Case Study #1
Student Perspective

My professor wants everyone to buy this $120 online homework system subscription on top of the textbook. He said "if you're paying $60,000 a year to come here surely another $100 can't hurt." What he doesn't understand is that I don't have $120 right now, and that's like two weeks of work-study to earn it. Not everybody is paying $60,000, I couldn't be here without scholarships and loans and they're not nearly enough to cover everything. What if my car breaks down or I have to go to the doctor?

Case Study #2
Student Perspective

The inner-city environment is completely different from campus, because whether you are wealthy or non-wealthy there is a code that everyone has to abide by. For the most part this code is not understood by students who live outside of inner-city areas or outside of the United States. A lot of students and faculty don't understand the transition that inner-city students of color face when they return back home and when they come to campus. They have to change a huge aspect of their identity, and during the transition they find themselves questioning who they are, in relation to both spaces. Some come to the conclusion that they are living to the expectations of the Other. This of course causes conflict between students of color, and division within students of color. This division is silenced by the white space that we are part of when we come to campus. It is silenced, because the one thing that as students of color we all understand is, no matter what our socioeconomic class is and where we are from, there is a greater outside force that we have to deal with and that's the white space.

Case Study #3
Student Perspective

I'm a Latina student from a public high school. I did really well in high school; I graduated in the 10% of my class. I took lots of science in high school -- biology, chemistry and physics, and pre-calc math. I really liked my physics class and like reading about the latest discoveries of dark energy and the new telescopes being built to study the cosmos. I applied to Bryn Mawr College in part because of its reputation in the sciences, and because I want to be a research scientist. I was so happy when the final aid package came through to make it possible. My parents were less excited, I think. They were first in their families to go to college, and they've always pushed us to work hard in school and get a degree. But they didn't understand the whole scientist thing and were nervous about me going so far away and having to take out loans. They wanted me to stay home and pursue something practical like business or pharmacy school, and maybe they were right.

This first semester has been amazing in some ways, but also scary. My first physics exam wasn't at all what I was expecting; it was nothing like tests in high school. And I got a C! I've never gotten a grade below a B, but I'm starting to think maybe my high school was just really easy, and that's why I did well. We certainly didn't cover anywhere near as much as in college physics. My hall-mates are also freaking out about exams, but I think they're just saying it to make me feel better. I'm the only Latina on the floor and probably the only public-school student, too, so they are all probably better prepared than me. We're not supposed to talk about grades anyway because of the honor code, and this doesn't seem like the kind of thing I should ask my professor about. I don't want him to think I'm grade-grubbing or something, I wouldn't want a good grade if I didn't deserve it.

Case Study #4
Student Perspective

I'm so glad I didn't drop my physics class earlier this semester. Yes it's hard, but I once I started to get to know people in class I realized it was hard for everybody, and now that we've started working on problem sets and studying together it's getting better. Sarah has been a big help – her dad is a professor and had great advice on how to study for exams. And working with Elizabeth's been fun too, she doesn't care at all about grades, but she's great to talk about cool physics ideas for hours with.

Still I don't feel like I really fit in or anyone really understands what it is like here for me. Professor Hans is always telling stories about things that got him interested in physics. For example, the time on vacation in Italy when they went to see Foucault's pendulum, the time at space camp in Florida where he got to experience simulated free-fall, or building his first computer with his Dad. I saw other students nodding, but I had no idea what he was talking about I mean, it's not like I grew up in "the barrio" or anything, but still, do normal kids really do all of these things? My high school was mostly Latino, but we weren't poor – our parents had good, middle-class jobs. But no one I went high school with went to space camp or to Europe or anything like that.

Case Study #2
Faculty Perspective
Last week we were talking about addressing white privilege inside an inner city classroom and only two students spoke. I am not really sure why students didn't speak. Maybe it was discomfort, fear, or lack of interest. How does a professor or teacher deal with silence and differentiate between the silences? If it was discomfort, will this discomfort stop, once they begin writing their journals for one another? Or will the journals just make people feel more uncomfortable or silenced?

Case Study #1
Faculty Perspective
My college recently started a community college bridge program that allows high-achieving students to transfer credits here and complete a bachelor's degree. I worry that these students are underprepared to succeed here. I'm only one person – how can I teach the same material to students with radically different levels of preparation? One of my colleagues suggested I use an online homework system to give additional assignments to students who need more review so maybe I will try that.

Case Study #4
Faculty Perspective
In my physics class this semester, I have started to share more about how I became a scientist and what experiences inspired me, in the hopes of inspiring my students. Most of my students seem to enjoy this, and some have even said so and shared experiences of their own. However, when I look around the room, I feel like I'm not reaching the students of color specifically. They don't make eye contact with me; they look out the window, or at friends, or stare down at their notebooks. I've also noticed that these students are less likely to show up at my office hours, and they always seem to sit with each other. Am I just being paranoid? I really want to connect with all of my students, and I worry that I am saying or doing something that offends some of them without realizing it. On the other hand, I don't want to offend anyone by singling them out and asking them what's going on. What if I am just imagining all of this?

