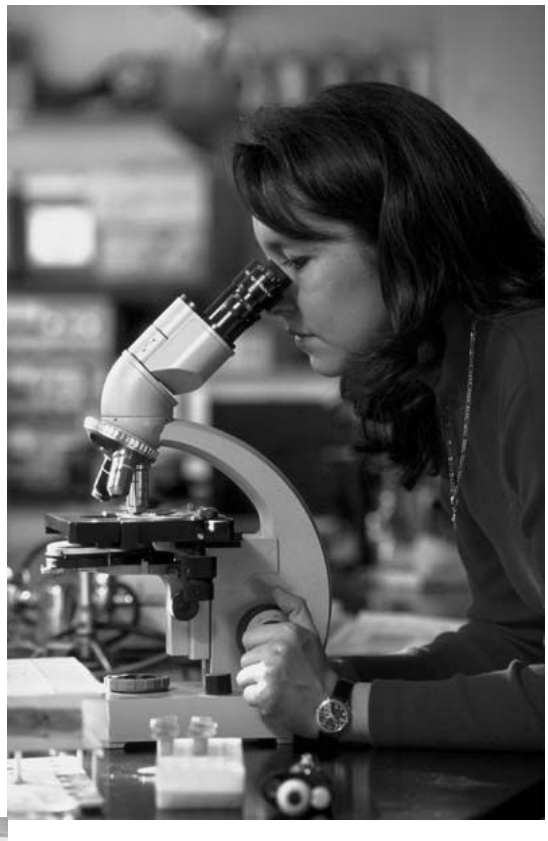
Case Studies in Inclusive Teaching in Science, Technology, Engineering and Mathematics



2nd Edition

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CIRTL

This case book was developed by the Diversity Institute of the Center for the Integration of Research, Teaching, and Learning (CIRTL), a NSF-funded multi-institutional project of the University of Wisconsin-Madison, Pennsylvania State University and Michigan State University. Diversity Scholars recruited from across the nation collaborated with the CIRTL Diversity Team to explore inclusive teaching in post-secondary science, technology, engineering, and mathematics. The Diversity Institute generated a set of reviewed teaching and learning resources that will aid faculty and future faculty in creating inclusive classrooms and laboratories. Resources currently available include:

- *Reaching All Students: A Resource for Teaching in Science, Technology, Engineering & Mathematics*
- *Case Studies in Inclusive Teaching in Science, Technology, Engineering and Mathematics*
- *Literature Review*
- *Content Matters: An Inclusive Syllabus Project*
- *Web Resources*

For more information on these and other resources, visit http://www.cirtl.net/diversityinstitute/.

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Diversity Institute

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Why We Wrote This Book

When you first consider discussing diversity with your colleagues or students, you may experience a moment of doubt. How can you handle this often volatile issue without people becoming uncomfortable about participating in the conversation? How can you facilitate the discussion so that everyone leaves with a sense of respect and even some insight?

If you are new to this conversation, you may feel tempted to stop at this point. The situation may seem too risky. But first, consider these facts.

Even though proportionately higher numbers of African Americans aspire to science graduate degrees than European Americans do, the actual percentage of doctorates in the sciences awarded to African Americans in 1995 was only 2.0% (Maton, Hrabowski & Schmitt, 2000).

The percentage of full professorships in the sciences currently held by women is currently under 15% (Nelson & Rogers, 2004). In many cases, talented girls are discouraged from entering the sciences before they graduate from high school. Studies have documented that women face exclusionary behavior in college and in graduate school (Seymour & Hewitt, 1997; Ferreira, 2002).

These percentages are not representative of the numbers of African Americans and women in the general population. This discrepancy indicates that the scientific community is not fully connecting with the professional potential of college and graduate students. Research by Sheila Tobias has documented that many college students have the academic preparation and talent to enter the sciences, but are discouraged by the education they receive in large introductory courses (Tobias, 1990).

Why, despite efforts towards recruitment and social support, do these discrepancies persist? Many factors contribute to the loss of women and minority students from science, technology, engineering and mathematics fields. As you will see when you read through the case studies that follow, exclusion is rarely deliberate. A well-intentioned professor who enjoys talking with his male students may be oblivious to the fact that his female students are leaving the course. An international student Teaching Assistant may be puzzled by unfriendly reactions in class. White students may not know how to react when their underrepresented minority peers express discomfort with the classroom culture. These dynamics are often both subtle and complex.

The advantage of the case study method is that it allows for multiple points of view, to create discussion and foster greater understanding. The cases in this book are designed **not** to have “one right answer.” Understanding diversity is not a simple project that can be addressed in one hour or one day. Diversity is a complex and evolving aspect of the academic community.

This case book deals extensively with teaching technique, as most of the scenarios take place in instructional settings. Therefore, this book may particularly interest faculty and graduate students who would like to enhance their teaching by discussing ways to resolve challenging situations. Just as research in the physical sciences increases in depth and sophistication, so can our understanding of teaching practices.

Now is an ideal time for this dialogue. The U.S. population is becoming increasingly multiethnic, and college students are mirroring this increased diversity. Greater numbers of students with disabilities are entering college. Greater numbers of women are also pursuing higher education. It is time to discuss the issues that discourage promising students from pursuing careers in science, technology, engineering, and mathematics.

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Reflections of a Science Practitioner and Instructor

By Judith N. Burstyn, Professor of Chemistry and Pharmacology

Economic growth relies on the development of new technologies: with many U.S.-born students turning away from science, technology, engineering, and mathematics (STEM) in pursuit of “softer” disciplines, our country faces a considerable challenge if we wish to maintain our current economic supremacy. Including a broader range of individuals in the STEM workforce is one solution to this challenge.

Many of us believe that talent determines who succeeds and who does not in our disciplines, but the research evidence says otherwise. Gifted and capable students leave STEM in their early college years because they find introductory courses unwelcoming and uninspiring: they conclude that it is not worth the time and effort required to excel. Instructor attitudes may encourage this response.

If instructors do not make an effort to engage students in the excitement of the discipline and demonstrate its relevance to modern society, students may receive the message that the field is not worthy of pursuit. Women and under-represented minority students are vulnerable to this type of influence, as they may be less familiar with STEM career options and may be particularly motivated to pursue a career with social value.

Including a broader range of students in our disciplines does not mean degrading the quality of our courses. In fact, research shows that low expectations correlate with low performance; this situation is particularly insidious for minority students, who may spend their academic careers in institutions where expectations are lower than average. The greatest gift we can give to our students is to intellectually challenge them with the real excitement and promise of our fields, while providing an appropriate level of support for their learning and growth.

Blaming foundational education in primary and secondary schools for poorly preparing students for STEM disciplinary study in college has, in some cases, become an excuse for inaction. As higher education instructors, we must teach the students who enter our classrooms. We have an obligation to provide them with the best and most rigorous education possible. To do so, we must engage in understanding how people learn and in developing our own teaching expertise. We do our students a great disservice if we blame them for failure when we have not taken the time and effort to develop our own gifts as teachers.

As STEM practitioners and instructors, we play a profound role in the lives of our students. Each one of us who stands in front of a classroom has the potential to inspire, to lead and to nourish. Our responsibility is to train the future STEM workforce: if we are not producing outstanding practitioners, men and women of all cultural and racial heritages, we are not meeting the expectations of our society, our students, or ourselves.

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How to Facilitate a Case Study Exercise

By Katherine Friedrich
Based on an interview with Dr. James Stith of the American Institute of Physics

Case studies are useful tools in discussions of diversity in technical fields. Discussing cases can help participants open up and talk with their colleagues about their experiences as professors and students. (For example, a professor resistant to conversations about diversity may sit near a colleague who has had personal experiences that are relevant to the discussion.) As people begin to speak openly with each other, the discussion provides evidence to reluctant participants that diversity is a topic worthy of consideration.

The purpose of case study discussion is not to solve the problems of racism, sexism, or other forms of discrimination in an hour, but to create an open forum in which all points of view are respected. It is not necessary for the group to find the most politically correct answer, the most compassionate answer, or the most pragmatic answer to the questions raised by the case.

A good facilitator is interested in diversity, willing to question his or her own ideas, and willing to listen. His or her job is to foster group discussion of the issues and problems in the case scenario, discuss possible responses to the problem, and explore the consequences of these responses.

During preparation, the facilitator should read the study and think through the case. Next, the facilitator should identify some flexible guiding goals and a few issues of interest, and develop a set of questions that he or she plans to ask.

Before presenting a workshop, it is a good idea to become familiar with participants' seniority, the demographics of the group, and their familiarity with diversity issues. It is also useful to know which issues may be controversial in that state or on that campus.

Case studies that deal with social problems are much more effective when presented together with statistics. A few simple but visually striking charts or graphs from reliable sources, presented before the case is introduced, can put the study in context and motivate listeners to take interest in the material.

A skilled facilitator speaks without lecturing. Through creative use of open-ended questions, he or she guides the discussion. Well-conceived questions do not have easy "yes or no" answers. It is essential to avoid injecting preconceived responses into the conversation. A facilitator should answer questions with other questions, stimulating further discussion. In an educational culture where people are trained to seek solutions, this lack of easy answers may surprise the group.

Some case study facilitators use a forceful method of questioning, known as the Socratic Method, to encourage participants to think critically about issues. Other facilitators simply ask a question and then step back to observe the conversation that unfolds, only interjecting a comment when it is necessary to maintain the positive group dynamics and the flow of conversation. Most facilitators prefer an intermediate method (Herreid, 2004).

An effective method of generating dialogue is to divide the participants into groups and tell them that, after a small group discussion, you will ask one member of each group to present their conclusions to the rest of the participants. Groups of three to four people are large enough to generate a variety of responses, but small enough that everyone has the opportunity to speak. The facilitator can circulate around the room and pose questions to quiet groups. The facilitator can also share ideas generated by one group with other groups to stimulate discussion.

Some problems may develop during the small group session. For instance, one participant may dominate the small group discussion, another may be silent, or group members may completely disagree on the

major issues presented in the case. However, these problems are not difficult to address. If a disagreement develops at a table, the participants can present both sides of the issue to the larger group when the groups rejoin. If one person is unusually quiet, the facilitator can ask that person to report the small group's consensus to the larger group.

During the large group discussion, a lively dialogue may take place between groups. To add depth to the discussion, the facilitator may encourage groups to explore the reasons that they selected the conclusions they produced. With experience, a facilitator learns when to ask a question and when to allow conversation to continue. It is a good idea for the facilitator to continue to move around the room during this period.

Aside from setup requirements typical of most lectures (e.g., audiovisual technology), there are some logistical issues unique to case study facilitation. Some practical considerations for your setup will include:

1.) Flexible seating arrangements are preferable to fixed auditorium-style seating because of the movement and reconfiguration of groups that takes place.
2.) It is also important to allow sufficient time for facilitation. Some experts recommend 90 minutes for a thorough discussion of a case (Herreid, 2004).

    The following is a sample schedule for facilitating a case:
    5-10 minutes–Orientation
    40-50 minutes–Small Group Discussion
    20-30 minutes–Large Group Discussion

As a facilitator becomes more comfortable working with groups and smoothly directing the flow of conversation, he or she will likely find that the case study method is especially rewarding.

Case studies, sometimes called case-based learning, can be an effective tool for delivering technical content, but here we use them to explore diversity issues. This method, which fosters dialogue and values all participants' experiences, may be one of our best tools for fostering a welcoming culture in science, technology, mathematics, and engineering.

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Herreid, C. F. (2004). Case studies in science: A novel method of science education. Retrieved December 11, 2004, from http://ublib.buffalo.edu/libraries/projects/cases/teaching/novel.html

Stith, J. Vice President, Physics Resources, American Institute of Physics. Personal interview, December 23, 2004.

Introduction to the Cases

As you read the cases and the discussions that follow them, the following information will help you to prepare for facilitation.

The cases in this book vary in complexity. The reader may approach each case from a variety of levels. Each case contains a number of themes. Some of the cases may seem fairly straightforward, but all have multiple issues to address. Intentionally, we did not fully script the cases.

The table below was written to guide users of this book to relevant cases pertaining to issues that an instructor or student may face in a classroom, teaching lab, faculty office, department, and/or on campus. For instance, if one wanted to look up a case related to “learning style” in the context of a classroom, the table indicates that the “Mike Bertal” case would be the relevant case for this topic. Please note that the cases addressed in this book are not restricted to the contexts indicated by the following table.

	Gender and Sexual Harassment	Race/ Ethnicity	Nationality	Disability	Sexual Orientation	Religion	Learning Style	Academic Preparation
Classroom		Angela Tsu p. 85-89	Gina Gilbertson p.25-29 Mike Bertal p.13-17	Dan Reilly p.67-71 Angela Tsu p.85-89	Jennifer O’Connor p.55-59	Jeremy Geraci p.19-23 Jennifer O’Connor p.55-59	Mike Bertal p.13-17	Mike Bertal p.13-17 Jeremy Geraci p.19-23
Teaching Lab	Marie Louise Moreau p.49-53	Marie Louise Moreau p.49-53	Sam Gold p.31-35 Marie Louise Moreau p.49-53	Dan Reilly p.67-71	Sharon Whitby p.91-95			Marie Louise Moreau p.49-53 Sharon Whitby p.91-95
Faculty Office	Frank Taylor p.79-83	Barbara Ross p.73-77 Angela Tsu p.85-89		Angela Tsu p.85-89				Barbara Ross p.73-77
Department	Melanie Wong p.97-101 Frank Taylor p.79-83	Martin Hernandez p.37-41	Allen Powell p.61-65		Jennifer O’Connor p.55-59			Martin Hernandez p.37-41 Allen Powell p.61-65

We have provided real-life situations as examples to demonstrate the importance, as well as the complexity, of inclusive practice.

We have provided a brief summary, theoretical material, and resource information at the conclusion of each case. The discussion material has been developed by STEM faculty and Diversity Team staff. It is intended to assist you in using the case for self-development or with a group. The discussion material is not exhaustive. Rather, we hope to provide useful starting points as you consider the different facets of the case.

