz, a puzzle, or a short problem to solve that is based on the reading. Reading assessments should take no longer than 10 minutes and should assess understanding of the key points of the "lead reading" for that day (designated on the syllabus).

These exercises are often more useful for the participants who are designing them than the other participants in class. We sent each team of participants some feedback from the instructors after their implementation to help them digest how the exercise went from our perspective. As will be discussed in the week-to-week section of this manual, it is also worthwhile in class to ask the participants leading the exercise to discuss the learning objective(s) of their exercise, and share why they felt this was the most important thing to design around in their opinion. Subsequent teams may then be able to benefit.

Choice of Classroom Observation OR Syllabus Development

Option 1: Classroom Observation

One of the most effective ways to improve one's own teaching and learning practice is to observe the practices of others. Based on their observations of the students and the teacher in a given classroom, participants considered what "worked," what didn't, what was missing, and how they might teach a similar topic in the future. For this assignment, participants were asked to:

"Observe a class being taught in your discipline. While you are observing, you might consider the following questions:
- What worked well in this class? Who did it work well for?
- What did not work well? How could it be improved?
- How ethnically diverse was the student population? Is there a relationship between ethnicity and seating patterns or student participation?
- As a student, how well does this instructor's teaching style/approach match your learning style?
- Consider the learning atmosphere: was the flow of knowledge uni-directional or shared?
- Did the instructor take full advantage of the diversity in the classroom in order to gain a wider perspective?"

For the second part of this assignment, participants were asked to observe a different class and reflect on their experience, considering the same questions as above. They were asked to consider whether they were more aware of certain aspects of diversity than during the first observation and whether it was easier for them to come up with ideas for how they would improve the teaching and learning if they were teaching the class.

Option 2: Syllabus Development

One of the first tasks we face when teaching a course for the first time is developing a syllabus. In many senses, a course syllabus is a distillation of the instructor's hopes and intentions for the course. For the first part of this assignment, participants were asked to:
- "Acquire (from faculty you've worked with, from friends, from your pile of notes from your undergraduate days) a copy of a syllabus for a course that you may have to teach in the future
  OR
- Bring a syllabus for a course you have already developed and taught."

For the second part, participants were asked to retool this syllabus based on the conversations about diversity we had had in this course. They were also asked to consider how, if at all, is a syllabus where the instructor is highly concerned with issues of diversity different from one where the instructor is not?

Teaching Philosophy: The Diversity Component (2 drafts)

Applications for teaching positions often include a teaching statement or philosophy. Participants were asked to develop *part of* their teaching philosophy that directly incorporates the concept of diversity.

Action Plan (1 draft)

We wanted participants to leave this course with an articulated "action plan." This could be either an immediate plan for what they would like to do for their participation in the second module of this course series or (for those not going on) for something they'd like to do later in their careers.

Course evaluation

Because we hoped to revise and improve DCC1 for future semesters, participants were required to complete a course assessment as a class assignment at the end of the course. The evaluations were conducted electronically and anonymously, and completion of the evaluation was considered as part of participants' grades.

DCC2 schedule

Week	Class plan	Assignment due
1	Introduction Course goals construction Guest: Don Gillian-Daniel, Delta Internship Program	Bring your action plan from the previous course.
2	Doing rigorous teaching research: • Delta's pillars • WPST's scientific teaching DCC Open Forum: structure and scheduling	Read: • Delta Pillar one-pagers • Handelsman et al., 2005 Initial project description due
3	Working time and project advising Guests: TBA	
4	Personal project progress • Informal sharing of project progress and problems	WORK ON YOUR PROJECT AT HOME
5	Revisiting rigorous teaching research , including development of evaluation plans for each project	
6	Peer review session: guidelines and practice Ideas and questions about forum displays	Bring whatever materials, text, drawings, files, ideas you have created to share with your peer-reviewers
7	Translating projects to visual media	Project write-up due
8	DCC Open Forum (Open to the public, including your guests!)	Visual display of projects due
Post course	Course evaluation	Complete online course evaluation

Description of DCC2 assignments

Project development

The main purpose of this course is to provide participants with the structure and support to develop, and perhaps implement, a project of their choosing regarding the topic of diversity in STEM/SBE education. All classroom activities and most assignments were organized around this

project development. Participants' projects could be based on the action plan they developed from DCC1 or a different idea they had.

Participants were invited to consider the following possibilities:
- Design and develop instructional materials (i.e., labs, case studies, problem-based learning activities, etc.) that can be used to educate faculty or students about diversity or enhance diversity in the classroom. Instructional material could be developed to teach:
  o Undergraduate students about the value and impact of diversity on their college experience
  o Faculty how to be sensitive to diversity issues in their classroom
  o A seminar on the value of diversity for colleagues or administrators

  Ideas might include:
  o A video about group dynamics and diversity in the classroom for undergraduates
  o An accessible database of literature on diversity
  o A collection of examples of diverse scientists or of your discipline taught in a social context
- Write a broader impact proposal for a grant you are planning to submit that incorporates some of what you have learned in this course into reaching broader audiences
- Write a paper (and submit it for publication!) regarding how the topic of diversity is treated in your discipline
- Develop a Web site on the roles of women, ethnic minorities, people with disabilities, or other populations on the development of your discipline
- Develop a course module that integrates diversity into an existing disciplinary course that you may need to teach some day
- Write the diversity focus of a Delta internship proposal or a proposal to integrate diversity into an existing internship offering
- Research the history of your discipline and the contributions (or reasons for the lack thereof) of women and minorities to your field. Develop an informal educational product (Web site, poster, leaflet, museum exhibit) to share this history with others
- Other projects focused around diversity in science and engineering teaching

Project initial description:
To make the best use of the 8 weeks we had together, we asked that participants bring a 1-2 page write-up about the project they wanted like to pursue during this course. We asked them to include consideration of:
- The goals of their project (and why these goals are important to them and their students)
- The audience for their project (and why they chose this audience)
- A short literature review/other background to support their idea
- What evidence they might need to prove the worth or success of their project

Peer review activity:
In university contexts, we often engage in activities which are determined academically acceptable if a selection of our peers have agreed that they are. We designed peer review into the structure of this course to give participants some experience in reviewing others' academic work, and to receive feedback on their own project from others engaged in similar pursuits.

Participants were asked to:
- Informally present their work to two of their peer participants

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- Provide specific, thoughtful feedback to two of their peer participants orally and by completion of a peer-review rubric that we provided.

Project write-up and submission:

In addition to developing whatever project they liked, we requested that participants write a short (5-10 page) paper describing the project. This paper was supposed to include the following:

- A description of the diversity-related issue/challenge they are addressing
- A rationale, supported with literature or a needs-assessment, for doing this project
- A description of their audience
- A description of their approach, supported by any relevant literature
- A plan for how they have assessed/will assess or evaluate the success of their project
- A reflection on the development process (and, if relevant, the implementation) of their project

In addition to this, we asked for some kind of representation of their project to be submitted. For example, if their project was:

- To create a video to be shown to faculty, then they should include the script
- To write a paper for publication, then they should include a draft
- To build a Web site to educate kids about your discipline, then they should include a mock-up or set of storyboards
- To develop a module on the historical context of your discipline to be included in an intro geology class, then they should include class plans, handouts, a syllabus, or whatever else may be relevant
- To redesign a lab you teach to be accessible to people with visual impairments, then they should include a video of how a real person with this disability tried out their modifications

DCC Open Forum presentation:

We wanted to give participants the opportunity to share a visual representation of their projects, at whatever stage they were at by the end of the semester, in an "open forum" to members of the Delta teaching and learning community, the Wisconsin Program for Scientific Teaching community, and the broader UW-Madison community. As a group, we discussed what this forum would look like as part of the course including its goals, the activities we would do to accomplish those goals, and how we would assess our success.

Course evaluation

Because we hoped to revise and improve DCC2 for future semesters, participants were required to complete a course assessment as a class assignment at the end of the course. The evaluations were conducted electronically and anonymously, and completion of the evaluation was considered as part of participants' grades.

Section III: Week-by-week plans

A. DCC1: 7-week semester version

In reading this section, you will see *italicized paragraphs*: this text consists of detailed descriptions and explanations for why we did what we did and whether we would recommend revising it for successive iterations.

For each week in DCC1, we describe our class goals and activities we had planned. We outline the materials we used each week and the main preparation tasks we needed to do before each class. We remind the reader of what the participants are expected to do ahead of class and provide a sketch (with estimated times) of the activities we planned. We include a list of handouts we prepared, including our "content decisions" handout – text of the actual handouts are included in Section IV of this manual and may be photocopied directly as you find appropriate.

Finally, for most weeks, we articulate our assessment strategy. Some of the assessment we did was qualitative and based on instructor observation of the class, while other assessment was more explicit and was based on activities that came at the end of class. Most assessment was done on the course evaluation at the end of the 7 weeks of this course. At the end of each week, a short table summarizes the assessment strategy; the table headings of "participation," "satisfaction," "information," "application," and "impact" are described more fully in Section V.

Estimated timings are based on a 2-hour per week class period. We tried to take a 5-minute break halfway through the class each week. We regularly went overtime and thus we suggest increasing the time of the course to 2.5 or 3 hours for successive iterations.

Week 1: Defining diversity

Class goals
- Introduce participants and instructors to each other
- Lay out plans for the semester
- Articulate individual and group-constructed definitions of diversity to guide the rest of the semester

Materials needed
- Visual Explorer photos (Palus et al., 1999)
- Enough photocopies for all class members of:
    - Syllabus (not included)
    - Reading assessment handout (see Section IV)
    - Content decision handout (see Section IV)
    - Consent forms (not included)
- Markers
- Post-its
- Big post-it paper for board
- Colored paper for individual concept maps
- Chalk
- Snacks

Assignment/readings done in advance
> *Prior to the first class, we asked participants to write a draft of the diversity component of a teaching philosophy (described on p. 21). The draft of this e-mail follows.*

> Hello everyone --

> We are looking forward to seeing you at our first class on Sept. 13th from 10 am - 12 pm in 594 Russell Labs. We mentioned in our last e-mail that, while we are not able to meet this week, we would like you to do a little thinking and writing in advance of our Sept. 13 meeting, so we can hit the ground running. Here is a description of the assignment:

> You are writing a teaching philosophy to include in your application packet for a variety of academic jobs. You want to include something in the overall teaching philosophy about diversity. Write us a draft of what you might say about diversity as part of your philosophy (max. 1 page).

> We will collect this assignment on Sept 13 in class.

> Please let us know if you have questions. See you on Tuesday!

Class activities

Welcome! (5 min)
> Plan for today will be intros, course overview, topic of the day

Visual Explorer introductions (25 min)
> *We decided to use the Visual Explorer as an icebreaker activity with some relevance to the topic of diversity. Instructors lay out as many 8x10 color photographs as will fit in the room, aiming for at least a 4:1 photograph to student ratio.*

> Directions: Choose a picture that represents what diversity means to you. (5 min)

Share your name, department, picture, and why you selected this picture. (20 min)

Sum up: The reason we did introductions this way is because we wanted to introduce to you an "ice-breaker" strategy. This is a visual way to introduce yourselves, which not only benefits the visual learners in the group (who might remember you by your picture) but also aural learners after hearing everyone's descriptions.

It is also a visual representation of the diversity among us— all of us were asked the same question, saw the same photos, but chose different ones to represent ourselves.

Course overview (25 min)
Spend some time going over the course syllabus. We emphasized the broader course structure of foundation, research on bias, ways of knowing and learning, and action. We also described the assignments and the instructors' goals for them, and then we took questions.

We did not spend much time here talking about the Reading Assessments, because we wanted to see what participants would come up with on their own. However, as the course progressed, at least one instructor felt like participants needed a bit more direction. In particular, she felt like participants should reflect a bit about what the important points of the article rather than simply design a marvelous but disconnected activity. She recommends encouraging students engage in a meta-analysis of their activity by discussing:
  - *What were your goals in this activity?*
  - *What was your process for coming up with this activity?*
  - *How well do you think it worked?*

This also provided room for discussion by the group regarding the activity, particularly about how they felt completing the exercise.

We passed around a sign-up sheet for people to select the week that they wanted to do their reading assessment. This allowed students to form groups based on interest.

Consent forms (5 min)
Because this course is part of a broader research project known as CIRTL participants needed to read and complete a consent form. If you are considering implementing this (or a variation of this) course and then share your results (through a publication), you will need to go through your institution's IRB approval process.

Personal concept map (10 min)
We wanted to collect various forms of student work to assess their learning over the length of the course. We used this time to introduce students to the idea of a concept map and encouraged them to use this tool to explore their thoughts about what "diversity" meant for them. We intended to do this activity again in the last class session and do a qualitative content analysis to compare the two. This latter idea was less successful than we had intended.

Introduction to concept maps:
- Concept maps are broadly defined as graphical representation of information.
- They usually include containers/aspects, and something indicating the relationships between the containers/aspects.
- You may make as much or as little meaning from containers (boxes, circles, etc.) or lines as you intend (and make clear).

Directions:
Draw a concept map of what you think diversity means to you as a teacher (or future teacher). On top, write the last 4 digits of your phone number or SSN— something that you

will remember but that we won't know. We are going to collect them, make copies, and give them back to you next week.

Group concept map (20 min)

We then wanted participants to try to collaboratively develop a "group" concept map. This activity encourages contributions from all participants (even the more shy or quiet ones) and visually demonstrates the "diversity" of definitions.

Directions:
1. Take post-it notes and write all the "aspects" from your individual map that you can. List one aspect per post-it.
2. [Instructors write DIVERSITY on board.]
3. On board, the word DIVERSITY is written. Place your post-its around this word in a way which is meaningful to you AND relates to the way others are putting their post-its up. We'll help.
4. [Copy map down, or photograph?]
5. [If appropriate, after the map is copied down, instructors can reorganize post-its into a frequency histogram.]
6. The new histogram is a map of where the class is now and can show us where we can go over the semester.

Variation:
Use the post-it notes to create a histogram for each category that participants develop. This requires a little more conceptual integration time. In addition, if participants have many different categories, you might run out of board. However, it has the advantage of being analogous to bar charts familiar to many STEM/SBE students and faculty.

Concept map discussion (15 min)

Possible discussion questions:
- How are these different aspects related?
- Why are these ones important to include?
- Did you decide not to include something? Why?
- Are there any remaining holes?

Wrap-up: This is a broad definition of diversity. You will see in the literature on diversity in STEM/SBE education tends to focus on race and gender, and broader discourses in education and culture often focus on race. Hence, at a first approximation, our conversations will be focused around these categories. However, all of these things should remain in your mind as additional and moderating factors when we have our discussions. We will try to bring them in explicitly as we can, and we hope you will too.

You can transfer post-its on the board to flip chart paper, or do the activity on flip-chart paper from the beginning. It is useful if an instructor takes this concept map home and transfers it to some electronic medium (in PowerPoint, Illustrator etc.). Copies can be distributed to the class next week.

A word about readings in this course (15 min)

Many of the readings we selected for this course are more along the social-science axis than physical or natural science axes. This may be the first social science research many of your participants have read. As a result, it is important to provide a quick primer to social sciences methodology. It also might be worth while to spend 10 minutes giving students pointers on how to read quantitative statistics when applied to people. We did not do this, and found that the subtleties of many papers' results were often lost in participants' discussion.

Remind participants of the readings for next week and how to find them. *We scanned readings and posted them online. However, some participants with visual impairments may not be able to read these. In this case, text can be scanned and the image turned into text using character recognition software. Your disability services center can likely help you with this.*

Two key ideas to keep in mind while doing readings for this course are:
- Understanding the level of analysis is important, particularly for considering how generalizable the results might be. Is the paper at the micro (individual), the meso (group or organizational), or the macro (societal) level?
- When reading studies' methodologies, also look for what is unsaid. When a researcher writes about their subjects, first, do they tell you about gender, race, age, background, socioeconomic status, etc? In addition, do you think that including this information makes a difference to how you understand the results?

Handouts (see Section IV)

Reading assessment handout
Content decisions handout

Assessment

Two pre-course artifacts are collected in week 1: the pre-course diversity statement, and the individual concept maps. These were to be combined with post-course diversity statements and concept maps for the purpose of a pre-post content analysis. This worked well for the diversity statements, but not the concept map. While the participants said they found it an interesting activity, the lack of discussion and disconnected nature of the activity was problematic. It is probably worth doing again, but either as a pre- or post- activity, with more discussion and modification time.

Specific final course evaluation questions focused on:
- *The utility of the diversity statement*
- *The value of this session overall*

Overall:

	Mode of inquiry
Participation	*Instructor observation*
Satisfaction	*Re: readings- final evaluation*
	Re: class- final evaluation
Learning	*Pre-course concept map*
	Diversity statement
Application	*Open question on final evaluation*
Impact	*None*

Week 2: Value of diversity

Class goals
- Understand why participants are taking this class and what teaching experiences they already have
- Introduce participants to the process of Reading Assessments
- Participants familiarize themselves with the small group literature about the value of "minority" opinions
- Increase awareness of the multiple reasons institutions/disciplines give for valuing different definitions of diversity

Materials needed
- Appropriate number of copies of
  - Delta Teaching portfolio guidebooks (available at http://www.delta.wisc.edu)
  - "Classroom observation" handout (see Section IV)
  - "Content decisions" handout (see Section IV)
- Folders and markers for table-tents
- Original concept maps from last week
- Snack

Advance preparation
- Scan and label all of the pre-course concept maps (in color) so the originals may be returned during class.
- Create an electronic version of group concept map to be copied and given out next class.
- Develop content decisions handout (described below).
- Sign missing people up for Reading Assessment slots.
- Check in with the group assigned to do the first Reading Assessment.

Assignment/readings done in advance

Chan, Sucheng. 1995. "You're short, besides!" in *Race, class and gender: an anthology*, edited by M. L. Andersen and P. Hill Collins. Belmont, CA: Wadsworth.

McLeod, Poppy Lauretta, Sharon Alisa Lobel, and Taylor H. Cox. 1996. "Ethnic diversity and creativity in small groups." *Small group research* 27:248-264.

Nemeth, Charlan Jeanne. "Dissent, Group Process, and Creativity: The Contribution of Minority Influence." Advances in group processes 2 (1985): 57-75.

Sands, Aimee. 2001. "Never meant to survive, a Black woman's journey: An interview with Evelynn Hammonds." Pp. 17-25 in *Women, Science and Technology: A Reader in Feminist Science Studies*, edited by M. Wyer, M. Barbercheck, D. Giesman, H. Orun Ozturk, and M. Wayne. New York: Routledge.

Class activities

Welcome! (5 minutes)

Check in regarding Web site access, readings access

Today's topic: "value of diversity"

Diversity anecdote

Each week we asked whether anyone would like to share a story about "diversity" that they had experienced the previous week. We called these "diversity anecdotes" and felt they provided participants with both the opportunity to use their own experiences as data, as well as aid in the formation of our class as a learning community.

Introductions (10 minutes)
- Have participants make name table tents.
- Everyone take 2 minutes to introduce yourself to someone you don't know already.
- Go around the room and ask participants to introduce each other to the group.
- Instructors take notes on participants' responses.

Reading Assessment (40 minutes)
Reading Assessment activity developed and implemented by assigned team

Additional points for instructors to make:
- How do these papers make use of "data"?
- How can these papers be used in making a case for diversity?

In the Nemeth reading:
- To what contexts can the Nemeth article be applied in participants' academic lives?
  - students' group work activities
  - introduction to tokenism and "critical mass" notion
  - diversity in research groups
  - minority member of faculty in departmental/service activities
  - other places?
- What might be interactions with race and gender in Nemeth article?

In the McLeod reading:
- What characteristics can we add to our definition of diversity?
- What is an "Anglo"-American? What is problematic about this term?
- What interaction is there with the population being studied and the task characteristic?

In the Sand and Chan articles:
- How do these articles include "data"?
- What do these articles add to the story about the value of diversity?
- Thoughts about Hammonds' experience at Spelman and Morehouse, and then at Georgia Tech and MIT
  - Diversity at all levels of education? Same sex or HBCU education?

Meta-analysis of the exercise
- To the group running the exercise, ask:
  - What were your goals in this activity?
  - What was your process for coming up with this activity?
  - How well do you think it worked?
- To all the participants, ask:
  - How did you feel completing this exercise?
  - What did you learn from a meta perspective?

Mini-lecture on value of diversity (25 min)
Science and education are strengthened by attracting diverse intellects and personalities to our classrooms and providing environments in which diverse people succeed flourish.

A scientific community benefits from diversity.
Good science necessitates building teams that contain members with different approaches, experience, and ways of thinking. Evidence from controlled research studies shows that heterogeneous groups are more creative in problem solving than homogenous groups (Cox 1993, McLeod et al. 1996).

Groups with a minority view defend their solutions to problems more effectively than those that do not contain a minority view (Nemeth 1985, Nemeth 1995). In studies of mock juries,

those that contained members of ethnic minority groups deliberated more effectively and processed information more carefully than juries that lacked ethnic diversity.

Studies of real life reinforce the results from controlled studies. A study of the teams that produced hit Broadway plays and high-impact scientific papers found that diversity of experience was a common feature of the most effective groups—the mixture of novices and veterans produced the most creative and successful teams (Guimerá et al. 2005).

Diversity also enhances education.

Studies of students in many different colleges and universities showed that a diverse student body produces better educated graduates who have more highly developed cognitive abilities, interpersonal skills, and leadership abilities (Astin 1993, Gurin 1999, Gurin 2002).

The scientific engine of the United States is not taking full advantage of the diversity or brainpower that it trains. In many fields, such as biology and chemistry, nearly 50% of the Ph.D.s have been granted to women for years, but the proportion of women in the faculty does not reflect this.

Particular arguments on the value of diversity:

  Scientific argument: there is no existing biological data that indicates women and people of color are incapable of "doing science."

  Economic argument: people with different life experiences than the majority population (whether defined by gender, ethnicity, age, nationality, ability, and so on) can bring different ideas, different ways of identifying, viewing and developing problems or solutions, and different knowledge and language to the practice of the sciences, engineering, or mathematics. These different life experiences can be transformed into different ways of viewing scientific problems and data, or developing new technology and consumer products. The groups (whether academic or industrial) that incorporate these new ways of viewing their work best will develop the most innovative or previously understudied areas, to the benefit of that group (new scientific ways of understanding the world, new mathematical solutions, or new products).

  Political argument: In contemporary American society, physical, natural and social scientists and engineers wield a tremendous amount of institutional, economic, and environmental power, and this argument points out it is socially problematic for a large proportion of the American population—whether women or people of color—not to be included in the application and distribution of this power. Brown University President Ruth Simmons, who was president of Smith College when it developed the first engineering program at a women's college, has argued that "Engineers literally design and build much of the human environment. Women must not accept so marginal a role in so important a field." (Simmons 2002)

  Legal argument: It is *illegal* to discriminate against individuals and groups based on many characteristics such as gender, ethnicity, age, family status, class, and so on. Some groups have argued that it is legal to discriminate based on ability, sexuality and nationality, however. (This can serve as an interesting topic for discussion!)

Ask participants to discuss other values of diversity:
- Are there any disciplinary differences, like between math and biology, or physics and psychology?
- How has "diversity" been valued differently at different historical times?
- Is there a difference in how "diversity" is interpreted or defined in a community context compared to academic context, or an industrial context?

Assessment: "burning issues" roundtable (5 min)

Go around the table and ask everyone share one sentence about something they're leaving with today. No comments or discussion, just listen to what others are thinking about today.

Notes on assignments for next week (5 min)

CLASSROOM OBSERVATION HANDOUT

Explain to participants that, in this course, activities and assignments are supposed to be useful to them above and beyond their interest in the topic. These assignments:

- Can be included in teaching portfolios
- Will give them pedagogical techniques that one can use in one's future classes; and
- Will give them experience to talk about in job interviews

Handouts (see Section IV)

Sanders article on group dynamics (Sanders, 1996)
Content decisions handout
Classroom observation handout

Assessment

We did two assessment "activities" today. For next few weeks, every class includes a Reading Assessment designed and implemented by the participants. While this does not always provide an accurate assessment of what the whole group of participants have learned from the readings, the instructors observing the exercise can make some qualitative assessment notes about misunderstandings, the direction of the exercises, and to what extent each person in the group is participating. We encouraged people to share something significant they were thinking about upon leaving class. Instructors can use this information to help structure how they approach future topics, as well as how to rethink material from today based on any misconceptions or remaining issues that arise in this roundtable.

Specific final course evaluation questions focused on:

- *The value of today's readings*
- *The value of this session overall compared to other sessions*

Overall:

	Mode of inquiry
Participation	*Instructor observation*
Satisfaction	*Re: readings - final evaluation* *Re: class - final evaluation*
Learning	*Reading assessment* *"Burning issues" roundtable*
Application	*Open question on final evaluation*
Impact	*None*

Week 3: Unconscious bias, prejudice and stereotype threat

Class goals
- Understand unconscious bias, prejudice, and stereotype threat and how these phenomena can impact our teaching as well as student learning
- Understand that we all carry unconscious bias and be able to deal with our biases so that they do not negatively impact our students
- Have strategies for dealing with unconscious bias and prejudice in the classroom
- Know that stereotype threat exists and how to minimize its impact on your students

Materials needed
- Folders and markers for table-tents
- Content decisions handout (see Section IV)
- Action plan handout (see Section IV)
- Diversity Institute resources (available online at http://www.cirtl.net/DiversityInstitute/)
- Snack

Advance preparation
- Prepare Content Decisions handout
- Send feedback to group that facilitated last week's Reading Assessment

Assignment/readings done in advance

Steele, Claude M. and Joshua Aronson. 1995. "Stereotype threat and the intellectual test performance of African Americans." Journal of personality and social psychology 69:797-811

Steinpreis, Rhea E., Katie A. Anders, and Dawn Ritzke. 1999. "The impact of gender on the review of the curricula vitae of job applicants and tenure candidates: a national empirical study." Sex roles 41:509-528.

Participants will have classroom observation #1 *or* a sample syllabus they plan on redesigning ready to turn in.

Class activities

Welcome (10 min)
Any announcements to share with the group?

Today's topic and plan for class: last set of introductions, reading assessment, break, short lecture and discussion, final assessment

Diversity anecdote?

Introductions (15 min)
Go around the table and ask participants to share their name, and what assignment did they did. If they did the classroom observation, what was 1 major thing they noticed that they'd like to share with the group? If they chose the syllabus, why did they choose it and what did they notice about it upon selection?

Reading Assessment (30 min)
Invite the participants organizing this activity to do a meta-analysis of their activity:
- What were their goals for this activity?
- What were they trying to assess from the readings?
- Why did they choose the method they did?

Additional comments to make if necessary:

In the Steele and Aronson article:

- Ask about the difference between Black and African-American (race and ethnicity). What is behind the difference in the terms we use? What about White and Jewish (as mentioned in the opening)?
- Might there be a statistical effect resulting from:
  o The fact that participants in the study are college students?
  o What about that all the participants were women in Study 2 (might the cause of the dearth of Black men influence the results)?
  o What about students with disabilities -- were they included somehow?
  o Would people of different races, genders, abilities feel stereotype threat differently?
- What does it mean that the mean scores are statistically different? How do the error bars influence how we understand the results of this study?

In the Steinpreis et al. article:

- Go over the statistical ideas of "main effects," "interaction effects," p-values, F-values and so on
- The authors modified the CVs to remove any political/professional organizations that might identify the CV author as female. What might be other arguably gendered markers that would be harder to change on a CV? (Study interest? Break in career for raising children? Or none?)
- What might have been the impact if the name included was racialized? How about comparing a "Black" name with a "Asian" name, or a "Jewish" name with a "Catholic" name? What do these patterns that we suspect say about our own understanding of race?
- Now that we know such issues exist, what do we do about it?

Mini-lecture (40 min)

Although most people consider themselves fair, objective, and unprejudiced, everyone brings bias and prejudice to interactions with other people.

- If subjects are asked to judge a set of credentials, they rated the quality of the materials lower if told the credentials were for a woman than for a man (Olian et al. 1988, Steinpreis et al. 1999).
- When asked to rate a subject's verbal ability based on a paragraph of text, evaluators gave a lower rating if they were told the paragraph was written by an African American person or a woman than if they thought it was written by a white person or a man (Biernat and Manis 1994).
- One research group sent a résumé of a real person to a large group of academic psychologists and asked them whether they would hire the person. The frequency of positive answers was substantially higher if the résumé had a man's name than if it had a woman's name (Steinpreis et al. 1999).
- In another study, evaluators were given a description of a person's career path and photograph of the subject and asked to judge whether the person's success was due primarily to ability, luck, or political skills. If the subject of evaluation was attractive, the attribution was quite different than if the subject was unattractive, but the trend was gender specific: more raters attributed success to ability for attractive than for unattractive men, but the response was reversed for women subjects, whose success was twice as likely to be attributed to ability if they were unattractive.
- Evaluation of postdoctoral fellowship applications in Sweden indicated that for male applicants, "impact scores" based on the number and impact of applicants' publications were tightly correlated with "competence scores," which were used to rank the applicants and award fellowships. For women applicants, however, impact scores were much less well correlated with competence ratings and women needed to have many more publications (the equivalent of 3 more papers in Science or Nature and 20 more papers in a

specialty journal such as Neuroscience) in order to achieve the same "competence rating" as their male counterparts (Wenneras and Wold 1997).