Case Study #3
Faculty Perspective

Today I handed back the first graded exams of the semester. To me, this exam is a great way for students to begin to understand how to apply the information they learned in class and show me their thinking process and problem solving skills. Most students receive grades lower than 80% because it's a difficult exam, but I give many opportunities to improve their grades throughout the semester. I know that many students are overly concerned with their grades, so I'm always surprised that no one comes to my office hours. Maybe I should change the time or something?

Be Explicit about Stance and Pedagogical Rationale

Make Expectations Explicit

Get to Know Students

Share Your Own Experiences

Regarding the class: At the beginning of the semester, ideally the first or second class meeting, distribute index cards to students and ask them to take a few minutes and write down why they are taking the class and what they hope to get out of it. Tell them you will collect these. Have a conversation with students after they have written on their cards. Also, take the cards away and read them and, if it seems appropriate, share the student statements in generic form (i.e., not with names or any other identifying information) so that everyone knows the range of reasons why people are in the class.

Regarding Disciplinary Approaches: Find occasions (in class) and forums (e.g., syllabus, in framing assignments) to make explicit (a) general expectations regarding discipline-specific ways of thinking and writing and (b) your own particular expectations regarding these in a particular course. Ask students for their experiences of and feedback on these.

Regarding Assignments: With any forum for participation in the class, graded or ungraded but particularly graded, be explicit up front (in syllabus, in introducing the class or an assignment) about what your goals and expectations are for the assignment and check in with students regularly about how they are experiencing the assignment, what they are getting out of it, and what their frustrations with it are. This kind of ongoing dialogue takes time, but it is worth it so that students feel clear about and engaged in the assignments.

Professors' Expectations: When asking students to write down why they are taking the class and what they hope to get out of it, answer those questions yourself and share them with the class. Clarify and articulate for yourself (a) general expectations regarding discipline-specific ways of thinking and writing and (b) your own particular expectations regarding these in a particular course and find occasions (in class) and forums (e.g., syllabus, in framing assignments) to make those explicit. With any forum for participation in the class, be explicit up front (in syllabus, in introducing the class or an assignment) about what your goals and expectations for the assignment are and check in with students regularly about how they are experiencing the assignment, what they are getting out of it, and what their frustrations with it are. Then make choices about how to clarify or modify your expectations.

State explicitly and repeatedly the reason why you are doing something or asking students to do something.

Be clear about but not impositional with your own biases and commitments. They inform your practice regardless of whether you name them or not, so naming them makes for a more genuine dialogue.

Consider your own 'social location' in your thinking about what and how to share aspects of your life.

Think ahead of time—before you begin teaching a particular class—about the kinds of things you feel are comfortable and appropriate to share with students within the context of exploring the subject matter of any given course, and be aware as you move through the course of opportunities to share your own personal angles on or experiences of the subject.

Find ways early in the semester to get to know your students, such a questionnaire or an interest or experience survey.

Sources for ideas:

What Kids Can Do. (2003). "First Ask, Then Listen."

MacBeath et al. (2003). *Consulting Pupils: A Toolkit for Teachers*

Provide Various Forums for Participation

Use Multiple, Inclusive Examples and Illustrations

Consider the Role of Silence

Be Allies and Advocates

Analyze the examples you use to illustrate concepts or points and consider whether you are making assumptions about background knowledge and experiences.

Building on what you learn from getting to know students and what you are comfortable sharing from your own experiences, generate a range of examples that illustrate different concepts or points, and include more than one example or illustration in your discussions.

Think about the nature of participation you want from students—listening and taking notes, engaging in discussion, etc.—and think about what different learning styles, cultural and otherwise, students bring to your classroom, then configure the room in various ways at different times so that it is most conducive to each of those modes and styles.

For active student participation, create smaller, structured forums—talking briefly with one other student; writing for a minute, then sharing with a partner, then sharing with the larger group; etc.—within which students can clarify and deepen their own ideas, gain confidence, and prepare to contribute to larger class discussion.

Make conscious with whom you align yourself and why and try to complicate, question, and perhaps expand that positioning.

Find ways to be clear about how you position yourself in relation to students and speak with students whose voices are often marginalized or silenced but without silencing other voices.

Find ways to bring various students' voices into dialogue.

Consider ways you can make yourself vulnerable and take risks comparable to—not necessarily the same as—the ones you ask students to take.

During the course of a class, be conscious of allowing for student silence—and remaining silent yourself—while students have the chance to think and formulate their thoughts.

Create regular opportunities—short writing times, memos, Blackboard forums, etc.—for students to have silent times during and outside of class to process what they are learning.

Consider ways to bring a variety of student voices into dialogue within the class without making students too vulnerable, such as reading aloud anonymous journal excerpts and framing/facilitating discussion around them.

Be More Conscious and Deliberate

Giving students opportunities to think and talk about the course subject

Encouraging, demanding, and actively managing the participation of *all* students

Building an inclusive and fair classroom community for *all* students

Wait time: Increasing wait time to promote student engagement and participation,

Allow students time to write: Another way to scaffold wait time is to explicitly require students to write out one ideas that capture their initial thoughts on how to answer the question posed. This act of may lead students to discover points of confusion or key insights.