Please note that we do not necessarily recommend all of the possible responses we have included. They are intended to stimulate groups to develop their own perspectives on the issues raised by each case. The audience for this book, coming from diverse backgrounds, will develop a variety of ideas about each case study.

You may choose to share some of the material on the worksheet page with your group in writing, mention it verbally, or not use it at all. We have found that giving less information tends to produce more creative

responses. If you prefer a more structured discussion, you may ask your group to follow the model we used and identify issues, generate possible responses, and explore potential consequences.

Even if you are reading the cases on your own, you may wish to discuss your thoughts and impressions with your colleagues. As scientists know, a discussion of a complex issue can often yield greater insight than an individual could develop in isolation.

As you review the cases and discussion, try considering the situation from the following perspectives:

Institutional-level change	Student perspective
Course-level change	Teaching Assistant perspective
Individual actions	Faculty perspective
	Administrator perspective (if applicable)

We have found that the case studies in this book motivate workshop attendees to read our other teaching resources. Our web site, http://www.cirtl.net/diversityinstitute/, has enhanced search functions that lead visitors directly from each case into using the other resources. As a facilitator, you may find these links useful both when preparing your questions and when working with groups that have Internet access.

You may want to build these viewpoints into the questions that you ask your group. It is not necessary for you to follow the issue lists or discussion questions that we have provided. The analyses are intended as a starting point for discussion and creative thinking.

We hope that your discussion will be dynamic, engaging, and thought-provoking.

Case #1: Mike Bertal

Mike Bertal always rolled up his sleeves when he entered his design classroom. A highly motivated and physically active professor in his late thirties, Mike still remembered what it was like to be a college student. He was committed to improving the educational experience of the next generation of engineers.

This semester, Mike was teaching an introductory engineering design course at his university – a large, public institution in the United States. Mike enjoyed involving his students in lively experiential activities, such as discussions of real-world applications and ethical and environmental issues. His teaching was founded on principles of collaborative learning. In recognition of his high satisfaction ratings from students, Mike recently won a university award for excellence in teaching.

One student in his class, who had recently come to the United States for undergraduate studies, seemed particularly reserved, perhaps even uncomfortable. The student did not participate in group discussions. His projects, although they were proficient, accurate and detailed, did not offer evidence of original thinking or creativity. Mike was concerned about the issue, but had not yet talked with the student.

Halfway into the semester, Mike gave his students an assignment which did not involve group work. This project required that his students develop a simple and practical solution to an engineering problem. This assignment would count for 25% of the students' grades in the class. Many of the students were excited about their task and began generating ideas immediately. They continued to gesture and describe their projects as they walked out into the hallway.

The international student approached Mike cautiously as Mike was gathering up his books. Addressing Mike formally, the student said, "Professor Bertal, I do not understand this project."

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

Mike Bertal believes that collaborative learning is "good for everyone." Indeed, many studies show that United States students are more responsive to collaborative learning than to traditional lecturing styles. However, a student who comes from an academic culture in which structures of authority are more fixed may feel at a loss in a relaxed class environment. Although this student may be quite talented, he is not used to the expectations that Mike Bertal holds for his students. These expectations may not have been clearly articulated at the beginning of the course. It is also possible that the assignment is not clearly described, and that this student is particularly perceptive.

Possible Discussion Questions:

- What assumptions is Mike Bertal making about his students' backgrounds, learning styles, and/or interests?
- Is Mike Bertal's extensive use of collaborative learning just as one-sided as teaching styles that focus extensively on individualized learning?
- Why did Mike Bertal wait so long to talk to the student and try to determine the origin of the problem?
- Is the central problem a learning style issue, a cultural issue, or something else?

A Possible Set of Responses and Their Consequences:

1. Response: Address the problem as early in the semester as possible by talking to students who do not participate in class.

Consequences: Both the instructor and the student might develop a better understanding of one another's perspectives. This understanding could lead to the use of both collaborative and individualized learning activities in the course. On the other hand, the student may withdraw even further. If this occurs, the instructor may wish to draw on other campus resources.

2. Response: Discuss the concept of collaborative learning with the student and explain that, in Western culture, it is a common method of teaching/learning.

Consequences: The student could have ambitions to remain in the United States after graduating and might realize that it is in his best interest to learn how to function effectively in collaborative teaching/learning environments. However, the student may continue to be quiet. Since the assignments reflect understanding of the material, the instructor should not penalize the student.

3. Response: Explain the assignment and clarify its connection to readings, lecture, and class discussion.

Consequences: Perhaps the assignment is unclear or assumes knowledge specific to the United States. Other students may have "filled-in" the blanks, while the international student does not have the cultural tools to do so. Next semester, Mike Bertal could rewrite the assignment to be more culturally neutral.

4. Response: Understand that one teaching style does not work for all students. Incorporate a variety of different assignment types to meet a variety of learning needs.

Consequences: The student's performance will probably improve if the assignment accommodates his learning style. It is possible that other students, who prefer collaborative learning, may resent any changes that were made to the course.

Resources

Cabrera, A. F., & La Nasa, S. M. (2002, January 11). Classroom teaching practices: Ten lessons learned. *II Seminario Calidad e Innovacion en el Sistema Universitario*. Retrieved November 20, 2006, from http://www.education.umd.edu/EDPA/faculty/cabrera/Classroom%20Teaching.PDF

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Case #2: Jeremy Geraci

As a graduate student, Jeremy Geraci had been an enthusiastic promoter of science literacy and environmental education. Until he accepted a college teaching position, he had never been confronted with such disturbing student evaluations.

Jeremy had been excited about teaching an introductory biology class for students who were not majoring in the field. He knew that many students graduated from high school without understanding basic biological principles, and that this would be their last opportunity to grasp these ideas before they went out into the working world.

The course had run smoothly, although, as Jeremy recalled, there had been some unusual questions from a few students during the section on evolution. One young man had approached Jeremy after class and asked him whether he thought that carbon dating was a reliable process. Jeremy had explained that the inaccuracies in C-14 dating were only moderately significant in comparison to the large time scales the dates encompassed. The student had seemed unconvinced, but left without explaining his position fully. There were many other students in line after class that day, and Jeremy hadn't thought much of the question at the time.

There had been several other student questions which, in retrospect, bothered Jeremy. A female student had seemed to have difficulty comprehending the principle of survival of the fittest. She'd asked Jeremy after class: "Don't you think that there might be something else at work with evolution? I mean, look how complicated we are." She had gestured to her hand, which was decorated with pink nail polish.

Jeremy had begun talking about the process of genetic variation, but the young woman had seemed unconvinced. "I guess as long as I get this right for the exam, I'll be o.k.," she had replied, turning back up the aisle to exit the room. Jeremy had wondered whether he said something wrong.

At the end of the semester, most of Jeremy's evaluations were complimentary. Students noted his enthusiasm and said they had learned a great deal. Several mentioned that they were now interested in science majors.

But halfway through the stack were three evaluations that disturbed Jeremy.

"Doesn't value differing points of view."

"Brainwashes students."

And last, the worst comment Jeremy had ever received:

"You'll burn in hell for this. Stop teaching evolution or else."

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

The issue of respect for alternative viewpoints is important in this case. To what degree should Jeremy Geraci respect non-scientific points of view, or at least acknowledge them? Should he stay within the realm of science entirely? The comments he received, while harsh, reflected students' genuine dissatisfaction with the way he handled the evolution issue. The instructor was unaware of the issue in his responses to student questions.

Possible Discussion Questions:

- What could the instructor have done to address these students' concerns?
- What is the students' responsibility in this situation? Could they have addressed their concerns directly with their professor, rather than leaving anonymous comments on his course evaluations?
- How would the situation be different if the professor was intentionally ignoring his students' dissatisfaction?
- Would student-centered teaching practices have been helpful in this situation?
- How can one separate faith-based beliefs from science without devaluing students' convictions?

A Possible Set of Responses and Their Consequences:

1. Response: Develop a response to handle this issue when it comes up again. For example, the instructor could acknowledge in class that there are opposing views and that he will discuss the scientific approach to the issue. He could explain to his students what the scientific method is and what it is not.

Consequences: The evaluations may become somewhat less harsh. Students may understand the difference between scientific and religious thinking. However, other students may resent that their professor is bringing up the issue at all.

2. Response: Discuss the issue at a faculty meeting.

Consequences: Jeremy Geraci may get support from other faculty in developing strategies to handle students with religious perspectives.

3. Response: Ignore the comments.

Consequences: The issue may come up again and may affect future student ratings. In addition, the students' learning may be affected by their adversarial attitudes.

4. Response: Stop teaching evolution.

Consequences: The entire class will be less informed. The curriculum of the institution and its reputation could suffer.

5. Response: Host a class discussion on evolution.

Consequences: A debate may ensue. Students may become more open about their beliefs. Holding an open discussion could teach the professor what his students are thinking when they enter the course.

6. Response: At the beginning of the next semester, ask students to write an essay on their beliefs about evolution.

Consequences: This will give the professor the information he needs to know about student attitudes, but in a less confrontational setting.

7. Response: Try to learn to “read” students better, so as to understand their concerns and address them on the spot.

Consequences: This will improve the professor’s teaching style and help him respond effectively to future student questions.

Resources

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Case #3: Gina Gilbertson

As she taught her discussion section of Engineering Dynamics, Gina Gilbertson wrote out an expression for momentum on the blackboard. Outside the window were the metal struts of the engineering building. Inside were twenty-five college students in various stages of alertness. Half of them were paying attention, and the rest seemed to be otherwise occupied.

In the third row sat a group of five students from China. They often talked with one another, but did not socialize with the rest of the class. Next semester, Gina thought, she would start the class off with an ice-breaker to get the students to step outside of their cliques.

Gina had asked each student to fill out a card with his or her name on it and set the cards out at each class period. This made it easier for her to call on people.

After she was done writing out her equations, Gina turned to the class, looking for someone to call on. Her eyes fell on a young Chinese man in a blue athletic sweatshirt. His card read, “Jay.” She had not called on him yet this semester.

Gina took a deep breath. “Jay,” she said, gesturing towards him, “what is an everyday life situation where momentum is important? We’ve talked about the equations – let’s think about how to apply them.”

Jay said something that she could not understand. The other four Chinese students- three men and one woman- laughed. The rest of the class remained silent.

There was an awkward pause. Gina was not sure how to handle the situation. “Could you repeat that?” she said. “I didn’t hear you.”

Susan, another Chinese student, spoke up. “He is just making a joke,” she said, attempting to spare Gina further embarrassment.

Gina shrugged and turned to a white student who was looking out the window. “Mike, what situations can you think of in which momentum would play a role?”

Mike grinned at Gina. “What about those little silver colliding balls executives put on their desks, where you pull out one ball and the other bounces back?”

“That’s a great example,” said Gina, relieved to have found a cooperative student whom she could understand. She turned back to the class. “What about some other examples from everyday life?”

As the discussion continued, Jay leaned back in his chair and went to sleep. Gina noticed this and thought about calling on him again. She decided not to do so. She tried to think back to her teaching assistants’ orientation the previous summer. What was she supposed to do?

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

We do not know the nature of Jay's comment. The comment could have been innocent, sexist, related to her teaching style, or a joke completely unrelated to the topic. What we do know is that Gina is uncomfortable, and perhaps her students are taking advantage of her discomfort. Gina is still learning basic teaching skills, including how to dialogue with her students. She has not attempted to bring her Chinese students into social contact with other students in the course. This scenario is not unusual; students from the same country often do sit together. On the positive side, the students provide one another with social support; on the negative side, they may become segregated from other students – and even from their TA. Gina is somewhat uncomfortable teaching students from a different cultural background than her own, and is not sure how to deal with the language barrier. There may also be other cultural differences at work.

Possible Discussion Questions:

- What do you think of Gina's response?
- Could she have set up the situation differently to avoid the problems that occurred?
- Does Gina frame her request for the student to repeat his statement effectively? How else could she state it?
- Does Jay's behavior require a disciplinarian response?
- How might Gina respond constructively to her discomfort with students whose cultural background is different from her own?

A Possible Set of Responses and Their Consequences:

1. Response: Gina could laugh with the student and then ask the question again.

Consequences: Laughing and asking again neither approves nor disapproves of the behavior, which deflects the issue of discipline. However, if Gina did not understand the comment, laughing would not be a natural response for her.

2. Response: Gina could ignore the student in the future.

Consequences: Ignoring the behavior would allow the students to control the classroom atmosphere.

3. Response: Gina could increase the course relevance to get the students focused on the course content and establish the teacher/student hierarchy. Relevance, in this situation, does not mean connecting course content to real life experiences, but giving the students an incentive to answer the question. For example, Gina could offer extra credit for class participation.

Consequences: Students will see that they have a stake in the learning environment. When students feel that the topics being discussed are irrelevant or peripheral to the course, they are more likely to be disruptive.

4. Response: Gina could make a statement at the beginning of class that she will ask for clarification if she has difficulty understanding a student comment. Then, when a student makes a comment that is hard for her to understand, she should ask the student to repeat it, and be firm.

Consequences: Gina's students would probably improve their behavior. Gina's growing communication skills and leadership ability would also improve the classroom climate. If Gina communicates effectively with her students, she may be able to draw them out about their relevant experiences, as she is attempting to do.

Resources

Sellers, S.L., Roberts, J., Giovanetto, L., & Friedrich, K. (2005). *Reaching all students: A resource for teaching in science, technology, engineering & mathematics*. Madison, WI: Center for the Integration of Research, Teaching and Learning.

Henwood, F. (1998). *Engineering difference: Discourses on gender, sexuality and work in a college of technology.* Gender and Education, 10, 35-49.

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Case #4: Sam Gold

As he stood under the fluorescent lighting of the chemical engineering laboratory where he taught a sophomore course, Sam Gold did not know what to say. A dark expression passed across his face. He knew that his university was known as a “party” school. The students could be rowdy on Thursday nights… but this was too much!