- In professional music, symphony orchestras experienced a 60% increase in selection of women following the installation of screens that obscured the gender of people auditioning from the evaluators (Goldin and Rouse 2000).

A key element of all of these studies is that in none of them does the gender of the evaluator show a significant effect on the results. This means that all of us are likely to bring similar unconscious biases to the classroom, even if we are the subject of those very same negative biases.

Stereotype Threat:
Selected references to refer to describe the phenomenon of students being reminded of the stereotypes associated with their background and the impact that has on their performance.

Aronson, J., Lustina, M.J., Good, C., Keough, K., Steele, C.M., & Brown, J. (1999). When white men can't do math: Necessary and sufficient factors in stereotype threat. Journal of Experimental and Social Psychology, 35, 29-46.

Gonzales, P.M., Blanton, H., & Williams, K.J. (2002). The effects of stereotype threat and double-minority status on the test performance of Latino women. Personality and Social Psychology Bulletin, 28(5), 659-670.

Inzlicht, M., & Ben-Zeev, T. (2002). A threatening intellectual environment: Why females are susceptible to experiencing problem-solving deficits in the presence of males. Psychological Science, 11(5), 365-371.

Steele, C.M. (1999, August). Thin ice: Stereotype threat and black college students. The Atlantic Monthly, pp.44-54.

Steele, C.M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. American Psychologist, 52(6), 613-629.

Steele, C.M. & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. Journal of Personality and Social Psychology, 69(5), 797-811.

Discussion (20 min)
Open the floor up for discussion using some of these guiding questions:
- Whose responsibility is it for dealing with the issues of diversity such as bias in the classroom?
- Should you be proactive? Should you try to minimize its visibility?
- How can the idea of "learning community" help you in dealing with issues of bias and prejudice? Ideas might include:
  - o Use class time to discuss issues of diversity
  - o Evaluate how included students feel in your class
  - o Encourage students to keep you and each other accountable with respect to issues of prejudice and bias
  - o What to do about bias & stereotype threat? How do we minimize this threat to our students? Whose responsibility is doing this in the classroom? Encourage participants to consider distributed responsibility, and how an instructor can motivate her/his students to take responsibility for responding to bias etc.?

Wrap-up (5 min)
Remind participants of readings for next week
Recap of main points of class

Handouts (see Section IV)

Action plan handout
  Our participants told us this handout did not give them enough information. We intend to include more suggestions for the write-up structure in the next course iteration.
Content decisions handout

Assessment

The in-class assessment today was done through instructor observation of the introductions: what did participants articulate as the reasons they chose the activity they did? What were the aspects they chose to share with the group as "interesting?"

Specific final course evaluation questions focused on:
- *The utility of the assignment turned in today*
- *The value of the readings*
- *The value of this session overall*

Overall:

	Mode of inquiry
Participation	*Instructor observation*
Satisfaction	*Re: readings - final evaluation* *Re: class - final evaluation*
Learning	*Reading assessment* *Classroom observation assignment* *Instructor observation of discussion*
Application	*Open question on final evaluation*
Impact	*None*

Week 4: Ways of learning: biology, practice and environment

Class goals
- Understand the need to group people to study them as well as the need for individual self-identification
- Understand the biological basis for how people learn
- Know various principles of learning such as constructivism and social learning principles
- Explore various approaches to help students learn
- Be able to actively engage students in their own learning and improve their learning through active assessment

Materials needed
- Copies of CIRTL demographic data form (see Section IV)
- Copies of "revised" demographic data form (see Section IV)
- Copies of content decisions handout (see Section IV)
- Folders and markers for table-tents
- Snack

Advance preparation
- Scan assignments turned in last week.
  If you want to use the classroom observation write-ups as assessment data, you need to decide whether you want to provide comments to participants on their assignments. If you do, the write-ups will undoubtedly improve for the second assignment, but you will have a harder time arguing that any improvements are due to participants' work in the class and not your specific comments on the first assignment.
- Prepare Content Decisions handout
- Send feedback to group that facilitated the previous week's Reading Assessment

Assignment/readings done in advance

Angier, Natalie and Kenneth Chang. 2005. "Gray Matter and the Sexes: Still a Scientific Gray Area." P. 1 in New York Times. New York.

DeHaan, Robert. 2005. "The Impending Revolution in Undergraduate Science Education." Journal of Science Education and Technology, 14 (2): 253-269.

Class activities

Welcome (10 min)
Plan for today, and today's topic

Diversity anecdote?

Demographic data exercise (20 min)
Provide participants with the "official" CIRTL demographic form, which asks participants to fill in their ethnicity, gender, ability/disability etc. using official NSF categories.

After they have completed this, collect it, and distribute the "modified" form, where the demographic aspects are followed by open response boxes rather than checkboxes.

Discussion: Which set of data would you use for a research project on the participants in this course? Why? What is the tension between the need to self-identify in a way that feels true to us personally, and the need to have categories for grouping data to use in research? How, if at all, might we resolve this tension?

Reading Assessment (35 min)
Invite the participants organizing this activity to do a meta-analysis of their activity:
- What were their goals for this activity?
- What were they trying to assess from the readings?
- Why did they choose the method they did?

Mini-lecture (25 min): Biology of How People Learn

Learning: Acquisition of new information that leads to a change in behavior
- Human brain is comprised of: 1011 neurons (DeHaan, 2005)
- Each neuron is capable of THOUSANDS of connections
- Average brain has 1015 neural connections
- Networks are unique to each person, and they can change.
- More stimulus leads to more complex neural networks

Implications for Learning
Learning must
- Account for and contend with existing neural networks
- Provide opportunity to challenge those networks and construct new networks.

How people learn:

1. PRIOR KNOWLEDGE
Everyone has an understanding of how the world works:
some ideas are correct, some incomplete, some wrong.

2. DISSONANCE
New information challenges these views. If consistent with the view, the info validates that view. If inconsistent, the difference must be reconciled and explained.

3. CONSTRUCTION OF NEW KNOWLEDGE
In reconciling how the new information contradicts a view, new neural networks form.

Importance of students knowing their own learning style and how they learn best.

You can help students identify their learning styles and help them continually assess their learning

Goals of Active Assessment
- Measure whether teaching & learning goals are met.
- Motivate students to take responsibility for their own learning.

Principles of Active Assessment
- Based on what we know about how people learn
- Ongoing, iterative process
- Provides feedback to both students and instructors about learning
- Creates safe space for students to check anxiety at the door, to take responsibility for their own learning, and to solve problems that challenge their world view

Discussion on assessment (20 min)
Introduce this activity as follows: "We would like to know if the students in this course are learning the major concepts. At the same time, we would like the students to be able to assess their own learning of these concepts. We would like to use this information to improve our own approach to the course and we would like the students to use the information to improve

their own performance in the course."

In groups of 2, discuss a strategy to achieve both of these goals."

Assessment discussion (5 min)

Ask participants what they think the main 3 points of the day were. Write all contributions on the board.

Wrap-up (5 min)

Reminder of readings for next week, and assignments that are due.
Recap of main points from class

Handouts (see Section IV)

CIRTL demographic form text
"Modified" demographic form text
Content decisions handout

Assessment

In-class assessment today consisted of instructor observation and the final assessment discussion in the last 5 minutes in class (the list on the board).

Specific final course evaluation questions focused on:
- *The value of the readings*
- *The value of this session overall compared to other sessions*

Overall:

	Mode of inquiry
Participation	*Instructor observation*
Satisfaction	*Re: readings - final evaluation*
	Re: class - final evaluation
Learning	*Reading assessment*
	Final assessment discussion
Application	*Open question on final evaluation*
Impact	*None*

Week 5: Race, class, gender and pedagogy

Class goals

- Participate in a reading assessment activity which elicits conversations about the main points of the readings
    - Many different learning styles that intersect with dimensions of diversity
    - Need to consider these when deciding on our pedagogies
    - Class is a major organizer of our educational system— its purpose, its methods, and whom it teaches what
- Develop familiarity with the concept of "hidden curriculum" and its impact on pedagogy with respect to race, class and gender
- Develop familiarity with the concept of "partial knowledges"

Materials needed

- Copies of mini-lecture handout (see Section IV)
- Copies of content decisions handouts (see Section IV)
- Copies of handout by Shihmei Barger (2005)
- Talking stone
- Snack

Advance preparation

- Prepare Content Decisions handout
- Send feedback to group that facilitated last week's Reading Assessment

Assignment/readings done in advance

Little Soldier, Lee 1989. "Cooperative learning and the Native American student." Phi Delta Kappan, October, pp. 161-163.
Choice of:
Knapp, Michael S. and Sara Woolverton. 1995. "Social class and schooling." Pp. 548-569 in Handbook of research on multicultural education, edited by J. A. Banks and C. A. M. Banks. New York: Simon & Schuster Macmillan. *OR*
Banks, James A. 1995. "Multicultural education: historical development, dimensions and practice." Pp. 3-24 in Handbook of Research on Multicultural Education, edited by J. A. Banks and C. A. M. Banks. New York: Simon & Schuster Macmillan.

Participants will have their revised course syllabus or their second classroom observation to turn in.

Class activities

Welcome (10 min)
Structure of today's class

Diversity anecdote?

Reading Assessment (40 min)
Invite the participants organizing this activity to do a meta-analysis of their activity:
- What were their goals for this activity?
- What were they trying to assess from the readings?
- Why did they choose the method they did?

Mini-lecture: pedagogy, hidden curriculum, and partial knowledges (30 min)

Start off with a definition of pedagogy. Ask participants to volunteer a definition.

One possibility: pedagogy is considered the method and practice of teaching. For convenience of today (and elsewhere in course), pedagogy constitutes:
- The defining of GOALS for your class/learning experience;
- The "delivery" or APPROACH for achieving those goals;
- The ASSESSMENT of whether you achieved your goals; and
- The REVISION either of your approach based on your assessment outcomes or of your goals based on your assessment.

One route for discussion: spend class going over different techniques that various people have used to make their pedagogies more diverse. These could include some popular ones like:
- Team composition— vary by learning style, skill, gender, and ethnicity, assign groups or not? Assign roles or not?
- Making content more socially relevant or culturally sensitive
- Varying content delivery— lecture, facilitated discussion, small group work etc.
- Varying room layout— circle vs. rows
- Varying how you elicit responses from your class— how long you wait, how public the answering must be, etc.

However, this suggests that these are the answers. They will help, but they're not IT. The literature on this kind of toolbox stuff is enormous and the quality varies considerably. You can read about some of these if you are interested through this handout on inclusive teaching. [BARGER HANDOUT]

Alternatively, we could develop a framework to help us learn how to judge this literature for ourselves and develop analytical tools for our own practice.

How did the readings for today deal with the notion of pedagogy?
- Little Soldier: modes of content delivery through carefully organized cooperative learning
- Irvine & York: learning styles that have implications for content delivery
- Knapp & Woolverton: most directly linked to how you determine the goals of your class, course, or even of education in general, although there is a wonderful section on pedagogy

Often, participants are already aware of the importance of multiple modes of content delivery, more of which they read about in the Irvine & York and Little Soldier articles.

Another important concept when considering pedagogy and diversity is the notion of the HIDDEN CURRICULUM. This is discussed in Knapp & Woolverton, although it applies to race, class and gender— it means the unintentional learning outcomes that come from how one teaches, and what one teaches.

As an example, Knapp & Woolverton discuss Jean Anyon, who did observations and interviews of different K-12 schools in the early 1980s serving kids from working class, middle class, affluent professional, and executive elite families.

[MINI-LECTURE HANDOUT]

This work looked at math, language arts, social studies, and control over time and space, and found distinct patterns in how kids of different classes are taught.

[REFER TO HANDOUT: ANYON TABLE]

Point of this hidden curriculum: the development of workers to fulfill various social functions

Anyon argues that the way students learned math - the way that their environments were manipulated and so on - trained them to understand the "real world" in ways that were classed from the beginning. These modes are the hidden curriculum: that working class kids were destined for working class jobs that won't value creativity, whereas elite kids will become executives who try to bend the rules.   However, Anyon does not include any data on the ethnicities of the kids being studied, and note these are American schools from the early 1980s— a particular historical moment in time.

This suggests direct implications for how social class influences who we teach at the college level, which has an impact on our trying to be inclusive of social classes in our teaching. There are also direct parallels between Anyon's argument about the hidden curriculum based on social class in general education and the discussion about race and gender and science & engineering education.
- The fact that white men constitute the main "doers" of science in textbooks
- Suggests that women and people of color are incapable of doing science
- Otherwise the existing contributions by women and people of color would be included OR even a discussion about why women and people of color have comparatively few.
- We have stringent ways of "doing" science in grades K-12,and into college, that don't really map to what "scientists really do"— this is where the notion of "scientific teaching" comes from. [Handelsman et al., 2004]

Another really easy example is how instructors don't discuss their selection of content with students. The implication is that the instructor knows better, or that the content selected is somehow the best or most rational selection. Instructor bias and time limitations never come into it.

The hidden curriculum of many research articles is the deracialization of whiteness and the degendering of men— included on handout is a little primer about race here to help you negotiate this hidden curriculum.

[REFER TO HANDOUT: PRIMER ON RACE]

These are all things for participants to keep in mind as they analyze the upcoming articles in this class.

Switch gears now to think about a new topic in relation to gender (no specific reading on this). There is so much being written out there about gender these days. It is a topic of pop-psychology books, of novels and talk shows, and of headlines in newspapers.

There is also a lot of research out there that talks about gender differences that can have an impact on how we teach, for example Valian's (1999) book about how women and men view and treat each other differently, and how the differential treatment of girls and boys has outcomes on their learning and success in life. I've included a list of some similar articles (with respect to cognitive styles) on the content decisions handout.

There is also literature out there that argues that men and women aren't really all that different after all— Hyde (2005) paper on meta-analyses of various types of literature on gender differences - including cognitive and communication skills, social and personality variables, psychological well-being, and motor behaviors - which found that the differences between men and women are small except in certain measures of sexuality and motor performance. This is a great "evidence" article.

However, there is an inconsistency here— you can find data-driven research that finds gender differences, and research that does not. This inconsistency illustrates a concept to consider called "PARTIAL KNOWLEDGE."

Data on people are invariably incomplete. They are a slice of reality, or, framed through another epistemology. As an example, take Anyon's article about ethnicity, or last week's article on "minority opinion" that didn't mention the impact of race or gender on outcomes. That doesn't make the conclusions invalid— it just means you need to be careful how generally you apply them.

Another illustration based on gender:

Two theories about learning that you should know about are Perry's (1968) model, and Belenky, et al.'s (1986) model. Perry's is based on interviews with Harvard undergraduates in the 1950s (white, male, young, upper class, that map back to Anyon's typology) and Belenky et al.'s is based on interviews with women from many types of institutions— rural, urban, Ivy league, community colleges, women in family agencies.

[REFER TO HANDOUT: PERRY & BELENKY]

Both of these are based on data that are analyzed by gender, and that interact with race and class (as well as, for example, age). Does it mean that one is wrong and one is right? Not necessarily.

Unlike research in the physical sciences, it is NOT POSSIBLE to conduct research on people that holds all kinds of social categories constant. As a result, the best you can do is create PARTIAL KNOWLEDGES— little slices of understanding that are contextual and messy.

So, SO WHAT? What does this mean for your practice?

Read. Ask:
- Who is this article about?
- Who is not included in this data set?

Try things out. Ask:
- What is the hidden curriculum behind how you're teaching, what you're teaching, or how you're assessing your teaching?
- Your students what they think about certain pedagogies, assessment techniques, content.

Reflect. Ask:
- What is the sum total of your partial knowledges?
- Can you triangulate somehow using different data?— test scores, attendance patterns, what students say to you in office hours, mistakes people make on assignments

Document. Ask:
- What have I learned through this experience?
- What can other people learn from my experience?

Discussion (20 min)
To participants, ask: "I've thrown a lot at you, what is going on in your head at the moment? Anyone want to express a different opinion?"

Summary assessment (20 min)
Talking stone
Native American tradition from Midwestern Woodland tribes (Running Wolf, 2003)
Three rules:
- only the person holding the stone can talk

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- you can pass the stone
- In your time holding the stone, you can't respond to something someone else said.

First circle: what is one main thing you learned today and how will this impact your teaching practice?

Second circle (if time): what did other peoples' responses make you think about?

Handouts (see Section IV)

Mini-lecture handout
Content decisions handout

Assessment

Today's in-class assessment consisted of instructor observation of the discussion and the summary assessment activity of the talking stone.

Specific final course evaluation questions focused on:
- *The utility of the assignment turned in today*
- *The value of the readings*
- *The value of this session overall*

Overall:

	Mode of inquiry
Participation	Instructor observation
Satisfaction	Re: readings - final evaluation
	Re: class - final evaluation
	Talking stone activity
Learning	Reading assessment
	Talking stone activity
Application	Open question on final evaluation
Impact	None

Week 6: Multicultural and feminist pedagogy

Class goals
- Know the stages of the multicultural education movement
- Know the stages of feminist "waves"
- Experience various pedagogies
  - Feminist considerations of student voice and instructor authority
  - Multiple levels of student participation (individual, pairs, large group)
  - Just-in-time lecture (based on note cards at beginning of class)
- Have a chance to discuss the readings without a Reading Assessment attached

Materials needed
- Content decisions handout (see Section IV)
- Note cards (2 per participant)
- Action plan models handout (see Section IV)
- Timeline handout (see Section IV)
- Name tents
- Snack

Advance preparation
- Prepare Content Decisions handout
- Send feedback to group that facilitated last week's Reading Assessment

Assignment/readings done in advance

Banks, James A. 1995. "Multicultural education: historical development, dimensions and practice." Pp. 3-24 in *Handbook of Research on Multicultural Education*, edited by J. A. Banks and C. A. M. Banks. New York: Simon & Schuster Macmillan.

Barton, Angela Calabrese. 1998. *Feminist Science Education*. New York: Teachers College Press.

Participants should have the second draft of their diversity teaching statements to turn in.

Class activities

Before class:
- Collect diversity statements
- Pass out handouts, and two note cards per participant
- Change the "head" of the table by standing at the other side of the room.

Welcome! (10 min)
- Plan for today
- Opening discussion
- Reading assessment
- Short lecture— normal lecture idea antithetical to the topic, so I really want to minimize it
- More discussion about the readings, and your questions

Diversity anecdote?

Opening discussion preparation
    Write on an index card: What questions are you coming out of the readings with? Write a question from each reading on different cards.

Collect the cards. While participants are discussing the next exercise, the instructors read through the cards and think about how to integrate responses into the rest of the class. This is an exercise to try the "Just-in-Time Teaching" technique, where the instructor responds to misconceptions or questions about a topic as they come up for students.

Discussion (10 minutes)
Pair-wise discussion regarding the diversity statements for 5 minutes
Ask for a few volunteers to share the other person's highlights with the group

Reading assessment (35 min)

Mini-lecture (15 min): feminist "waves" historically mapped with multicultural education movement

Look at the feminist "waves", and how this overlaps with multicultural movements. Both movements include race, gender, and hidden curriculum. Aspects of each wave can still be seen today, although waves are considered "over"

First-wave feminism:
- 19th and early 20th centuries
- Used to be considered "different feminism"— women have something special to contribute to society because they are essentially different from men
- "Suffrage movement"— focused on getting women the right to vote.
- Retronym— the term was invented *after* "second wave feminism" was invented
- Ended with passage of the 19th amendment in 1920
- Today, considered to be issues of equity, associated with term "liberal feminism"
- With respect to science: inferior treatment of girls and students of color in schools and science curricula

Second-wave feminism
- "Women's liberation" or "women's movement"
- Originated around 1960s, emerging out of civil rights movement
- Concerned with women's rights beyond the vote:
  - Anti-discrimination work— "oppression"
  - Economic equality
  - Women working in traditionally "male" areas
- Also considered "equal-rights feminism"— women and men are not different, except in a few areas like childbirth
- Criticism of early actions from women of color and lesbians— identity politics
- People who self-identify as such-and-such are the only people who can understand how that group is oppressed
- Smaller and smaller groups according to more and more identity characteristics
- With respect to science: "gender-inclusive science"
  - Incorporate marginalized ways of knowing into science
  - Gender-inclusive science
  - Scientific knowledge acknowledged as culturally and socially bound

Third-wave feminism
- Arguably begun in the 1990s
- The identity politics of 2nd wave feminism turns into fractionation, which turns into poststructuralism
- Poststructuralism in this context is roughly the notion that language is where gender identity is culturally produced— > gender identities not static, fixed, but rather an

effect of discourse, constantly being produced by people and hence changeable. Gender as a process that occurs through verbal interaction.

- Expand common definitions of gender and sexuality.
- Queer theory, women-of-color consciousness
- Third world feminism — challenging notion that third world women are ignorant, poor, uneducated, tradition-bound, family-orientated, victimized etc.
- With respect to science: knowing and learning
  - Self-reflexivity
  - Intersectionality: trifocal lens of gender, race and class
  - How earlier feminist works also essentialized gender
  - Move from deconstruction towards reconstruction and agency
- With respect to science pedagogy:
  - Challenging how science is situated as a school subject
  - Situating the role of teachers and students

Where does this locate Calabrese Barton's article? ASK!
- Firmly in 3rd wave
- Positionality: the idea that where you situate yourself along various social axes of import affects how you understand the world— different lenses come into focus at some times more than others

For her, the hallmarks of a "feminist classroom" include:
- Student voice
- Instructor (and student) power— makes valuing student voice tricky - do instructors use their power to coerce students to speak?
- Positionality with respect to race, class, gender, other

Multicultural education and pedagogy was discussed in the reading— here are the highlights and major dates (on handout).

Both "multicultural" and "feminist" pedagogies look at both race and gender, & feminist pedagogies includes other things, too, like sexuality, ability, nationality, etc.

Both deal with concepts of hidden curriculum: unintentional learning outcomes that come from how you teach and what you teach.

[Note: praxis: action informed by theory/revolutionary consciousness. Related to idea of reflexivity]

Discussion (20 minutes)
- What are your thoughts about these readings?
- What questions do you have?
- Read through cards made at beginning. What hasn't been answered yet?

Ending assessment: note cards (5 minutes)
What pedagogies have you seen modeled in class today?
Remember - pedagogies include:
- Goals
- Approach
- Assessment
- Revision

Assignment for next week (10 minutes)
- Set-up for Action Plan, due next week

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- Handout of action plan models
- Riley and Middlecamp readings might help, so if you're at a loss, read these first.

Next class, we will spend the whole time discussing your action plans.
- No formal presentations (PowerPoint, etc.)
- Be prepared to talk about your plan in a convincing manner:
  - What is the rationale behind the plan,
  - Any background literature that might support their ideas,
  - The basics of the plan itself,
  - When and how you hope to implement your plan, and finally,
  - Why this plan should inspire us.

Handouts (see Section IV)

Action plans handout
Timeline handout
Content decisions handout

Assessment

Today's in-class assessment consisted of instructor observation of the discussion, and the note card activity listing the number of pedagogies modeled.

Specific final course evaluation questions focused on:
- *The utility of the assignment turned in today*
- *The value of the readings*
- *The value of this session overall*

Overall:

	Mode of inquiry
Participation	*Instructor observation*
Satisfaction	*Re: readings - final evaluation*
	Re: class - final evaluation
Learning	*Reading assessment*
	Diversity statements
Application	*Open question on final evaluation*
Impact	*None*

Week 7: Participant action plans

Class goals
- Provide a chance for everyone to share aspects of their action plans
- Provide a summing up of the course

Materials needed
- Snack
- Copies of DCC2 syllabus (if teaching next!)
- Sign-up sheet for e-mail addresses to be shared amongst the group
- Copies of pre-course concept map
- Copies of list for course-wide pedagogies modeled (not included)
- Blank paper for post-course individual concept maps
- Name tents
- Note cards

Advance preparation
- Make a handout of all the "Just in Time Teaching" note cards from last week, and provide responses to the questions that weren't answered in class. Distribute online or during class.
- Make a handout of all the pedagogy note cards from the last activity last week to be distributed this week
- Write content decisions handout
- Send feedback to group that facilitated last week's Reading Assessment
- Prepare online evaluation

Assignment/readings done in advance

Riley, Donna. 2003. "Employing lacerative pedagogies in engineering education." Journal of Women and Minorities in Science and Engineering 9:137-158.

Choice of:
Blair, Irene V., Jennifer E. Ma, and Alison P. Lenton. 2001. "Imagining stereotypes away: the moderation of implicit stereotypes through mental imagery." *Journal of personality and social psychology 81:*828-841.
Middlecamp, Cathy. "Diversity in the Physical Science Curriculum: The Intellectual Challenge." *In Handbook of College Science Teaching: Theory, Research and Practice, edited by National Science Teachers Association,* 2006 (forthcoming).

Participants should have their action plans to turn in.

Class activities
Before class
- Write sharing/feedback guidelines on board (from first week of class)
- Handout: new syllabus, list of pedagogies from last week
- Pass back assignments

Welcome! (10 min)
- Plan for day: group concept map, then presentations
- Time for one last diversity anecdote? Someone maybe who hasn't offered one yet?

Individual concept maps (10 min)
- Individual concept maps around diversity in STEM/SBE education

- Put the same 4-digit code you wrote on the last concept map on this map

What do you want us to know you learned during this course? How can you incorporate that visually in the context of this activity?

Action-plan sharing (90 min)
- Break time up based on number of participants. Keep a couple of minutes per presentation for questions.
- Instructors ask big-picture questions, like why this work is important, or how participants came up with this idea.

Course summary (10 min)
It has been an exciting romp through the literature!
- Wide range of methodologies (interviews, psychological statistics, theory)
- Wide range of voices
- Wide range of disciplines

Those who are stopping, we hope you found this course interesting and worthwhile.

Remember to complete online evaluation— we will send out link later today.

1-minute card: final thought from this course— leave it on the table before you leave.

Thank you!
See some of you in DCC2.

Handouts

None.

Assessment

Today's in-class assessment consisted of instructor observation of the discussion, and the final 1-minute note card.

Specific final course evaluation questions focused on:
- *The utility of the assignment turned in today*
- *The value of the readings*
- *The value of this session overall*

Overall:

	Mode of inquiry
Participation	Instructor observation
Satisfaction	Re: readings - final evaluation
	Re: class - final evaluation
	1-minute note card
Learning	Action plans
Application	Open question on final evaluation
Impact	Action plans

B. DCC2: 8-week semester version

In reading this section, you will see *italicized paragraphs*: this text consists of detailed descriptions and explanations for why we did what we did, and whether we would recommend "tweaking" it for successive iterations.

For each week in DCC2, we describe our class goals and activities we had planned. We outline the materials we used each week, and the main preparation tasks we needed to do before each class. We remind the reader of what the participants are expected to do ahead of class, and provide a sketch (with estimated times) of the activities we planned. We include text of handouts we prepared, but we no longer developed the "content decisions" handouts because the focus of each class was more on the process of project development and less on the diversity literature. Text of the actual handouts are included in Section IV of this manual and may be photocopied directly as you find appropriate.

Assessment during DCC2 was less structured than in DCC1 because each week was focused on improving participants' projects and their impact. Most in-class assessment came through instructor observation. Nevertheless, if a specific assessment activity was implemented, it is described for each week. A final course evaluation was also applied at the end of the course, and is included in the section in this manual on "assessment."

Estimated timings are based on a 2 hour/week class period. We tried to take a 5-minute break halfway through the class each week. We regularly went overtime and thus we suggest increasing the time of the course to 2.5 or 3 hours for successive iterations.

Week 1: Introduction and course goals

Class goals

- Clear outline of rest of semester
- Instructors and students co-construct course goals for rest of semester
- Students understand levels of assessment
- Students leave with broadened project idea that will have "significant" impact
- Set up snack roster (if desired)

Materials needed

- Copies of syllabus
- Handout of educational resources
- Hand back action plans from DCC1 with comments
- Sign-up sheet for snack
- Index cards
- Snack

Advance preparation

- Finalize DCC2 syllabus
- Read through and write feedback on action plans from DCC1
- Identify and invite consultation experts for week 3:
  We organized week 3 to be a time where participants could get some outside advice on their projects. We also used this opportunity to introduce participants to key members of the Delta Program with particular areas of expertise, including the PIs and people involved on program evaluation, internships, and diversity teams. We called these people "expert consultants" and they covered the following areas:
  - *Educational technology*
  - *Evaluation/assessment*
  - *Learning community*
  - *Social science research*
  - *Developing an internship*
  - *Literature on diversity efforts*
  - *Case studies on diversity*
  - *Resources for TAs on diversity*
  - *Assistive technology*
  - *Teaching-as-Research applied to a project*
  - *Mapping content to diversity*

  Your available expertise pool may cover different areas. Consider the types of projects your participants are planning, and what goals you have for their learning. Invite your own "experts" based on these considerations, and make sure you give them enough advance notice.