Think–pair–share: This activity generally involves giving all students to think (or usually write) about their ideas on a question. Then, students are charged to turn and talk with a neighboring student, compare ideas, and identify points of agreement and misalignment. These pair discussions may or may not be followed by a whole-group conversation in which individual students are asked to share the results of their pair discussion aloud with the whole class.

Do not try to do too much

One strategy for prioritizing how to spend precious class time is to decide on which biological ideas in a course are most difficult to learn, are rooted in common misconceptions, and/or represent fundamental biological principles.

Identify the choices we make for particular pedagogical reasons and then analyze them for how they might also address other pedagogical issues, particularly, how they might be responsive to diverse students; Take a step back from the choices we make regarding how we construct and facilitate a course and ask ourselves if there are other choices we could make that would be more responsive to diverse students.

Step back and try to look at the content of our courses with the eye of someone unfamiliar with it and think about what might need to be flagged or highlighted; and

Find and develop a relationship with a long-term consultant, ideally someone in a cognitive place that is very different than your own.

Learn or have access to students' names: Having students submit index cards with their names and personal information is an easy first step to learning names.

Integrate culturally diverse and relevant example: Attention to integrating culturally diverse and personally relevant connections to the course subject can demonstrate for students that diverse perspectives are valued in your classroom (Ladson-Billings, 1995).

Work in stations or small groups: Instructors can structure opportunities to practice thinking and talking about the course subject by regularly engaging students in tasks that require students to work together in small groups. Care must be taken to be explicit with students about the goal of the group work and, whenever possible, to assign roles so that no student in a small group is left out (Johnson *et al.*, 1991, 1993, 1998; Tanner *et al*., 2003).

Use varied active-learning strategies: The "best" way to teach equitably may be to consistently provide multiple entry points into the conceptual material for students. Lack of variation could result in the alienation and exclusion from learning of a subpopulation of students.

Be explicit about promoting access and equity for *all* students: Explicit statements by the instructor about the importance of diverse perspectives in science can make issues of fairness and equity explicit. Instructors can share with students why they use the teaching strategies they do, for example, sharing the reasoning behind having students write to allow thinking and processing time for everyone.

Hand raising can establish a culture that the instructor expects all students to be participating. The instructor can also be explicit about asking for "hands from those of us who haven't had a chance yet to share" and strive to cultivate a classroom conversation that goes beyond a few students.

Multiple hands, multiple voices. Instructors can set the stage by asserting, "I'm going to pose a question, and I'd like to see at least three hands of colleagues here who would share their ideas. I won't hear from anyone until I've got those three volunteers."

Random calling using popsicle sticks/index cards: Ithe instructor is explicit that all students in the course have great ideas and perspectives to share, random calling on students in courses can broaden student participation.

Assign reporters for small groups: Assigning a "reporter"—an individual who will report back on their small-group discussion—is a simple strategy to provide access to verbal participation for students who would not otherwise volunteer.

Whip (around): The instructor poses a question to which each individual student will respond, with each response usually being <30s in length.

Monitor student participation: During each class session, instructors can keep a running list of those students who have contributed to the discussion that day. When the same students attempt to volunteer for subsequent times, instructors can explicitly invite participation from other students, using language such as "I know that there are lots of good ideas on this in here, and I'd like to hear from some members of our community who I haven't heard from yet today."

Monitoring
(your own & students')
behavior to cultivate divergent critical thinking

Teaching *all* of the students in your classroom

Teach them from the moment they arrive: Instructors are best served by considering what students are learning, not just about the subject matter, but also about culture of the classroom from the moment they enter the room. If the course is about learning biology, then instructors can implicitly and explicitly teach this by engaging students in exciting, intellectually challenging, and rewarding experiences about biology on the first day of a course.

Collect assessment evidence from every student, every class**:** Frequent collection of assessment evidence is essential for instructors to know the learners they are trying to teach. While the nature of the assessment evidence may vary from class session to class session, the evidence collected from each and every student in a course can aid instructors in continuously re-evaluating student ideas and iteratively changing the arc of the course to best support the learning of that course's student population.

Ask open-ended questions: Open-ended questions are by definition those which have multiple possible responses, such that inviting answers from a large group can yield more than an expected set of responses (Bloom *et al.*, 1956; Allen and Tanner, 2002; Crowe *et al*., 2008).

Do not judge responses: To create a safe environment that encourages students to share all of their ideas, instructors may be best served in acknowledging student responses as neutrally as possible. This does not require inadvertently supporting a scientifically inaccurate idea. Clearly stating "I'd like to hear from a number of us about our thinking on this, and then we can sort out what we are sure of and what we are confused about," sets the stage that all the responses may not be correct.

Use praise with caution: Instructors may inadvertently convey to the rest of the students who are not participating that the response given was so wonderful that it is impossible to build on or exceed. Using praise with caution is essential, so other students feel that they still have something to add and can be successful in sharing.

Establish classroom community and norms: Common group norms established by experienced instructors include the following: "Everyone here has something to learn." For many instructors, these classroom norms are simply verbally asserted from the first few days of a class and then regularly reiterated as the term progresses.