Sam liked to use humor to bridge the divide between himself and his students. While most of Sam’s students were from rural families in the Midwest, Sam had grown up in New York City. His political beliefs were considerably more liberal than those of the professors he worked with, as well as those of his students. Because of his considerate behavior and sense of humor, Sam got along well with his professors and the other graduate students.

“All right, everyone, let’s get started,” Sam had said loudly, as his students settled noisily into their seats. “Today, we’re going to talk about catalysts.”

With some encouragement, the class had quieted down. As Sam began describing the role of a catalyst in a reaction, he heard one student say, “We could blow the Arabs away with that shit, huh?”

Most of the class had laughed at the joke. “Yeah, we’d turn Iraq into a dust bowl,” said another young man who had a brother in the Army.

“Show those ragheads what we’re there for,” a third had chimed in.

Sam felt frustrated. However, he knew that the professor he worked for would probably not have been upset by these comments. He generally adopted a “boys will be boys” attitude towards students’ shenanigans.

“Am I being too much of an idealist?” Sam wondered. He was the authority in this room, but his political views were unpopular at the university. He turned back to the blackboard. “Let’s stay on topic, all right?” he said, as he resumed the lecture.

The students who had spoken could tell that Sam was irritated, and looked at each other in surprise.

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

Sam's students have raised controversial educational issues through their classroom behavior. How does a teacher who is in the minority in some way maintain his or her authority with students whose beliefs may represent the view of a vocal minority or of the majority? What if these beliefs are expressed using language that is derogatory towards other cultures? Sam feels himself to be in a tenuous position because he is a TA rather than a professor and does not agree with the professor's methods. Because of this situation, Sam hesitates to express his point of view.

This case raises the question of the appropriateness and relevance of political discussion in STEM classrooms, where the focus is usually on technical topics. It also brings up the issue of controversial language in the classroom. Students bring their backgrounds with them to class, as do professors. How does one maintain a respectful atmosphere for all students when controversial issues arise? How can Sam let his students know that their behavior is unprofessional?

Possible Discussion Questions:

- What are the best ways to handle disruptions in the classroom?
- What are the best ways to handle students who test the limits of their instructor's authority?
- What level of professional behavior should be expected of our students?
- To what extent should instructors try to "bridge the divide" between students and themselves?
- To what extent should issues like politics be brought into a STEM classroom?
- What is the professor's role in dealing with all these issues?
- When is expressing emotion appropriate for an instructor?
- Is the problem the perspectives of the students, or the way they are expressed?
- What are some possible consequences of Sam's silence?
- How might a student with a Middle Eastern background have felt in Sam's class?

A Possible Set of Responses and Their Consequences:

1. Response: Do what Sam did.

Consequences: Sam got them back on topic, but that did little to address the underlying issues of this incident.

2. Response: Improve TA training in class management.

Consequences: This appears to be a case where, with each subsequent comment, the students were trying to be ever more outrageous. As a result, Sam quickly lost control. With better training, he may have been able to reclaim his authority after the very first comment, or even before it. However, any training comes with a certain expense in time and money.

3. Response: Introduce concepts of professionalism and ethics earlier in the course. Make it clear in the syllabus that this is a Chemical Engineering class and, as such, appropriate behavior is expected and unprofessional language or actions will not be tolerated.

Consequences: Although this strategy does not solve Sam's immediate problem, it does suggest an institutional response to the issue of classroom management. Hopefully, by understanding that clear boundaries of decorum exist in the class, students in future semesters will be better prepared for their professional lives. At the very least, providing more structure would give the next TA the authority to actively address the inappropriateness of such disruptions and let the class know that they have passed the limits of proper behavior. Such actions by the TAs may, though, increase the divide between the students and the TAs, and that may have negative consequences for teaching and learning.

4. Response: Use this as an opportunity to draw connections between Chemical Engineering and other societal issues. Sam could have stopped the disruption and then, rather than simply returning to the lesson, he could have suggested a meeting outside of class to discuss Iraq, politics, the use of chemical engineering in military applications, or other controversial real-world examples.

Consequences: While the disruption was inappropriate, and one might question the place of politics in a STEM classroom, the students did get excited about catalysis. An outside discussion might be a better way for Sam to "bridge the divide" between himself and his students. It might also give other students in the class a chance to present their views. Sam might meet students with more liberal views than he expected. Both Sam and the students might benefit from an exchange of political views. Unfortunately, the time devoted to these political discussions may be time away from Sam's research.

5. Response: Despite Sam's assumption that the professor would not have been upset by these comments, Sam could have informed him of the problem and asked for his help. Similarly, the professor could recognize that divides also exist between faculty and TAs, and establish a clear mechanism for involving faculty in these issues.

Consequences: Sam might find his assumptions to be at least somewhat inaccurate; the professor may offer some welcome assistance now or in the future. Of course, in bringing problems like this to the attention of the professor, Sam might find his assumptions to be well founded and be labeled a complainer. Likewise, informing his professor of the exchange between the students could cause his standing with the students to suffer. This may have negative consequences in terms of teaching and learning.

6. Response: Sam could turn this event into a learning opportunity and make clear that he is concerned about negative language being used in the classroom. He could initiate a short discussion about this issue in which all viewpoints are valued. This discussion could be an opportunity for education about derogatory language, or it could become a political discussion. This last situation may be somewhat volatile ground for Sam, considering his feelings on the matter.

Consequences: The students may feel defensive and accusatory. Sam would need to handle their emotions with care and treat all students with respect. It is best if he can deal with the problem during that lab session, rather than postponing the conversation until later. Since this topic is highly controversial, such a conversation would require skill, emotional neutrality and tact on Sam's part.

Resources

Cabrera, A. F., & Nora, A. (1994). *College students' perceptions of prejudice and discrimination and their feelings of alienation: A construct validation approach.* Review of Education/Pedagogy/Cultural Studies, 16, 387-409.

Sellers, S.L., Roberts, J., Giovanetto, L., & Friedrich, K. (2005). *Reaching all students: A resource for teaching in science, technology, engineering & mathematics*. Madison, WI: Center for the Integration of Research, Teaching and Learning.

Jenkins, M. L., Gappa, J. M., & Pearce, J. (1983). *Removing bias: Guidelines for student-faculty communication*. Annandale, Virginia: Speech Communication Association.

Conflict resolution information for graduate students: Setting expectations and resolving conflicts. Retrieved November 17, 2006, from http://www.msu.edu/user/gradschl/all/crvideo.htm

Case #5: Martin Hernandez

Martin Hernandez, Director of Graduate Studies in the Department of Industrial Engineering, stood up to greet Angela Johnson when she entered his office. She was wearing a dark brown dress that almost matched her complexion and carried a black briefcase on one shoulder.

Martin's desk was empty except for one file – Angela's academic record. He was surprised to find that Angela's performance was not outstanding. When she had taken a course with him, she had done very well. But now, he found that she had received a number of B's in important subjects. Perhaps this interview would explain the discrepancy. Angela was leaving the industrial engineering program; in fact, she was dropping out of graduate school.

"Have a seat," Martin gestured to a chair across from his desk. He liked to adopt an informal style with students. "So, let's talk about why you're leaving the program. Frankly, I'm surprised to see you go. You always struck me as a bright student."

Angela shifted in her seat and gazed out the window briefly. Then she looked back at Martin. "Do you want the official answer or the real one?"

"The real one, I should hope," said Martin, with some concern. "If there's any problem in our department, I want to know about it."

"Well, it's a long list," said Angela, with some hesitation. "To begin with, my advisor, Larry Hofstedt, told me that I would have to take lower-level courses because my preparation at a historically black institution was not up to par. I found out that none of the other students had to do this. I also had a series of very discouraging in-class experiences. I was hoping for rapport with the faculty, but none of my professors ever called on me or asked me to answer a question."

"Did you raise your hand?" Martin asked.

"I did, but they seemed surprised whenever I participated," replied Angela. "I was even accused of cheating once when I got an "A" on an exam. And my grades tended to be lower than average, even though I worked just as hard as my peers. Also, I was always left out of social events with the other students in the department. It's hard to be black around here, Professor Hernandez. It's very isolating."

Martin was disturbed by Angela's remarks. "Angela, if this is true, this is a serious problem. We certainly don't want to have a discriminatory environment on campus. We have many international students, and none of them have complained about this type of treatment. I'm Latin American, myself, and I have never noticed this kind of behavior before. Would you be willing to document what happened?"

Angela shook her head. "I don't think it would help, Professor Hernandez," she replied. "I'm leaving, and maybe in a few decades things will change... but I'm not going to stay around and be treated this way. I'm going to work in industry for a while, I think. There are some progressive companies that have good diversity policies. I'll be more welcome there." She stood up to leave the room. "I did the best I could," she said, quietly, as she picked up her briefcase.

Martin escorted her to the door. "Take care, Angela. Good luck," he said.

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

Angela has faced a series of isolating and discouraging academic and social experiences that she attributes to racism. Although Angela has a story to tell, Martin Hernandez's statements suggest that he does not truly hear her. He feels that his own positive experiences in the department, as well as the lack of discrimination complaints, mean that Angela is not entirely credible, or perhaps is rather sensitive. Angela senses this and quickly ends the conversation.

Possible Discussion Questions:

- How might Martin Hernandez have responded in a more helpful way?
- Is asking for documentation appropriate? Does this question further isolate the student?
- Why might Martin Hernandez be oblivious to this problem?
- What does Martin Hernandez's position as Director of Graduate Studies enable him to do?
- Why might Angela have "written off" graduate school entirely?
- What are the institutional changes that need to be made to address these issues?

A Possible Set of Responses and Their Consequences:

1. Response: Martin Hernandez could have communicated that he believed Angela or, at least, that he was open to considering her story. Rather than asking her to document the situation, he could have taken the burden upon himself. He could have announced to her his intention to investigate the situation, independently of her decision to pursue or leave graduate school.

Consequences: Expressing belief in Angela's story is essential to establishing the communication needed to get further information. Martin Hernandez's taking the initiative would relieve Angela of feeling that the issue and solution depend entirely on her own actions. Faculty taking immediate action would communicate to the student (and to others) the sincerity of the department in its desire to provide a welcoming atmosphere for all students.

2. Response: Martin Hernandez could organize a focus group for students on the topic of fairness in the classroom, and find out whether other students are experiencing discrimination. If he finds that this is the case, he could bring the problem to the attention of the department and discuss potential responses.

Consequences: Perhaps some other students would also appreciate the opportunity to express themselves. These types of controversies, although they may ruffle feathers, may be more effectively resolved through open discussion. However, this approach does not address Angela's specific needs.

3. Response: Martin Hernandez could ask Angela about her professional interests and encourage her to find another graduate program, possibly at a more diverse institution, where she might feel more welcome. He could also offer to write her a letter of recommendation, emphasizing her work in his course.

Consequences: Angela would probably appreciate some helpful advice at this point in her life. In fact, it may be valuable for her career. However, this would not change the climate of the department.

4. Response: Martin Hernandez could present his concerns in a faculty meeting.

Consequences: The faculty, especially Angela's former advisor, might benefit from such a discussion. However, the topic must be handled with care to avoid making Angela visible, if she has not agreed to speak openly about the issue.

Resources

Cabrera, A. F., & Nora, A. (1994). College students' perceptions of prejudice and discrimination and their feelings of alienation: A construct validation approach. *Review of Education/Pedagogy/Cultural Studies, 16*, 387-409.

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Cross, S. E., & Vick, N. V. (2001). The interdependent self-construal and social support: The case of persistence in engineering. *Personality and Social Psychology Bulletin, 27*, 820-832.

Perry, T., Steele, C., & Hilliard, A. G. III. (2003).*Young, gifted, and Black: Promoting high achievement among African-American students*. Boston: Beacon Press.

Seymour, E., & Hewett, N. M. (1997). *Talking about leaving: Why undergraduates leave the sciences.* Boulder, CO: Westview Press.

Case #6: John Lithcovich

“I just can’t take this any more,” John said to his wife, Mary, over Friday dinner. His microbiology textbooks were stacked on a shelf behind him. He leaned over the white plastic kitchen table and took a bite of the casserole Mary had made.

Mary turned around to face him. She looked tired. It had been a long day of caring for three children. She was wearing a yellow apron and carrying their youngest daughter, Susan, on one hip. “You’ve got to stick with it,” she said. “It’s your dream. You’ve always wanted to go to nursing school. Don’t give up now. You have to take this course.”

“I know, honey,” said John. “But there’s no way I’m going to make the grade. I can never find time to meet with the other students in my group. They always want to meet in the evenings when I have to work. And there’s another problem, too – after my shift, I’m too tired to keep up with the homework. I didn’t realize how much work it is, being in college.”

“Isn’t there anything you could do to reduce your hours?” Mary asked. “Maybe you could take out another student loan.”

“Daddy! I can’t reach the butter!” said Nina, Susan’s six-year-old sister.

“Here it is, honey,” said John. He buttered a slice of bread for her, and she took a large bite.

“Now, what do you say?” John said patiently.

“Thank you,” said Nina, with her mouth full.

“Good,” said John. He turned back to Mary. “I know I could take out more loans, but they wouldn’t be enough to cover our mortgage and bills, with neither of us working. I found that out when I talked with someone at the financial aid office, after I signed up for classes.”

John paused and took another forkful. He was so angry that he could hardly taste it. “I don’t want to come across like I’m blaming people. But everything would be all right if my professor understood that we don’t all have time for this group work and extra projects. He calls it ‘student-centered teaching.’ I don’t want to talk to him, because I don’t want to come off like I’m telling him what to do. Plus, I can’t make it to office hours.” John pushed his plate aside and stood up. “I tried talking to this guy at the beginning of the semester. I told him I hadn’t taken biology since high school and I wanted to make sure I would do well in the course. He said it would be fine.”

Mary set Susan down in a high chair and gave her some baby food. “Isn’t there some kind of office for returning students at your college?” she said.