Assignment/readings done in advance

    None.

Class activities

Welcome! (10 min)
    Plan for the day
    Go around the table and share – why did you take the 2nd half of this course?

Course syllabus (10 min)
    Go over syllabus

Snack roster?
Questions?

Course goal co-construction (25 min)
The next part of this course is going to be about what you make of it. Take a minute to write down a few specific things that you would like us to accomplish as a class over the next 7 weeks.

Brainstorm on the board

Discussion: anything not up here that should be? Anything you disagree with (and why)?

After class, transcribe these goals down and type up for distribution next week.

Introduction to assessment (15 min)
One of our goals is to have you develop thoughtful projects, and ones that stand up to peer-review.

As we said yesterday, one of the ways to silence that criticism is to present compelling evidence that your students have learned "enough." So our next task is to consider the various ways we can assess how well we meet our own teaching goals.

Assessment levels (from Colbeck 2003):
- Participation - do they come?
- Satisfaction - are they happy?
- Information - what do they learn?
- Application - what can they apply?
- Impact - what is the outcome of what they apply?

Preliminary personal project ideas and brainstorming (30 min)
Read over your feedback (3-5 minutes)
What is the biggest possible impact you could have with your project? On whom?
First work in pairs (15 min) and then in large group (10 min)

Introduction to Delta Internship program (20 min)
We invited program director Don Gillian-Daniel and Delta intern Erica Howard to introduce participants to the internship program. We encouraged them to think about turning their projects into internships from the very beginning; however, we also introduced them to some of the already-developed internships that they could turn into projects.

Class wrap-up (5 min)
Readings for next week on the CIRTL/Delta Pillars, and on Scientific Teaching

Handouts (see Section IV)

Course syllabus (not included)
Educational resources (A Starting Point)

Week 2: Doing rigorous teaching research

Class goals
- Understand the main points of the Delta pillars and Scientific Teaching
- Be able to articulate defined project with measurable learning goals and assessment ideas
- Develop a plan for work development over next 6 weeks
- Experience multiple modes of work— individual, pairs, large group

Materials needed
- Copies of complete course goals (not included)
- Copies of timeline handout (see Section IV)
- Copies of guiding questions for developing learning objectives handout (see Section IV)
- Note cards

Advance preparation

Type up brainstormed list of co-constructed course goals

Assignment/readings done in advance

Delta Pillar "one-pagers": Teaching-as-Research, Learning Community, and Learning-through-Diversity. (Available at http://www.cirtl.net/pillars.html)

Handelsman, Jo, Diane Ebert-May, Robert Beichner, Peter Bruns, Amy Chang, Robert DeHaan, Jim Gentile, Sarah Miller Lauffer, James Stewart, Shirley M. Tilghman, and William B. Wood. 2004. "Scientific Teaching." Science 304:521-522.

Participants should have their "initial project description" write-up to turn in.

Class activities

Welcome (10 min)
Plan for the day

Opening discussion (20 min)
Talking stone— talk about one pillar, or scientific teaching (ST), and what you think it means. include one question?

If multiple instructors: one instructor facilitate while the other takes notes to assess participants' understanding

For the remaining time, discuss different participants' interpretations.

Constructing learning objectives (30 min)

HANDOUT: guiding questions

10 minutes individually thinking about what you want your project's learning objectives to be
20 minutes sharing learning objectives with partner

By the end of this time, have your learning objectives written down on the board.

Instructors can ask participants what issue their project is trying to address. They may need to remind participants about diversity: where does diversity come into your learning objectives?

After ideas are on board:
"We are using this activity to assess whether we are meeting our class goal of understanding the pillars. Do your objectives meet what we consider the objectives to be?"

Sharing objectives (40 min)

Ask participants to read their learning objectives out to the group (10 min)

Ask participants to find a different partner than earlier, choose one of the learning objectives they just brainstormed, and talk together about how to measure it (20 min)

Then have everyone come back to the big group to share their ideas about measuring their objective. (10 min)

Timeline planning (10 min)

TIMELINE HANDOUT
Ask participants to individually fill in a timeline of their working goals, including what to have done by what dates.

Make copies and hand originals back

Wrap-up assessment

1-minute assessment card: ask participants to record what help they think they need on their projects. Pairs with experts next week will be based on these, so participants should include their names on the card.

Ask participants to prepare a 5-min "presentation" to introduce the expert they're paired with next week to their project and what questions they still have.

Handouts (see Section IV)

Guiding Questions handout
Timeline handout

Week 3: Working time and project advising

Class goals
- Introduce students to various key members of the Delta Program - the "expert consultants"
- Students will be further along in their project after their consultations with Delta Program members today.

Materials needed
None

Advance preparation
- Make sure that each participant will get to meet with at least 1 "expert" who can consult in an area based on participant's identified area of need (from week 2 index card).
- Send experts reminder e-mail.
- Make meeting schedule with each participant meeting with 2 "experts" over 1 hour.

Assignment/readings done in advance
Participants should prepare 5 minutes to present their project ideas to the expert, and then outline their questions.

Class activities

Welcome! (5 min)
Plan for the day. Consultants will be arriving in 30 minutes.

Opening discussion (25 min)
Everyone share one learning objective they have developed for their project. How will you assess it?

How are you feeling with respect to this task?

Participants will likely need some reassurance at this point!

First consultation (30 min)

Second consultation (30 min)

Brainstorming session about DCC Forum (25 min)
The DCC Forum is currently scheduled for the last day of class. Brainstorm ideas about the following things, and write all ideas on the board (and make explicit that this is modeling the design process they are doing for their projects):
- Scheduling: do you want to move the time so more people from the community will come? Who has time on this day to help set-up and clean up?
- Learning objectives: what do you want Forum attendees to learn about your projects, or about the topic of diversity in the college classroom? How can you make these learning objectives measurable?
- Activities: how might you develop activities which allow Forum attendees to meet your learning objectives?
- Assessment: how might you find out whether these activities were effective, and whether the Forum participants achieved your learning objectives?
- Audience: who should we invite to the DCC Forum? Consider: people involved in your teaching and learning enterprise, program facilitators, program participants, labmates,

students, advisors and other faculty, people in the university community interested in diversity, friends and family.

Transcribe the ideas on the board onto paper. In a later class, you will bring these ideas back to the table so that participants can focus their objectives, perhaps eliminate some and develop others, and then match activity ideas with the objectives (but this doesn't need to happen yet).

Class wrap-up (5 min)

Next week, the majority of the class period will be dedicated to hearing how your projects are going.

Everyone has X minutes *(depending on number of participants)* to do the following:
- Provide a rationale for your project, including verbal referral to one or 2 literature references;
- Describe the specific problem you're addressing;
- Propose 2-3 primary "learning objectives" or goals;
- Describe what you are doing to meet these objectives and goals; and
- End with a specific question for the other class members to help you work on for the rest of your dedicated time.

Keep in mind this is not a lot of time, and most of your time should be used for discussion. Practice your "spiel" before coming to class!

Make explicit that this is an "abstracting" skill that participants will have to use for describing their teaching and their research to prospective employers*.*

Handouts

None.

Week 4: Personal project progress

Class goals
- Provide an opportunity for students to practice describing their projects
- Provide an opportunity for people to give critical but constructive feedback
- Determine where people are in the process of project development and see where they are struggling.
- Build learning community amongst participants by discussing their project insights and struggles together

Materials needed
- Mid-course correction handout (see Section IV)
- Institutional review board (IRB) application materials and training URL
- Constructive feedback handout (see Section IV)

Advance preparation
Prepare mid-course correction handout based on the co-constructed course goals from week 2.

Assignment/readings done in advance
Participants should have prepared their presentation.

Class activities

Welcome! (5 min)
Plan for the day.

Institutional Review Board (IRB) application process (10 min)
Run through:
- Why participants might want to apply for IRB approval for their project (i.e. if they might want to publish something on it later
- What the steps are for applying (e.g., choosing between Education and Social Science IRBs, visiting their Web sites, completing application online. One tricky part is deciding who will be listed as PI on the application— graduate students are not allowed to act as PIs.)
- How Delta can help (e.g., serve as PIs, review applications, contribute letters of support, etc.)

Ask participants to complete the IRB online tutorial by next week. Remind them when they get to the last page, to be sure to print out a copy of the "certificate," or, even better, make a PDF of it so they can save it electronically. They will need to submit this certificate with their application when they prepare one. We will spend a little more time discussing IRB next week, so participants should bring their questions.

Presentations (until 30 minutes remaining)
We all know your ideas are great. Now push each other, and give constructive feedback

Should include:
- Rationale, including verbal referral to one or two references
- The specific problem you're addressing
- Two-three primary "learning objectives" or goals
- What you are doing to meet these objectives and goals
- End with a specific question for the group to help you work on for 10 minutes.

DCC Forum brainstorming (20 min)
Bring out the ideas brainstormed from last week. Brainstorm:
- What aspects of the course or ideas are missing?
- What other activities could be done to achieve these learning objectives?
- What ways can we find to assess our success?

Mid-course correction (10 min)
MID-COURSE CORRECTION HANDOUT

To find out how well are we doing with meeting the course goals we laid out in week 2, ask participants to complete this assessment either in the next 10 minutes, or you can get us your comments by mid-week. We will compile your responses and talk about them next week.

Wrap-up (1 min)
Take a vote to find out when participants would like to send out their materials for peer review (in advance of week 6)

Handouts (see Section IV)
Constructive feedback information from DCC1 week 1 ("Reading Assessment").
Mid-course correction handout

Assessment (see Section V)
Mid course correction

Week 5: Revisiting rigorous teaching research

Class goals
- Assess student understanding of TAR, LC, and LtD
- Mid-course correction
- Develop strategies for facing resistance

Materials needed
- Rubric
- Outcome of mid-course survey
- Note cards
- Handout on feedback

Advance preparation
- Prepare peer-review schedule. Make sure every participant has a chance to both give and receive feedback. "Empty" spots can be spent consulting with instructors, reflecting on their feedback, or talking with other participants who also "empty" spots.
- Read through mid-course correction feedback— summarize main points and common concerns, and consider what changes are possible to address those concerns

Assignment/readings done in advance
Participants should have completed the online IRB tutorial

Class activities

Welcome! (5 min)
Plan for the day

IRB tutorial (15 min)
What did you think about the tutorial? What questions do you have remaining?

Revisiting the ideas of TAR, LC and LtD (30 min)
Ask participants to take 10 min to write a note card definition of each term (one note card per term): Teaching-as-Research (TAR), Learning Community (LC), Learning-through-Diversity (LtD). We will collect these, but participants can leave them anonymous.

Ask participants to put cards in piles by term; take another person's card and read it.

Big group discussion: between the card they wrote and the card they read, were there any inconsistencies? Anything they didn't think about? Anything they disagree with? Any remaining questions?"

TAR, LC, LtD Rubric (45 min)
PILLAR RUBRIC HANDOUT. Tell the participants this handout may be useful in presenting their peer-review partner with feedback on their project.

Think-Pair-Share: Ask participants to take some time to read through the rubric. They should be sure to read the Diversity line and either LC line or TAR line. With their neighbor, when both ready, they should choose one line each to discuss.

Big group discussion: each pair describes their rubric line to everyone, and outlines their discussion. As a group, how can we better understand these issues?

Mid-course correction discussion (15 min)

Thank you for your comments and honest feedback.

Summarize main points, common concerns
What should we change *for this course* to address these concerns?
What should we change *for the next time* we implement this course?

Class wrap-up (5 min)

Remember that next class is completely peer review. Discuss schedule, and remind participants of the date by which they agreed to share their materials with their partner. Make sure everyone has everyone else's e-mail address as needed. When sending their partner their materials, they should be sure to remember to include what aspects they do <u>not</u> want feedback on (things they're still working on).

Handouts (see Section IV)

Pillar rubric handout
Note: in this handout, participants in the DCC course are referred to as "practitioners," the people who participate in their project (as <u>their</u> students) are referred to as "participants/students."

Week 6: Peer review session

Class goals
- Experience giving and receiving peer review feedback on work
- Participants' projects should improve from the feedback

Materials needed

Advance preparation
Remind participants to send out materials for peer review on the agreed-upon date

Assignment/readings done in advance
Participants should have prepared their project materials for peer review and sent them out on the agreed-upon date. They should have alerted their partner to the material that they do <u>not</u> want feedback on. They should also have read through the materials that were sent to them and considered how well they match the TAR/ST, LC, LtD rubric distributed last week.

Class activities

Welcome! (5 min)
Plan for today

Guidelines for peer review (10 min)
Tell participants to begin by asking their partner to double-check what she/he doesn't want feedback on.

Participants should in mind these points when reviewing:
- "Address your comments towards the project, and don't make them personal. Ex: "This learning objective doesn't match the assessment plan" rather than "You didn't match your assessment plan with your learning objective."
- Are you clear about your partner's:
    - o audience?
    - o issue/problem and rationale?
    - o method for addressing the issue?
    - o plan for assessing the method?
    Note: these are questions about understanding what your partner has laid out, not whether you agree or disagree with it.
- Has your partner made the case (using the literature, and addressing your potential misconceptions) that this is an important problem, and that this method will address the problem? (Now this is a question of whether you agree with your partner.) If not, where are the weak areas?
- Where are the areas in the project that will spark controversy? Can you help your partner develop a strategy to address those controversies or misconceptions before they occur?
- Keep in mind how little time you have to discuss this project. Keep an eye on the time and don't get hung up discussing about one part to the overlooking of the rest."

Peer review (based on schedule) (until 10 minutes left)

Class wrap-up (10 min)
What questions do you have about turning your paper and project in next week?

Decide whether you are willing to give participants feedback on their papers before they need to turn them in; if you are, be sure to set a deadline.

Next week, we'll decide on the final learning objectives for the DCC Forum, plan the activities and assessment, and work out the timing.

Handouts

None.

Week 7: Planning the DCC Forum

Class goals
- Set goals for DCC Forum
- Learn strategies for dealing with "resistance"

Materials needed
- Worksheet for "resistance" questions
- Consent forms
- Note cards

Advance preparation

Participants may ask for instructors to read their papers in advance of turning them in. We thought this was a good idea, but it depends on how much time you have available to spend on it.

Prepare a list of all the learning objectives, activities and assessment ideas about the DCC Forum that have been brainstormed so far.

Assignment/readings done in advance

Participants should have their project (whether a syllabus, video script, survey, CD with a Web site on it, etc.) and a write-up describing the work behind the project.

Class activities

Welcome (5 min)
Plan for today's class

Dealing with resistance (30 min)
We have developed a community in this class based on the assumption that we think diversity, however we define it, is important. This is not an assumption that holds outside of this class. What kinds of resistance might you confront when trying to do this kind of work back in your departments?

HANDOUT: "Resistance" questions.

(10 min) In groups of 2 or 3, participants should choose 1-2 questions to tackle. They should try to choose at least one "hard" one, as they have other people to help think about how to respond to them!

Remind participants that it might help to break the challenges up: consider what the assumptions are behind them. Once they have brainstormed the assumptions, what kind of data or rhetoric can they use to respond to them? Ideas could include:
- What is the person's definition of "diversity"?
- Are they misunderstanding your comment, your definition of diversity, or other terms being used in your conversation?
- Is there data or research that can be used to clear up a misunderstanding?

(10 min) Participants should share their conversations with everyone in the big group

(10 min) Participants should brainstorm other strategies for dealing with resistance. Put these on the board. Transcribe these after class, and keep the list for next year.

DCC Forum planning (80 min, divided as needed)

(20 min) Learning objectives: Provide the list of learning objectives brainstormed during previous weeks.

- Ask if there are any final additions
- We need to narrow the list down to a maximum of 4 objectives.
    - Can any objectives be combined?
    - Are there any that should be highlighted? Any that should be discarded?

If the conversation doesn't go smoothly, try this activity: give participants 3 small stickers or post-its each. Participants can stick their "vote" next to the goals they think are most important— they can bunch them up or spread them around. This will help them narrow their focus.

- How can we make these objectives measurable?
- Write the final selection on the board.

(20 min) Activities: Repeat the "narrowing" discussion described above. Consider the overall time available for the DCC Forum. How much time will each activity take? What should be cut if things go overtime?

(20 min) Assessment: Brainstorm first a strategy for finding out what DCC Forum attendees have learned, and then (if necessary) what kind of questions should be asked.

(20 min) Implementation:

- Sort out the scheduling. How much time will set-up, each activity, and tear-down take?
- What documents (a Forum program, handouts, assessment instrument, etc.) need to be prepared in advance?
- What advertising needs to happen?
- Volunteering: who can help with which tasks?

Class wrap-up (5 min)

Write one sentence on a note card about what you want the instructors to know you learned during this second course.

Handouts (see Section IV)

Blank "Resistance" question
Instructor cheat sheet for "Resistance" question

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Week 8: DCC Forum

Class goals
- Developed by participants!

Materials needed
- Depends on needs of participants

Advance preparation
- Order/purchase any food needed for the Forum
- Prepare sign-in sheets, including name, e-mail, department, whether they'd like more information on your course/program
- Copy whatever handouts, programs, etc. needed
- Sign-out whatever technology is needed (LCD projector, overhead projector, computer, etc.)

Assignment/readings done in advance
None.

Class activities
Prepared by participants.

Handouts (see Section IV)
Prepared by participants.

Assessment (see Section V)
Prepared by participants

C. DCC1: 2-week summer version

This two-week version of DCC1 will be held for the first time May 31-June 9, 2006. At the time of writing (April 2006), the following table outlines how we intend to modify the topics, readings and assignments. This section will be completed after we implement the course.

Course schedule

Date	Topic	Readings (done before class!)	Assignment due
May 31	Defining diversity Value of diversity	McLeod et al. 1996 Chan 1995	Pre-course draft of diversity statement
June 2	Biology and environment of learning	Cahill 2005 Barta 2001	
June 5	Unconscious bias, prejudice and stereotype threat	Steele & Aronson 1995 Trix 2003	Classroom observation due
June 7	Race, class, gender and pedagogy	Barton 1998 Knapp & Woolverton 1995	
June 9	Responding to challenges; Action reflection	Riley 2003 Middlecamp 2006	Action reflection due
Post-course	Course evaluation		

Readings

Barta, Jim, Ann Abeyta, Drusilla Gould, Ed Galindo, Georgia Matt, Delverne Seaman, and Garrit Voggessor. "The Mathematical Ecology of the Shoshoni and Implications for Elementary Mathematics Education and the Young Learner." Journal of American Indian Education 40, no. 2 (2001): 1.

Barton, Angela Calabrese. Feminist Science Education, Athene Series. New York: Teachers College Press, 1998.

Cahill, Larry. "His Brain, Her Brain." Scientific American, May 2005, 40-47.

Chan, Sucheng. "You're Short, Besides!" In Race, Class and Gender: An Anthology, edited by Margaret L. Andersen and Patricia Hill Collins. Belmont, CA: Wadsworth, 1995.

Knapp, Michael S., and Sara Woolverton. "Social Class and Schooling." In Handbook of Research on Multicultural Education, edited by James A. Banks and Cherry A. McGee Banks, 548-69. New York: Simon & Schuster Macmillan, 1995.

McLeod, Poppy Lauretta, Sharon Alisa Lobel, and Taylor H. Cox. "Ethnic Diversity and Creativity in Small Groups." Small group research 27, no. 2 (1996): 248-64.

Middlecamp, Cathy. "Diversity in the Physical Science Curriculum: The Intellectual Challenge." In Handbook of College Science Teaching: Theory, Research and Practice, edited by National Science Teachers Association, 2006 (forthcoming).

Riley, Donna. "Employing Liberative Pedagogies in Engineering Education." Journal of Women and Minorities in Science and Engineering 9, no. 2 (2003): 137-58.

Steele, Claude M., and Joshua Aronson. "Stereotype Threat and the Intellectual Test Performance of African Americans." Journal of personality and social psychology 69, no. 5 (1995): 797-811.

Trix, Frances, and Carolyn Psenka. "Exploring the Color of Glass: Letters of Recommendation for Female and Male Medical Faculty." Discourse & Society 14, no. 2 (2003): 191-220.

Cases from DO-IT: http://www.washington.edu/doit/

Section IV: Course handouts

These handouts are formatted such that, should they be relevant to your implementation, you could photocopy them directly from this manual.

DCC1

Week 1: Reading Assessment

For each class session, one team of students will be assigned the job of developing a "reading assessment" that we will all do at the beginning of class. The reading assessment may be a quiz, a puzzle, or a short problem to solve that is based on the reading. Reading assessments should take no longer than 10 minutes and should assess understanding of **the key points** of the "lead reading" for that day. When developing your reading assessment, consider what the key points of the reading are, and set some goals for the activity based on those key points. Your activity should match these goals. This assignment gives you the opportunity to develop and implement an assessment activity using your classmates as a testing ground.

Giving and receiving feedback

You can best benefit from your teaching practice if you receive clear feedback. This requires an open and caring atmosphere in which your fellow participants feel comfortable enough to offer honest feedback, motivated by your willingness to receive it. Feedback provides you with information about how you affect others and how well your behavior and activities match your intentions; it helps you identify your strengths and areas for improvement.

Giving constructive feedback

Constructive feedback is descriptive rather than evaluative. By describing one's own reaction and avoiding evaluative language, the individual receiving feedback is less likely to react defensively. Constructive feedback has the following characteristics:
1. It is specific rather than general.
2. It considers the needs of the receiver and giver.
3. It is directed toward behavior that the receiver can change. Frustration is generated when a person is reminded of a shortcoming s/he cannot control.
4. It is solicited rather than imposed. Feedback is most useful when the receiver has a question the observers can answer.
5. It is given immediately after the event.
6. It is checked to ensure clear communication. Have the receiver rephrase the feedback.

Both giver and receiver can check with others on the accuracy of the feedback; is this one person's impression or a shared impression?

Feedback Basics

Recommended (focus on the giver's perception, specific)	Not Recommended (judgmental, general)
I was confused when you explained…	Your explanation was confusing.
It would help me understand better if you could pause longer between introducing major concepts.	Your lecture went too fast.
It would help if you didn't stand behind the high podium.	You are too short to be seen.
It would help if you make more eye contact during the class and …	It felt unfriendly and cold when you taught.

Week 1: Content decisions handout

This is the first of a set of handouts that we will distribute weekly over the length of this course. In designing any course, we as instructors must make decisions about what to include— there is never enough time to talk about everything. We must decide what topics are critical for students to understand, and which are peripheral and have to be dropped; in this filtering role, we wield considerable disciplinary power. In many traditional STEM/SBE courses, these decisions are often transparent to the participants— the topics appear on the syllabi or as chapter headings in the course textbook, with no discussion about why they were the ones selected. This has had the effect of naturalizing, or solidifying, the topics as what constitutes thermodynamics, "calculus," or general genetics for students, overlooking the perhaps-relevant work that the instructor has filtered out.

We want to make this filtering activity explicit, not only because it models a different way of interacting with course participants, but also because articulating our reasoning (both publicly and to ourselves) gives us an opportunity to reflect on what biases may be manifesting themselves in our course. It also gives course participants a snippet of what else is published regarding the topic, allowing the instructor(s) to not "cover everything."

We hope you find these handouts instructive in understanding why the course is laid out how it is, and we look forward to your reactions to our reasoning.

What we chose to talk about:
> Consistent with the theme of "Foundations," we decided to spend the first meeting setting the groundwork for future discussions. To this end, we decided to spend time getting to know one another and sharing different definitions of diversity. We also wanted to spend some time talking about ways to read social research papers, and the methodological considerations that research on "diversity" needs to incorporate.

Why we chose this to talk about:
> As in any new course, the instructors and participants are strangers to each other. Participants come from different educational backgrounds and disciplines, and unique life experiences. We wanted to provide a little time for participants and instructors to get to know each other and establish a welcoming learning environment for discussion.
> We wanted to give everyone a chance to express their own thoughts about diversity and then have a chance to co-construct a collective definition. The instructors planned to add aspects of diversity they have encountered in the literature to the collective definition as needed.
>
> We realize that many of the articles you will be reading in this course may be very different from those you are familiar with from your discipline. We wanted to spend some time talking about the types of literature we will be exploring as well as the methods used to study issues of diversity.

What we didn't include:
> Nothing much this week.

Extended bibliography:
> Andersen, Margaret L. and Patricia Hill Collins. 2001. "Introduction: Toward inclusive thinking through the study of race, class, and gender." in Race, class, and gender: An anthology, edited by M. L. Andersen and P. Hill Collins. Belmont, CA: Wadsworth/Thomson Learning.
> Janssens, Maddy and Patrizia Zanoni. 2005. "Many diversities for many services: Theorizing diversity (management) in service companies." Human Relations 58:311-340.
> Thomas, David A. 2004. "Diversity as strategy." Harvard Business Review:1-11.

Week 2: Content decisions handout

What we chose to talk about:

Continuing with the theme of "Foundations" from last week, we decided to spend the second meeting discussing the value of diversity on several levels. First, we wanted to explore the many reasons each of you decided to take a course on diversity. Second, we wanted to discuss several readings which describe the value of diversity in group work. Third, we wanted to introduce you to some of the literature describing the value of diversity in groups, teams, and even on campuses and in disciplines.

Why we chose this to talk about:

- During the first few meetings of any new course, the instructors and participants are strangers to each other.   We wanted to provide a little more time for participants and instructors to get to know each other and continue to establish a welcoming learning environment for discussion, while modeling another method for helping students to get to know one another.
- We wanted to discuss the some of the literature, both data driven and anecdotal, on the value of diverse groups and the value of the "minority" opinion.
- We wanted to give you all time to discuss the reasons why you think diversity is important and provide some time to think about how diversity impacts our work and disciplines.

What we didn't include:

- We did not include several additional readings on the benefits of diverse groups. We also did not ask you to read readings on the benefits of diversity on teams, campuses, and even the impact diversity can have on disciplines. We chose to present a summary of that work instead in the form of a mini-lecture.
- We did not discuss why certain "minorities" (such as people with disabilities) do not pursue science and engineering or leave these fields at higher rates than "majority" populations.
- We did not have time to discuss at length the history of certain disciplines and how diversity or lack thereof has influenced them.

Extended bibliography of topics we covered and those we chose not to cover in class:

Appel, Toby A. "Physiology in American Women's Colleges: The Rise and Decline of a Female Subculture." *Isis* 85, no. 1 (March) (1994): 26-56.
Describes the ways in which the discipline of physiology differed between men's and women's colleges in the mid 19th century, and how physiologists at women's colleges were able to advance research on women's health that was otherwise not being done.

Lucena, Juan C. 2000. "Making Women and Minorities in Science and Engineering for National Purposes in the United States." *Journal of women and minorities in science and engineering* 6:1-31.
Argues that the category of "women and underrepresented minorities" is a historical artifact stemming from Cold War concerns about the comparatively slow pace of United States' scientific and technological advances

Mack, Pamela E. 2001. "What difference has feminism made to engineering in the twentieth century?" Pp. 149-168 in *Feminism in twentieth-century science, technology and medicine*, edited by A. N. H. Creager, E. Lunbeck, and L. Schiebinger. Chicago: University of Chicago Press.
Argues that women's participation in engineering has historically come about because of two strategies for "equality feminism" and "difference feminism."

Malcom, Shirley M. 1996. "Science and Diversity: A Compelling National Interest." *Science* 271:1817-1819.

Milem, J.F. and K. Hakuta (2000). The benefits of racial and ethnic diversity in higher education. Minorities in Higher Education: Seventeeth Annual Status Report. D. Wilds. Washington, D.C., American Council on Education.

Nemeth, C.J. (1995). "Dissent as driving cognition, attitudes, and judgements." *Social Cognition*

13: 273-291.

Oldenziel, Ruth. 2001. "Man the Maker, Woman the Consumer: The consumption junction revisited." Pp. 128-148 in *Feminism in twentieth-century science, technology and medicine*, edited by A. N. H. Creager, E. Lunbeck, and L. Schiebinger. Chicago: University of Chicago Press.
Argues that women's participation in technological advancement has been impacted by producers notions of women as consumers rather than producers of technology. Provides examples of how women as consumers have changed how some technologies are used.

Penn, Michael. "Native Ground." *On Wisconsin* 2004, 22-29.
Story of former UW-Madison engineering student who is Native American and why he is no longer at UW.

Pfatteicher, Sarah K. A., and Margaret P. Tongue. "What Drives Diversity?" Paper presented at the 32nd ASEE/IEEE Frontiers in Education Conference, Boston, MA 2002.
Summarizes many of the arguments for diversity in engineering, and provides criticism.

Rutherford, F. James, and Andrew Ahlgren. *Science for All Americans*. New York: Oxford University Press, 1990.

Seymour, Elaine, and Nancy M. Hewitt. *Talking About Leaving: Why Undergraduates Leave the Sciences*. Boulder: Westview Press, 1997.
Massive ethnographic study about why undergraduates— including women and people of color— drop out of the sciences and engineering at such a high rate.

Stanley, Autumn. 1983. "Women Hold Up Two-Thirds of the Sky: Notes for a Revised History of Technology." in *Machina Ex Dea: Feminist Perspectives of Technology*, *The Athene Series*, edited by J. Rothschild. Elmsford: Pergamon Press.
Calls for a revisionist history of technology to better acknowledge the historical technological contributions of women.