“I don’t know,” said John. He began pacing across the linoleum. “These 12-hour days - they don’t design paramedic jobs around schooling, and they certainly don’t design college for anyone who has to work.” He paused. “I’ll do the dishes tonight, okay? You’ve had a long day.”

“Don’t worry about it,” Mary replied.

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

Sometimes, students' goals for academic and financial success are difficult to achieve. In this case, John's goals may or may not be within his reach. Since he has not connected with appropriate advising at school, he does not know what his options are. The heavy work load may be due to the large volume of content in this course. Also, the professor may not have considered who his students are. He may be unaware that some of his students are supporting families. The nursing program may be overly time-intensive. John's low income, and the fact that he is married with children, also play a role, since child care is expensive.

Possible Discussion Questions:

- How much outreach should be done by returning student resource centers?
- Why might John feel uncomfortable approaching the professor? Are there ways the professor could be more approachable?
- How could the professor have anticipated this issue? Could he have made a statement on his syllabus?
- Is it the professor's responsibility to accommodate returning students, or is it the responsibility of the college to assist students with course selection and time management?
- How could technology help with the logistics of the group project?
- Many students have time commitments outside of school. Are the expectations for the course realistic?
- Does this example point to a disadvantage of student-centered learning?
- How can a course be designed to challenge students without taxing their schedules?
- How can an instructor find out the needs of his or her students?
- How might John's perception of the instructor be different from the instructor's perception of himself?
- How can one balance accommodating individual needs with class goals?
- If the university offered child care for returning students, how might that change John's situation?

A Possible Set of Responses and Their Consequences:

1. Response: The course could be modified to use the Internet to facilitate student collaboration and communication with faculty.

Consequences: This may make it easier for John to interact with the professor and the other students, if John owns a computer with Internet access. However, Web interactivity may not completely substitute for collaborative work time in study groups. Also, the group work may lose its value as a face-to-face interpersonal skill builder.

2. Response: The instructor could connect the student with the office that supports returning students for financial aid and advising.

Consequences: With a realistic work plan and better financial management, John will probably be more relaxed. This will improve his outlook, health, and academic achievement.

3. Response: The instructor could offer alternatives to group activities.

Consequences: Although John will not have the opportunity to connect with his peers and engage in collaborative learning, he will be able to fulfill the requirements for the course.

4. Response: The instructor could explain to students what the benefits of collaborative learning are.

Consequences: While this may eliminate some of the misunderstandings students may have, it will not address the scheduling issues. If John could meet with his study group, he would meet with them.

5. Response: John could contact the faculty member and explain his situation honestly.

Consequences: The faculty member may offer him improved accommodations or help connect him with resources.

6. Response: John could seek academic advising.

Consequences: An academic advisor may be able to assist John with acclimating to college culture and getting the help he needs to succeed.

7. Response: The faculty member could give his students a demographic questionnaire on the first day.

Consequences: This would alert the professor to students who might need accommodation.

8. Response: The faculty member could hold group work in class.

Consequences: This would reduce available lecture time. However, it would make the course more convenient for some students. It would also make it easier for the instructor to assess group progress and answer student questions.

9. Response: The instructor could set clearer expectations at the beginning of class, so that students know what they will need to do.

Consequences: Students will be able to judge whether the course fits their schedule. Also, they will be able to figure out early in the semester whether they need to ask for accommodations.

10. Response: The instructor could make a statement about accommodating students at the beginning of the course.

Consequences: This would make students such as John, who are reluctant to ask for help, more at ease about approaching the faculty member.

Resources

Davis, B. G. (1993). Reentry students. In B. G. Davis (Ed.), *Tools for Teaching.* (pp. 52-54). San Francisco: Jossey-Bass.

Sellers, S.L., Roberts, J., Giovanetto, L., & Friedrich, K. (2005). *Reaching all students: A resource for teaching in science, technology, engineering & mathematics*. Madison, WI: Center for the Integration of Research, Teaching and Learning.

Case #7: Marie Louise Moreau

Marie Louise Moreau wondered whether she was the only student in her chemistry group who had read the assignment before coming to class. As her partners debated how they would do a titration, Marie sat on a stool and flipped a tiny braid over her shoulder impatiently. She had expected more when she had taken a plane from Haiti to study at a prestigious college in the United States. This modern chemistry lab with its new equipment, white walls and ceiling, and modern lighting system was fancy enough, but the students expected everything to be spoon-fed to them. It was ridiculous.

Joe Tickham, the unspoken leader of her lab group, was concerned. He was not sure how they would be able to carry out the titration successfully. “I just don’t know how we’re going to do this,” he said. Joe didn’t like to admit that he didn’t have the answer – but, this time, he was stumped.

Marie looked around the room and saw that they were lagging behind the other groups, who were already mixing their solutions. She spoke up. “Well, when I was doing the reading,” she said, “there was a note in the sidebar that said that when you’re doing a titration, you should add titrant slowly near the endpoint. That way, when the solution changes color, it is easier to tell how much titrant was added.”

Joe looked at her with doubt. Could she be right? He didn’t want to rely on Marie’s word alone. She had many ideas, but they weren’t always good ones. “Adam!” he called to their TA.

Adam finished talking with another group and walked across the white-tiled floor towards Joe. “Do you have a question?”

“Well,” said Joe, “We read in the book that we should add titrant slowly near the endpoint, so that when the solution changes color, we can accurately determine how much titrant was added. Is that true?”

“Good memory, Joe,” said Adam, clapping Joe on the shoulder. “That’s right. You’re an asset to your group.” He turned towards the other members of the group. “It’s always important to pay attention when you’re reading. Now, you need to get started with the titration in order to finish before the end of class. Let me know if you have any other questions.”

The two other students in the group, Anna Lee and Brandon Peck, looked at each other uncomfortably as the TA left. Joe had just stolen credit for Marie’s answer. It wasn’t the first time he had done this.

Marie was furious. This was just another example of the old boys’ network she thought. She stood up and began to gather their titration equipment together. “So,” she said, turning towards the rest of the group, “let’s get started. We’ll do the titration slowly, like I said.” She looked pointedly at Joe.

“Yeah, let’s get started,” Joe said brusquely, ignoring her gaze. He didn’t know what she was glaring at him for. If he didn’t take charge, nothing would get done. Anna was too passive, Brandon wasn’t interested in school work, and Marie just didn’t know enough about chemistry to make good decisions on her own.

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

Group work can be challenging. In this case, Joe assumes that Marie is not competent, perhaps because of her race and/or gender, while Marie considers Joe to be a member of the "old boys' club." Marie and Joe have a stronger work ethic than their teammates do. Marie's academic preparation and understanding of the material are superior to that of the rest of the group, but her skills are not acknowledged by the TA or by Joe. The TA also makes assumptions about Joe's competence relative to that of the rest of the group.

Possible Discussion Questions:

- What is the best way to handle personality differences in group work without losing the educational benefits of group projects?
- Why did the TA automatically give Joe individual credit for observations that he suggested came from the group?
- Why did Joe assume that "Marie just didn't know enough about chemistry to make good decisions on her own?"
- What was the basis for Marie's view that "students expected everything to be spoon-fed to them?"
- Are the above assumptions due to Haitian vs. American cultural differences, are they race-based, are they gender-based, or are they a reflection of personality differences?
- Would the TA clap Marie or other female students on the shoulder? If not, why not? If so, how would Marie view such an action? Did that action contribute to Marie's thought that the exchange between Joe and the TA was "just another example of the old boys' network?"
- Would it be helpful for Marie to approach Joe in private about her concerns?
- What is the professor's role in dealing with all these issues?

A Possible Set of Responses and Their Consequences:

1. Response: Train or instruct TA's on how to interact with students who are working in groups.

Consequences: With better training or instruction, perhaps the TA would have been more careful about singling out individuals for credit during group assignments. Likewise, the TA might have become more proactive in getting feedback from all group members, so as to make more accurate judgments as to who are the "assets" to the group. Also, the TA did not come over to the group that was lagging behind until called over by Joe. Perhaps, with better instruction, he would have checked on each group sooner.

2. Response: Provide clearer instruction to the students on how to work as a team.

Consequences: By providing students with an explanation of how they should work as a group and giving them clear mechanisms for feedback, perhaps the TA could make it easier for Marie or the group to stop Joe's credit appropriation from becoming a recurring event.

3. Response: Eliminate group projects.

Consequences: Eliminating group projects minimizes the potential for the type of conflict between students like Joe and Marie, while also making it more difficult for students like Anna Lee and Brandon Peck to be passive. On the other hand, the benefits of group work include the experience of working with various personality types. Moreover, the resources available in the lab may necessitate that students work in groups.

4. Response: Give more consideration to the composition of the groups. For example, (a) consider regular rotation of the group members or, if there are particular problems, selective rotation of group members, (b)

appoint the leader of each group and rotate that leadership position, (c) segregate the groups by gender, or (d) use Myers-Briggs profiling to assign students to groups.

Consequences: Rotating the members of the groups would minimize the chance that one group would have their education compromised because of a bad mix of personalities. Plus, group rotation would give the entire class a chance to learn how to deal with various people. Unfortunately, such rotations make it hard for groups to truly develop into teams.

In this case study, leaders were apparently not appointed, as Joe is the “unspoken leader” of his group. If the TA chose a leader and, perhaps, rotated that position, perhaps more students would feel comfortable speaking for the group and feel more obliged to participate.

Creating all-female groups may, as some studies suggest, afford a better learning environment for women who would otherwise be marginalized. However, such segregation might be looked at as condescending by women, or viewed as preferential treatment by men. Furthermore, such groups may not prepare students for their future work environments.

Selecting the groups so as to mix and match personalities based on Myers-Briggs or other personality testing methods could make the groups more evenly composed and thus improve evaluation results. However, doing so requires considerable time and instructional expertise, and does not guarantee an absence of interpersonal conflict. In fact, the presence of complementary Myers-Briggs types, while it may make groups more effective, may also lead to conflicts when group members disagree about how to solve a problem.

5. Response: Let the groups sort out their own issues (do nothing).

Consequences: Doing nothing could alienate Marie further and does little to engage Anna Lee and Brandon Peck. Yet, if the other groups are meeting the instructional goals of the professor, perhaps the problem does not warrant interdiction. Perhaps time will allow Marie and Joe to develop a better working relationship.

Resources

Sellers, S.L., Roberts, J., Giovanetto, L., & Friedrich, K. (2005). *Reaching all students: A resource for teaching in science, technology, engineering & mathematics*. Madison, WI: Center for the Integration of Research, Teaching and Learning. (See the sections on Science Labs and Group Work.)

Davis, B. (1993). *Tools for teaching.* San Francisco: Jossey-Bass.

Hughes, W. J. (2000). Perceived gender interaction and course confidence among undergraduate science, mathematics, and technology majors. *Journal of Women and Minorities in Science and Engineering, 6*, 155-167.

Moore, J. L., III, Madison-Colmore, O., & Smith, D. M. (2003). To prove-them-wrong syndrome: Voices from unheard African-American males in engineering disciplines. *The Journal of Men's Studies, 12*(1), 61-74.

Rosser, S. V. (1998). Group work in science, engineering, and mathematics: Consequences of ignoring gender and race. *College Teaching, 46*, 82-88.

Case #8: Jennifer O’Connor

Assistant Professor Jennifer O'Connor stood confidently in front of her class of sixty-five students at a Midwestern community college. She was well prepared to discuss what she thought would be an interesting topic related to current events.

Jennifer often exposed her students to facts and ideas that were new to them. This strategy engaged her students in the course content. Today's section on the sexual reproduction of plants and animals was filled with facts that students often found surprising. For example, a lively discussion usually ensued when Jennifer mentioned species, such as spiders, that had unusual gender roles.

Standing in front of the chalkboard, Jennifer greeted her students. "Today," she said, "we will be discussing the reproductive patterns of many different species. As we focus on the diversity of these behaviors, consider how these adaptations may be useful within the ecosystem each species inhabits. Let's begin with the seahorse." Jennifer cued up her slide projector and showed an image of a male seahorse with a pouch on his belly. Her next slide juxtaposed the seahorse with a female kangaroo. Jennifer discussed the reproductive behavior of each species.

Jennifer turned back to the class before moving to the next slide. "Does anyone know of a species – other than humans – where some individuals form life-long same-sex partnerships?"

There were some looks of disbelief on the faces of Jennifer's students. No one spoke up, but Jennifer could sense that her students were paying attention. Even the people in the back row had looked up. Jennifer thought that this would be a good teaching moment. She clicked the projector to the next image – a picture of a male duck. "Several species of ducks, for example…"

Jennifer went on to describe the mate selection and longevity of these same-sex partnerships in the animal kingdom. "These partnerships are an example of the occurrence of homosexuality in nature," she explained. The class listened attentively, taking notes, and no one voiced any concern – at the time.

Jennifer was surprised when, several weeks later, she found a letter tucked under her door. It was an anonymous letter from a parent of one of the students in her biology course. The letter decried her attempts to "poison young minds." "We, as parents, should not have to pay this high tuition to have someone shove the homosexual agenda in our faces," the letter concluded. Jennifer was further dismayed to read that a copy had been sent to her dean.

Jennifer was not sure what to do. She was concerned that this letter could affect her upcoming third year review – a crucial step in her tenure process.

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

In this case study, the professor was insensitive to a controversial issue. Her naiveté led to reactions that she did not expect. This case raises the issue of academic freedom. Is Jennifer O'Connor's responsibility to teach biology, or to challenge student assumptions about topics that may be politically sensitive? Or, on the other hand, does she have a responsibility to communicate about both biology and current issues?