Thomas, David A. "Diversity as Strategy." *Harvard Business Review* (2004): 1-11.
Qualitative study of IBM's "diversity strategy," arguing that "diversity is good for business."

Wulf, Wm. A. "Diversity in Engineering." *The Bridge* 1998, 8-13.
President of the National Academy of Engineering argues that products designed by "diverse" groups of engineers are "better" for a variety of reasons

Week 2: Classroom observations

Before your visit…
- Choose class you want to visit.
- E-mail instructor to get permission to visit. Emphasize that you are observing to inform your own practice, NOT to judge theirs.
- Enter date, time, location on your calendar
- Check out course listing in Timetable to get a sense for the level of preparation students need to take course.
- Check out the course Web site (if it exists).

The day of the visit…
- Arrive at least 15 minutes early. If possible, stand where lecturer typically would teach from. Sit in various seats around the classroom. Watch students and instructor as they prepare for class.
- Potential questions to consider:
- Note the instructor's view: how well can they see students at the back of the classroom?
- How close are the nearest students? Are they above or below the instructor's eye level?
- How is the lighting? Do overhead projector or LCD projector lights keep the instructor from clearly seeing students?
- Do students interact with instructor before class begins? If so, what is the nature of the interaction?
- Do students sit in clusters?
- Is there a lot of conversation between students? If so, can you tell if it's class-related or social?

During the visit…
- Carefully observe the instructor and students during class:
- Potential questions to consider:
- How much potential space does the instructor have to move around? How much of this is actually used?
- If they use a microphone, is it portable? Is it adequate (can students in all parts of the classroom can hear the instructor well)?
- If they use electronic media such as PowerPoint, do they have a remote to advance the slides, or do they have to remain close to their computer?
- What percentage of the students arrives late? How does the instructor react to late students?
- Are students required to actively participate in the class? (e.g., group discussion/problem solving, responding to instructor's questions). If so, how do their responses shape the focus of the lecture?
- If students are asked questions and expected to respond, does instructor choose volunteers? If not, how are responses elicited?
- How long does the instructor wait for students to respond after a question is asked?
- Are the responses more or less equally volunteered/drawn from men and women?
- If students were expected to work in groups during the lecture, how conducive is the seating to group work?
- What percentage of the students appears to be writing careful notes? How much time do they spend listening/watching the lecturer/chalkboard/screen vs. writing notes?
- How ethnically diverse is the student population? Is there a relationship between ethnicity and seating patterns or student participation?
- What is the gender ratio in the student population? Is there a relationship between gender and seating patterns or student participation?
- Are there disabled students? If so, where do they sit and how are they included or excluded? If they are excluded, is it a barrier in the physical environment or is it a social barrier?

After the visit…
- Take a few moments to reflect on your experience and write a 1-2 page reflection. You may find these questions helpful in the reflection process:
- As a student, how well does this instructor's teaching style/approach match your learning style?
- Were the instructor's learning objectives for their students clearly communicated? If so, how would the instructor know if the learning objectives have been met?
- Consider the learning atmosphere: was the flow of knowledge uni-directional or shared? Who has power in this classroom?
- Did the instructor take full advantage of the diversity in the classroom in order to gain a wider perspective?
- Did the students feel included in the learning process? How could you tell?
- How would you have taught this particular class? What would you do the same or different, specifically?

Helpful Reference:

Helling, Barbara B. (1988). "Looking for Good Teaching: A Guide to Peer Observation". The Journal of Staff, Program and Organization Development 6(4), pp. 1-12.

Week 3: Action plan handout

The "action plan" is the culminating assignment for part 1 of Diversity in the College Classroom. We would like you to articulate some of the ideas and questions you are leaving this course with in the form of a proposal for how you, as a future or present educator, think you might address them.

For those of you going on to the 2nd part of the course, this is an opportunity to get some ideas on paper about what you would like to do for your project. For those of you who are not continuing on to the second session, it is a chance to set some goals for yourself regarding your integration of diversity.

Consider the following possibilities:
Design and develop instructional materials that can be used to educate faculty or students about diversity or enhance diversity in the classroom:

- To teach undergraduate students about the value and impact of diversity on their college experience;
- To teach faculty about how to be sensitive to diversity issues in their classroom; or
- To teach faculty who wish to have a set of materials to use as the basis of a seminar on the value of diversity for colleagues or administrators.

Ideas might include:

- A video about group dynamics and diversity in the classroom for undergraduates; an accessible database of literature on diversity
- A collection of examples of diverse biologists or of biology taught in a social context.
- Write a broader impact proposal for a grant you are planning to submit that incorporates some of what you have learned in this course into reaching broader audiences
- Write a paper (and submit it for publication!) regarding how the topic of diversity is treated in your discipline
- Develop a Web site the roles of women, ethnic minorities, people with disabilities, or other populations on the development of your discipline
- Develop a course module that integrates diversity into an existing disciplinary course that you may need to teach some day
- Write the diversity focus of a Delta internship proposal
- Other projects focused around diversity in science and engineering teaching.

Write up your action plan in 1-2 pages to be submitted to the instructors on the last class day. During class, be prepared to share what aspects you are comfortable with amongst the group.

Week 3: Content decisions handout

What we chose to talk about:
- Unconscious bias, prejudice, and stereotype threat and how they can impact our teaching as well as student learning
- Strategies for dealing with unconscious bias, prejudice and stereotype threat in the classroom
- Dealing with unconscious bias, prejudice and stereotype threat in your own professional career

What we didn't include:
- Role of gender bias in the classroom
- Affirmative action
- Chilly climate for women
- Why women and underrepresented minorities leave science

Extended bibliography:

Basow, Susan A. 1998. "Student Evaluations: The Role of Gender Bias and Teaching Styles." Pp. 135-156 in Career strategies for women in academe: Arming Athena, edited by L. H. Collins, J. C. Chrisler, and K. Quina. Thousand Oaks: SAGE Publications.

Blair, Irene V., Jennifer E. Ma, and Alison P. Lenton. 2001. "Imagining stereotypes away: the moderation of implicit stereotypes through mental imagery." Journal of personality and social psychology 81:828-841.

Collins, Lynn H. 1998. "Competition and Contact: The Dynamics Behind Resistance to Affirmative Action in Academe." Pp. 45-74 in Career Strategies for Women in Academe: Arming Athena, edited by L. H. Collins, J. C. Chrisler, and K. Quina. Thousand Oaks: SAGE Publishing, Inc.

Dasgupta, Nilanjana and Anthony G. Greenwald. 2001. "On the malleability of automatic attitudes: combating automatic prejudice with images of admired and disliked individuals." Journal of personality and social psychology 81:800-814.

Freeman, Jo. 1979. "How to Discriminate Against Women Without Really Trying." in Women: A Feminist Perspective, edited by J. Freeman. Palo Alto, CA: Mayfield Publishing.

Massachusetts Institute of Technology. 1999. "A Study on the Status of Women Faculty in Science at MIT." Massachusetts Institute of Technology, Cambridge, MA.

Sadker, Myra and David Sadker. 1994. Failing at Fairness: How Our Schools Cheat Girls. New York: Touchstone.

Sandler, Bernice R., Lisa A. Silverberg, and Roberta M. Hall. 1996. The chilly classroom climate: a guide to improve the education of women. Washington DC: National Association for Women in Education.

Sandler, Bernice Resnick and Roberta M. Hall. 1986. "The Campus Climate Revisited: Chilly for Women Faculty, Administrators, and Graduate Students." Association of American Colleges, Washington DC.

Scholnick, Ellin Kofsky. 1998. "Paying Athena: Statistics, Statutes, and Strategies." Pp. 81-104 in Career Strategies for Women in Academe, edited by L. H. Collins, J. C. Chrisler, and K. Quina. Thousand Oaks: SAGE Publications Inc.

Spanier, Bonnie. 2001. "From Molecules to Brains, Normal Science Supports Sexist Beliefs About Differences." in The Gender and Science Reader, vol. 367-372, edited by I. Bartsch. New York: Routledge.

Trix, Frances and Carolyn Psenka. 2003. "Exploring the color of glass: letters of recommendation for female and male medical faculty." Discourse & Society 14:191-220.

Week 4: CIRTL demographic form

Name: _____

Campus Email: _____

Gender: ☐ Male ☐ Female

Ethnicity: ☐ Not Hispanic or Latino ☐ Hispanic or Latino
☐ Unknown

Race: *(select one or more)*
☐ American Indian/Alaskan Native ☐ Asian
☐ Black/African-American ☐ Native Hawaiian/Pacific Islander
☐ White

Citizenship: ☐ U.S. Citizen/Permanent Resident ☐ Non-U.S. Citizen

Disability Status: *(select one or more)*
☐ None ☐ Hearing Impairment
☐ Visual Impairment ☐ Mobility/Orthopedic Impairment
☐ Other

Degree in Progress: *(if applicable)*
☐ Professional Degree ☐ Doctoral Degree
☐ Master's Degree ☐ Bachelor's Degree

Expected Year: *(if applicable)* _____

College:
☐ College of Agricultural and Life Sciences ☐ College of Engineering
☐ College of Letters & Sciences ☐ General Services
☐ Division of Continuing Studies ☐ Law School
☐ Institute for Environmental Studies ☐ Medical School
☐ School of Business ☐ School of Education
☐ School of Human Ecology ☐ School of Nursing
☐ School Veterinary Medicine ☐ School of Pharmacy
☐ Other, please specify: _____

Department: _____

Career Status: *(check all that apply)*
☐ Graduate Student ☐ Professor ☐ Postdoctoral Fellow ☐ Assistant Researcher
☐ Project Assistant ☐ Associate Professor ☐ Postdoctoral Trainee ☐ Associate Researcher
☐ Research Assistant ☐ Assistant Professor ☐ Research Associate ☐ Researcher
☐ Teaching Assistant ☐ Instructor/Lecturer ☐ Post-Doctorate ☐ Senior Researcher
☐ Faculty Associate ☐ Assistant Scientist
☐ Associate Scientist
☐ Scientist
☐ Senior Scientist
☐ Other Academic Staff

☐ Other _____

Number of years teaching at a higher education institution: _____ years
(Do not include teaching as a T.A. Each semester equals .5 years.)

Number of years teaching as a TA or RA at a higher education institution: _____ years
(Each semester equals .5 years.)

National Science Foundation field in which you primarily teach: *(select from list below)* _____

01 – Non-teaching

02 – Agricultural Sciences

03 – Computer Science

04 – Psychology (clinical)

05 – Psychology (except clinical)

Biological Sciences
06 – Biochemistry
07 – Biometry and Epidemiology
08 – Biophysics
09 – Botany
10 – Cell and Molecular Biology
11 – Entomology and Parisitology
12 – Genetics
13 – Microbiology, Immunology and Virology
14 – Nutrition
15 – Pathology
16 – Pharmacology
17 – Physiology
18 – Zoology
19 – Biological Sciences, n.e.c.

Earth, Atmospheric and Oceanic Sciences
20 – Atmospheric Sciences
21 – Geosciences
22 – Ocean Sciences

Engineering
23 – Agricultural Engineering
24 – Biomedical Engineering
25 – Chemical engineering
26 – Civil Engineering
27 – Electrical Engineering
28 – Engineering Physics
29 – Industrial/Manufacturing Engineering
30 – Mechanical Engineering
31 – Metallurgical and Materials Engineering
32 – Mining Engineering
33 – Nuclear Engineering
34 – Engineering, n.e.c.

Health Fields
35 – Clinical Medicine
36 – Communicative Disorders Science
37 – Dental Sciences
38 – Endocrinology
39 – Neurology
40 – Nursing
41 – Oncology/Cancer Research
42 – Pharmaceutical Sciences
43 – Preventative Medicine/Community Health
44 – Veterinary Sciences
45 – Health Fields, n.e.c.

Mathematical Sciences
46 – Mathematics and Applied Mathematics
47 – Statistics

Physical Science
48 – Astronomy
49 – Chemistry
50 – Physics

Social Sciences
51 – Anthropology
52 – Geography
53 – History and Philosophy of Science
54 – Sociology
55 – Social Sciences, n.e.c.

56 – Other _____

Week 4: Modified demographic form

Name: _____

Gender: _____

Ethnicity: _____

Race: _____

Citizenship: _____

Disability Status: _____

Is there anything else you could share with us which would help us facilitate your learning in this course?

Week 4: Content decisions handout

What we chose to talk about:
- How people learn
- Thoughts on how different people learn
- Strategies for helping people learn – active learning, role of emotion, role of music, etc.
- Helping students improve their own learning through identifying their own learning style, challenging themselves to learn in various ways, and active assessment

What we didn't include:
- Learning Styles inventories and a discussion of why you think and learn the way you do
- Discussion of a large body of literature on the biological differences between men and women and the resulting theories about their differences in learning
- A detailed discussion on the biology of learning, in particular formation of memory
- Overview of various teaching and learning practices
- Discussion of the genetic and environmental impacts on learning

Extended bibliography:

Cahill, Larry 2005. "His brain, her brain." Scientific American, May, pp. 40-47.

Fausto-Sterling, Anne. 1992. Myths of gender: biological theories about women and men. New York: Basic Books.

Gould, Stephen Jay. 1996. The mismeasure of man. New York: W. W. Norton & Co.

Squire, Larry and Kandel, Eric. 2000. Memory: From Mind to Molecules. W.H. Freeman & Company.

Zull, James E. 2002. The Art of Changing the Brain: Enriching Teaching by Exploring the Biology of Learning Virginia: Stylus Publishing.

Week 5: Mini-lecture handout

Hidden curriculum and class
Jean Anyon (1980; 1981)

	Working class	Middle class	Affluent professional	Executive elite
Evaluation	Not right or wrong, but following right steps	right answer	Creative activity, done independently	Develop analytical intellectual powers
Math	Follow procedures	Choice about procedure to get right answer	Collect real data, compile, verified by classmate	Develop reasoning, right ans-wers may be challenged
Overall	Conflict with capital - resistance to authority	Bureaucratic	Symbolic capital to be artistic professionals	Symbolic capital to manipulate system

Primer on "race":
- "Race" = American "races"
  - Don't include international conceptualization of race
  - Don't include "white" as a racial category
- The use of "ethnicity" vs. "race"
  - The terms have different histories -- some scholars have argued that race is more a "political" and conflict-ridden term, and that "ethnicity" is simply cultural.
  - The US government uses "race" to represent "Hispanic" or "non-Hispanic" and "ethnicity" to represent "African-American," "Asian", "American Indian/Alaskan Native" and so on.
- No biological basis of "race." (Livingstone 1993)
  - There may be phenotypes, but few other genetic markers.
  - The categories of "Hispanic" "American Indian", "Asian" and "African-American", and particularly "White" or "Caucasian" are all modern constructions that have changed over time. (Jacobson 1999)
  - Racial categories are blurring even faster now (Rodriguez 2002)

Partial knowledges:
Perry's typology of intellectual development (9 stages, briefly summarized):
1. Dualism -- right and wrong in the world, follow authority
2. Multiplicity -- different perspectives valid, authority doesn't always have THE answers
3. Relativism -- all knowledge is contextual and relative
4. Commitment in relativism -- make commitment to some values -- career, values, religion, own views may be incorrect

For more details, see http://www.indiana.edu/~I506/theoryframe/506Model.htm or read his book (Perry 1968)

Response study by Belenky et al. (1986)
1. Silence: total dependence on whims of external authority
2. Received Knowledge: receive and reproduce knowledge
3. Subjective Knowledge: truth and knowledge are conceived of as personal, private, and intuited
4. Procedural Knowledge: rely on objective procedures for obtaining and communicating knowledge

5. Constructed Knowledge: view all knowledge as contextual; value subjective and objective strategies

References:
Anyon, Jean. 1980. "Social class and the hidden curriculum of work." *Journal of Education* 162:67-92.

—. 1981. "Social Class and School Knowledge." *Curriculum Inquiry* 11:3-42.

Belenky, M. F., B. M. Clinchy, N. R. Goldberger, and J. M. Tarule. 1986. *Women's Ways of Knowing: The Development of Self, Voice and Mind*. New York: Basic Books.

Jacobson, Matthew Frye. 1999. *Whiteness of a different color: European immigrants and the alchemy of race*. Cambridge, MA: Harvard University Press.

Livingstone, Frank B. 1993. "On the nonexistence of human races." in *The "racial" economy of science: toward a democratic future*, edited by S. Harding. Bloomington, IN: Indiana University Press.

Perry, William G. 1968. *Forms of Intellectual and Ethical Development In the College Years: A Scheme.* New York: Holt, Rinehart and Winston.

Rodriguez, Richard. 2002. Brown: The last discovery of America. New York: Viking Books.

Week 5: Content decisions handout

What we chose to talk about:

Concepts:

- There are many different learning styles that intersect with dimensions of diversity
- Class is a major organizer of our educational system— its purpose, its methods, and to whom it teaches what
- We need to consider these when deciding on our pedagogies

Organization of time:

- A large amount of time on the Reading Assessment, including a meta-cognition activity
- Another discussion method, emerging from a Native American tradition (Running Wolf and Rickard, 2003)
- A lecture about the "hidden curriculum" and its impact on race, class & gender, and the notion of "partial knowledges."
- Mentioned some key research on gender (Belenky, Clinchy, Goldberger, and Tarule, 1986; Hyde, 2005; Perry, 1968; Valian, 1999)

Why we chose this to talk about:

- Going over individual points of articles that are literature reviews would waste your time and not give rise to the problems with generalizations.
- It is more useful for you to have ways of weighing studies against each other, and determining their usefulness for your practice.

What we didn't include:

- Discussion of gender schemas (Valian, 1999) and social psychology literature on persisting behavioral and cognitive differences between men and women (Conwell, Griffin, and Algozzine, 1993; Okebukola, 1986)
- The literature arguing for and against single-sex education (American Association of University Women, 1998; Canada and Pringle, 1995)
- The literature on girls in K-12 education (American Association of University Women, 1992; American Association of University Women, 1999; Sadker and Sadker, 1994)
- Discussion of pedagogies to facilitate the learning of people with disabilities (see DO-IT Web site, below) for STEM-specific applications)(Johnson, Johnson, Scott, and Ramolae, 1985; Nelson-Le Gall and Decooke, 1987)
- Discussion about the interaction of different students' races and other characteristics on students' learning (Brown, 1980; Quintana-Baker, 2002; Swisher, 1990; Zuniga, Olson, and Winter, 2005)
- Laundry lists of pedagogical techniques published in the STEM/SBE practitioner literature
- A discussion of pipeline theories and chilly climate theories (Massachusetts Institute of Technology, 1999; Rosser, 1995; Sandler, Silverberg, and Hall, 1996; Sandler and Hall, 1986)

Extended bibliography

University of Washington Disabilities, Opportunities, Internetworking & Technology
http://www.washington.edu/doit/

American Association of University Women. 1992. "How schools shortchange girls." AAUW Education Foundation, National Education Association, Washington.

—. 1998. *Separated by sex: a critical look at single-sex education for girls*. Washington: American Association of University Women Educational Foundation.

—. 1999. *Gender Gaps: Where Schools Still Fail Our Children*. New York: Marlowe & Company.

Belenky, M. F., B. M. Clinchy, N. R. Goldberger, and J. M. Tarule. 1986. *Women's Ways of Knowing: The Development of Self, Voice and Mind*. New York: Basic Books.

Brown, Anthony D. 1980. "Cherokee culture and school achievement." *American Indian Culture and Research Journal* 4:55-74.

Canada, Katherine and Richard Pringle. 1995. "The Role of Gender in College Classroom Interactions: A Social Context Approach." *Sociology of Education* 68:161-186.

Conwell, Catherine R., Sandra Griffin, and Bob Algozzine. 1993. "Gender and racial differences in unstructured learning groups in science." *International Journal of Science Education* 15:107-115.

Hyde, Janet Shibley. 2005. "The gender similarities hypothesis." *American Psychology* 60:581-592.

Johnson, Roger T., David W. Johnson, Linda E. Scott, and Beverly A. Ramolae. 1985. "Effects of single-sex and mixed-sex cooperative interaction on science achievement and attitudes and cross-handicap and cross-sex relationships." *Journal of Research in Science Teaching* 22:207-220.

Massachusetts Institute of Technology. 1999. "A Study on the Status of Women Faculty in Science at MIT." Massachusetts Institute of Technology, Cambridge, MA.

Nelson-Le Gall, Sharon and Peggy A. Decooke. 1987. "Same-sex and cross-sex help exhanges in the classroom." *Journal of Educational Psychology* 79:67-71.

Okebukola, Peter Akinsola. 1986. "Cooperative learning and students' attitudes to laboratory work." *School Science and Mathematics* 86:582-590.

Perry, William G. 1968. *Forms of Intellectual and Ethical Development In the College Years: A Scheme.* New York: Holt, Rinehart and Winston.

Quintana-Baker, Maricel. 2002. "A profile of Mexican American, Puerto Rican, and other Hispanic STEM doctorates: 1983-1997." *Journal of Women and Minorities in Science and Engineering* 8:99-121.

Rosser, Sue V. 1995. "Reaching the Majority: Retaining Women in the Pipeline." Pp. 1-21 in *Teaching the Majority: Breaking the Gender Barrier in Science, Mathematics and Engineering*, edited by S. V. Rosser. New York: Teachers College Press.

Running Wolf, Paulette and Julie A. Rickard. 2003. "Talking Circles: A Native American Approach to Experiential Learning." *Journal of Multicultural Counseling and Development* 31:39-43.

Sadker, Myra and David Sadker. 1994. *Failing at Fairness: How Our Schools Cheat Girls*. New York: Touchstone.

Sandler, Bernice R., Lisa A. Silverberg, and Roberta M. Hall. 1996. *The chilly classroom climate: a guide to improve the education of women*. Washington DC: National Association for Women in Education.

Sandler, Bernice Resnick and Roberta M. Hall. 1986. "The Campus Climate Revisited: Chilly for Women Faculty, Administrators, and Graduate Students." Association of American Colleges, Washington DC.

Swisher, Karen. 1990. "Cooperative learning and the education of American Indian/Alaskan Native students: a review of the literature and suggestions for implementation." *Journal of American Indian Education*:36-43.

Valian, Virginia. 1999. *Why So Slow? The Advancement of Women*. Cambridge, MA: MIT Press.

Zuniga, Keren, Joanne K. Olson, and Mary Winter. 2005. "Science education for rural Latino/a students: course placement and success in science." *Journal of Research in Science Teaching* 42:376-402.

Week 6: Action plan models

Banks (1995)

Dimensions of multicultural education
- Content integration
- Knowledge construction
- Prejudice reduction
- Equity pedagogy
- Empowering school culture

Approaches to Multicultural Curriculum reform
1. Contributions approach— heroes, heroines, holidays, foods, and discrete cultural elements are celebrated occasionally
2. Additive approach— content, concepts, lessons, and units are added to the curriculum without changing its structure
3. Transformation approach— the structure of the curriculum is changed to enable students to view concepts, issues, events, and themes from the perspectives of diverse ethnic and cultural groups
4. Action approach— students make decisions on important personal, social, and civic problems and take actions to help solve them

Rosser (1993) (taken from http://onlineethics.org/div/abstracts/femfriendsci.html):
1. Absence of women is not noted
    o In this phase, many scientists would suggest that science is by nature objective, both womanless and manless. They do not realize that gender can influence science through theories, data collection, subjects chosen for experimentation, or questions asked.
2. Recognition that most scientists are male and that science may reflect a masculine perspective
    o Undertake fewer experiments likely to have direct military applications, and instead support more experiments to explore problems of social concern.
    o Consider problems that have not previously been considered worthy of scientific investigation because of the field with which the problem has been traditionally associated.
3. Identification of barriers that prevent women from entering science
    o Increase the numbers of observations and remain longer in the observational stage of the scientific method. It is important to counter the gender gap in use of scientific equipment and experimental materials, by providing more hands-on experience during an increased observational stage of data-gathering.
    o Incorporate and validate personal experiences women are likely to have had as part of the class discussion or the lab exercise.
    o Decrease laboratory exercises in introductory courses in which students must kill animals or perform acts that may be perceived as particularly harsh.
    o Expand the kinds of observation beyond those traditionally carried out in scientific research
4. Search for women scientists and their unique contributions
5. Science done by feminists/women
    o Using precise, gender-neutral language in describing data and presenting theories.
    o Uncovering biases such as those of gender, race, class, sexual orientation, and religious affiliation which may permeate theories and conclusions drawn from experimental observation.
6. Science redefined and reconstructed to include us all

Calabrese Barton 1998
1. First-wave feminism— equity issues, liberal feminism
2. Second-wave feminism— gender-inclusive science

- o Nature of science and scientific knowledge
- o Incorporating marginalized ways of knowing
- o Relationships between science and society
3. Third-wave feminism
   - o Situated knowing and learning: self-reflexivity, intersectionality
   - o Challenge how science is situated as a school subject
   - o Situating role of teachers and students

Mack 2001
1. Difference feminism
2. Equal rights feminism

Reddick, Lois, Jacobson, Wayne, Linse, Angela, and Yong, Darryl (in press) A Framework for Inclusive Teaching in STEM Disciplines. In, M. Ouellett (Ed.), Teaching Inclusively: Diversity and Faculty Development. Stillwater, OK: New Forums Press.
Find online at http://www.mines.edu/research/cee/Inclusive_teaching_revised.pdf

STEM model parallel to Banks 1995:

Problem Definition	Clearly identify goals, rationales, starting conditions, appropriate design, and principles of implementation to achieve optimal learning outcomes.
Redundant Systems	Recognize that an effective system is designed to monitor and respond to feedback, adapt to changing conditions, and provide alternate strategies when systems do not function or other obstacles are encountered.
Expert Practice	Establish that your design and approach to teaching support effective learning of course content for all students.
External Constraints	Anticipate and minimize or compensate for ways in which teaching and learning processes and outcomes are influenced by environmental factors and other external constraints.
Comprehensiveness	Maintain thoroughness and rigor of what is taught, grounded in actual (rather than idealized) conditions.

Week 6: Timeline handout

Overlap of US feminist and multicultural education movements

DCC Mini-lecture 10/18/05

1920: passage of 19th Amendment   1953: Brown vs. Board of Education
Women have right to vote   Racial desegregation of public schools

1880   1900   1920   1940   1960   1980   2000

US FEMINISM WAVES (From Barton 1998)

First-wave feminism
retronym for suffrage movement
focused on getting the right to vote
strategy of "difference feminism" --
women different than men, so have
different things to contribute to society
historical period ended in 1920 with
passage of 19th Amendment
current ideas manifested as "liberal
feminism" -- questions of access
SCIENCE: access of underrepr. people
to scientific education, resources

Second-wave feminism
Emerges from civil rights movement as
the women's movement/
women's liberation
strategy of "equal-rights" feminism --
women and men are much the same
except in few specific areas, so
should be treated the same
Issues of discrimination, workplace and
economic equity
Public discourse around "oppression"
Criticism of white middle-class feminist
leaders of classism & racism
Identity politics resulting in fractionation
of social action mvmts
SCIENCE: gender inclusive science

Third-wave feminism
other terms: "womanism"
and "postfeminism"
emerges in 80s/90s as new
generation of women
grow up post women's lib
movement
poststructural notion of
positionality rather than
litany of identity
characteristics
development of queer
theory, third world
feminism
SCIENCE: reflexivity,
power of scientists,
praxis (action informed
by theory)

MULTICULTURAL EDUCATION HISTORY (From Banks 1995)

Early ethnic studies
W.E.B DuBois
Woodson

intergroup
education mvmt
philosophy: we are all
different but
essentially the
same
interracial harmony
through assimilation
into "general"
culture

Ethnic studies
emerging from civil rights
movement
development of Black
studies, Afro-American
studies movements, and
later other ethnic studies
efforts (American Indian,
Chicano/a, Latino/a
studies)

Multicultural education
James Banks (U
Wash), Carl Grant
(UW-Madison)

Week 6: Content decisions handout

What we chose to talk about:
- Historical outline of feminist movement and how it overlaps with history of multicultural education
- Highlight participants' stories and thoughts about the readings

Why we chose this to talk about:
- Modeling these pedagogies:
  Part of what is critical about feminist and multicultural pedagogies is that you *must* practice what you preach. If problematizing instructor authority is important, then one should not lecture the whole time, or stand at the front of a room filled with rows of desks. If saying students' lived experiences are important to "Science" as well as their own scientific understanding, then one should make room to hear students' voices.

What we didn't include:
- A discussion of queer theory and how it relates in particular to biology textbooks
- Discussion of the Americans with Disabilities Act and the "ability movement", and how that effects how we educate students
- A discussion about feminist science studies
- A discussion about the modern ethnic studies movement

Extended bibliography:

Christian, Barbara. 1990. "The Race for Theory." in *Making Face, Making Soul=Haciendo Caras: Creative and Critical Perspectives by Feminists of Color*, edited by G. Analduza. San Francisco: aunt lute books.

Fausto-Sterling, Anne. 1992. "Building Two-Way Streets: The Case of Feminism and Science." *NWSA Journal* 4:336-349.

Gunn Allen, Paula. 1997. "Where I Come From Is Like This." in *Feminist Frontiers IV*, edited by L. Richardson, V. Taylor, and N. Whittier. New York: McGraw-Hill.

Hacker, Sally L. 1983. "Mathematization of Engineering: Limits on Women and the Field." Pp. 38-58 in *Machina Ex Dea: Feminist Perspectives on Technology*, *The Athene Series*, edited by J. Rothschild. Elmsford NY: Pergamon Press.

Haraway, Donna. 1994. "A Game of Cat's Cradle: Science Studies, Feminist Theory, Cultural Studies." *Configurations* 1:59-71.

Harding, Sandra. 1986. *The Science Question in Feminism*. Ithaca: Cornell University Press.

—. 1987. "Feminism and Methodology: Social Science Issues." Bloomington: Indiana University Press.

—. 1991. *Whose Science? Whose Knowledge? Thinking from Women's Lives*. Ithaca NY: Cornell University Press.

—. 1993. "The "Racial" Economy of Science." in *Race, Gender, and Science*, edited by A. Fausto-Sterling. Bloomington, IN: Indiana University Press.

—. 1993. "Forum: Feminism and Science." *National Women's Studies Association Journal* 5:56-64.

Hill Collins, Patricia. 1998. "The Social Construction of Black Feminist Thought." Pp. 371-396 in *Feminist Foundations: Towards Transforming Sociology*, edited by K. A. Myers, B. J. Risman, and C. D. Anderson. Thousand Oaks, CA: Sage Publications.

Hubbard, Ruth. 1997. "In a Science Restructured Along Feminist Lines, Would the Laws of Gravity No Longer Hold?" in *Doing Feminism: Teaching and Research in the Academy*, edited by M. Anderson, L. Fine, K. Geissler, and J. Ladenson. Ann Arbor: Michigan University Press.

Keller, Evelyn Fox. 1983. *A feeling for the organism: the life and work of Barbara McClintock*. W. H. Freeman.

—. 2001. "From Working Scientist to Feminist Critic." Pp. 59-62 in *The Gender and Science Reader*, edited by M. Lederman and I. Bartsch. New York: Routledge.

Khayatt, Didi. 1997. "Sex and the Teacher: Should We Come Out in Class?" *Harvard Educational Review* 67:126-143.

Lederman, Muriel and Ingrid Bartsch. 2001. "The Gender and Science Reader." New York: Routledge.

Mack, Pamela E. 2001. "What difference has feminism made to engineering in the twentieth century?" Pp. 149-168 in *Feminism in twentieth-century science, technology and medicine*, edited by A. N. H. Creager, E. Lunbeck, and L. Schiebinger. Chicago: University of Chicago Press.

Maher, Frances A. and Mary Kay Thompson Tetreault. 2001. *The feminist classroom: dynamics of gender, race, and privilege*. Lanham, MD: Rowman & Littlefield Publishers, Inc.

Martin, Emily. 1991. "The Egg and the Sperm: How Science Has Constructed a Romance Based on Stereotypical Male-Female Roles." *Signs* 16:485-501.

Mayberry, Maralee. 1998. "Reproductive and Resistant Pedagogies: The Comparative Roles of Collaborative Learning and Feminist Pedagogy in Science Education." *Journal of Research in Science Teaching* 35:443-459.

Mayberry, Maralee and Margaret N. Rees. 1997. "Feminist Pedagogy, Interdisciplinary Praxis, and Science Education." *NWSA Journal* 9:57-75.

Mayberry, Maralee and Ellen Cronan Rose. 1999. "Meeting the Challenge: Innovative Feminist Pedagogies in Action." New York: Routledge.

Mayberry, Maralee, Banu Subramaniam, and Lisa H. Weasel. 2001. "Feminist Science Studies: A New Generation." Pp. 354. New York: Routledge.

Miller, Janneli F. 1996. "'I Have a Frog in My Stomach': Mythology and Truth in Life History." Pp. 103-119 in *Unrelated Kin: Race and Gender in Women's Personal Narratives*, edited by M. Foster. New York: Routledge.

Orner, Mimi. 1992. "Interrupting the Calls for Student Voice in "Liberatory" Education: A Feminist Poststructuralist Perspective." Pp. 74-89 in *Feminisms and Critical Pedagogy*, edited by C. Luke and J. Gore. New York: Routledge.

Reddick, Lois, Jacobson, Wayne, Linse, Angela, and Yong, Darryl (in press) A Framework for Inclusive Teaching in STEM Disciplines. In, M. Ouellett (Ed.), Teaching Inclusively: Diversity and Faculty Development. Stillwater, OK: New Forums Press.

Rosser, Sue V. 1995. *Teaching the Majority: Breaking the Gender Barrier in Science, Mathematics and Engineering*. New York: Teachers College Press.

Snyder, Vicky L. and Francis S. Broadway. 2004. "Queering High School Biology Textbooks." *Journal of Research in Science Teaching* 41:617-636.

Stepan, Nancy Leys. 1986. "Race and gender: The role of analogy in science." *Isis* 77:261-277.

Subramaniam, Banu, Angela B. Ginorio, and Shirley J. Yee. 1999. "Feminism, Women's Studies, and Engineering: Opportunities and Challenges." *Journal of Women and Minorities in Science and Engineering* 5:311-322.

Wajcman, Judy. 1991. *Feminism Confronts Technology*. University Park, PA: Pennsylvania State University Press.

DCC2

Week 1: Educational resources (A Starting Point)

UW-Madison electronic educational databases (through e-resource gateway)
ERIC - Educational Resources Information Center
Education Full Text
JSTOR

Educational journals available through the University of Wisconsin
Journal of Cell Biology Education
Journal of Chemical Education
Journal of Engineering Education
Journal of Research in Science Teaching
Educational Studies in Mathematics
Educational Technology, Research and Development
Journal of College Science Teaching
New Directions for Teaching and Learning
Journal of Women and Minorities in Science and Engineering
Journal of Geoscience Education (paper only)
Teaching Sociology

UW-Madison teaching and learning resources
Delta: http://www.delta.wisc.edu
WPST: http://scientificteaching.wisc.edu/
Center for Biology Education: http://www.wisc.edu/cbe/
Institute for Chemical Education: http://ice.chem.wisc.edu/
Engineering Learning Center: http://www.engr.wisc.edu/services/elc/
Teaching & Learning Excellence@UW-Madison: http://www.provost.wisc.edu/tle/

Online journals
Journal of American Indian Education: http://jaie.asu.edu/
2005 NSF Report: Women, Minorities, and Persons with Disabilities in Science and Engineering: http://www.nsf.gov/statistics/wmpd/

Online teaching and learning resources
University of Washington DO-IT: Disabilities, Opportunities, Internetworking and Technology: http://www.washington.edu/doit/
CIRTL Innovative Programs Database: http://ed-web2.educ.msu.edu/JHernandez/main.htm
National Center for Case Study Teaching in Science: Science Education Journals (journals in Agriculture/Agronomy, Anatomy/Physiology, Anthropology, Biology, Chemistry/Chemical Engineering, Cooperative/Collaborative Learning, Dentistry, Engineering, Environmental Science & Studies, General Science Education, Geography/Geology, Mathematics, Medicine, Nursing, Pharmacy, Physics, Psychology, Statistics, Veterinary, Medicine): http://ublib.buffalo.edu/libraries/projects/cases/journal.htm
Sociology Cases Database Project: http://www.nd.edu/~dhachen/cases/

Week 2: "Guiding Questions" handout

Teaching-as-Research
- What do I want students to learn?
- What is already known about teaching these concepts and /or this approach?
- What evidence will I need in order to determine whether my students have achieved the learning goals? What will constitute credible evidence?
- What will I do to enable students to achieve the learning goals?
- How will I collect and analyze information to determine what students have learned?
- Who am I trying to convince with my data? Who are the stakeholders?
- How will I use what I have learned to continue to improve my teaching?

Learning-through-Diversity
- How do participants' different backgrounds influence how they learn?
- How will considering "diversity" influence how I practice my teaching, and what I decide to include as content?
- How can the diversity of individual participants help other participants learn better?
- How do I identify and address inequities that exist in my teaching environment?

Learning Community
- How do I promote shared discovery and learning among learners?
- How do I support the meaningful interactions among learners that are necessary to achieve the learning goals?
- How do I connect my materials and activities to other related topics and experiences?
- How do I create an inclusive learning environment?

Scientific Teaching
- Do the goals of the unit reflect the nature of science?
- Do the assessments determine how well students are able to demonstrate their knowledge, abilities, and understanding of science?
- Do the activities reflect authentic actions, behaviors, and processes of science?
- Does the unit include scientific content that is accurate, appropriate, and engaging?
- Does the unit provide goals, assessments, activities, and examples that are inclusive to a diversity of students?
- Are the assessments and activities aligned with the unit's goals?
- Are the unit's goals aligned with your teaching goals?
- Do the assessments provide you with data about your teaching?
- Are the activities based on sound teaching principles?

Week 2: "Timeline planning" handout

	Class deadline	Personal work goals
Week 2	Initial project description due	
Week 3		
Week 4		
Week 5		
Week 6	Peer-review in class	
Week 7	Project write-up due	
Week 8	Project product due - DCC Forum today!	

Week 5: Pillar rubric handout

Element	Levels of Completion		
	Comprehensive	Intermediate	Cursory or Absent
Learning Goals: Overall What students/ participants will learn	It is clear what students will know, understand, and be able to do after they engage in these activities. The goals are challenging and appropriate for the intended audience.	The goals are identified but could be stated more explicitly, or they could be more innovative or varied. The goals are clear, but they are too challenging or too simple.	The goals are vague, ambiguous, too broad or ambitious, too detailed or focused, lack essential information, or omitted.
Learning Goals: Content What content students/ participants are expected to know	It is clear what knowledge (concepts, topics, theories, facts, and terminology) students are expected to learn. It is clear why this content is interesting or relevant. The expected knowledge is accurate, challenging, and appropriate for the intended audience.	Expected knowledge is identified but could be more specific, varied, or accurate. Expected knowledge is clear, but it is too challenging or simple. Some content is inaccurate.	Expected knowledge is vague, ambiguous, not specific, inappropriate, inaccurate, or omitted.
Diversity: How diversity of students/ participants will be included, drawn upon, and enhanced.	The practitioner presents her definition of diversity in a clear and detailed manner. It is clear that the activities are designed to allow students to construct their own learning in the context of their own minds, to foster student responsibility for learning, and to engage a diversity of students. It is clear that the activities address multiple aspects of student diversity, such as cognitive, racial/ethnic /cultural, gender, and ability. A diversity of teaching methods, content, examples, or metaphors is used. It is clear that attempts have been made to address issues such as hidden curriculum, inclusive learning environment, and multicultural education.	The practitioner presents her definition of diversity but it is not clear or detailed. The activities offer some opportunity for students to construct their own learning, but could include more diverse or effective teaching methods. The activities could use more examples that reflect student diversity in background, gender, learning or physical abilities. The activities include diverse teaching methods, but otherwise do not address diversity in students. Issues such as hidden curriculum, inclusive learning environment, and multicultural education are mentioned but there is no clear attempt to address them.	No definition of diversity is presented. The activities are teacher-centered and do not foster student responsibility for learning. The activities do not address diversity or includes examples which may not be inclusive. Issues such as hidden curriculum, inclusive learning environment, and multicultural education are not mentioned.

Learning Community How students/ participants will actively engage in shared learning and discovery	The activities are designed to help students work together to meet the learning goals. Collaborative student-centered exercises are used effectively. The activities are interesting, engaging and meaningful. It is clear how students will be made to feel included in the learning process and how the practitioner will determine if they feel included. It is clear from the description presented that the practitioner has a good understanding of learning community.	The activities are designed to help students work together but it is not clear how they will rely on one another to meet the learning goals. Collaborative student-centered exercises are mentioned but it is not clear how they will be used. The activities could be more engaging and meaningful. It is not clear how students will be made to feel included in the learning process or how the practitioner will determine if they feel included. It is not clear that the practitioner has a complete understanding of learning community.	The activities are not clearly designed to help students work together to meet the learning goals. Collaborative student-centered exercises not are used. The activities are not very interesting nor engaging and their meaning is not apparent. There is no mention of how students will be included in the learning process. No definition or description of learning community is presented.
Scientific Teaching/ Teaching-as-Research How an approach to research is used to improve teaching and learning goals	It is clear how the activities and assessments are aligned with the learning goals. It is clear how the activities address the themes of diversity, learning community and teaching-as-research/ scientific teaching. It is clear how the activities elicit and build on students' prior knowledge and addresses common misconceptions. It is clear what references were used to develop the approached, including content, approaches, and ideas used for adaptation. It is clear how the unit meets YOUR teaching goals. It is clear from the description presented that the practitioner has a good understanding of scientific teaching/ teaching-as-research.	The approach contains some information, but it needs more detail about the alignment of learning goals, assessment, learning community, and diversity. References are provided without a clear description of their relevance. Some references are omitted or insufficient. It is not clear from the description presented that the practitioner has a complete understanding of scientific teaching/ teaching-as-research.	The activities and assessments do not align with goals. References are omitted. No definition or description of scientific teaching/ teaching-as-research is presented.

Assessment How practitioners will measure students/ participant learning How students or participants will self-assess learning	The assessments provide practitioners and students with feedback about learning. Assessments are designed to measure participant progress toward the learning goals throughout the activities. Assessments are designed to drive participant learning toward the goals. Criteria for evaluation (and grading) are clear.	The assessments provide some feedback to the practitioners and the students but could be improved. The assessments align somewhat with the learning goals. The assessments include formative and summative formats but could be improved.	The assessments are incomplete or ambiguous. The assessments are not aligned with the learning goals. Feedback to students or practitioners is missing. Formative or summative assessments are missing.
Action Plan What the practitioner and participants or students will do	The plan includes a clear schedule of events for activities and assessments for both the practitioner and the students. The sequence of events is logical and aligned with goals. Detailed instructions are provided so that another practitioner could easily implement the activities, including guiding questions, tips, and supporting materials. Detailed instructions are provided for students/ participants.	The schedule of activities is described broadly, but more detailed instructions are needed for another practitioner to implement. The order of events is somewhat logical, but could be improved.	The schedule of activities is vague, not logical, or omitted. Detailed instructions are not included for practitioners or students.

Week 6: Blank "Resistance" questions handout.

	CHALLENGE	ASSUMPTIONS	STRATEGY
1.	My class is full of white people from Wisconsin. Why do I need to consider diversity?		
2.	My class is full of students who look the same. Why do I need to consider diversity?		
3.	My class is not about social issues. Why do I need to consider diversity?		
4.	I measure skills and abilities that have nothing to do with diversity. Why do I need to consider diversity?		
5.	Everyone has an equal chance to succeed in my class because I treat everyone the same. Isn't that enough?		
6.	Women and minority students just aren't as well prepared as my other students in my class. Why should it be my job to give them extra help?		
7.	If we spend all this time covering diversity, we won't cover any content. Isn't my job to cover content?		
8.	I'm a scientist. I'm not trained in this stuff. How can I know enough about how to consider diversity?		
9.	If I try to teach so that everyone understands and does well, I am guilty of grade inflation/the average of the class will rise and the excellent students won't get a chance to shine. Why should I do this?		
10.	I'm a white male. I'm afraid anything I say about diversity will make people think I'm racist and sexist. How can I begin to address diversity in my		

	CHALLENGE	ASSUMPTIONS	STRATEGY
	class?		
11.	If I make an effort to help women and minorities in my class, I'll be accused of "reverse discrimination." Isn't that what this is?		
12.	The university is supposed to make accommodations for people with disabilities, not me. What can I do, if my class is scheduled in an inaccessible place?		
13	Asking for people's personal backgrounds is an invasion of privacy. Why should I breach this for everyone, just for the sake of a few?		
14.	If I try to reach out to everyone in my class, it will give them an unrealistic impression of what the "real world" is like. The "real world" isn't friendly, it is cutthroat. It won't wait for everyone to understand the material. Why should I give my students a false impression?		

Week 6: Instructor cheat sheet for "Resistance" questions

	CHALLENGE	STRATEGY
1.	My class is full of white people from Wisconsin. Why do I need to consider diversity?	How do you know? We can't always rely on our eyes to tell us ethnicity. Some people who don't consider themselves "white" sometimes have lighter skin than Euro-American people. If your class is populated with only white people from Wisconsin, you are teaching only one slice of society. This is despite the charge of a public university to educate the populous of the state. Why are other people present in this state not taking your class?
2.	My class is full of students who look the same. Why do I need to consider diversity?	Characteristics that make us different are not always visible. You may have first-generation college students and students whose parents are both PhDs. You may have straight students and gay students. You may have poor students and rich students. You may have students who are traditional college age, and older students, perhaps with families. These are all things that affect how and what we learn, and hence should affect how you teach.
3.	My class is not about social issues. Why do I need to consider diversity?	Even though your class may not be about social issues, students bring their social selves (that is, how they participate in various social groups in society) to your class. Your material will be interpreted by students through a social issues lens, whether you intend it or not. (or the next one too)
4.	I measure skills and abilities that have nothing to do with diversity. Why do I need to consider diversity?	Research suggests that students from different kinds of social groups may learn differently, and that students' learning preferences vary with time, context, mood, and so on. Even if your material is entirely abstract, yours students all learn in different ways. I think it is the role of the instructor to make material as accessible to students as possible; hence you should learn about students' diversity so you can teach them better.
5.	Everyone has an equal chance to succeed in my class because I treat everyone the same. Isn't that enough?	Research suggests that invariably people don't know when they're being biased or treating people unequally. How do you know you treat everyone the same? If someone came to observe your class, would they agree? Would your students agree? (Why don't you ask them?)
8.	I'm a scientist. I'm not trained in this stuff. How can I know enough about how to consider diversity?	There are lots of opportunities on campus to learn about how to incorporate considerations of diversity into your classroom. As a scientist, you are trained to draw conclusions about the world based on research questions you pose, and then engaging in some process to try and find out the answer. How would you as a scientist work out whether you treat all your students the same, or whether your students feel part of a learning community in your class?
9.	If I try to teach so that everyone understands and does well, I am guilty of grade inflation/the average of the class will rise and the excellent students won't get a chance to shine. Why should I do this?	In my opinion, the purpose of grading is not to rank the students from best to worst, but to give feedback to individual students about how much they think they learned out of what you wanted them to learn. In my opinion, your job is to teach everyone about chemistry (or whatever), not to apply a chemistry treatment and see how everyone reacts, and then rank them. You can provide your outstanding students other opportunities to shine outside of the material you want everyone to learn.

Week 8: DCC Forum evaluation handout

Question 1: Why did you come to the DCC Forum on Dec 13?

Question 2: How much experience do you feel you have with "diversity issues"?
- ☐ A great deal
- ☐ A moderate amount
- ☐ Some
- ☐ Not much
- ☐ None at all.

Question 3: What did you hope to get from the experience of attending the DCC Forum?

Question 4: Please describe your experience attending.

Question 5: The following statements are based on the goals the DCC students collaboratively set out for this event. Please rate how much or how little you agree or disagree with these statements. From attending this event:
- ☐ I see the students' broad definition of diversity
- ☐ I better understand the value of diversity, and why it is important to address it, even in science and engineering classrooms
- ☐ I have learned some creative ways to integrate diversity in teaching, research and learning
- ☐ I have collected some doable ideas regarding diversity for my work
- ☐ I see the students model their own commitment to diversity in their presentations
- ☐ I see these students as valuable potential colleagues

Question 6: Did your understanding of the term "diversity" change as a result of attending the DCC Forum? - Please comment.

Question 7: What comments do you have for the students who presented? (The program was: Colleen Robinson on using Learning Community Norms, Jenny Kao-Kniffin on redesigning an Environmental Studies seminar, Michele Price on the draw-a-scientist and "scientist of the week" activities, Aya Diab on drop-in ideas in a heat transfer class and evaluations, and Erica Siegl on assessing understanding of diversity in the Sociology department.)

Question 8: How satisfied are/were you with this event?
- ☐ Very unsatisfied
- ☐ Unsatisfied
- ☐ Neither satisfied nor unsatisfied
- ☐ Satisfied
- ☐ Very satisfied

Question 9: Any additional comments?

Section V: Assessment and evaluation

A. DCC1: 7-week semester version

We designed our assessment instruments and opportunities to vary along two different dimensions: different levels of assessment, as outlined by Colbeck (2002); and the different levels outlined by the CIRTL pillars (described in Section I).

Colbeck (2002) outlines 5 different levels of program assessment which we adapted to a classroom setting. She describes:
- *Participation*: the least sophisticated and most limiting measure, based on whether people actually attend a program. We used classroom attendance for this measure. This does not give us much information about what our participants learned, particularly as we included participation as part of participants' final grade.
- *Satisfaction:* the most frequently used type in program assessment, questions along this line inquire as to how satisfied participants feel with different aspects of a program. We assessed this dimension by asking to report their perceived satisfaction with readings, class sessions, and their general experience in the course. Information of this type is also of limited use -- while these questions help you determine whether participants are satisfied with how their time was spent, and maybe whether they will recommend the experience to friends or colleagues, sometimes learning about diversity can also be very difficult due to the confrontation of strongly-held beliefs about such highly charged subjects as race and gender. Participants might report high satisfaction because their core beliefs were never challenged; alternatively, they might also report low satisfaction because they did have to confront core beliefs, which they may have found to be an uncomfortable experience.
- *Learning, or knowledge*: the most often assessed level in classroom settings, and least often assessed in program settings, this level tries to gauge what participants actually learned. Do participants report that they learned the content the instructors intended? Can they report it back to the instructors? This level is what exams, papers, reports, and other assignments in undergraduate courses are intended to do. Programs also sometimes ask participants to self-report how much they believe they have learned. Both formats can be unreliable, as the instructor may not ask questions that facilitate participants demonstrating their knowledge, and participants may over- or under-estimate how much they have indeed learned.
- *Application*: this level is difficult to assess in most settings, as it requires the participants demonstrate they can apply the knowledge they have learned. In classroom settings, instructors design assignments and exams with this intent; in program situations, instructors rely on self-reports of *intent* to apply knowledge. In the DCC course, we asked questions about intent, but we also have planned various assessment opportunities to occur after the course ended to ask participants about what they *actually* applied.
- *Impact*: this level is the most difficult to assess, as, in the context of learning about teaching, this requires instructors to find out how much *our participants' students* are now learning. Are *our participants' students* learning more from their instructors (our program's participants) than before their instructors participated in our program? Again, during the course we used self-reported data from participants to help us understand this level, and hope to do some post-course assessment to find out if our participants have any data from their own students suggesting the overall impact of this DCC course.

After each DCC1 week-to-week description, we have included a short table that summarizes the different levels that were assessed during that class period. Below is a table which summarizes all the assessment strategies employed during both DCC1 and DCC2:

	DCC1	DCC2
Participation	• Participant attendance in class	• Participant attendance in class • DCC Forum attendance
Satisfaction	• Participant self-reporting on final	• Participant self-reporting on final

	course evaluation • Talking stone activity	course evaluation • DCC Forum participant evaluation
Learning	• Reading Assessment activities (see examples below) • Course assignments • Final evaluation • End-of-class assessment cards (see examples below) • Instructor observation	• Course assignments • Final evaluation • Instructor observation • Mid-course assessment • DCC Forum participant evaluation
Application	• Course assignments • Final evaluation	• Course assignments • Designing, implementing and assessing the DCC Forum
Impact	• Final evaluation • Post-course assessment	• Final evaluation • Post-course assessment

We also tried to assess how well the DCC course followed/modeled the different levels of the CIRTL pillars. In DCC1, we only used self-reported data gathered from the end of DCC1 course evaluation (see Section V), but the evaluation only assessed the pillars of Learning Community and Learning-through-Diversity. The different dimensions were linked to those described by the CIRTL one-pagers, and the question wording and responses for DCC1 are included below (Q14):

14. Please rate how much you agree with the following statements:

The top percentage indicates total respondent ratio; the bottom number represents actual number of respondents selecting the option	1 I strongly disagree	2 I disagree	3 I am not sure	4 I agree	5 I strongly agree
1. I felt we (the students and instructors) learned together as a group	0% 0	0% 0	0% 0	45% 5	55% 6
2. I experienced functional connections with others in the class	0% 0	9% 1	18% 2	55% 6	18% 2
3. I felt the course pedagogies and materials were connected to my life experiences	0% 0	0% 0	27% 3	36% 4	36% 4
4. I felt this course exhibited an inclusive learning environment	0% 0	0% 0	9% 1	36% 4	55% 6
5. I and my ideas were welcomed and respected by the instructors	0% 0	0% 0	9% 1	9% 1	82% 9
6. I and my ideas were welcomed and respected by the other students	0% 0	9% 1	9% 1	9% 1	73% 8
7. I felt the content of the course represented a wide range of ideas and research	0% 0	0% 0	9% 1	45% 5	45% 5

In DCC2, we used multiple sources of data to assess the different pillars. We first used the same question as employed in the DCC1 evaluation that assessed only LC and LtD. The table (with responses) is included below (Q13).

We also did a superficial content analysis of participants' final papers, looking for key dimensions outlined in the CIRTL pillar descriptions; the results from this exercise are included as part of our ASEE publication (included in this manual – see Section VII). Finally, we asked participants to describe how they might make use of the pillars in their future teaching; to a limited extent, these responses allowed us to further assess participants' understanding of the pillars. This question and participants' responses are included further below (Q6).

13. Please rate how much you agree with the following statements:

The top percentage indicates total respondent ratio; the bottom number represents actual number of respondents selecting the option	1 I strongly disagree	2 I disagree	3 I am not sure	4 I agree	5 I strongly agree
1. I felt we (the students and instructors) learned together as a group	0% 0	0% 0	0% 0	40% 2	60% 3
2. I experienced functional connections with others in the class	0% 0	0% 0	0% 0	80% 4	20% 1
3. I felt the course pedagogies and materials were connected to my life experiences	0% 0	0% 0	20% 1	80% 4	0% 0
4. I felt this course exhibited an inclusive learning environment	0% 0	0% 0	0% 0	40% 2	60% 3
5. I and my ideas were welcomed and respected by the instructors	0% 0	0% 0	0% 0	40% 2	60% 3
6. I and my ideas were welcomed and respected by the other students	0% 0	0% 0	0% 0	40% 2	60% 3
7. I felt the content of the course represented a wide range of ideas and research	0% 0	0% 0	0% 0	80% 4	20% 1

6. In what ways, if at all, have the 3 framing concepts of the Delta Program -- teaching-as-research, learning community, and learning-through-diversity -- influenced your interest in, and capacity for, being an excellent educator? If possible, please provide several examples.

#	Response
1	The concepts have given me a model for education and teaching that I can integrate into my instruction.
2	Teaching as research has helped me to realize that teaching is as much of a process as learning. I am much more motivated to improve my teaching now that I know how to pull out specific questions and work with each one at a time to assess teaching and learning in my classrooms. Learning community and learning through diversity have both given me a larger perspective about teaching and learning. Working with these concepts has continuously reminded me of my own role, influence, bias, strengths and limitations in the classroom whereas before I would have focused more on my students as if they performed in isolation from me and my choices in a sense. These concepts have also broadened my view of education and helped me to realize the rich possibilities available in every group and every classroom. Ultimately, we are all human beings in the room and what applies outside the classroom very much applies instead as well. Background, experience, emotional tendencies and so much more cannot be removed from a person once they get down to the business of teaching and learning. And what's more - if these were removed it would be tragic to teaching and learning! Tap into these instead, in a respectful manner and everyone grows.
3	By learning more about the term "LC", it has helped me understand why there have been particular sucesses and failures in the classroom. Last semester was the first semester I felt an uneasy feeling in the classroom, where typically students feel free to ask questions and discuss almost anything. However, my co-TA was rather "blunt" in respects to talking to the students. I know with talking to some students they found him rather difficult to talk to and would either confront him or stay quiet. LC is a concept that can be brought up in various TA meetings and part of training, and use examples of what works and what doesn't. I never realized the power of food, and it is something I have done for a while in the classroom. I'm really interested this semester keeping a journal and really trying to make sure no one feels left out.
4	these pillars are very helpful in shaping my teaching philosophy and consequently in implementing this in a classroom setting. I find these concepts very essential in planning in-class activities, teaching pedagogies, course design, etc
5	The course certainly raised the bar for my own self-expectations as an educator. Being surrounded by others who also care about the 3 Delta Pilars reinforces the idea that teaching is valuable, even though it is a role that is not always supported by advisors, compensation or reviews. Having a specific project to work on, where the ideas of learning thru diversity could be seen as concrete went a long way to making these goals of Delta seem attainable. It made abstract and somewhat lofty aspirations more touchable. Hearing about the work of my peers The class itself is a terriffic example of a learning community.