Possible Discussion Questions:

- If a male professor had addressed the same issue, would the students have reacted in the same way?
- Does the fact that the letter is anonymous make it less worthy of consideration?
- Was this a reaction on the part of a student or a parent? Should parents influence the education of college students?
- Was Jennifer O'Connor attempting to surprise her students? If so, was this appropriate?
- Is a science class an appropriate place to discuss social issues?
- Should the professor frame divisive issues in a way that allows for disagreement or a "balanced" discussion, even if she has strong beliefs about the topics?
- How might a gay student in Jennifer O'Connor's course have felt?
- How could Jennifer O'Connor reduce politicization and increase intellectuality in her course?
- How could Jennifer O'Connor encourage open discussion of controversial issues? Should she?

A Possible Set of Responses and Their Consequences:

1. Response: Next time the course is offered, have an open discussion with the class about the issue. Before the discussion, prepare the class for discussing controversial issues by setting ground rules and encouraging participation.

Consequences: This may add a social science element to the course. On the positive side, it may expose Jennifer O'Connor's students to a new way of talking about difficult issues, which may be beneficial for them in the future. However, it does depart from strict adherence to science content.

2. Response: Do nothing. Address the issue only if the dean raises it.

Consequences: If Jennifer O'Connor believes that receiving one letter is not sufficient to make the issue worthy of consideration, she may choose this tactic. However, if she ignores the issue, it may be raised later at a time she would not prefer, such as at her tenure review.

3. Response: Discuss the letter with the dean and seek advice.

Consequences: Depending on the climate of the institution, the dean is likely to be supportive about the issue, and would probably appreciate Jennifer O'Connor's request for advice

4. Response: Bring the topic up in a faculty meeting.

Consequences: Other faculty may have experiences they can share which would be helpful to her. On the other hand, they may disapprove of her teaching methods.

5. Response: Apologize to the class.

Consequences: This action would admit that the issue was political, and would bring an interdisciplinary element into the class. Also, if Jennifer O'Connor does not believe she has done anything wrong, this

would be a sign of low confidence as an instructor. Bringing up the issue again may enrage the students or their parents further.

6. Response: Omit that section of the course next time it is taught.

Consequences: This may deprive students of an opportunity to learn an important science fact which is socially relevant. In effect, the professor would be censoring herself.

Resources

Connolly, M. (2000). Issues for lesbian, gay and bisexual students in traditional college classrooms. In V. A. Wall, & N. J. Evans (Eds.), *Toward acceptance: Sexual orientation issues on campus*. Washington, DC: American College Personnel Association.

Oldham, J., & Kasser, T.. (1999). Attitude change in response to information that male homosexuality has a biological basis. *Journal of Sex & Marital Therapy*, *25*, 121.

Schellenberg, E., Hirt, J. & Sears, A. (1999). Attitudes Toward Homosexuals Among Students at a Canadian University. *Sex Roles*, *40*(1/2), 139.

Case #9: Allen Powell

Department Chair Allen Powell gazed out of the window of the Electrical Engineering building, deep in thought. His desk was neatly organized and decorated with a glass faceted ball. Allen straightened his tie, stretched his fingers, and thought of what he would say to his colleague who was due to visit him soon. He decided the direct approach would be best. Too much tact might indicate that he was not serious about the problem.

Powell heard a knock on the door – a brisk, staccato tap. He rose and opened the door to greet Bimal Silva, the new faculty member in his department. They shook hands politely, and Silva took a seat opposite the grey desk.

Silva was neatly dressed in a suit and tie. His hair was short and his eyes were bright and intense. Powell knew Silva was brilliant, and wanted to keep him in the department. But this issue had to be addressed.

“So, how was your first semester of teaching?” Powell asked.

Silva shifted in his chair and cleared his throat. “Well, to be honest,” he said, “I am a little disappointed in the quality of student participation.”

“How so?”

“I often noticed that students would roll their eyes in class when asked a question or given assignments,” Silva replied. “The questions were clear. At my university in Sri Lanka, I participated in teaching courses. I am experienced in coming up with questions that students can easily understand.”

“How was their work?” Powell said. This conversation was turning out to be easier than he had anticipated.

“I was surprised to find that they were often unfamiliar with basic mathematical and scientific concepts,” Silva answered, “I understand that student retention of information can be short-lived, but these students have taken calculus.”

Powell recalled the remarks he had heard from the students in his laboratory. “Silva thinks we all ought to be geniuses,” one had said. “He’s arrogant,” another student replied. “I couldn’t solve those problem sets last week at all.”

Powell looked out the window briefly and then back at Silva. “The students are concerned, too, Silva,” he said. “On the one hand, I can understand your desire to give them a thorough and high-caliber education. But you need to work with them at the level where they currently are – even though it may seem elementary.”

“I’ve considered that as well,” Silva replied. “However, I feel strongly that I do not want to compromise academic standards. This would be taking them back to the freshman level.”

“I understand,” Powell replied, although he disagreed. “However, we must accommodate the students’ existing level of knowledge, or we cannot educate them. We need to make both our presentation and our content accessible to as many students as possible.” Powell leaned across his desk. “Frankly, Silva,” he said, “we’re honored to have you on our faculty. We’ll work with you. We want to help you succeed. But some things will have to change.”

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

Allen Powell and Bimal Silva hold differing expectations for the students in their department. Bimal Silva's culture of origin may play a role; on the other hand, he may simply have high expectations. It is possible that Bimal Silva's students really are underprepared, and that the other instructors are not doing an adequate job of educating them. The students view their professor as arrogant; he may not be reaching them at their level. Rather than blaming the students, perhaps Bimal Silva should seek to understand their situation.

Possible Discussion Questions:

- What responsibility does a university have for training faculty in teaching?
- How could Bimal Silva adopt a more flexible teaching style? Should he?
- How could the communication in this situation be improved?
- Would mentoring have improved Bimal Silva's experience?
- How can one encourage faculty to recognize their own shortcomings as teachers?

A Possible Set of Responses and Their Consequences:

1. Response: Allen Powell could visit the class and offer recommendations based on Bimal Silva's observed interaction with students, rather than on hearsay. He could even make developmental mentoring in teaching, including regular observation, an expected process for all new faculty.

Consequences: Bimal Silva might accept this kind of feedback more easily. It would also be more accurate. On the other hand, he might not appreciate being observed.

2. Response: Allen Powell could consider that Bimal Silva may be accurate in his perceptions, and assist him in motivating his students rather than intimidating them.

Consequences: The quality of teaching in the department may improve once Bimal Silva learns to communicate well with his students. Other instructors may be motivated to raise their expectations as well. However, if Bimal Silva's teaching does not improve sufficiently, the students may remain discouraged.

3. Response: Allen Powell could review the teaching evaluations with Bimal Silva non-judgmentally, and talk with him about how to improve the class environment.

Consequences: Bimal Silva would probably appreciate the assistance, since he indicated that he is aware of the problem. It might take several semesters before the evaluations improved.

4. Response: Allen Powell could take the initiative to improve teacher training for faculty within his department by working together with resource centers on campus.

Consequences: This would depersonalize the issue and improve the quality of teaching in the department. However, it would require time and resources.

5. Response: Bimal Silva could improve his mid-course assessments so that he gets feedback on his performance throughout the course. This may alert him to areas of his teaching that need improvement.

Consequences: Bimal Silva may alter his teaching style to accommodate student requests for improvement. However, if he is not willing to accept the student feedback, or wants to maintain his high expectations, he may need to seek advice from a teaching resource center or from colleagues.

6. Response: Allen Powell could have a conversation with Bimal Silva about cultural differences in educational systems, to find out whether Bimal Silva's own educational experience has caused him to have higher expectations for students.

Consequences: This conversation would require tact on Allen Powell's part. However, at the end, Allen Powell and Bimal Silva might understand each other's perspectives better. Despite their mutual understanding, they might still disagree on what constitutes appropriate preparation and sufficient work for college students.

Resources

Colbeck, C.L., Cabrera, A.F. Terenzini, P.T. (2001). Learning professional confidence: linking teaching practices, students' self-perceptions, and gender. *Review of Higher Education, 42*(3), 324-352.

Sellers, S.L., Roberts, J., Giovanetto, L., & Friedrich, K. (2005). *Reaching all students: A resource for teaching in science, technology, engineering & mathematics*. Madison, WI: Center for the Integration of Research, Teaching and Learning. (See sections on How to Talk to Students and Cultural Differences for International Instructors.)

Tobias, S. (1990). They're not dumb. They're different. A new "tier of talent" for science. *Change, 22*(4), 11-30.

Case #10: Dan Reilly

This week, Dan Reilly was not looking forward to his chemistry discussion section. As he entered the classroom, he knew what was going to happen. It was the same issue every time.

Every two weeks, Professor Sylvia O'Rourke's chemistry class had a session of what Professor O'Rourke called "challenge problems." Dan had another word for them, but he did not share his opinion – even with his interpreter, Jane McIntosh, who accompanied him to every class.

Jane had majored in English as an undergraduate and gone on to become a sign language interpreter. Although her vocabulary was extensive, chemistry was like a foreign language to her. There had been several times so far during a lecture when she had difficulty translating. She wished that the professor would talk a bit more slowly.

Jane and Dan sat down near Dan's discussion group. The TA nodded to them as they entered and said something to Jane.

As the TA began to write out the day's problem on the board, Jane's fingers began flying. "Whichever group solves today's challenge problem first will have five points of extra credit."

The group around Dan turned to each other. Mitch Cottrell took out a sheet of paper, straightened his striped collar unconsciously, and looked around at the group, ignoring Dan. "So, what do you guys think we should do?"

"I think we have to start by figuring out what poly(acetylene) is," Shania Skylar suggested, tucking a black curl behind her ear. She took out her textbook and shuffled through the pages of the chapter on polymers. "See – acetylene, there," she pointed, "but what..."

Jane didn't know signs for acetylene or poly(acetylene), so she had to spell them out. "A-c-e-t-y-l..."

"O.K.," Dan signed. He moved over so that he could see the book.

"What should the structure of poly(acetylene) be?" Mark Amery scratched his crew cut.

"I think we can tell if we check our notes and draw it out," replied Mitch. He turned towards a nearby blackboard. "Professor O'Rourke showed us how to make poly(ethylene) from ethylene... Don't you think it might be the same idea?"

Jane began spelling again. By the time she was halfway through, Mark and Mitch were arguing about the mechanism of the polymerization reaction. Soon they moved on to trying to figure out the mistake that the chemist who synthesized poly(acetylene) had made, and to devise a correct synthesis for the desired product, engaging in a lively dialogue. The TA was talking with another group.

In frustration, Dan walked back to his desk and opened his own textbook. He took out a pen and paper. Jane followed him and watched as he sat silently for a few moments. "Do you want me to keep signing?" she asked.

"Wait a minute," replied Dan. He looked closely at the textbook description of addition polymerization. Slowly and steadily he worked through the problem. The mistake and its solution became glaringly obvious.

As Dan and Jane walked back to the group, there was a commotion at the front of the room. Another group had won.

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

The TA may be engaging in poor classroom practice by setting up a time competition on a problem where time to solution is not relevant. In addition, the TA, the professor, and the interpreter are not collaborating to make sure that Dan is included in the course. Dan may be tired of having to advocate for himself, or he may be resigned to the situation. However, Dan appears to have an aptitude for chemistry. Unfortunately, his teammates are unable to benefit from his knowledge because they are ignoring him – perhaps, because they are uncomfortable communicating with students with hearing disabilities.

Possible Discussion Questions:

- What could the TA have done at the beginning of the class to help his students learn to work with Dan? What could Sylvia O'Rourke have done? How could they have made their expectations clear?
- Why might Dan not have shared his feelings with Jane, his teammates, or his instructors?
- Why are the other students ignoring Dan and Jane?
- What responsibility does Sylvia O'Rourke have to ensure that Dan is able to participate fully in her class?
- How could the professor, TA and interpreter have worked together to optimize Dan's learning experience?
- What is the role of the university support services in resolving these kinds of communication problems?

A Possible Set of Responses and Their Consequences:

1. Response: The instructors could reassess the original intent of the time-based competition and consider alternative techniques for having students complete challenge problems. There are a variety of students in the class and, while Dan's problems with this approach might be the most obvious, there are probably other students who are also disadvantaged by this competition.

Consequences: Alternative techniques are likely to provide the TA with a better assessment of student learning and create a more meaningful learning experience for the students.

2. Response: Share the content with the interpreter in advance of the class meeting so she is familiar with the terminology and better prepared to present the problem and follow-up discussion to Dan.

Consequences: There will be a better accommodation for Dan without the appearance that he is getting "special treatment."

3. Response: Sylvia O'Rourke could have communicated directly with Dan's TA to establish effective mechanisms for including Dan in the challenge problem experience. An option might have been to have his group meet outside of class so that Dan and his interpreter could talk with the group about how to best include Dan in the conversation.

Consequences: All the students would benefit from Dan's understanding of chemistry, and they would learn how to communicate with a hearing impaired colleague. The students would have to devote more time to their challenge problem. However, Dan's group would be better prepared to work together, having taken the time to develop a communication strategy.

4. Response: The TA could contact the disability services center, and ask for advice on how to best accommodate Dan in the classroom.

Consequences: The TA would get expert support and would learn new strategies to include hearing-impaired students in the classroom. The TA would need to devote time and energy beyond the normal expectations of the job to get help.

Resources

Center for Research on Learning and Teaching. (2000). *Making accommodations for students with disabilities: A guide for faculty and graduate student instructors.* Retrieved March 15th, 2004, from http://www.crlt.umich.edu/publinks/occasional17.pdf

AccessSTEM (University of Washington). Retrieved October 19, 2004 from http://www.washington.edu/doit/Stem/

Case #11: Barbara Ross

The cement block walls of Barbara Ross's office were decorated with pictures. Behind her hung a poster of the solar system and an equally large image of the moon. Her diplomas hung beside them. When she leaned back in her chair, she could see the Physics Department's modern façade across the street.

Barbara was a prolific researcher at a large public university. Her astrophysics research analyzing X-ray data for information about the stellar life cycle was well regarded, and her record in attracting grant funding was excellent, but she knew that she needed to improve her teaching to assure her tenure.