Finally, we found the following piece of advice to be very useful in designing assessment instruments, including course assignments, end-of-class assessment cards, and final course evaluations: never

miss a chance to inform your participants about the information you want them to leave with. As an example, if you implement your course in concert with other programs and courses, and you would like to know where else your participants have participated, you might write the following survey question:

Q. What other XYZ Program opportunities have you participated in? _____

However, your participants either might not know something they participated in was affiliated with XYZ Program, or might be interested in learning about other opportunities they could participate in. So you could reword the question:

Q. Which of the following XYZ Program opportunities have you participated in?
☐   ABC Course
☐   DEF Course
☐   GHI Workshop
☐   JKL Brownbag
☐   MNO Online workshop
☐   PQR Discussion group

In this example, not only are you finding out where else your participants may have encountered key ideas (thereby moderating the impact of your course) but you are also educating them about additional types of opportunities. We used this technique multiple times in our overall course assessment.

Reading assessment examples (from fall 2005)

Described below are some of the activities our participants developed during the fall 2005 implementation. Please keep in mind that some of us had concerns about the focus of some of these reading assessment activities, and that both the participants who developed the RAs and the participants who played them out might benefit from some discussion about what the main points of the readings were, or what the goals of the activity are.

Week 2

Activity 1 (icebreaker): find enough photos of different people doing different activities to have one image per group of 3-4 participants. Ask participants to look at the photos for 30 seconds and remember as much as they can. Then turn the photos over, and ask participants to write down as much as they could about the image. After 1 minute, and without turning the images back over, have participants discuss what they recalled. After 5 minutes of discussion, turn the images right side up. Ask participants to discuss what they remembered correctly, what they had forgotten or gotten wrong. Ask them to hypothesize why some things stuck out and others they misremembered or not remembered at all.

Activity 2: Search for images and biographical information about the authors for today's readings. Make a matching handout, where participants should match the names of the authors with their photo or biographical material. Ask participants to complete the handout alone, and then in pairs. Read out the correct answers. Discuss how people made their matches, and where the guesses/assumptions turned out to be correct or incorrect.

Week 3

Invite one or two guests to attend class. Before class, record a short audio segment of each person describing her/his family heritage and educational background. Create a worksheet for participants to complete where, based on hearing the audio recording, they try to guess various demographic categories (age, gender, nationality, ethnicity, highest degree attained, etc.). After completing the worksheets, you may want to invite participants to share their guesses and write them on the board. Finally, introduce your guest(s), and have them provide "correct" responses to the worksheet's fill-in-the-blanks. Discussion can occur around the misconceptions and assumptions, and how it felt to be confronted by one's own misconceptions.

Week 4

Prepare a worksheet with three sections. The first section asks fact-based questions coming directly from the readings— this assesses content retention. The second section requires participants explain different concepts from the readings to a partner in their own words. The third section asks participants to brainstorm ways that they might be able to apply the information they learned from these articles to different learning situations, such as distance learning on the Internet, peer instruction, research groups, or classroom group work. Ask participants to work in pairs or groups to complete the worksheet, and then provide a lot of time for discussion of the third section in particular.

Week 5

Ask participants in advance to write down one thing they liked and disliked about each article. Just before class begins, put up note cards with the title of each article on the wall. When participants arrive, pass out note cards (color-coordinated as "like" or "dislike") to each person, and have them write down their thoughts on the appropriate note card. Ask them to tape/post the note cards on the wall under the correct article header, and then spend 10 minutes reading other peoples' cards. Then discuss: what things did participants notice from other people's cards? What do they agree or disagree with? Perhaps complete this activity with a talking stone circle or two about what participants have learned from each other.

Week 6

Activity 1: Ask participants to form groups. Assign one aspect of Banks' multicultural education model to each group, and ask them to brainstorm ways that they might be able to apply this aspect to teaching a STEM/SBE-related class. After 10 minutes, ask groups to share ideas; write the ideas on the board under each model heading.

Activity 2: Before class, ask participants to think about one positive and one negative learning experience they have had. Upon arrival at class, pair participants up and ask them to take turns sharing with their partners both their positive and negative experiences. After 10-15 minutes, ask participants to discuss in pairs: "as an educator, based on these experiences, how do you think this would shape how you teach?" After 10 minutes, ask people to share insights with the whole group. If necessary, point out that this is an exercise to analyze our own positionality and how it affects how we interact with our students.

End-of-class assessment questions

☐ What do you think were the 2-3 most important points from today's class?
☐ What do you want the instructors to know you're thinking about today?
☐ What concerns are you leaving class with today?
☐ What is one thing that surprised you today?
☐ What do you want the instructors to know you learned from this course?

Final evaluation questions

This evaluation was conducted online (using Zoomerang: http://www.zoomerang.com). Some results are discussed in the case study included at the end of this manual (Section VII).

1: Which class session did you attend? (Remember, this survey is anonymous. Please check all that apply.)

☐ Session 1: Diversity defined
☐ Session 2: Value of diversity
☐ Session 3: Race, gender and pedagogy
☐ Session 4: Ways of knowing: biology, practice & environment
☐ Session 5: Unconscious bias, prejudice and stereotype threat
☐ Session 6: Multicultural and feminist pedagogy

☐ Session 7: Action plans

2: Please share one substantial thing you learned in this course.

3: There will be several questions coming up that ask you to rate the value of certain topics, readings or activities. Please describe what a rating of "very valuable" means to you.

4: How valuable was each class period? Select the appropriate number (Select NOT APPLICABLE if you missed this class period.) 1= Not valuable; 2=somewhat valuable; 3=valuable; 4=very valuable; Not applicable

☐ Session 1: Diversity defined
☐ Session 2: Value of diversity
☐ Session 3: Race, gender and pedagogy
☐ Session 4: Ways of knowing: biology, practice & environment
☐ Session 5: Unconscious bias, prejudice and stereotype threat
☐ Session 6: Multicultural and feminist pedagogy
☐ Session 7: Action plans

5: Which, if any, of the classes changed the way you think about the topic covered? Please explain.

6: How valuable was each reading for helping you understand that day's topic(s)? (Select "NOT APPLICABLE" if you did not read it.) 1= Not valuable; 2=somewhat valuable; 3=valuable; 4=very valuable; Not applicable

☐ Session 2: Ethnic diversity and creativity in small groups (McLeod et al.)
☐ Session 2: Dissent, group process, and creativity: the contribution of minority influence (Nemeth)
☐ Session 2: You're short besides! (Chan)
☐ Session 2: Never meant to survive: a Black woman's journey (Sands and Hammonds)
☐ Session 3: Cooperative learning and the Native American student (Little Soldier)
☐ Session 3: Social class and schooling (Knapp & Woolverton)
☐ Session 3: Learning styles and culturally diverse students: a literature review (Irvine & York)
☐ Session 4: Gray matter and the sexes: still a scientific gray area (Angier & Chang)
☐ Session 4: The impending revolution in undergraduate science education (DeHaan)
☐ Session 5: Stereotype threat and the intellectual test performance of African Americans (Steele & Aronson)
☐ Session 5: The impact of gender on the review of the curricular vitae of job applicants and tenure candidates (Steinpreis et al.)
☐ Session 6: Positionality and the politics of feminist teacher research (Calabrese Barton)
☐ Session 6: Multicultural education: historical development, dimensions and practice (Banks)
☐ Session 7: Employing liberative pedagogies in engineering education (Riley)
☐ Session 7: Diversity in the physical science curriculum: the intellectual challenge (Middlecamp)

7: Which, if any, of the readings changed the way you think about the topic covered? Please explain.

8: How valuable was each assignment to your overall understanding of the course topic? (Select "NOT APPLICABLE" if you did not do this assignment.) 1= Not valuable; 2=somewhat valuable; 3=valuable; 4=very valuable; Not applicable

☐ Diversity statements (both drafts)
☐ Classroom observation (both times)
☐ Syllabi revision
☐ Designing and teaching a Reading Assessment
☐ Action plans

9: Which classroom pedagogies have been effective at helping you understand the topic for the day?
- ☐ Receiving feedback from instructors regarding the Reading Assessment you (and your partner(s)) designed and implemented
- ☐ In-class discussions
- ☐ Mini-lectures by instructors
- ☐ Active learning exercises by instructors
- ☐ End-of-class assessment techniques by instructors
- ☐ "Diversity anecdotes"
- ☐ Content decisions descriptions (on the weekly content decisions handout)
- ☐ Extended bibliographies (on the weekly content decisions handout)

10: How often has each item been modeled in this course?
- ☐ Active learning
- ☐ Assessment
- ☐ Activities to develop community between students
- ☐ Highlighting student voices
- ☐ Multiple modes of content delivery
- ☐ Content and pedagogical decisions made explicit
- ☐ Linking the research literature to practice

11: Could you please comment on your responses to Q9 and Q10 (on assignments and classroom pedagogies)?

12: How well do you feel you achieved the following class goals (from the syllabus) over the time of the course? Please answer this question according to your current satisfaction— we recognize you may also value the concept of "lifelong learning."
- ☐ I have developed a personally meaningful definition of diversity
- ☐ I have developed a knowledge of the fundamental literature on diversity as it pertains to STEM contexts
- ☐ I have developed an understanding of how my definition of diversity influences the content of my (present or future) classes
- ☐ I have developed a toolbox of tips and ideas that I can apply to my (present or future) teaching
- ☐ I have developed a community of peers who could be a resource for me in the future
- ☐ I have developed ways of arguing in support of diversity in STEM contexts

13: Could you please comment on your responses to the previous question?

14: Please rate how much you agree with the following statements (1=strongly disagree, 5=strongly agree):
- ☐ I felt we (the students and instructors) learned together as a group
- ☐ I experienced functional connections with others in the class
- ☐ I felt the course pedagogies and materials were connected to my life experiences
- ☐ I felt this course exhibited an inclusive learning environment
- ☐ I and my ideas were welcomed and respected by the instructors
- ☐ I and my ideas were welcomed and respected by the other students
- ☐ I felt the content of the course represented a wide range of ideas and research

15: Please share your opinion regarding the following statements about the course Web site (Learn@UW). If you never used a particular aspect, please click NOT APPLICABLE. (1=strongly disagree, 5=strongly agree.)
- ☐ The readings were accessible and convenient to download.
- ☐ I value the possibility of having online discussions.
- ☐ The class e-mail list was overused.

☐ I would have rather had the course readings distributed as a course packet available at the University Bookstore or local copy shop, or on physical reserve at a library.
☐ I felt the use of a course Web site was unneccesary.
☐ I thought the Learn@UW Web site interface worked well.
☐ The class e-mail list was underused.
☐ The online schedule (listing events of interest to class members) was useful.
☐ The online "extended bibliography" was helpful to me.

16: What topics would you recommend we address in more detail in future offerings of this course?

17: Did your understanding of the topic of "diversity" change since the beginning of the semester? Please explain.

18: How, if at all, do you think this course will impact your teaching in the future? Please be specific, if possible.

19: Please share one substantial thing you learned from the other people enrolled in this course.

20: Please suggest any ideas you have to improve this course in the future.

21: Overall, I would rate my satisfaction with this course as: [Very dissatisfied - to- Very satisfied]

22: Are you planning on taking the second part of this course (for the second credit)? Why or why not?

23: Other comments?

B. DCC2: 8-week semester version

Mid-course correction questions

1. The following are the course goals that the instructors set up, or that were brainstormed by the class on the first day. How well do you feel this course is helping you meet these goals? (Place an "X" in the appropriate box.)

Instructors' goals	Not at all	Some-what	Greatly
a. conceive of, develop and present a project on the topic of diversity in STEM/SBE			
b. learn how to receive, benefit from, and give constructive peer-review criticism regarding issues of diversity			
c. understand, and learn to apply the following concepts to your teaching:			
"Teaching-as-Research"			
"Learning Community"			
"Learning-through-Diversity"			
Scientific Teaching			
Co-constructed goals			
Copy your co-constructed goals from week 2 here, and letter each one for reference in Q2.			

2. For the places where you marked "not at all" or "somewhat," what could we as a class to improve on these? (Please refer to specific goals using their letter markers.)

3. I find the following aspects of class to be valuable and hope that they not be changed (please include why!):

4. Any other comments for us?

Final evaluation questions

This evaluation was conducted online (using Zoomerang: http://www.zoomerang.com). Some results are discussed in the case study included at the end of this manual.

1: Please mark any Delta courses, programs, and activities *other than this one* in which you have participated (check all that apply):
- ☐ The College Classroom
- ☐ Informal Education
- ☐ Effective Uses of Educational Technology
- ☐ Instructional Materials Development
- ☐ Teaching in Science and Engineering: International Students, International Faculty
- ☐ Delta Internship Seminar
- ☐ Expeditionary Learning
- ☐ Creating a Collaborative Environment
- ☐ Roundtable dinners
- ☐ Delta workshop
- ☐ Other, Please Specify _____

2: Which class sessions did you attend? (Remember, this survey is anonymous. Please check all that apply.)

- ☐ Session 1: Course goal construction
- ☐ Session 2: Doing rigorous teaching research
- ☐ Session 3: Project advising (with guests)
- ☐ Session 4: Personal project progress (short presentations and feedback)
- ☐ Session 5: Revisiting rigorous teaching research (definitions and rubrics)
- ☐ Session 6: Peer review
- ☐ Session 7: Planning the DCC Forum
- ☐ Session 8: DCC Forum

3: How valuable was each class period? (Select NOT APPLICABLE if you missed this class period.)

- ☐ Session 1: Course goal construction
- ☐ Session 2: Doing rigorous teaching research
- ☐ Session 3: Project advising (with guests)
- ☐ Session 4: Personal project progress (short presentations and feedback)
- ☐ Session 5: Revisiting rigorous teaching research (definitions and rubrics)
- ☐ Session 6: Peer review
- ☐ Session 7: Planning the DCC Forum
- ☐ Session 8: DCC Forum

4: How valuable was each assignment to your overall understanding of the course topic? (Select "NOT APPLICABLE" if you did not do this assignment.)

- ☐ Initial project description (due week 2)
- ☐ Receiving peer review on your project
- ☐ Giving peer review to someone else about their project
- ☐ Final project submission (including write-up)
- ☐ Collaboratively developing the DCC Forum
- ☐ Giving a presentation at the DCC Forum
- ☐ Hearing others' presentations at the DCC Forum

5: Which of these course pedagogies have been effective at helping you develop your project?

- ☐ Deadlines imposed by instructors
- ☐ Readings on Teaching-as-Research, Scientific Teaching, Learning Community, Learning-through-Diversity
- ☐ Large group general discussions in class
- ☐ Small group general discussions in class
- ☐ Individual feedback on project from peers
- ☐ Individual feedback on project from instructors

6: In what ways, if at all, have the 3 framing concepts of the Delta Program— teaching-as-research, learning community, and learning-through-diversity— influenced your interest in, and capacity for, being an excellent educator? If possible, please provide several examples.

7: How often has each item been modeled (either by instructors or by students) in this course?

- ☐ Teaching-as-Research
- ☐ Learning Community
- ☐ Learning-through-Diversity
- ☐ Active learning
- ☐ Assessment
- ☐ Activities to develop community between students
- ☐ Highlighting student voices
- ☐ Linking the research literature to practice

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8: How well do you feel you achieved the following goals set by the instructors over the time of the course? Please answer this question according to your current satisfaction— we recognize you may also value the concept of "lifelong learning."
- [ ] I have conceived of, developed and presented a project on the topic of diversity in STEM/SBE
- [ ] I have learned how to receive, benefit from, and give constructive peer-review criticism regarding issues of diversity
- [ ] I understand, and have learned to apply, concepts of "Teaching-as-Research" and/or "Scientific Teaching" to my teaching.
- [ ] I understand, and have learned to apply, concepts of "Learning Community" to my teaching.
- [ ] I understand, and have learned to apply, concepts of "Learning-through-Diversity" to my teaching.

9: How well do you feel you achieved the following goals set by the other members of the class over the time of the course? Please answer this question according to your current satisfaction— we recognize you may also value the concept of "lifelong learning."

- [ ] [Include the co-constructed objectives brainstormed by participants during week 2 of DCC2]

10: How should responsibility be divided for achieving the instructor-defined goals for this course? (percentages provided)
- [ ] The students
- [ ] The instructors

11: How should the responsibility be divided for achieving the collaboratively-defined goals for this course? (percentages provided)
- [ ] The students
- [ ] The instructors

12: Please explain your response to the previous two questions.

13: Please rate how much you agree with the following statements:
- [ ] I felt we (the students and instructors) learned together as a group
- [ ] I experienced functional connections with others in the class
- [ ] I felt the course pedagogies and materials were connected to my life experiences
- [ ] I felt this course exhibited an inclusive learning environment
- [ ] I and my ideas were welcomed and respected by the instructors
- [ ] I and my ideas were welcomed and respected by the other students
- [ ] I felt the content of the course represented a wide range of ideas and research

14: What is your current understanding of "diversity"?

15: How, if at all, has your understanding of the term "diversity" changed since the beginning of this second course?

16: How and where, if at all, might you apply what you learned in this course or program? If possible, please give 2-3 specific examples.

17: What is the most memorable thing from this course for you?

18: Please share one substantial thing you learned from the other people enrolled in this course.

19: How do you rate your overall satisfaction with this Delta course or activity? [Very dissatisfied - to- Very satisfied]

20: What, if anything, could be changed to increase your satisfaction with this course or program?

21: Do you have any specific comments for Alice?

22: Do you have any specific comments for Chris?

23: Other comments?

C. DCC1: 2-week summer version

This course is being implemented May 31-June 9 2006; assessment data will be forthcoming.

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Section VI: Bibliography

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A. Course manual bibliography

Anyon, Jean. "Social Class and the Hidden Curriculum of Work." Journal of Education 162, no. 1 (1980): 67-92.

Barger, Shihmei. (2005) "Strategies for inclusive and effective teaching," document prepared for the Center for the Integration of Research, Teaching, and Learning (CIRTL), University of Wisconsin-Madison.

Barton, Angela Calabrese. Feminist Science Education, Athene Series. New York: Teachers College Press, 1998.

Connolly, Mark R., Jana L. Bouwma-Gearhart, and Matthew A. Clifford. "The Birth of a Notion: The Windfalls and Pitfalls of Tailoring an Sotl-Like Concept to a Research-Extensive University." Paper presented at the Proceedings of the Annual Meeting of the Association for the Study of Higher Education, Philadelphia, PA 2005.

Handelsman, Jo, Diane Ebert-May, Robert Beichner, Peter Bruns, Amy Chang, Robert DeHaan, Jim Gentile, Sarah Miller Lauffer, James Stewart, Shirley M. Tilghman, and William B. Wood. "Scientific Teaching." Science 304, no. 23 April 2004 (2004): 521-22.

Handelsman, Jo, Sarah Miller Lauffer, and Christine Pfund. Scientific Teaching: A Guide to Transforming Undergraduate Biology Education. Greenwood Village, CO: Roberts and Company Publishers, 2006.

Jackson, Philip W. Life in Classrooms. New York: Holt, Rinehart & Winston, 1968.

Palus, C.J., Horth, D.M., and Drath, W.H. (1999) "Visual Explorer: A tool for making shared sense of complexity" Center for Creative Leadership, Greensboro, NC.

Sanders, K. (1996). Introduction to Teamwork. Included in CIRTL "Creating a Collaborative Learning Environment" Handbook

Smith, Dorothy E. The Everyday World as Problematic: A Feminist Sociology. Edited by Evelyn Fox Keller, Northeastern Series in Feminist Theory. Boston: Northeastern University, 1987.

B. DCC1: 7-week course readings

Angier, Natalie and Kenneth Chang. 2005. "Gray Matter and the Sexes: Still a Scientific Gray Area." Pp. 1 in *New York Times*. New York.

Blair, Irene V., Jennifer E. Ma, and Alison P. Lenton. 2001. "Imagining stereotypes away: the moderation of implicit stereotypes through mental imagery." *Journal of personality and social psychology* 81:828-841.

Banks, James A. 1995. "Multicultural education: historical development, dimensions and practice." Pp. 3-24 in *Handbook of Research on Multicultural Education*, edited by J. A. Banks and C. A. M. Banks. New York: Simon & Schuster Macmillan.

Barton, Angela Calabrese. 1998. *Feminist Science Education*. New York: Teachers College Press.

Chan, Sucheng. 1995. "You're short, besides!" in *Race, class and gender: an anthology*, edited by M. L. Andersen and P. Hill Collins. Belmont, CA: Wadsworth.

DeHaan , Robert. 2005. "The Impending Revolution in Undergraduate Science Education." *Journal of Science Education and Technology*, 14 (2): 253-269.

Irvine, Jacqueline Jordan and Darlene Eleanor York. 1995. "Learning styles and culturally diverse students: a literature review." Pp. 484-497 in *Handbook of research on multicultural education*, edited by J. A. Banks and C. A. M. Banks. New York: Simon & Schuster Macmillan.

Knapp, Michael S. and Sara Woolverton. 1995. "Social class and schooling." Pp. 548-569 in *Handbook of research on multicultural education*, edited by J. A. Banks and C. A. M. Banks. New York: Simon & Schuster Macmillan.

Little Soldier, Lee 1989. "Cooperative learning and the Native American student." *Phi Delta Kappan*, October, pp. 161-163.

McLeod, Poppy Lauretta, Sharon Alisa Lobel, and Taylor H. Cox. 1996. "Ethnic diversity and creativity in small groups." *Small group research* 27:248-264.

Nemeth, Charlan Jeanne. 1985. "Dissent, group process, and creativity: the contribution of minority influence." *Advances in group processes* 2:57-75.

Riley, Donna. 2003. "Employing liberative pedagogies in engineering education." *Journal of Women and Minorities in Science and Engineering* 9:137-158.

Steele, Claude M. and Joshua Aronson. 1995. "Stereotype threat and the intellectual test performance of African Americans." *Journal of personality and social psychology* 69:797-811.

Sands, Aimee. 2001. "Never meant to survive, a Black woman's journey: An interview with Evelynn Hammonds." Pp. 17-25 in *Women, Science and Technology: A Reader in Feminist Science Studies*, edited by M. Wyer, M. Barbercheck, D. Giesman, H. Orun Ozturk, and M. Wayne. New York: Routledge.

Steinpreis, Rhea E., Katie A. Anders, and Dawn Ritzke. 1999. "The impact of gender on the review of the curricula vitae of job applicants and tenure candidates: a national empirical study." *Sex roles* 41:509-528

The following table summarizes how Fall 2005 participants rated these readings:

6.	How valuable was each reading for helping you understand that day's topic(s)? (Select "NOT APPLICABLE" if you did not read it.)				
The top percentage indicates total respondent ratio; the bottom number represents actual number of respondents selecting the option	**1** Not valuable	**2** Somewhat valuable	**3** Valuable	**4** Very valuable	**NOT APPLICABLE** or don't remember this paper
1. Session 2: Ethnic diversity and creativity in small groups (McLeod et al)	0% 0	0% 0	36% 4	55% 6	9% 1
2. Session 2: Dissent, group process, and creativity: the contribution of minority influence (Nemeth)	0% 0	9% 1	45% 5	45% 5	0% 0
3. Session 2: You're short besides! (Chan)	10% 1	0% 0	10% 1	80% 8	0% 0
4. Session 2: Never meant to survive: a Black woman's journey (Sands and Hammonds)	0% 0	9% 1	36% 4	55% 6	0% 0
5. Session 3: Cooperative learning and the Native American student (Little Soldier)	0% 0	9% 1	55% 6	27% 3	9% 1
6. Session 3: Social class and schooling (Knapp & Woolverton)	0% 0	18% 2	9% 1	45% 5	27% 3
7. Session 3: Learning styles and culturally diverse students: a literature review (Irvine & York)	0% 0	27% 3	45% 5	0% 0	27% 3
8. Session 4: Gray matter and the sexes: still a scientific gray area (Angier & Chang)	0% 0	9% 1	73% 8	18% 2	0% 0
9. Session 4: The impending revolution in undergraduate science education (DeHaan)	0% 0	18% 2	45% 5	36% 4	0% 0
10. Session 5: Stereotype threat and the intellectual test performance of African Americans (Steele & Aronson)	0% 0	0% 0	36% 4	64% 7	0% 0
11. Session 5: The impact of gender on the review of the curricular vitae of job applicants and tenure candidates (Steinpreis et al)	0% 0	0% 0	36% 4	55% 6	9% 1
12. Session 6: Positionality and the politics of feminist teacher research (Calabrese Barton)	0% 0	9% 1	18% 2	73% 8	0% 0
13. Session 6: Multicultural education: historical development, dimensions and practice (Banks)	0% 0	18% 2	27% 3	55% 6	0% 0
14. Session 7: Employing liberative pedagogies in engineering education (Riley)	0% 0	0% 0	9% 1	73% 8	18% 2
15. Session 7: Diversity in the physical science curriculum: the intellectual challenge (Middlecamp)	0% 0	9% 1	27% 3	55% 6	9% 1

C. DCC2: 8-week course readings

Delta Pillars' "one-pagers": Teaching-as-Research, Learning Community, and Learning-through-Diversity. (Available at http://www.cirtl.net/pillars.html)

Handelsman, Jo, Diane Ebert-May, Robert Beichner, Peter Bruns, Amy Chang, Robert DeHaan, Jim Gentile, Sarah Miller Lauffer, James Stewart, Shirley M. Tilghman, and William B. Wood. 2004. "Scientific Teaching." *Science* 304:521-522.

D. DCC1: 2-week course readings

Barta, Jim, Ann Abeyta, Drusilla Gould, Ed Galindo, Georgia Matt, Delverne Seaman, and Garrit Voggessor. "The Mathematical Ecology of the Shoshoni and Implications for Elementary Mathematics Education and the Young Learner." Journal of American Indian Education 40, no. 2 (2001): 1.

Barton, Angela Calabrese. Feminist Science Education, Athene Series. New York: Teachers College Press, 1998.

Cahill, Larry. "His Brain, Her Brain." Scientific American, May 2005, 40-47.

Chan, Sucheng. "You're Short, Besides!" In Race, Class and Gender: An Anthology, edited by Margaret L. Andersen and Patricia Hill Collins. Belmont, CA: Wadsworth, 1995.

Knapp, Michael S., and Sara Woolverton. "Social Class and Schooling." In Handbook of Research on Multicultural Education, edited by James A. Banks and Cherry A. McGee Banks, 548-69. New York: Simon & Schuster Macmillan, 1995.

McLeod, Poppy Lauretta, Sharon Alisa Lobel, and Taylor H. Cox. "Ethnic Diversity and Creativity in Small Groups." Small group research 27, no. 2 (1996): 248-64.

Middlecamp, Cathy. "Diversity in the Physical Science Curriculum: The Intellectual Challenge." In Handbook of College Science Teaching: Theory, Research and Practice, edited by National Science Teachers Association, 2006 (forthcoming).

Riley, Donna. "Employing Liberative Pedagogies in Engineering Education." Journal of Women and Minorities in Science and Engineering 9, no. 2 (2003): 137-58.

Steele, Claude M., and Joshua Aronson. "Stereotype Threat and the Intellectual Test Performance of African Americans." Journal of personality and social psychology 69, no. 5 (1995): 797-811.

Trix, Frances, and Carolyn Psenka. "Exploring the Color of Glass: Letters of Recommendation for Female and Male Medical Faculty." Discourse & Society 14, no. 2 (2003): 191-220.

Cases from DO-IT: http://www.washington.edu/doit/

E. Additional resources

Week 1

Andersen, Margaret L. and Patricia Hill Collins. 2001. "Introduction: Toward inclusive thinking through the study of race, class, and gender." in Race, class, and gender: An anthology, edited by M. L. Andersen and P. Hill Collins. Belmont, CA: Wadsworth/Thomson Learning.

Janssens, Maddy and Patrizia Zanoni. 2005. "Many diversities for many services: Theorizing diversity (management) in service companies." Human Relations 58:311-340.

Thomas, David A. 2004. "Diversity as strategy." Harvard Business Review:1-11.

Week 2

Appel, Toby A. "Physiology in American Women's Colleges: The Rise and Decline of a Female Subculture." *Isis* 85, no. 1 (March) (1994): 26-56.

Lucena, Juan C. 2000. "Making Women and Minorities in Science and Engineering for National Purposes in the United States." *Journal of women and minorities in science and engineering* 6:1-31.

Mack, Pamela E. 2001. "What difference has feminism made to engineering in the twentieth century?" Pp. 149-168 in *Feminism in twentieth-century science, technology and medicine*, edited by A. N. H. Creager, E. Lunbeck, and L. Schiebinger. Chicago: University of Chicago Press.

Malcom, Shirley M. 1996. "Science and Diversity: A Compelling National Interest." *Science* 271:1817-1819.

Milem, J.F. and K. Hakuta (2000). The benefits of racial and ethnic diversity in higher education. Minorities in Higher Education: Seventeeth Annual Status Report. D. Wilds. Washington, D.C., American Council on Education.

Nemeth, C.J. (1995). "Dissent as driving cognition, attitudes, and judgements." *Social Cognition* 13: 273-291.

Oldenziel, Ruth. 2001. "Man the Maker, Woman the Consumer: The consumption junction revisited." Pp. 128-148 in *Feminism in twentieth-century science, technology and medicine*, edited by A. N. H. Creager, E. Lunbeck, and L. Schiebinger. Chicago: University of Chicago Press.

Penn, Michael. "Native Ground." *On Wisconsin* 2004, 22-29.

Pfatteicher, Sarah K. A., and Margaret P. Tongue. "What Drives Diversity?" Paper presented at the 32nd ASEE/IEEE Frontiers in Education Conference, Boston, MA 2002.

Rutherford, F. James, and Andrew Ahlgren. *Science for All Americans*. New York: Oxford University Press, 1990.

Seymour, Elaine, and Nancy M. Hewitt. *Talking About Leaving: Why Undergraduates Leave the Sciences*. Boulder: Westview Press, 1997.

Stanley, Autumn. 1983. "Women Hold Up Two-Thirds of the Sky: Notes for a Revised History of Technology." in *Machina Ex Dea: Feminist Perspectives of Technology*, *The Athene Series*, edited by J. Rothschild. Elmsford: Pergamon Press.

Thomas, David A. "Diversity as Strategy." *Harvard Business Review* (2004): 1-11.

Wulf, Wm. A. "Diversity in Engineering." *The Bridge* 1998, 8-13.

Week 3

Basow, Susan A. 1998. "Student Evaluations: The Role of Gender Bias and Teaching Styles." Pp. 135-156 in Career strategies for women in academe: Arming Athena, edited by L. H. Collins, J. C. Chrisler, and K. Quina. Thousand Oaks: SAGE Publications.

Blair, Irene V., Jennifer E. Ma, and Alison P. Lenton. 2001. "Imagining stereotypes away: the moderation of implicit stereotypes through mental imagery." Journal of personality and social psychology 81:828-841.

Collins, Lynn H. 1998. "Competition and Contact: The Dynamics Behind Resistance to Affirmative Action in Academe." Pp. 45-74 in Career Strategies for Women in Academe: Arming Athena, edited by L. H. Collins, J. C. Chrisler, and K. Quina. Thousand Oaks: SAGE Publishing, Inc.

Dasgupta, Nilanjana and Anthony G. Greenwald. 2001. "On the malleability of automatic attitudes: combating automatic prejudice with images of admired and disliked individuals." Journal of personality and social psychology 81:800-814.

Freeman, Jo. 1979. "How to Discriminate Against Women Without Really Trying." in Women: A Feminist Perspective, edited by J. Freeman. Palo Alto, CA: Mayfield Publishing.

Massachusetts Institute of Technology. 1999. "A Study on the Status of Women Faculty in Science at MIT." Massachusetts Institute of Technology, Cambridge, MA.

Sadker, Myra and David Sadker. 1994. Failing at Fairness: How Our Schools Cheat Girls. New York: Touchstone.

Sandler, Bernice R., Lisa A. Silverberg, and Roberta M. Hall. 1996. The chilly classroom climate: a guide to improve the education of women. Washington DC: National Association for Women in Education.

Sandler, Bernice Resnick and Roberta M. Hall. 1986. "The Campus Climate Revisited: Chilly for Women Faculty, Administrators, and Graduate Students." Association of American Colleges, Washington DC.

Scholnick, Ellin Kofsky. 1998. "Paying Athena: Statistics, Statutes, and Strategies." Pp. 81-104 in Career Strategies for Women in Academe, edited by L. H. Collins, J. C. Chrisler, and K. Quina. Thousand Oaks: SAGE Publications Inc.

Spanier, Bonnie. 2001. "From Molecules to Brains, Normal Science Supports Sexist Beliefs About Differences." in The Gender and Science Reader, vol. 367-372, edited by I. Bartsch. New York: Routledge.

Trix, Frances and Carolyn Psenka. 2003. "Exploring the color of glass: letters of recommendation for female and male medical faculty." Discourse & Society 14:191-220.

Week 4

Cahill, Larry 2005. "His brain, her brain." Scientific American, May, pp. 40-47.

Fausto-Sterling, Anne. 1992. Myths of gender: biological theories about women and men. New York: Basic Books.

Gould, Stephen Jay. 1996. The mismeasure of man. New York: W. W. Norton & Co.

Squire, Larry and Kandel, Eric. 2000. Memory: From Mind to Molecules. W.H. Freeman & Company.

Zull, James E. 2002. The Art of Changing the Brain: Enriching Teaching by Exploring the Biology of Learning Virginia: Stylus Publishing.

Week 5

University of Washington Disabilities, Opportunities, Internetworking & Technology
http://www.washington.edu/doit/

American Association of University Women. 1992. "How schools shortchange girls." AAUW Education Foundation,
National Education Association, Washington.

—. 1998. Separated by sex: a critical look at single-sex education for girls. Washington: American Association of University Women Educational Foundation.

—. 1999. Gender Gaps: Where Schools Still Fail Our Children. New York: Marlowe & Company.

Belenky, M. F., B. M. Clinchy, N. R. Goldberger, and J. M. Tarule. 1986. Women's Ways of Knowing: The Development of Self, Voice and Mind. New York: Basic Books.

Brown, Anthony D. 1980. "Cherokee culture and school achievement." American Indian Culture and Research Journal 4:55-74.

Canada, Katherine and Richard Pringle. 1995. "The Role of Gender in College Classroom Interactions: A Social Context Approach." Sociology of Education 68:161-186.

Conwell, Catherine R., Sandra Griffin, and Bob Algozzine. 1993. "Gender and racial differences in unstructured learning groups in science." International Journal of Science Education 15:107-115.

Hyde, Janet Shibley. 2005. "The gender similarities hypothesis." American Psychology 60:581-592.

Johnson, Roger T., David W. Johnson, Linda E. Scott, and Beverly A. Ramolae. 1985. "Effects of single-sex and mixed-sex cooperative interaction on science achievement and attitudes and cross-handicap and cross-sex relationships." Journal of Research in Science Teaching 22:207-220.

Massachusetts Institute of Technology. 1999. "A Study on the Status of Women Faculty in Science at MIT." Massachusetts Institute of Technology, Cambridge, MA.

Nelson-Le Gall, Sharon and Peggy A. Decooke. 1987. "Same-sex and cross-sex help exhanges in the classroom." Journal of Educational Psychology 79:67-71.

Okebukola, Peter Akinsola. 1986. "Cooperative learning and students' attitudes to laboratory work." School Science and Mathematics 86:582-590.

Perry, William G. 1968. Forms of Intellectual and Ethical Development In the College Years: A Scheme. New York: Holt, Rinehart and Winston.

Quintana-Baker, Maricel. 2002. "A profile of Mexican American, Puerto Rican, and other Hispanic STEM doctorates: 1983-1997." Journal of Women and Minorities in Science and Engineering 8:99-121.

Rosser, Sue V. 1995. "Reaching the Majority: Retaining Women in the Pipeline." Pp. 1-21 in Teaching the Majority: Breaking the Gender Barrier in Science, Mathematics and Engineering, edited by S. V. Rosser. New York: Teachers College Press.

Running Wolf, Paulette and Julie A. Rickard. 2003. "Talking Circles: A Native American Approach to Experiential Learning." Journal of Multicultural Counseling and Development 31:39-43.

Sadker, Myra and David Sadker. 1994. Failing at Fairness: How Our Schools Cheat Girls. New York: Touchstone.

Sandler, Bernice R., Lisa A. Silverberg, and Roberta M. Hall. 1996. The chilly classroom climate: a guide to improve the education of women. Washington DC: National Association for Women in Education.

Sandler, Bernice Resnick and Roberta M. Hall. 1986. "The Campus Climate Revisited: Chilly for Women Faculty, Administrators, and Graduate Students." Association of American Colleges, Washington DC.

Swisher, Karen. 1990. "Cooperative learning and the education of American Indian/Alaskan Native students: a review of the literature and suggestions for implementation." Journal of American Indian Education:36-43.

Valian, Virginia. 1999. Why So Slow? The Advancement of Women. Cambridge, MA: MIT Press.

Zuniga, Keren, Joanne K. Olson, and Mary Winter. 2005. "Science education for rural Latino/a students: course placement and success in science." Journal of Research in Science Teaching 42:376-402.

Week 6

Christian, Barbara. 1990. "The Race for Theory." in *Making Face, Making Soul=Haciendo Caras: Creative and Critical Perspectives by Feminists of Color*, edited by G. Analduza. San Francisco: aunt lute books.

Fausto-Sterling, Anne. 1992. "Building Two-Way Streets: The Case of Feminism and Science." *NWSA Journal* 4:336-349.

Gunn Allen, Paula. 1997. "Where I Come From Is Like This." in *Feminist Frontiers IV*, edited by L. Richardson, V. Taylor, and N. Whittier. New York: McGraw-Hill.

Hacker, Sally L. 1983. "Mathematization of Engineering: Limits on Women and the Field." Pp. 38-58 in *Machina Ex Dea: Feminist Perspectives on Technology*, *The Athene Series*, edited by J. Rothschild. Elmsford NY: Pergamon Press.

Haraway, Donna. 1994. "A Game of Cat's Cradle: Science Studies, Feminist Theory, Cultural Studies." *Configurations* 1:59-71.

Harding, Sandra. 1986. *The Science Question in Feminism*. Ithaca: Cornell University Press.

—. 1987. "Feminism and Methodology: Social Science Issues." Bloomington: Indiana University Press.

—. 1991. *Whose Science? Whose Knowledge? Thinking from Women's Lives*. Ithaca NY: Cornell University Press.

—. 1993. "The "Racial" Economy of Science." in *Race, Gender, and Science*, edited by A. Fausto-Sterling. Bloomington, IN: Indiana University Press.

—. 1993. "Forum: Feminism and Science." *National Women's Studies Association Journal* 5:56-64.

Hill Collins, Patricia. 1998. "The Social Construction of Black Feminist Thought." Pp. 371-396 in *Feminist Foundations: Towards Transforming Sociology*, edited by K. A. Myers, B. J. Risman, and C. D. Anderson. Thousand Oaks, CA: Sage Publications.

Hubbard, Ruth. 1997. "In a Science Restructured Along Feminist Lines, Would the Laws of Gravity No Longer Hold?" in *Doing Feminism: Teaching and Research in the Academy*, edited by M. Anderson, L. Fine, K. Geissler, and J. Ladenson. Ann Arbor: Michigan University Press.

Keller, Evelyn Fox. 1983. *A feeling for the organism: the life and work of Barbara McClintock*. W. H. Freeman.

—. 2001. "From Working Scientist to Feminist Critic." Pp. 59-62 in *The Gender and Science Reader*,

edited by M. Lederman and I. Bartsch. New York: Routledge.

Khayatt, Didi. 1997. "Sex and the Teacher: Should We Come Out in Class?" *Harvard Educational Review* 67:126-143.

Lederman, Muriel and Ingrid Bartsch. 2001. "The Gender and Science Reader." New York: Routledge.

Mack, Pamela E. 2001. "What difference has feminism made to engineering in the twentieth century?" Pp. 149-168 in *Feminism in twentieth-century science, technology and medicine*, edited by A. N. H. Creager, E. Lunbeck, and L. Schiebinger. Chicago: University of Chicago Press.

Maher, Frances A. and Mary Kay Thompson Tetreault. 2001. *The feminist classroom: dynamics of gender, race, and privilege*. Lanham, MD: Rowman & Littlefield Publishers, Inc.

Martin, Emily. 1991. "The Egg and the Sperm: How Science Has Constructed a Romance Based on Stereotypical Male-Female Roles." *Signs* 16:485-501.

Mayberry, Maralee. 1998. "Reproductive and Resistant Pedagogies: The Comparative Roles of Collaborative Learning and Feminist Pedagogy in Science Education." *Journal of Research in Science Teaching* 35:443-459.

Mayberry, Maralee and Margaret N. Rees. 1997. "Feminist Pedagogy, Interdisciplinary Praxis, and Science Education." *NWSA Journal* 9:57-75.

Mayberry, Maralee and Ellen Cronan Rose. 1999. "Meeting the Challenge: Innovative Feminist Pedagogies in Action." New York: Routledge.

Mayberry, Maralee, Banu Subramaniam, and Lisa H. Weasel. 2001. "Feminist Science Studies: A New Generation." Pp. 354. New York: Routledge.

Miller, Janneli F. 1996. "'I Have a Frog in My Stomach': Mythology and Truth in Life History." Pp. 103-119 in *Unrelated Kin: Race and Gender in Women's Personal Narratives*, edited by M. Foster. New York: Routledge.

Orner, Mimi. 1992. "Interrupting the Calls for Student Voice in "Liberatory" Education: A Feminist Poststructuralist Perspective." Pp. 74-89 in *Feminisms and Critical Pedagogy*, edited by C. Luke and J. Gore. New York: Routledge.

Reddick, Lois, Jacobson, Wayne, Linse, Angela, and Yong, Darryl (in press) A Framework for Inclusive Teaching in STEM Disciplines. In, M. Ouellett (Ed.), Teaching Inclusively: Diversity and Faculty Development. Stillwater, OK: New Forums Press.

Rosser, Sue V. 1995. *Teaching the Majority: Breaking the Gender Barrier in Science, Mathematics and Engineering*. New York: Teachers College Press.

Snyder, Vicky L. and Francis S. Broadway. 2004. "Queering High School Biology Textbooks." *Journal of Research in Science Teaching* 41:617-636.

Stepan, Nancy Leys. 1986. "Race and gender: The role of analogy in science." *Isis* 77:261-277.

Subramaniam, Banu, Angela B. Ginorio, and Shirley J. Yee. 1999. "Feminism, Women's Studies, and Engineering: Opportunities and Challenges." *Journal of Women and Minorities in Science and Engineering* 5:311-322.

Wajcman, Judy. 1991. *Feminism Confronts Technology*. University Park, PA: Pennsylvania State University Press.

Section VII: Publications

The text that follows was published in the 2006 Proceedings for the American Society for Engineering Education National Conference and Exposition. We include it here because it demonstrates "closing the loop" on the Teaching-as-Research process.

Information about this course was also presented at the University of Wisconsin-Madison Teaching and Learning Symposium and the National Women's Studies Association Conference

A case study of "Diversity in the College Classroom," a course to improve the next generation of faculty

Alice L. Pawley, Christine Pfund, Sarah Miller Lauffer, Jo Handelsman

Introduction[1]

The underrepresentation of women and people of color in science and engineering, from education to industry to government, is well documented[1-3] and considered problematic.[4,5] From all sectors, calls to increase the representation of women and underrepresented ethnic minorities in science, technology, engineering and mathematics (STEM) professions have tended to produce institutional and programmatic solutions influenced by chilly climate and pipeline models of change. Within university settings, these solutions usually focus on achieving two objects: supporting women and ethnic minorities through their undergraduate and graduate education and into the professoriate, and anti-discrimination training and legislation for the benefit of majority faculty. Fewer solutions have focused on training the next generation of faculty to become more knowledgeable, resourceful, and empowered in their teaching and mentoring.

This paper briefly describes the pipeline and climate metaphors and some of their limitations, and suggests a complementary strategy: the direct education of graduate students on issues of diversity and ways that consideration for diversity can be integrated into the pedagogies and content of the disciplinary courses they may teach as future faculty. This latter strategy was applied to a graduate-level course, titled "Diversity in the College Classroom," that was offered for credit at the University of Wisconsin-Madison during the 2005 fall semester. This paper outlines the institutional context of the course, describes its structure and learning goals, and provides detailed evidence about how well students achieved three of these goals.

Background

The pipeline metaphor was first offered in the context of science and math education by Sue Berryman;[6] it has proved an electrifying and enduring contribution to the way current universities and institutions think about the underrepresentation of women and ethnic minorities. Berryman argued that the reason so few women and people of color have emerged from their educational experience as professional scientists is that so few girls and students of color go into science and math-related classes and programs to begin with; this is followed by significant leakage out of the original small population. She argued that there is considerable "migration" (p. 7) into and out of the "scientific talent pool" (p. 6) from students' elementary school experiences onwards, but at the point of high school, "migration is almost entirely out of, not into, the pool." (p. 7) She provided two particular suggestions for improving policy: "First, strategies to increase the size of initial scientific/mathematical pool of minorities and women should be targeted before and during high school. Second, strategies to decrease attrition from the pool can be targeted at any point in the process, since attrition from the pipeline and from quantitative fields occurs at all points."[6]

This pipeline metaphor has become a dominant model for considering the underrepresentation of women and people of color in engineering. It has captivated the minds of the public, program directors, and researchers alike, partially because it suggests a deceptively simple solution: put more people from underrepresented demographic categories into the system, and when the system is

finished educating them, there will be more of them left to come out. Of course, while a compelling tool for understanding what by all accounts is considered a highly complex issue, this simplification comes with limitations; Xie and Shauman[7] have argued that the pipeline metaphor is particularly problematic when applied to modeling women's scientific careers.

An alternative and overlapping conceptual metaphor of the "pipeline" is the "chilly climate" as outlined by Roberta Hall and Bernice Sandler in the context of women in higher education.[8,9] They suggested that the poor retention rates of women in (particularly scientific) courses, educational tracks, and professions are due to a "chilly climate" created by an accumulation of micro-inequities. The aggregate of these micro-inequities serve to make many women's working and learning environments intolerable. Similar rhetoric has been applied to describing the experiences of people of color in higher education.[10] Remediation strategies also seem to follow from this metaphor: underrepresented people are encouraged to developing supportive peer communities who can help them withstand the unpleasant environment ("find and wear a sweater"), and departments can do environmental-level improvements by training existing faculty members in anti-discrimination policies and strategies ("turn up the thermostat"). These strategies have helped considerably in improving the poor working environments particularly experienced by underrepresented people across the labor market.

Pipeline and chilly climate models have proved important for increasing the number of underrepresented students in STEM. However, their overlap describes a heretofore unacknowledged theoretical hole: while those underrepresented students are being supported and current faculty are being educated about diversity, the training of *future* STEM faculty— that is, graduate students, and particularly majority graduate students— is being overlooked. The hope apparently is that, through a "trickle-down" effect, these future faculty will somehow avoid reproducing problematic assumptions that many of their faculty still apply in their classrooms and research environments. This trickle-down assumption persists despite the increasing calls from the National Science Foundation, the American Association for the Advancement of Science and other governmental and educational institutions for the general improvement of undergraduate science education. [11-13] As the standards for instructing undergraduates are raised, the belief that good researchers will necessarily be good teachers of science is beginning to be called into question. In response to this call, graduate schools and centers for STEM education are starting to empower STEM graduate students with ways to train themselves to become good instructors.[14]

Together, these two parallel ideas— the strategies that involve discussing issues of diversity in the classroom only with current faculty, and the new expectation that STEM graduate students need to learn how to teach— highlight a compelling need to educate graduate students directly about issues of diversity in the STEM classroom. However, we could not identify any existing for-credit, STEM-focused courses that did so.[2] To address this need, we developed a 1-2 credit course on teaching in STEM with a focus on diversity. The remainder of this paper describes this course and our markers of success.

Course Design

The "Diversity in the College Classroom" (DCC) course was designed as a sequence of two single-credit courses occurring sequentially in a semester. The first credit (DCC1) occurred during the first seven

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[2] One course has been brought to our attention by one of our former DCC1 students since the DCC courses finished: the Rutgers' Women's Studies Program ran a year-long seminar (fall 2001-spring 2002) called "Teaching Inclusive Science and Engineering" for faculty and graduate students that focused on gender in, and feminist critiques of, science and engineering. Several teaching modules for different engineering disciplines were developed out of this seminar. More information about the syllabus can be found at http://womens-studies.rutgers.edu/outline.htm.
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weeks of the semester, and focused on reading and discussing existing literature "to explore what is known and theorized about the ways that diversity affects learning and help participants to develop practical classroom strategies that address diversity."[15]   The second credit (DCC2) occurred after DCC1 for the remaining 8 weeks of the semester, and provided participating students with the opportunity to explore the idea of "diversity" in the classroom through a project of their choosing. During the fall 2005 semester, eleven students registered for DCC1, and five elected to continue to DCC2. The class met for 2 hours, once per week. All of the students in this semester were women.

The DCC course was developed in collaboration between the Delta Program for Research, teaching, and learning (Delta), and the Wisconsin Program for Scientific Teaching (WPST) at the University of Wisconsin-Madison. The DCC course reflected a commitment to the theoretical principles espoused by each program. The Delta Program is the UW-Madison affiliate of the Center for the Integration of Research, teaching, and learning (http://www.cirtl.net), and structures its programmatic opportunities around the core ideas of:

- Teaching-as-Research (TAR): "the deliberate, systematic, and reflective use of research methods by STEM instructors to develop and implement teaching practices that advance the learning experiences and outcomes of both students and teachers."[16]
- Learning Community (LC): "the *process* by which individuals come together to achieve learning goals [which] can be specific to individual courses and activities, or can be those that guide an entire teaching and learning enterprise" and consists of the core ideas of shared discovery and learning, functional connections among learners, connections to other related learning and life experiences, and exhibiting an inclusive learning environment. [17]
- Learning-through-Diversity (LtD): the idea that effective teaching "capitalizes" on the "array of experiences, backgrounds, and skills" that instructors and students bring to a learning environment, and requires that effective instructors "know the diverse backgrounds of their students and their implications for learning… identify curricular, teaching and assessment practices that promote learning for all… draw upon the diversity of their students to enhance and enrich the learning of all, …[and] recognize existing inequities, and promote an equitable, inclusive and respectful climate for learning."[18]

The WPST offers, as a central tenet, a revised model for teaching science, which they specifically define as "scientific teaching." Handelsman and colleagues[14] have argued that pedagogies predominating in STEM undergraduate teaching environments— "'transmission-of-information' lectures and 'cookbook' laboratories" (p. 521)— train students for scientific careers without involving the creativity and excitement of "science at its best," and ignore existing research that demonstrates the effectiveness of alternative teaching strategies. "Scientific teaching" is teaching "[with] active learning strategies to engage students in the process of science and teaching methods that have been systematically tested and shown to reach diverse students." [14]

The DCC course sequence integrated all of these ideas in its design, implementation, and assessment. Some examples of how Delta and WPST ideas were incorporated into DCC1 include:

- The course was designed collaboratively (LC) and drew on the particular experiential and knowledge strengths of each of the co-instructors (LtD).
- The assignments were organized to give students with different learning strengths opportunities to participate in different ways (including individual and group assignments: LC); students were also offered a choice with respect to one assignment (LtD).
- Some assignments were designed to model work that students would have to do as future STEM faculty (scientific teaching).
- Each class period discussed existing research on diversity and teaching (TAR and scientific teaching).
- Each class period provided a mix of pedagogies and active learning strategies (scientific teaching and LtD).

- Each class period ended with an assessment activity to help both the students try to summarize the main points of the class and the instructors understand what information or ideas were being understood or overlooked by students (TAR and scientific teaching).
- Student's prior knowledge and experiences were solicited and highlighted multiple times per class (LtD).

The instructors also were cognizant of feminist critiques of traditional science education, particularly regarding the power relations between instructors and students, the value placed on objectivity over personal experience, and the perceived distance of science content from the world that students and scientists live in.[19] Some examples of how they integrated these considerations into DCC2 are:

- The instructors defined only 3 learning objectives for DCC2; the first class meeting consisted of a collaborative activity for students to construct additional goals they want to accomplish during the course (power sharing).
- Most of the students had experienced sexism or racism (as well as other forms of discrimination) at some point in their home departments. There was time each class to share these stories, and to discuss how these experiences can be considered "data points" along with the quantitative studies we were reading in class (valuing personal experience).
- Each student selected and worked on a project of their choosing related to diversity in the classroom. Without exception, these projects focused on real situations the students had identified as critical through their work in DCC1 (connection with the world they live in).

Additionally, instructors introduced students to the concept of the "hidden curriculum"[20] which is the idea that, in addition to the explicit content of a school's curriculum, students' official education also includes an implicit socialization into understanding privileged forms of knowledge and valuing certain power relations.[21,22] This topic is discussed further in the DCC1 evaluation section.

Course objectives and structure of DCC1

Through the course objectives for DCC1, students were challenged (1) to develop "a personally meaningful definition of 'diversity'; (2) to increase their knowledge of the fundamental literature on diversity that pertains to science, engineering and math; (3) to develop a rationale for including specific content in their courses, and an understanding of how selection of this content is influenced by one's definition of diversity; (4) to create a toolbox of tips and ideas on addressing diversity in future courses; (5) to cultivate a community of peers; and (6) to learn the theory and data one can use to support claims about the benefits and challenges of diversity in STEM education."[15]

To help the students accomplish these goals, the instructors developed a series of topics situated within four larger themes. These are described in Table 1, included at the end of this paper. The instructors designed a variety of assignments (described in Table 2) to help students work toward these course goals, and which could be eventually included in a teaching portfolio. (For faculty positions, evidence of teaching proficiency is increasingly being requested; some researchers have argued that teaching portfolios are good tools to use in these cases.[23] The Delta Program also offers a teaching certificate program that requires completion of a rigorous and evidence-based teaching portfolio.)

Evaluation of DCC1

Two sources of evidence were used to determine how well the class achieved the stated course objectives: quantitative and qualitative data derived from the final course evaluation, and qualitative content-based data drawn from students' assignments.

Students' self-reported success in achieving six of the course learning objectives is included in Table 3 (n=11) using a non-traditional achievement scale. We examined two of the six course objectives in depth for inclusion in this paper[3]: development of "a personally meaningful definition of 'diversity'" (objective 1), and development of a toolbox of tips and ideas on how students might address diversity in future courses they might teach (objective 4).

Objective #1: To develop a personally meaningful definition of diversity

During the seven weeks of DCC1, students were exposed to many different definitions of diversity through articles in which the authors expressed varied ideas about diversity, and through classroom discussions in which students heard different viewpoints from their classmates. Students had the opportunity to directly articulate their beliefs about diversity, and what it means for university STEM education in their "statements of diversity." One statement was written before the start of class, and the second statement was written after six weeks in the course. Students did not receive any written feedback from instructors in the interim; hence, we can infer that any differences between the two drafts are based on changes in their own understanding. In the first statement, most students tended to focus on the idea of treating all of their (future or present) students as individuals, noting each person's own ways of learning and being in the world. Some examples of this kind of statement are:

> "Even beyond respectful speech and body language, it is important for an instructor to lead by example, respecting each student as equal yet unique."

> "I believe that these variations make students intelligent in their own individual way and it is therefore not my goal to produce copies or "clones" of myself, but rather to help students know how to learn from these differences and how to utilize this inevitable diversity to reach a common learning goal."

Most students also proposed the development of welcoming and inclusive classroom environments, and gave a few specifics such as soliciting feedback from students regularly, or setting ground rules for how students should treat each other:

> "The most important part of my role is to create a positive learning environment that is grounded in respect for students as individuals."

> "Part of my responsibility as an instructor is creating a classroom environment where the free expression of ideas is both welcome and encouraged."

The ideas expressed in the second draft of statements, in general, had a different flavor. While one student modified her first statement only superficially, the rest either added more ideas or examples from new perspectives, or completely rewrote their statements to follow a new direction. Students, in these second drafts, more frequently referred to themselves as instructors, rather than a reference to a third party as "the instructor." They also considered diversity as a quality of themselves and not just of their students:

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[3] For the purpose of this paper, we selected the three course objectives included here (DCC1-1, DCC1-4 and DCC2-3) because they clearly illustrate the multiple modes of quantitative and qualitative data analysis other course instructors can do.

"My actions and words will set the tone of the class and as a role model I must be aware of how my own biases, perceptions, and historical perspectives shape the way I think, act and teach."

"I will also address my own experiences and unconscious biases and explore how they affect my knowledge construction outside and inside the classroom and how that relates to how I relay that knowledge to my students."

Some students, in describing how they will reconsider the content of their courses, included the idea of the hidden curriculum,[21] an idea discussed during the class session on race, class, gender and pedagogy:

"Because not all students understand the particular format and structure of how a college classroom works, I strive for transparency in communicating my expectations of students. I include an introduction to the invisible or unspoken rules and customs early in the term, and offer through my syllabus and class Web site information regarding University and community services available to students so that all students are aware of these resources."

"The idea of a hidden curriculum is an important thing for me to think about and work on from this point forward. I am guilty of thinking about science as a way of thinking which does not have a hidden agenda. Through my graduate school experience I realize that this is not the case. There are social and political factors that underlie science, the concept of what science is and what scientists do, many of which are exclusionary.

Analysis of these diversity statements suggests that the DCC1 course may lead to an increased complexity in student understanding of diversity. Additionally, these second statements demonstrate an increase in the number of practical ideas and a new tendency of students to write from their own perspective. These data suggest students developed an enhanced understanding of the impact of diversity in the STEM classroom. However, our stated learning objective was for students to develop a more "personally meaningful" definition of diversity. Course evaluation data indicated that students expressed satisfaction with their meeting this objective (82%, see Table 3). While this is a self-reported number, we can verify its accuracy with two other sources of data including results from another final evaluation question: "did your understanding of the topic of "diversity" change since the beginning of the semester?" Of the 9 students who completed this question, 7 explicitly talked about how their definition had become broader or more nuanced. Two students stated:

"I think diversity is more rich and complex than I initially perceived it to be."