During her pause for thought, Barbara heard a knock at the door. When she called, "Come in," Jim Burton, a thin young African-American student with glasses, entered the room. He stood awkwardly near the doorway as he greeted her. "I wanted to stop by, since you asked me to after class," he said.

"Have a seat," said Barbara, feigning warmth. Inwardly, she was bracing herself for a difficult meeting. She never liked to be the bearer of bad news.

Barbara had recently attended a presentation about the high dropout rate of minority students in science. After the presentation, she became uncomfortably aware of the small numbers of minority students in her classes, and resolved to try and mentor her students more. Jim was averaging a "C-" in the course, and she wanted to help him improve his grade.

"Jim," Barbara said, "What would you like to do after you're done with college?"

"I don't know," said Jim, looking down. "Be a scientist, I guess."

"So, then, you'd like to go to graduate school?" said Barbara briskly.

"Sure, if I can get a scholarship," Jim replied.

"There are a lot of fellowships and grants for graduate students," said Barbara. "But in order to get one, you'll probably need at least a "B+" in this class. My question is – how can I help you get that grade? Do you have any questions about the lectures or the textbook? I'm available every week during office hours."

"Oh, I'm doing all right," said Jim. "I got a "C" in high school chemistry, and I got a scholarship for college anyway. Plus, I want to major in geology… I'm just taking this class as an elective."

Barbara was not sure how to respond. "I don't usually recommend this to students," she said, "but I really would hate to see this course compromise your ability to get into graduate school. It's not too late to switch to Astronomy 150, if you'd like to see your grade improve."

Jim stood up. He looked offended. "No… that's okay," he said. "There's nothing wrong with a "C". I'm staying in your class. And I don't need extra help. I can do this on my own." He left the office quietly.

Barbara put her head in her hands. What had she done wrong this time? She had offered Jim options. She had tried to be sympathetic and diplomatic. But somehow, things had not gone as she had planned.

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

Relationships between black students and majority instructors are often complex. In this case, it is not clear that Barbara Ross is white. However, her communication with Jim seems to be hampered by assumptions on both sides. Jim seems to be accustomed to low expectations from his instructors – and, perhaps, from himself. The professor's brusqueness and her focus on grades make him uncomfortable. Although they are talking about the same subject, their perspectives are entirely different.

Possible Discussion Questions:

- Did Barbara Ross single out Jim because he was black? Was this appropriate?
- Is it ethical for a faculty member to encourage a student to take an "easier" course to get a better grade?
- Did Barbara Ross address the correct issues?
- Might Barbara Ross have been offended by the fact that Jim said he is "just taking the class as an elective?" Could this have influenced her response?
- What methods of mentoring might be more effective for Barbara Ross to use in the future?
- Why is Jim offended? Why does he choose to stay in the class?
- Is it reasonable for a student to decide what grade is good enough for him or herself, even though the student chooses a grade below a B?

A Possible Set of Responses and Their Consequences:

1. Response: Barbara Ross could be more persistent in convincing the student that he needs help.

Consequences: Jim could finally agree, or he could become more resistant.

2. Response: The professor could focus on specific issues related to the course in question rather than graduate school.

Consequences: A focus on the class might get to the root of the problem that Jim is experiencing. Jim might be reading the text but not the problem sets, or he might be involved in a study group that is more social than academic.

3. Response: Barbara Ross could begin the meeting with a more casual discussion in order to gain the student's trust, discuss his current course work load and extracurricular activities, and then begin the discussion of her course. Perhaps Jim has too little free time to study. Perhaps he took a similar course earlier, and is bored with the material.

Consequences: Building trust could lead to a more substantive and far-reaching discussion of the issues underlying this and related situations.

4. Response: In the future, rather than singling out students, the professor could make an announcement in class that extra credit is available for students who bring a question to office hours.

Consequences: Dialogue between the professor and her students will improve. She will be able to assist all students and stigmatize none.

5. Response: Barbara Ross could tell Jim that he is welcome to stay in the course.

Consequences: This may help repair the relationship between the professor and her student. However, the student may continue to be suspicious. The interaction with Professor Ross may affect his trust of other professors in the future.

Resources

Sellers, S.L., Roberts, J., Giovanetto, L., & Friedrich, K. (2005). *Reaching all students: A resource for teaching in science, technology, engineering & mathematics*. Madison, WI: Center for the Integration of Research, Teaching and Learning.

Davis, B. G. (1993). *Tools for teaching*. San Francisco: Jossey-Bass.

Institute for the Study of Social Change. (1991). *The Diversity Project: Final report*. Berkeley: University of California.

Perry, T., Steele, C., & Hilliard, A. G. III. (2003).*Young, gifted, and Black: Promoting high achievement among African-American students*. Boston: Beacon Press.

Case #12: Frank Taylor

Frank Taylor was a full professor in the Biology Department at Metropolitan University. In his earlier days, he had thought of himself as something of a rebel, but now he was basking in the comfortable role of elder statesman. Many faculty and students sought his advice. His classroom interactions were highly professional, and he encouraged students to visit him during office hours.

One day, two students, Audrey Blanton and Jenny O'Neill, stopped by Taylor's office. After some casual conversation, Audrey began talking about a problem she was having with an assignment in Professor George Castor's genetics class. She asked Taylor to help her with the assignment. Instead, he tried to guide her with some questions and suggested that she work on the problem by herself. If she was still stuck, he said, she should seek help from Professor Castor.

Audrey seemed uncomfortable with this suggestion. She said that she had recently gone to see Castor in his office about this homework problem. During their conversation, Castor had asked her for a date.

"He used those words, 'a date'?" Taylor asked.

"Well, he asked me if I would have dinner with him that evening," Audrey replied. "And he implied that, if I did, there would be no more trouble with my grade in the course or in any other course I took with him."

"What do you mean by implied? What exactly did he say?" Taylor's enjoyment of the visit had quickly evaporated.

"I can't remember his exact words. I was too shook up to think straight. I told him that I worked nights. I wanted to cut the conversation as short as possible and just get out of there. I didn't want to make him mad … I need his grade and recommendation to go to grad school," she continued despondently.

Before Taylor could respond, Jenny spoke up. She, too, had been 'propositioned,' as she called it, by Professor Castor.

"I turned him down flat," she said, "and I made it clear that I wouldn't be interested – ever! I must say, to give the beast his due, he never bothered me again after that. And I got my 'A.' I worked for it."

The faculty member in question, George Castor, had an international reputation for stellar research. At the time that he had come up for tenure, one of his students had had charged him with sexual harassment. In spite of this, the department had decided to recommend the promising researcher with an understanding on Castor's part that sexual harassment constituted unacceptable behavior. Taylor was polite to Castor but not particularly cordial with him.

Although Taylor felt he had a professional duty to respond, he understood the power structure at Metropolitan. His department chair, Thadwell Stevens II, had the motto: "To abstain from action is to acquire merit." Stevens believed that faculty members were always right. Taylor was certain that, were he to tell Stevens of these accusations, Stevens would find a way to turn the situation against him. Stevens thought that women lacked the ability to succeed in science. And the provost and president would insist that the problem be addressed by the chair and dean.

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

This case brings forth diverse issues, ranging from the university chain of command to individually differing perceptions of events. Dynamics of power, confidentiality, and responsibility are important to consider here. Gender and departmental culture certainly played a role in the students' responses and their comfort level with speaking up.

Alternatively, there may have been some misunderstanding between Castor and the students.

Possible Discussion Questions:

- What are the students' responsibilities and best course of action?
- What is the responsibility and best course of action for the senior faculty member?
- Should official channels be followed, or should the perceived inaction and gender bias of the chair be considered in deciding on a course of action?
- What roles do institutional hierarchy and social status play in this case study?
- Why might Castor feel that he can get away with this behavior?
- What kinds of pressures do the women in this scenario face?
- What pressures does Frank Taylor face? Should he pursue the issue, with or without the students' input?

A Possible Set of Responses and Their Consequences:

1. Response: Frank Taylor could do nothing. Perhaps the students were overstating the issue. However, given the repeated nature of the complaints, such exaggeration is unlikely.

Consequences: Castor will likely continue to behave inappropriately toward students. If the department is aware of his behavior, its silence constitutes complicity. This is why these issues need to be addressed.

2. Response: Frank Taylor could talk directly to Castor. Taylor is senior to Castor and therefore has some authority. Speaking to Castor directly would keep the issue off the radar screen of the department chair, who is the real authority (regardless of his position on harassment issues). Taylor could speak candidly to Castor about the inappropriateness of his behavior, and threaten further action if he hears any more complaints. Then Taylor, on his own initiative, could arrange for the department to receive general training on behavioral ethics, as part of faculty development through the university offices responsible for ethics and equity.

Consequences: The combined personal contact with Castor and the generalized training for everyone may improve the overall department climate and put an end to Castor's harassing behavior.

3. Response: The student could ask Frank Taylor to take the case to appropriate authorities, but request anonymity and a delay in action until the course is completed. Frank could take the case to the chair, respecting the student's requests. The chair would be told explicitly that the case will be taken to the Dean if the chair does not initiate an appropriate investigation.

Consequences: A significant amount of time may pass between the event and the action. A formal complaint takes considerable time and departmental resources. Castor may harass others during this time. Tension among the department faculty may increase, affecting the chair, Taylor, and the accused faculty member. Castor may lose his position or leave for another university, thus depriving the department of a star researcher. On the positive side, a clear departmental response may foster an environment that is more inclusive. Such an environment would be more attractive to students and faculty from underrepresented groups.

4. Response: The student and her friend could report the incident to the university affirmative action officer or ombudsman, and tell them that they have already told Taylor about the problem..

Consequences: The onus for action would be placed primarily on the victims of harassment. External pressure applied to a possibly reluctant Department Chair may be more effective and less divisive for the department.

5. Response: Frank Taylor could report the incident to the university affirmative action officer or ombudsman, as well as to his department chairperson and dean, against the wishes of the student.

Consequences: Due to lack of support from the student, the entire process may achieve nothing except the loss of political capital for Frank Taylor. Furthermore, the student may be very upset by this course of action. However, when the university addresses the issue, the department may undergo a shift in its power structure to the great benefit of the university in attracting undergraduate students, graduate students, and faculty.

Resources

Cabrera, A. & Nora, A. (1994). College students' perceptions of prejudice and discrimination and their feelings of alienation: A construct validation approach**.** *The Review of Education/Pedagogy/Cultural Studies, 16* (3-4), 387-409.

Ferreira, M. M. (2002). The research lab: A chilly place for graduate women. *Journal of Women and Minorities in Science and Engineering, 8,* 85-98.

Sadker, M. & Sadker, D. (1990). "Confronting sexism in the college classroom." In S. L. Gabriel and I. Smithson (Eds.), *Gender in the Classroom: Power and Pedagogy*. Urbana: University of Illinois Press.

Sandler, B. (n.d.). *The chilly climate: How men and women are treated differently in classrooms and at work*. Retrieved August 5, 2004, from http://www.bernicesandler.com/id4.htm.

Note: Most universities have specific sexual harassment policies and procedures.

Case #13: Angela Tsu

I can't think about physics right now, Angela told herself as she prepared to go home for her winter break. *I can't tell my family what happened. They all want me to succeed, to go on to medical school like I planned. I can't tell them about the 'F' I got on that exam. I can't tell them about barely passing the course.*

Angela, a first-semester sophomore, had tried to do well in introductory physics. She thought she understood the material. She worked through all the examples. Her grades on homework assignments were excellent.

But, when Angela sat down in front of her first exam, her mind went blank. She felt a familiar fluttery sensation in her ribcage. *I know this*, she told herself. *It's not hard.* She spent half of the test staring at the paper and trying to breathe slowly.

With her first "F" in hand, Angela went to the physics tutoring center. Jim, a friendly graduate student, agreed to assist Angela with her assignments and to help her study for the next exam.

When Angela described her anxiety to Jim, he suggested that she approach her professor.

Angela accepted Jim's offer. They went together to talk with her professor, Daniel Carter, during office hours.

When Jim explained the situation, Carter seemed amenable to the change. "Sure, we can give Jim's idea a try," he said. "You can have extra time to work on the next exam, and we'll see how that goes."

At the next exam, Angela felt none of the tension she had experienced before. She was allowed to work in a separate room and to take as much time as she needed to complete the test.

"Excellent job," Carter said to Angela when he handed her back her paper. The other students were filing out of the classroom, joking and talking with each other. "You probably won't need extra time on the next exam. You earned a 100%."

Angela looked uncomfortable. "But I do need time, Professor Carter," she said.

"You have to understand, Angela," Carter replied, "There are other students in this class who could earn an A+, given extra time, and I don't want to put them at a disadvantage." He smiled at her. "Consider it a compliment."

As Angela walked into the classroom for the final exam, she told herself that everything would be all right. She was prepared. She would not get anxious.

The exam began with a complicated question about a space shuttle that left Angela completely confused. She felt her heartbeat accelerating and rushed through the rest of the questions, pausing occasionally to chew on her pencil. *If I fail, I fail*, she thought.

Her final grade in the course was a C-.

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

Like many college students, Angela experiences test anxiety which interferes with her academic performance. Family pressures play an important role in this scenario. Angela is advocating for herself and seeking assistance more than many students do. Nevertheless, she is either unaware of other campus services, or unwilling to seek assistance from a counseling or disability-related office. Visiting a counseling or career center might offer Angela the chance to discuss her doubts about her professional aspirations. A career counselor or Dean of Students could also put Angela's grade in context and help her realize she has not failed. This case also raises the issue of the fairness of timed testing and the ethics of asking questions on exams for which students are not prepared. There is a difference between the faculty member's perception of the situation, and the way Angela perceives it.

Possible Discussion Questions:

- Was Carter being fair?
- How much can you expect a student to practice self-advocacy?
- How much responsibility should the tutor or professor take for assisting Angela?
- The case does not state clearly that Angela is Asian. However, if she is, could her ethnicity have played a role in this scenario? Might Carter have responded differently to a student who was not Asian?
- What are successful strategies to reduce test anxiety?
- Is this the best testing strategy for this course?
- Is this a "weed-out" course on campus? If so, might that have affected Carter's response?
- What other resources are available to Angela?
- Is the stress of student adjustment to college over by the sophomore year?
- Is accommodating Angela unfair to other students?

A Possible Set of Responses and Their Consequences:

1. Response: Either the tutor or the professor could have helped Angela to connect with the counseling center, where she could learn remedies for test anxiety. The instructor could also have followed up to make sure that she used the resources.

Consequences: Angela could have become a more effective test taker. Alternatively, the student support services might have determined that she needed accommodation, and provided her with the appropriate paperwork.

2. Response: Angela could have returned to the tutor before the final and told him that she was nervous.

Consequences: The tutor could have helped her or referred her to resources on campus.

3. Response: The university could institute training for faculty to improve their teaching and testing methods, and incorporate rewards for participation into their promotion and pay structure.

Consequences: Professors might be reluctant to change the methods they already are using. Tenured professors might be less likely to participate. However, the faculty who did take these courses might share their ideas with their colleagues, and the culture might change gradually.

4. Response: The professor could give all of the students more time by reducing the content covered on the exams or lengthening the time period allowed.

Consequences: Reducing the content covered on the exam would allow the professor to focus on specific learning objectives. This would not have an adverse effect on student learning. Allowing more time might

interfere with students' schedules, but would also reduce their level of tension. Both strategies might result in improvements in students' test scores.

5. Response: The professor could incorporate more examples relevant to the exams into the course, so that students would be better prepared for challenging questions.

Consequences: Student learning would improve. However, the professor would have less time to cover theoretical content.

6. Response: Angela could have skipped the first question on the exam.

Consequences: Angela's score might have improved, and she might have been less anxious.

7. Response: The professor could have allowed Angela to sit in a separate room while taking the exam, instead of giving her additional time.

Consequences: This method might have helped Angela to relax, while meeting the requirements of the course.

Resources

Center for Research on Learning and Teaching. (2000). *Making accommodations for students with disabilities: A guide for faculty and graduate student instructors.* Retrieved March 15th, 2004, from http://www.crlt.umich.edu/publinks/occasional17.pdf

AccessSTEM (University of Washington). Retrieved October 19, 2004 from http://www.washington.edu/doit/Stem/

Case #14: Sharon Whitby

“Ah, students,” Sharon Whitby thought as she sat with a pile of assignments to grade in front of her on her desk. Why did college students have to be so difficult?

It was the middle of a busy semester in Sharon’s Ph.D. program. Sharon was studying Computer Science after four years of service in the Air Force. She was bright, determined and disciplined. Outside of school, she volunteered for charities sponsored by her church. She planned to marry, settle down, and get a job in her field after she was done with her degree, although she was concerned about having enough time to raise a family.

Sharon did not resent working as a teaching assistant. In fact, she enjoyed interacting with her students and had good rapport with the class. Her students knew that she believed in treating people fairly.

This semester, there was a young man in her class named Jeff Eberhagen who had a mischievous sense of humor and asked many questions. Sharon quickly surmised that he was overqualified for the course when she graded his first assignment. Not only was his coding correct, but he had added extra features to the program. She gave him an “A” and wrote “Great Job” on his paper.

Jim Cruickshank, the professor for Sharon’s course, believed in giving students assignments that related to everyday life. The second assignment, which amused the teaching assistants a great deal, was to design a computerized dating program which would match people up based on their interests. During her discussion section, Sharon described the parameters of the program.

A week later, when she began to leaf through the stack of assignments, Sharon looked at Jeff’s results closely. There seemed to be too many variables. Had he misunderstood the assignment? She scanned down the printout and found a puzzling equation. “If gender1 does not equal gender2, then genderpref=0. If gender1 equals gender2, then...”

Sharon put down the paper. The assignment was incorrectly done. When Sharon referred to “dating”, she had meant heterosexual dating. But what if her best student was... well... trying to tell her something? Sharon disapproved of homosexuality in principle, but she knew that she shouldn’t let her beliefs influence her decision. Had she let Jeff get away with too much on the first assignment? Above all, she wanted to be fair. Sharon resolved to talk with Jeff after class. She was sure that he would redo the assignment perfectly once she explained it. She couldn’t bend the rules just because Jeff was an “A” student.

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

This case focuses on the moral beliefs of the teaching assistant and the extent to which they impact her assessment of a student's work. Her strong beliefs concerning sexuality and ambiguities in the parameters she set for the assignment conspire to confuse Sharon's judgment of fairness and her assessment of what constitutes an assignment "incorrectly done." Her response is incongruous, given her previous appreciation of "creative" answers to programming assignments.

Possible Discussion Questions:

- Was the assignment answered correctly, within the parameters provided?
- How does one recognize when one's own beliefs are unduly affecting assessment?
- Is it appropriate for Sharon to assume anything about Jeff, based on his answer?
- How open should instructors be to students' unusual or surprising answers?
- Should Sharon require Jeff to "correct" his answer?
- If Sharon refuses to give Jeff full credit, even though his program works, what should Jeff do?

A Possible Set of Responses and Their Consequences:

1. Response: Sharon could talk with the supervising professor about the appropriateness of the answer.

Consequences: Sharon may risk exposing her biases. This may also "out" the student to the professor.

2. Response: Sharon could ask another TA to grade the assignment.

Consequences: Asking another TA to grade the assignment places a burden on the other TA. This may also have the effect of making the student visible as gay, regardless of his actual orientation.

3. Response: Sharon could acknowledge that she made a mistake in not stating that the dating assignment was heterosexually oriented. Because she did not state that the assignment was for opposite sex couples, she could accept Jeff's work and give him full credit – as long as the program works.

Consequences: A challenge of presenting "real-world" examples is that our world is wonderfully complex. The goal of these examples is to engage students in the subject matter. The aim of the assignment – writing code and getting it to run – was successfully accomplished. Accepting Jeff's work should not pose a problem.

4. Response: Sharon could realize that she has overlooked part of the population in her assignment criteria. This could prompt her to pay more attention to inclusive assignment design in the future, regardless of her perspective on sexual orientation.

Consequences: It is likely that other assignments given in this class may not be inclusive. While Sharon may or may not choose to discuss her realization with the professor, she can alter her own syllabi and assignments in the future, thereby welcoming students of all backgrounds.

Resources

Sellers, S.L., Roberts, J., Giovanetto, L., & Friedrich, K. (2005). *Reaching all students: A resource for teaching in science, technology, engineering & mathematics*. Madison, WI: Center for the Integration of Research, Teaching and Learning. (See sections on bias-free grading.)

Connolly, M. (2000). Issues for lesbian, gay and bisexual students in traditional college classrooms. In V. A. Wall, & N. J. Evans (Eds.), *Toward acceptance: Sexual orientation issues on campus*. Washington, DC: American College Personnel Association.

Jenkins, M. L., Gappa, J. M., & Pearce, J. (1983). *Removing bias: Guidelines for student-faculty communication*. Annandale, Virginia: Speech Communication Association.

Case #15: Melanie Wong

Professor Melanie Wong, chairperson of the Mathematics Department, arrived early for the department meeting. She walked into the modern conference room with tall, tinted windows that overlooked the tree-lined central quadrangle of the West Coast campus where she worked. She sat down at the head of the table, opened a brown leather folder, and looked closely at the letter she had received that week from the local chapter of AWIS (American Women in Science).

“We urge you to ensure,” the letter read, “that your department looks toward the future by emphasizing the accomplishments of women scholars, addressing significant issues pertaining to women, and including research done by women in your curricula.”

Melanie closed her folder and waited as her colleagues entered the room. She greeted them as they joined her at the table. Her department was composed of many idiosyncratic faculty. Luckily, Melanie’s personal relations skills were excellent. She had managed to forge the department into a somewhat cohesive group by listening to what people wanted and taking the initiative when it was appropriate.

This meeting went well. There were no major business items on the agenda. Melanie waited until the “Other Business” portion of the meeting before she took out the letter.

It took courage for Melanie to speak up for the principles of AWIS. She had relied heavily on the organization when she was an undergraduate and a younger professor, and now, she felt, she owed that community something in return. After all, it wasn’t easy for a woman to become a math professor, even in the twenty-first century.

“Recently,” Melanie began, choosing her words with care, “I received a letter from an organization that provides support for women in science and math. Women who major in mathematics as undergraduates tend not to persist into higher levels of education. This occurs despite the fact that women often achieve high scores in math on standardized tests and perform very well as math majors. American Women In Science, the group which sent me the letter, believes that an increasing emphasis on women scholars’ achievements and on issues relevant to women can encourage women to participate more in math and science and to eventually become faculty. They are asking us to be a part of this effort by including female mathematicians’ work in our course material. I would like to hear from you as to what you think about this, and what you could do in your courses to make this happen.”

“I think it sounds fine,” said Bernard Frank, the youngest member of the faculty. “I don’t mind changing my course a bit – I’d probably ask my graduate students to find a few female mathematicians to profile. It shouldn’t be too much trouble.”

Ross Kosovich, his senior by thirty years, shifted in his chair and furrowed his brow. “This is all very well,” Ross said, “But mathematics is a gender-neutral subject. Of course, women have contributed to mathematics, but to single them out seems biased.”

Another senior mathematician, Alfred Beauregard, spoke up. “The letter is well-intentioned, and I believe that we should all make an effort towards mentoring female students,” said Alfred. “But to skew the curriculum, as this organization suggests, is a disturbing proposition.” Many of the other professors nodded in agreement.

Before you turn the page and read the sample analysis for this case, you may want to complete the following worksheet.

1. What issues does this case study raise?
2. What questions for group discussion come to mind as you read the case?
3. What could the instructor do in this situation? Generate several possible responses.
4. What might be the consequences of each of these responses?

An Example Case Analysis

Some Issues Raised By the Case:

The department chair was put in the position of recommending curriculum changes based upon the influence of an outside agent in what might be described as a “cold call.” This would be likely to be met with resistance, whether it included women in science issues or any other concerns. Perhaps the situation was exacerbated by the fact that the chair was a woman and the outside agent was AWIS.

This case raises basic questions about the nature of curricular content and how it does or does not relate to the lives of students. When Melanie Wong brings up the issue of inclusive curricula, she is questioning the neutrality of her discipline as it is traditionally taught. This critique, even in an implicit form, is difficult for some of her faculty colleagues to accept.

An additional issue is whether or not adding one “example” for each type of student is sufficient to improve climate. An extrapolation of this idea is that every “type” of student will need his or her own “example” to be “included,” which would seem ridiculous. This critique of the suggestion is valid, but that does not in any way invalidate the questions of how to improve climate and increase the relevance of the curriculum for the students.

Possible Discussion Questions:

- Given her history with AWIS and her role in the department, was it appropriate for Melanie Wong to bring this issue to the faculty?
- How long should it take to make a change in a traditional field like mathematics when change is stimulated by outside influences?
- Do students need to see their own gender or ethnicity reflected in their textbooks, or is interpersonal support more important?
- Was it appropriate for AWIS to adopt this strategy in their outreach efforts?
- How does one motivate change successfully in traditional environments?

A Possible Set of Responses and Their Consequences:

1. Response: Melanie Wong could use a slow but constant persuasive approach.

Consequences: Taking a slow approach could ensure that the change would not be derailed through irrelevant arguments to the contrary.

2. Response: Melanie Wong could lead by example and introduce examples of female contributions in her own course. She could also encourage the faculty who agree with her to do the same.

Consequences: Leading by example is the right of faculty in conducting their classes. So long as the course catalog description is satisfied, the faculty are free to design the curriculum as they wish.

3. Response: Melanie Wong could talk individually with the faculty members and network with supportive people both within and outside the department, focusing on how to “sell” the idea to the faculty, rather than just presenting it. She could mention key advantages of curriculum diversification to the other professors and connect them with the existing values of the discipline and the university administration. Some arguments could include:

A. Intellectual diversity is a cherished academic value tracing its roots back at least as far as Socrates;
B. The overwhelming majority of the American public want to move forward on diversity issues;
C. In math and science, women feel more comfortable if they can connect the course material to their everyday lives (Rosser, multiple works).

Consequences: The faculty may respond in varying ways to Melanie Wong's request. Most likely, she will be able to convince some, but perhaps not all, of the professors. She may have to bring up the topic again and discuss it individually with faculty several times over the course of several years. However, individual faculty members may start implementing her suggestions before the rest of the faculty "comes around."

Resources

Ayre, M., & Mills, J. (2003). Implementing an inclusive curriculum for women in engineering education. *Journal of Professional Issues in Engineering Education & Practice, 129*, 203-210.

Busch-Vishniac, I. J., & Jarosz, J. P. (2004). Can diversity in the undergraduate engineering population be enhanced through curricular change? *Journal of Women and Minorities in Science and Engineering, 10*, 255-282.

Mayberry, M., & Welling, L. (2000). Towards developing a feminist science curriculum: A transdisciplinary approach to feminist earth science. *Transformations, 11*, 1.

Additional Resources

By Tabassum Saleem

For science, technology, engineering and mathematics (STEM) courses to benefit all students, it is imperative for educators to understand how to approach students from diverse backgrounds and encourage them to pursue their educational goals. This case book offers insight into situations that may arise in classrooms owing to the intentional or unintentional actions of peers and/or instructors. It is intended to help educators understand, contemplate and facilitate discussions pertaining to difficult instructional situations.

By allowing the attrition rates of women and minority students to remain high, STEM fields are losing potential opportunities for the advancement of science and technology. Workplaces all over the world require individuals who can communicate and work effectively with people of diverse backgrounds. Moreover, United States demographics are evolving in such a way that the majority of individuals will no longer be of European descent. Hence, STEM educators should take steps to effectively accommodate all students and to make their classrooms welcoming for diverse student audiences.