"I have a clearer understanding of how background and life experience are as much a part of diversity as gender, race, age, learning styles, physical ability, etc… That whole concept was more abstract when I arrived to this course. Also, I have a broader understanding of the resistance that exists around discussions about diversity […] It comes up for all of us in some respects, as we are asked to look deeply into how we are actually perpetuating undesirable beliefs and actions in the world. Finally, I have included myself in thoughts and considerations about diversity in the classroom. Before I looked at this from an inside looking out perspective. Now I see that I play a huge role because my own diversity in [sic] present as well as what is there in the student body, and I effect [sic] the results I will see in ways that are both apparent to me and completely unconscious."

Of the two students who did not discuss this, one said she had entered the class with an already developed understanding of diversity; the other said she had desired more discussion and closure around developing a personally meaningful definition of diversity.

These data from four sources indicate that the students progressed towards achieving a more meaningful definition of diversity. However, through doing the data analysis as part of our commitment to TAR, we have ideas for curricular and pedagogical changes we will make the next time we offer the course, particularly by reorganizing the first class on defining diversity.

Course objective #4: To develop a toolbox of teaching ideas

The second course objective detailed in this paper described the need for students "to create a toolbox of tips and ideas on addressing diversity in future courses." Throughout the course, the instructors made explicit both the pedagogical choices being made and the rationale behind choosing them. For example, for the first three weeks of the semester, our first class activity was introductions. We pointed out that, through this activity, students became familiar with their classmates names, some identifying features of each person based on the activity (why others are taking this course, what teaching experience others have, what "fun fact" others wanted to share, and so on), *and* three ways that *they themselves* could have their own students introduce each other. By making this activity explicit by simply sharing with the students why we were spending time going around the room for introductions, the activity has the potential for improving the classroom experience of two generations of students: the students in the room, and their future students.

Although we made it a point to make pedagogical decisions explicit, we were uncertain if students were able to keep track of these ideas. To assess this, we modeled multiple teaching practices during one class period. Students were then asked to complete a 5-minute assessment note card listing "the pedagogies that were modeled in class today." We defined these pedagogies, or teaching practices, as including the processes of setting goals, determining an approach to achieve those goals, ways of assessing whether students met those goals, and revising your approach for the future. Each student proposed 2-4 ideas of pedagogies. Compiling the teaching practices on all the cards resulted in a list of 12 unique pedagogical processes identified by students, and 7 additional teaching practices that had also been modeled. This list was then distributed to all the students to illustrate the impact of activities that promote Learning Community (the list was more complete because students engaged in the task of developing it together) and Learning-through-Diversity (everyone's different perspective helped in developing a more complete list). At the end of the semester, instructors compiled and distributed a list of 42 unique teaching practices they had modeled throughout the course, and identified this as the "pedagogical toolbox" that students themselves had experienced and could use in the future.

Final course evaluation data show that 70% of the students self-reported being "well on their way" to being satisfied in achieving the learning goal of creating a toolbox of teaching ideas (Table 3). When asked to share one substantial thing they learned in the course, with no prompting, one person specifically identified "learning about different pedagogies - both how and why to use them." On the final evaluation, students were asked to estimate the frequency that various teaching practices were modeled (over the 7 weeks, or per class session): active learning, assessment, activities to develop community between students, highlighting student voices, multiple modes of content delivery, content and pedagogical decisions made explicit, and linking the research literature to practice. Except for the last, at least 90% of students felt each teaching practice had been modeled at least once and usually multiple times per class. Some students made explicit comments about the teaching practices:

> "Towards the end of the class we explicitly learned about different pedagogies."

> "I felt that a lot of different pedagogies were modeled and that the instructors were willing to take a chance and try out some different things."

> "I enjoyed seeing how the different pedagogies could be employed and I found myself more willing to try out the pedagogy myself."

While all these data present a compelling case for having accomplished this learning objective, there are two limitations. Firstly, we did not ask students at the end of the course to identify as many teaching practices as they could, and compare their responses with our list of 42 modeled pedagogies. Secondly, we do not know how simply distributing a list of teaching practices will translate into students' using them. We will ask students in the future to identify as many teaching practices as they can at the end of the course, and we hope to do a series of interviews next year of our students to determine the lasting impact of the course on their teaching.

The evaluation of these two course objectives (in addition to the remaining three objectives not detailed in this paper) has helped us as instructors reflect on our practice and reconsider our teaching and evaluation approaches for subsequent iterations of DCC1 (scheduled for both summer and fall of 2006).

Course objectives and structure of DCC2

While DCC1 was structured in order to discover existing literature on diversity, DCC2 was designed as an opportunity for each student to explore diversity in university STEM teaching through a project of her choosing, and with a supportive community engaged in a similar pursuit. Because of the philosophical shift from instructor-developed to student-led, two sets of course objectives were developed for DCC2: one set developed by the instructors, and a second set brainstormed and agreed upon by the students during the first class meeting.

The instructors' course objectives were that students would "(1) conceive of, develop and present a project on the topic of diversity in STEM/SBE[4]; (2) learn how to receive, benefit from, and give constructive peer-review criticism regarding issues of diversity; (3) understand, and learn to apply concepts of "Teaching-as-Research," "Scientific Teaching", "Learning Community" and "Learning-through-Diversity" to [their] teaching."[24]

Some of the student-set course objectives were that they would: (1) have deeper discussions about diversity, particularly regarding race and how it affects how we teach; (2) discuss how to deal with conflict in the classroom, potentially using case studies; (3) strategies for dealing with resistance from people beyond this class; (4) understand how to assess a change in mindset; (5) develop a functional and/or group-constructed definition of diversity; and (6) develop projects that we will professionally and personally benefit from. On the final evaluation, 4 of 5 students reported that they felt the instructors and the students equally shared responsibility for achieving both sets of objectives.

The weekly topics and assignments for the DCC2 were organized to help students work on their diversity projects, meet the course learning objectives, and to ensure that the work they invested in their course project was of high quality and broad impact. The weekly topics and assignments are described in Tables 4 and 5, respectively. Some ideas for projects that we suggested included: designing and developing instructional materials (i.e. labs, case studies, problem-based learning activities, etc.) that can be used to educate faculty or students about diversity or enhance diversity in the classroom; developing a course module that integrates diversity into an existing disciplinary course that students may need to teach some day; and researching the history of students' disciplines, focusing on the contributions (or reasons for the lack thereof) of women and minorities to their field. Students could develop an informal educational product (Web site, poster, leaflet, museum exhibit) to share this history with others. The actual projects students chose are listed and briefly described in Table 6.

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[4] SBE=Social, Behavioral and Economic sciences.

Evaluation of DCC2

Self-reported student data were collected from the final evaluation and qualitative data were gathered from completed course assignments. For the DCC2 course objectives set by the instructors and the student-determined course objectives, students' self-reported successes from the final course evaluation are shown in Tables 7 and 8 (n=5). For this paper, we focus on the instructor-defined objective: "understand, and learn to apply concepts of 'Teaching-as-Research,' 'Scientific Teaching,' 'Learning Community' and 'Learning-through-Diversity' to your teaching." [iii]

<u>Course objective #3: Understanding and applying TAR, LC, LtD and Scientific Teaching</u>

Throughout the course, the ideas of Teaching-as-Research (TAR), Learning Community (LC), Learning-through-Diversity (LtD), and Scientific Teaching were discussed. Data gathered from the final evaluation suggest that the ideas of LC and LtD based on the Delta Program's definitions[25,26] were well integrated into the design and implementation of the course itself. Most students reported agreeing or strongly agreeing with almost all the statements inquiring whether they had experienced various key characteristics of the concepts in the class (included in Table 9). Additionally, the final evaluation asked students to share how, if at all, Delta's framing concepts of TAR, LC and LtD influenced their interest in, and capacity for, being an excellent educator. All the students reported potential uses of the framing concepts in their future teaching; one student said:

> "Teaching as research has helped me to realize that teaching is as much of a process as learning. I am much more motivated to improve my teaching now that I know how to pull out specific questions and work with each one at a time to assess teaching and learning in my classrooms. Learning community and learning through diversity have both given me a larger perspective about teaching and learning. Working with these concepts has continuously reminded me of my own role, influence, bias, strengths and limitations in the classroom whereas before I would have focused more on my students as if they performed in isolation from me in a sense."

Not only did students report understanding the framing concepts of the course, they described specific situations in which they might apply them; in so doing, they illustrate their understanding, providing additional evidence that they adequately accomplished this goal. Additionally, we completed a brief content analysis of students' final project papers. We created a checklist based on the factors identified as defining each framing concept. We read each final paper with an eye to this checklist; the results are included in Table 10. The majority of the students discussed or otherwise included the majority of the factors that define the framing concepts in their project write-ups. Most students only missed one or two aspects each, and only one factor was consistently missed by students— that of "defining measures of success." We think that this constitutes compelling evidence that these students understand and can apply the concepts of TAR, LC, and LtD to their teaching practice and this result likely extends to the theme of scientific teaching, although we did not ask this directly.

The evidence presented supports the claim that our students accomplished the learning objective of understanding and applying TAR, LC, LtD. We also intend to stay in contact with the students from the Fall 2005 course, many of whom are intending to implement their projects through a Teaching-as-Research internship facilitated by the Delta Program.

Conclusion

The purpose of this paper is to describe a complementary strategy to popular pipeline- or chilly-climate-structured programs: educating graduate students directly about how they can teach their disciplinary content classes in ways that promote everyone's learning, including those people who have historically been marginalized and made unwelcome in STEM classrooms. We have described our implementation of a 1-2 credit course designed to follow this strategy. Data collected from the students indicate success in reaching the learning goals; students displayed an increased personal

understanding of diversity, developed knowledge about the impacts of diversity issues in STEM, and created projects and resources they will be able to use in their future teaching. Additionally, all the students who took the fall 2005 implementation reported that they were satisfied or very satisfied with the course. One student shared that she thought this was the most important course she has taken in graduate school, while another reported that "This was my absolute, by far, no question – MOST FAVORITE DELTA COURSE!" Many students wrote that they felt this course should be offered again, without a doubt.

This paper also describes the instructors' efforts to themselves engage in Teaching-as-Research/ Scientific Teaching: we describe the course objectives, indicate ways we helped students achieve those course objectives, provide evidence for how well they succeeded, and reflect on what to change or improve for the next implementation. This study includes a very small number of students from one course implementation; as such, the paper stands as a case study illustrating the importance and value of doing classroom research[27] for improving teaching practices, and indicating the importance of a teaching course focused on diversity.

To end this paper, we have included some final student voices that illustrate how empowered they feel by what they have learned:

> "I am amazed at the power that lies in a group coming together to discuss complex issues. Being exposed to readings and student sharing and student led assessments taught me so many new ways of looking at my own processing of diversity information."

> "I would like to thank you for the opportunity to explore diversity and its many facets. My thoughts and thought processes have been expanded and I feel ownership over the challenge of bringing diversity into my classroom and world."

Bibliography

1.   National Science Board. Science and engineering indicators 2000. Washington, DC: U.S. Government Printing Office; 2000. Report nr NSB 00-87.
2.   National Science Foundation Division of Science Resources Statistics. Women, Minorities, and Persons with Disabilities in Science and Engineering: 2004. Arlington, VA: National Science Foundation; 2004 May 2004. Report nr NSF 04-317.
3.   Seymour E, Hewitt NM. Talking About Leaving: Why Undergraduates Leave the Sciences. Boulder: Westview Press; 1997.
4.   Handelsman J, Cantor N, Carnes M, Denton D, Fine E, Grosz B, Hinshaw V, Marrett C, Rosser S, Shalala D and others. More Women in Science. Science 2005;309(19 Aug 2005):1190-1191.
5.   Malcom SM. Science and Diversity: A Compelling National Interest. Science 1996;271(29 March 1996):1817-1819.
6.   Berryman SE. Who will do science? Minority and female attainment of science and mathematics degrees: trends and causes: Rockefeller Foundation; 1983 November.
7.   Xie Y, Shauman KA. Women in science: career processes and outcomes. Cambridge, MA: Harvard University Press; 2003.
8.   Hall RM, Sandler BR. The Classroom Climate: A Chilly One for Women? Washington DC: Association of American Colleges; 1982 February.
9.   Sandler BR, Hall RM. The Campus Climate Revisited: Chilly for Women Faculty, Administrators, and Graduate Students. Washington DC: Association of American Colleges; 1986.
10.   Penn M. Native ground. On Wisconsin 2004:22-29.

11. Center for Science Mathematics and Engineering Education. Committee on Undergraduate Science Education. Transforming undergraduate education in science, mathematics, engineering, and technology. Washington, DC: National Academy Press; 1999.

12. National Science Foundation Directorate for Education and Human Resources. Shaping the future: New expectations for undergraduate education in science, mathematics, engineering, and technology. Arlington, VA: NSF; 1996.

13. Project 2061 (American Association for the Advancement of Science). Science for all Americans: a project 2061 report on literacy goals in science, mathematics, and technology. Washington, D.C.: American Association for the Advancement of Science; 1989.

14. Handelsman J, Ebert-May D, Beichner R, Bruns P, Chang A, DeHaan R, Gentile J, Lauffer SM, Stewart J, Tilghman SM and others. Scientific Teaching. Science 2004;304(23 April 2004):521-522.

15. Handelsman J, Pfund C, Pawley A. 2005 Jan 16 2006. Diversity in the College Classroom (DCC1) course syllabus.   Delta Program in Research, teaching, and learning, Wisconsin Program for Scientific Teaching <http://www.delta.wisc.edu/Courses/DiversityCollClass/DCC.html >. Accessed 2005 Jan 16 2006.

16. Center for the Integration of Research Teaching and Learning. 2005 March 16. Teaching-as-Research.   Center for the Integration of Research, teaching, and learning <http://www.cirtl.net/pillars_TAR.html >. Accessed 2005 March 16.

17. Center for the Integration of Research Teaching and Learning. 2005 January 8. Basic Learning Community Principles and Guidelines.   Center for the Integration of Research, teaching, and learning <http://www.cirtl.net/pillars_LC.html >. Accessed 2006 January 8.

18. Center for the Integration of Research Teaching and Learning. 2005 January 8. Learning-through-Diversity.   Center for the Integration of Research, teaching, and learning <http://www.cirtl.net/pillars_LtD.html >. Accessed 2006 January 8.

19. Barton AC. Feminist Science Education. New York: Teachers College Press; 1998.

20. Snyder BR. The Hidden Curriculum. Cambridge, MA: MIT Press; 1973.

21. Anyon J. Social class and the hidden curriculum of work. Journal of Education 1980;162(1):67-92.

22. Friere P. Pedagogy of the Oppressed. New York: Herder and Herder; 1972.

23. Seldin P. The Teaching Portfolio: A Practical Guide to Improved Performance and Promotion/Tenure Decisions. Bolton, MA: Anker; 1997.

24. Pawley A, Pfund C. 2005 Jan 16 2006. Diversity in the College Classroom (DCC2) course syllabus.   Delta Program in Research, teaching, and learning, Wisconsin Program for Scientific Teaching <http://www.delta.wisc.edu/Courses/DiversityCollClass/DCC.html >. Accessed 2005 Jan 16 2006.

25. CIRTL. 2005 January 8. Basic Learning Community Principles and Guidelines.   Center for the Integration of Research, teaching, and learning <http://www.cirtl.net/pillars_LC.html >. Accessed 2006 January 8.

26. CIRTL. 2005 January 8. Learning-through-Diversity.   Center for the Integration of Research, teaching, and learning <http://www.cirtl.net/pillars_LtD.html >. Accessed 2006 January 8.

27. Cross KP. Classroom research: Helping professors learn more about teaching and learning. In: Seldin P, editor. How administrators can improve teaching: Moving from talk to action in higher education. San Francisco: Jossey-Bass; 1990. p 122-142.

Data tables

Table 1: DCC1 themes and weekly topics (from DCC1 syllabus)			
Week	Theme	Theme description	Weekly topic
1	Foundation	Foundational knowledge on the topic of diversity and its particular application within STEM educational contexts. What do people mean when they use the word "diversity"? In what contexts is it used?	Diversity defined
2			Value of diversity

3	Research on bias	Experimental and analytical work on bias, prejudice, and assumption. How do aspects of diversity affect the judgments do we make about people and their work? This theme forms a basis for developing self-awareness and reflection on the biases and assumptions we bring to subsequent course material.	Unconscious bias, prejudice and stereotype threat
4	Ways of knowing, ways of learning	Theoretical work on diversity in education has often used the theme of "ways of knowing," to describe the different research traditions and cultural traditions that people use to make sense of their worlds. Experimental work examines "ways of learning" – practices that promote learning of diverse groups of people. How do we reconcile the ideas of these disciplines with the research on bias? How do we extrapolate from research showing group differences without imposing a new set of stereotypes and prejudices?	Ways of learning: biology, practice and environment
5			Race, gender, class & pedagogy
6			Multicultural and feminist pedagogy
7	Action: where now from here?	As teachers, we hold power. How does our understanding of diversity inform our use of that power? We studied what others have done and brainstormed collectively and individually about ways to address diversity in our own teaching of science and engineering.	Participant action plans shared

Table 2: Assignments for DCC1	
Assignment	Description
Reading assessments	For each class session, teams of 2-3 students developed a "reading assessment" that we did at the beginning of class. The reading assessment could be a quiz, a puzzle, or a short problem to solve that was based on the reading. Reading assessments were designed to take no longer than 10 minutes and should assess the class's understanding of the key points of the "lead reading" for that day (defined at the beginning of the course). Instructors provided individualized feedback.
Classroom observation	Students selecting this option visited two different classes of their choice during the course. Students wrote a short paper for each based on some guiding questions that encouraged them to focus on the classroom design and set-up, what pedagogies the instructor used to "convey" material, student participation, and content. Instructors provided feedback after the two papers were submitted.
Syllabus development	Students selecting this option revised a syllabus for a course they envisioned they might teach as future faculty. They then redesigned the course based on the concepts we were discussing in class. Instructors provided feedback after the redesigned syllabus was submitted.

Statement of diversity	When applying for faculty positions, students are often expected to include a "teaching statement" or a teaching philosophy. This assignment challenged students to write part of this document that directly incorporated the concept of "diversity." Instructors provided individual and group feedback after both drafts were completed. Completing two drafts with no intermediate feedback allowed students to track their own developmental progress over the length of the course.
Action plan	We wanted to encourage students to maintain the momentum that is often built up over a semester when focusing on a topic. This assignment required they think about (and articulate) what they thought they would do with respect to diversity in the future as STEM instructors. For those students going on to DCC2, this could serve as a first draft of their project proposal.
Course evaluation	This course was experimental in two senses— first, in the sense that future iterations of the course need to be improved, and second, that it is part of a larger research project for both WPST and Delta. Because of its experimental nature, we included completing a course assessment as a course assignment. We were aware of the power problems inherent in requiring students to complete an evaluation honestly yet making its completion seem as part of their grade. Students visiting the first page of the online evaluation discovered their choice in completing the evaluation— we asked that they e-mail the instructors regardless of they decided to complete or not complete the evaluation. Upon receipt of the e-mail, we checked off that student as having completed the assignment.

Table 3: How well do you feel you achieved the following class goals (from the syllabus) over the time of the course? Please answer this question according to your current satisfaction— we recognize you may also value the concept of "lifelong learning."

1= I have not achieved this goal at all
2= I have achieved little, and have little desire to learn more
3= I have achieved little but have lots of desire to learn more
4= I am well on my way to achieving this goal to my current satisfaction
5= I have achieved this goal to my current satisfaction.

	1	2	3	4	5
I have developed a personally meaningful definition of diversity	0	0	18% (2)	64% (7)	18% (2)
I have developed a knowledge of the fundamental literature on diversity as it pertains to STEM contexts	0	0	55% (6)	27% (3)	18% (2)
I have developed an understanding of how my definition of diversity influences the content of my (present or future) classes	0		9% (1)	73% (8)	18% (2)
I have developed a toolbox of tips and ideas that I can apply to my (present or future) teaching	0	0	30% (3)	70% (7)	0
I have developed a community of peers who could be a resource for me in the future.	0	9% (1)	18% (2)	64% (7)	9% (1)
I have developed ways of arguing in support of diversity in STEM contexts.	0	9% (1)	9% (1)	64% (7)	18% (2)

Table 4: Week to week topics for DCC2		
Week	Topic	Description
1	Introduction; course goals construction	Bring action plan from DCC1 Develop course goals
2	Doing rigorous teaching research	Discuss the Delta framing concepts of TAR, LC and LtD, and WPST concept of scientific teaching. Discuss how to apply these ideas to diversity project through aligning assessment strategies with project goals.
3	Working time and project advising	Key people involved elsewhere in Delta provided students feedback on what they had developed for their project so far.
4	Personal project progress	Students shared their project ideas and progress with each other.
5	Revisiting rigorous teaching research	Aligning assessment strategies with project goals. Discussing requirements for Institutional Review Board approval
6	Peer review session	Students send each other their project materials and write-up in advance; both give and receive structured feedback
7	DCC Forum planning	Planning the goals, implementation, and assessment of the DCC Forum, held in the final class session.
8	DCC Forum (open to the public)	Students ran activities and presentations to educate the audience about diversity in STEM through their projects.
Post		Online final course evaluation

Table 5: Assignments for DCC2	
Assignment	Description
Project initial description	Students wrote a 1-2 proposal on what they hoped to focus their course project on for the subsequent 7 weeks.
Peer-review preparation	Each student generated shareable project materials and text, shared it with one other student, and read a different student's project materials and text before the week 6 class meeting.
Project write-up and submission	Students developed whatever their project was— students called this "the thing"— and wrote a 7-15 page "meta" paper about the decisions and research that back the project up. Papers included a description of the diversity-related issue/challenge, a rationale for addressing this challenge (using published research or a needs-analysis), a description of the approach designed to address the challenge (supported by relevant literature), a plan for how the approach would be assessed, and a reflection on the development process of the project. The "thing" the students submitted could be a redesigned syllabus, survey tool, script for a video, the paper to be submitted for publication, the Web site, the poster, and so on.

DCC Forum	The instructors scheduled the final class meeting to be a public forum for students to share their projects— the "things"— with friends, family, colleagues, and other members of the university community. Students set out goals, planned an implementation strategy (consisting of active learning activities and short presentations), discussed assessment, and finally ran the event.

Table 6: Student projects in DCC2		
Discipline	Audience	Description
Sociology	Graduate student teaching assistants	This student questioned whether sociology faculty who, in their research, focus on the sociological effects of race, class and gender, take such ideas into consideration when teaching their students. She also noted the increase in the number of courses graduate teaching assistants (GTAs) are responsible for. She designed a survey to assess GTAs attitudes about diversity, and how diversity issues might impact their students' learning.
Zoology	Undergraduate students, biology majors and non-biology majors	This student found disturbing a report that over 50% of students who begin in a natural science major switch out of it within 2 years. She developed a set of exercises that could be included in an introductory zoology course that would help undergraduates (particularly women and people of color) learn to see themselves as scientists.
Mechanical engineering	Faculty	This student learned that teaching evaluations that undergraduates complete at the end of the course are not very effective at convincing faculty members to improve their teaching. She developed a pair of formative evaluations that faculty could use mid-course and at the end of a course to help them assess the climate in their classroom; making the evaluations formative could allow faculty to make specific changes to improve the classroom climate for all students.
Food Science	Senior undergraduates	This student discovered that a course she had taught in the past was misaligned— that is, the course objectives she had developed were not being assessed by her evaluation strategy. She redesigned her course objectives, explicitly including goals on creating an inclusive learning community, she produced a new tool to help her class accomplish the goal of learning community, and she developed a significant assessment plan that was aligned with her new course objectives.
Environmental studies	Undergraduates in an introductory course	This student, assigned to TA the discussion section of an introductory survey course with a lamentable reputation, redesigned the syllabus for the discussion section. She introduced the idea of collaborative learning to its structure, identified discussion topics particularly salient to understanding science's role in society, and searched out ways to highlight the impact of environmental issues on disenfranchised populations in America.

Table 7: How well do you feel you achieved the following class goals set by the instructors over the time of the course? Please answer this question according to your current satisfaction— we recognize you may also value the concept of "lifelong learning."

1= I have not achieved this goal at all
2= I have achieved little, and have little desire to learn more
3= I have achieved little but have lots of desire to learn more
4= I am well on my way to achieving this goal to my current satisfaction
5= I have achieved this goal to my current satisfaction.
NI = This goal was not an important part of the course for me

	1	2	3	4	5	NI
I have conceived of, developed and presented a project on the topic of diversity in STEM/SBE.	0	0	0	20% (1)	80% (4)	0
I have learned how to receive, benefit from, and give constructive peer-review criticism regarding issues of diversity	0	0	40% (2)	40% (2)	20% (1)	0
I understand, and have learned to apply concepts of "Teaching-as-Research" and/or "Scientific Teaching" to my teaching	0	0	20% (1)	40% (2)	40% (2)	0
I understand, and have learned to apply the concept of "Learning Community" to my teaching.	0	0	20% (1)	60% (3)	20% (1)	0
I understand, and have learned to apply the concept of "Learning-through-Diversity" to my teaching.	0	0	20% (1)	60% (3)	20% (1)	0

Table 8: How well do you feel you achieved the following class goals set by the students over the time of the course? Please answer this question according to your current satisfaction— we recognize you may also value the concept of "lifelong learning."

1= I have not achieved this goal at all
2= I have achieved little, and have little desire to learn more
3= I have achieved little but have lots of desire to learn more
4= I am well on my way to achieving this goal to my current satisfaction
5= I have achieved this goal to my current satisfaction.
NI = This goal was not an important part of the course for me

	1	2	3	4	5	NI
I have had deeper discussions about diversity, particularly regarding race and how it affects how we teach	0	0	20% (1)	80% (4)	0	0
I have had opportunities to get reactions from different people regarding different teaching-related ideas	0	0	20% (1)	20% (1)	40% (2)	20% (1)
I have discussed how to deal with conflict in the classroom, potentially using case studies	0	0	60% (3)	40% (2)	0	0
I can now see how to apply and share information beyond this class	0	0	20% (1)	40% (2)	40% (2)	0
I now have strategies for dealing with resistance from people beyond this class.	0	0	20% (1)	60% (3)	20% (1)	0
I have learned how to critique my own work	0	0	40% (2)	20% (1)	20% (1)	20% (1)
I have brought in, and shared with others in this course, other literature that we find outside class	0	0	40% (2)	20% (1)	20% (1)	20% (1)
I now understand how to assess a change in mindset	20% (1)	0	40% (2)	0	40% (2)	0

I have learned more about other campus teaching and learning resources	0	0	20% (1)	80% (4)	0	0
I feel this class has developed as a community to discuss teaching and learning issues outside of class	0	20% (1)	20% (1)	40% (2)	20% (1)	0
I have constructed a functional and/or group-constructed definition of diversity	0	0	0	80% (4)	20% (1)	0
I know better how to integrate the puzzle pieces of learning community, content, diversity, and so on	0	0	0	80% (4)	20% (1)	0
I have developed a project that I think I will professionally and personally benefit from	0	0	0	20% (1)	80% (4)	0

Table 9: Please rate how much you agree with the following statements (regarding TAR, LC, LtD)
SD: I strongly disagree; D: I disagree; NS: I am not sure; A: I agree; SA: I strongly agree

	SD	D	NS	A	SA
I felt we (the students and instructors) learned together as a group.	0	0	0	40% (2)	60% (3)
I experienced functional connections with others in the class.	0	0	0	80% (4)	20% (1)
I felt the course pedagogies and materials were connected to my life experiences.	0	0	20% (1)	80% (4)	0
I felt this course exhibited an inclusive learning environment.	0	0	0	40% (2)	60% (3)
I and my ideas were welcomed and respected by the instructors.	0	0	0	40% (2)	60% (3)
I and my ideas were welcomed and respected by the other students.	0	0	0	40% (2)	60% (3)
I felt the content of the course represented a wide range of ideas and research.	0	0	0	80% (4)	20% (1)

Table 10: Framing concepts content analysis of final papers. NA=not applicable. X=presence of this language or value within the paper's text.	Student #				
	1	2	3	4	5
Teaching-as-Research (TAR)					
Learning foundational knowledge	X	X	X		X
Creating objectives for student learning		X	X	X	X
Developing a hypothesis for practices to achieve the learning objectives	X	X	X		X
Defining measures of success			NA		
Developing and implementing teaching practices within an experimental design	X	X	NA	X	X
Collecting and analyzing data	X	X	X	X	X
Reflecting, evaluating, iterating	X		X	X	X
Learning Community (LC)					
Shared discovery and learning	X	X	NA	X	X

Functional connections among learners	X	X		X	X
Connections to other related learning and life experiences	X	X		X	X
Inclusive learning environment	X	X		½	
Learning-through-Diversity (LtD)					
Know the diverse backgrounds of students and implications for learning	X	½	X	X	X
Identify curricular, teaching and assessment practices that promote learning for all	X	X	X	X	X
Draw upon the diversity of students to enhance and enrich learning of all	X	X	X		X
Recognize existing inequities and promote equitable, inclusive, respectful climate for learning	X	X	X		X