A common misconception about students who drop out of STEM classes and fields is that these students lack the ability and/or drive to succeed and persist. However, *all* students in STEM classes and fields indicate that STEM instructional material is often presented in a way that does not engage student creativity or interest. Also, female and underrepresented minority students often encounter a “chilly” environment in STEM courses, which discourages them from persisting. Therefore, it is necessary to improve the quality of science teaching and interpersonal interaction in STEM courses. This requires educators to not only consider curriculum reform, but to also consider how material taught in class can be effectively understood, retained, and applied to real-life situations (Seymour & Hewitt, 1997).

For more information on incorporating diversity into the classroom, curriculum, or teaching and learning practices, as well as approaching difficult situations in classrooms, the following resources may be helpful:

Sellers, S.L., Roberts, J., Giovanetto, L., & Friedrich, K. (2005). *Reaching all students: A resource for teaching in science, technology, engineering & mathematics*. Madison, WI: Center for the Integration of Research, Teaching and Learning.

Davis, B. G. (1993). *Tools for teaching*. San Francisco: Jossey-Bass.

Seymour, E. & Hewitt, N. M. (1997). *Talking about leaving: Why undergraduates leave the sciences*. Boulder, Colorado: Westview Press.

Science Teaching Using Cases

For information on teaching scientific topics using the case study method, see the following sources:

BioQUEST. (2005). LifeLines OnLine: Accessible investigative case-based biology for community colleges. Retrieved April 26, 2005, from http://www.bioquest.org/lifelines/

Herreid, C. F. (2004). Case studies in science: A novel method of science education. Retrieved December 11, 2004, from http://ublib.buffalo.edu/libraries/projects/cases/teaching/novel.html

State University of New York at Buffalo (2005). The National Center for Case Study Teaching in Science case collection. Retrieved April 26, 2005, from http://ublib.buffalo.edu/libraries/projects/cases/ubcase.htm

University of Delaware. (2005). Problem-based learning clearinghouse. Retrieved April 26, 2005, from https://chico.nss.udel.edu/Pbl/

Case Sources

Our sources for each case are as follows:

Frank Taylor – Professor Rita Silverman, Department of Education, Pace University

Melanie Wong, Martin Hernandez, and Barbara Ross – Dr. James Stith, Vice President of Physics Resources, American Institute of Physics, and Professor Christine Stanley, Assistant Dean of Faculties, Texas A&M University

The remaining cases were developed by CIRTL staff at the University of Wisconsin-Madison.

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Tabassum Saleem was an undergraduate student majoring in Economics at the University of Wisconsin – Madison. She was a student hourly at the Center for the Integration of Research, Teaching and Learning. Her interests included exploring gender differences in investment behaviors, financial vulnerability of small business owners, and the implications of privatizing Social Security.

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Judith N. Burstyn is a Professor of Chemistry and Pharmacology at the University of Wisconsin-Madison, and former faculty director of the Women in Science and Engineering Residential Learning Community there. A long-time teacher of freshman chemistry, Judith was a leader in the redesign of the freshman chemistry curriculum and the chemistry major. Her research is in bioinorganic chemistry, studying the function of metal-containing proteins and metal-based compounds and materials in gas sensing.

Appendix: Presentation Materials

We have found that for presentation, each case should fit on one slide. The following PowerPoint slides are abbreviated versions of each case. You may Xerox them onto transparencies. The PowerPoint files will also be available on the CIRTL Diversity Institute Web site, where we additionally plan to make available PDF files of our workshop handouts for each case study.

For more information, please contact CIRTL at:

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Slide 1

Mike Bertal

This semester, Mike is teaching an introductory engineering design course at his university- a large, public institution in the United States. Mike enjoys involving his students in lively experiential activities such as discussions of real-world applications and ethical and environmental issues. In recognition of his high satisfaction ratings from students, Mike recently won a university-wide award for excellence in teaching.

One student in his class, who has recently come to the United States for undergraduate studies, seems particularly reserved, perhaps even uncomfortable. The student does not participate in group discussions. His projects, although they are proficient, accurate and detailed, do not offer evidence of original thinking or creativity. Mike is concerned about the problem, but has not yet talked with the student.

Slide 2

Jeremy Geraci

Jeremy Geraci had been excited about teaching an introductory biology class for non-majors. He knew that many students graduated from high school without understanding basic biological principles.

The course had run smoothly, although there had been some unusual questions during the section on evolution. One young man had approached Jeremy after class and asked him whether he thought that carbon dating was a reliable process. Jeremy had explained that the inaccuracies in C-14 dating were only moderately significant in comparison to the large time scales the dates encompassed. The student had seemed unconvinced, but left without explaining his position fully.

At the end of the semester, most of Jeremy's evaluations were complimentary. But halfway through the stack was the worst comment Jeremy had ever received:

"You'll burn in hell for this. Stop teaching evolution or else."

Slide 3

Gina Gilbertson

As she taught her discussion section of Engineering Dynamics, Gina Gilbertson wrote out an expression for momentum on the blackboard. In her classroom sat twenty-five college students in various stages of alertness.

In the third row sat a group of five students from China.

After she was done writing out her equations, Gina turned to the class and asked for an example of an everyday life situation where momentum was important.

Jay, a Chinese student, said something that Gina could not understand. The other four Chinese students, who all sat with him, laughed.

There was an awkward pause. “Could you repeat that?” Gina said. “I didn’t hear you.”

Susan, another Chinese student, spoke up. “He is just making a joke,” she said.

As the discussion continued, Jay leaned back in his chair and went to sleep. Gina thought about calling on him again. She decided not to do so.

Slide 4

Sam Gold

Sam Gold taught a rowdy Thursday night section of a chemistry course at a large public university. Sam’s political views were more liberal than those of most of his peers- and his students.

One night, as Sam began describing the role of a catalyst in a reaction, he heard one student say, “We could blow the Arabs away with that shit, huh?”

Many other students laughed at the joke. “Yeah, we’d turn Iraq into a dust bowl,” said another young man who had a brother in the Army.

“Show those ragheads what we’re there for,” a third person chimed in.

Sam was upset by these comments. However, he knew that the professor he worked for generally adopted a “boys will be boys” attitude towards students’ shenanigans. How could he handle the situation in a way that would encourage his students to be professional, without alienating them?

Slide 5

Martin Hernandez

Martin Hernandez, Director of Graduate Studies in the Department of Industrial Engineering, stood up to greet Angela Johnson when she entered his office. Angela was dropping out of graduate school.

"Have a seat," Martin gestured to a chair across from his desk. "So, let's talk about why you're leaving the program. Frankly, I'm surprised to see you go."

"Well," said Angela, with some hesitation. "To begin with, my advisor, Larry Hofstedt, told me that I would have to take lower-level courses because my college education at a historically black institution was not up to par. I also had a series of very discouraging in-class experiences. I was even accused of cheating when I got an "A" on an exam."

Slide 6

John Lithcovich

"I just can't take this any more," John said to his wife, Mary, over their dinner.

"You've got to stick with it," Mary said. "You've always wanted to go to nursing school."

"I know, honey," said John. "But I can never find time to meet with the other students in my group. And after my shift, I'm too tired to do the homework."

John paused. "I don't want to come across like I'm blaming people… But everything would be all right, if my professor understood that we don't all have time for this group work."

Mary set Susan down in a high chair and gave her some baby food. "Isn't there an office for returning students at your college?" she said.

"I don't know," said John. "These 12-hour days - they don't design paramedic jobs around schooling, and they certainly don't design college for working people."

Slide 7

Marie Louise Moreau

Marie Louise Moreau wondered whether she was the only student in her chemistry group who had read the assignment before coming to class. She had expected more when she had taken a plane from Haiti to study at a prestigious college in the United States.

She spoke up. “Well, when I was doing the reading,” she said, “there was a note in the sidebar that said you should add titrant slowly near the endpoint. That way, when the solution changes color, it is easier to tell how much titrant was added.”

Joe, her group’s self-appointed leader, looked at her with doubt. Could she be right? He didn’t want to rely on Marie’s word alone. “Adam!” he called to their TA.

Joe repeated Marie’s statement to Adam. “Is that true?” he said.

“Good memory, Joe,” said Adam, clapping Joe on the shoulder. “That’s right. You’re an asset to your group.”

Slide 8

Jennifer O’Connor

Assistant Professor Jennifer O’Connor showed her class a slide of a male seahorse with a pouch. She juxtaposed this with a photo of a female kangaroo. Today’s topic was animal reproduction.

"Does anyone know of a species – other than humans – that forms life-long same-sex partnerships?” O’Connor asked. “Several species of ducks, for example…” The class seemed surprised, but listened attentively, taking notes.

O’Connor was surprised when, several weeks later, she found an anonymous letter under her door. The letter decried her attempts to "poison young minds.“ “We, as parents, should not have to pay this high tuition to have someone shove the homosexual agenda in our faces," the letter concluded. A copy had been sent to her dean. O’Connor was concerned that this matter could affect her upcoming third year review – a crucial step in the tenure process.

Slide 9

Allen Powell

Department Chair Allen Powell opened the door to greet Bimal Silva, a new faculty member in Electrical Engineering.

"So, how was your first semester of teaching?" Powell asked.

Silva shifted in his chair and cleared his throat. "Well, to be honest," he said, "I am a little disappointed in the quality of student participation."

"How so?"

"I often noticed that students would roll their eyes in class," Silva replied. "The questions were clear. I was also surprised to find that my students were often unfamiliar with basic concepts."

Powell looked out the window briefly, and then back at Silva. "I can understand your desire to give your students a quality education. But you need to work with them at the level where they currently are."

Slide 10

Dan Reilly

Dan Reilly entered his chemistry discussion section with his ASL interpreter, Jane. Dan was a bright student, but was frustrated by his lack of communication with the other students.

Today, the TA announced that the first group to solve the challenge problem would have five points of extra credit. The group around Dan turned to each other and began trying to solve the problem, ignoring Dan. Jane, who didn't know the signs for acetylene or poly(acetylene), began spelling out the names of the polymers.

In frustration, Dan walked back to his desk and opened his own textbook. He took out a pen and paper. He looked closely at the textbook description of addition polymerization and worked through the problem. The solution became obvious.

As Dan and Jane walked back to the group, there was a commotion at the front of the room. Another group had won.

Slide 11

Barbara Ross

Barbara was a prolific researcher in Astronomy at a large public university. However, she knew that her teaching skills needed improvement.

After attending a diversity presentation, Barbara resolved to try and mentor her students of color more. She was particularly concerned about Jim, an African-American student whose grades were poor.

Barbara invited Jim to her office hours without telling him her concerns. When Jim stopped in, she asked him about his career plans. He responded that he wanted to be a scientist.

Attempting to be tactful, Barbara told him that he would need to improve his grades to get financial support in graduate school. However, Jim did not think that his grades were a problem. After all, he told her, he did not want to be an astronomy major.

Barbara recommended that Jim switch to a lower-level course to maintain his GPA. Jim told her that he could manage on his own. They parted on less than cordial terms.

Slide 12

Frank Taylor

Frank Taylor was a tenured Biology professor. His classroom interactions were highly professional.

One day, two students, Audrey Blanton and Jenny O'Neill, stopped by Taylor's office. After some conversation, Audrey began talking about a problem she was having with an assignment in Professor George Castor's class. She asked Taylor to help her with the problem. When he suggested that she talk with Professor Castor, Audrey said that when she had recently done this, Castor had asked her for a date.

Before Taylor could respond, Jenny spoke up. She, too, had been 'propositioned' by Professor Castor.

Castor produced stellar research. However, he had a track record of sexual harassment from the days before his tenure. Taylor was not particularly close to him.

Although Taylor felt he had a professional duty to respond, he understood the power structure at Metropolitan. His department chair was not favorably disposed towards female students- or towards him. What could he do?

Slide 13

Angela Tsu

Angela, a first-semester sophomore, had tried to do well in introductory physics. But, when Angela sat down in front of her first exam, she spent half of the test staring at the paper and trying to breathe slowly.

With her first “F” in hand, Angela went to the physics tutoring center. Her tutor, Jim, suggested that they approach her professor.

Angela was allowed to take as much time as she needed on the next exam.

“Excellent job,” Angela’s professor said to her. “You won’t need extra time on the next exam. You earned a 100%.”

The final exam began with a complicated question about a space shuttle that left Angela completely confused. She rushed through the rest of the questions. *If I fail, I fail*, she thought.

Slide 14

Sharon Whitby

Sharon Whitby was a graduate student TA in Computer Science.

This semester, there was a young man in her class named Jeff Eberhagen who seemed overqualified for the course. Not only was his coding correct, but he sometimes added extra features to the programs. Sharon was impressed.

Sharon gave an assignment for students to design a computerized dating program which would match people up based on their interests.

A week later, Sharon looked at Jeff’s results closely. There seemed to be too many variables. She found a puzzling equation. “If gender1 does not equal gender2, then genderpref=0. If gender1 equals gender2, then....”

Sharon put down the paper. The assignment was incorrectly done. Sharon disapproved of homosexuality in principle, but she knew that she shouldn’t let her beliefs influence her decision. Had she let Jeff get away with too much on the first assignment? She couldn’t bend the rules.

Slide 15

Melanie Wong

Professor Melanie Wong, chairperson of the Mathematics Department, looked around her at her colleagues as they sat in a department meeting. “Recently,” Melanie began, choosing her words with care, “I received a letter from an organization that provides support for women in science and math. Women who major in mathematics as undergraduates tend not to persist into higher levels of education. They are asking us to include female mathematicians in our course material. I would like to hear from you as to what you think about this, and what you could do in your courses to make this happen.”

“This is all very well,” Ross Kosovitch said, “But mathematics is a neutral science. Of course, women have contributed to mathematics, but to single them out seems biased.”

Another senior mathematician nodded in agreement. “I believe that we should all make an effort towards mentoring female students,” he said. “But to skew the curriculum is a disturbing proposition.” Many of the other professors nodded in agreement.

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