

This interview with P.K. Imbrie, Assistant Professor of Engineering at Purdue University, took place on the campus of Clemson University on March 19, 2001.

Susan Ledlow: How long have you used cooperative learning?

P.K. Imbrie: Probably about six and a half years now.

Ledlow: Why did you start to use cooperative learning techniques?

Imbrie: Actually, I attended a workshop by Karl Smith—and I had done the traditional “race-across-the-board” kind of classroom teaching—and then he came and gave a workshop, and I went “Wow! This is really cool,” because you actually engaged the students. Well, for the workshop he engaged us, but I saw how you could use that for students. So I went and tried it right after that, and it was really neat because you watched the students doing stuff versus you doing stuff, and I think that's what teaching's all about.

Ledlow: How would you compare your experience using cooperative learning versus traditional learning strategies, like lecture?

Imbrie: Actually, you'd have to [specify] freshman, sophomore, junior, senior—because I think [that with] each one of the levels of students, their academic maturity is a little different. For freshmen, learning how to learn is probably the most important thing they're going to do; and so they move from their model of success in high school—teacher gives, I memorize, I regurgitate, and I'm successful—and then they go off to college, and it's not that way. I found that active learning or collaborative learning in the classroom allows the students to engage at a level at which they're not normally used to engaging; but the risks aren't all that big, because they're interacting with all their fellow students. You hold them accountable, but they end up feeling like they're learning [throughout] the whole process, instead of twice a semester [right before the exams]. You give them an exam, and you see how well they've mastered the material. It's different for sophomores, juniors, and seniors, insofar as if they've never done it before—if it's the first time that they've been in an active, cooperative classroom—they're really resentful; because now they've already changed their model of success from high school to college in the transitional year, and then you're asking them to change it again.

The students that I think really engage in [cooperative learning] are those that, as soon as they come in, when they're freshmen . . . [learn that] this is how they can be successful in a college environment. Then they tend to adapt really well, and they're really a lot of fun in the classroom; because they know if they miss class, they've missed something The students want to come to class instead of feeling like they can miss it because they can just go read the book or get somebody's notes. It's not that I like to be center stage. It's more that when they're learning that level of responsibility of “I've got to show up to work,” or “I've got to show up to class,” then you're teaching them something besides just the academic part of it.

Ledlow: What skills did you need to develop as a teacher to be effective using cooperative learning? What does it take to be an effective cooperative learning teacher, as opposed to being an effective lecturer?

Imbrie: As I tell people all the time, you cannot go to class unprepared. You have to be prepared for the unexpected, because anything and everything will go differently. And I think that's probably why . . . there's resistance to moving to that mode by faculty members: they give up their control. I had a faculty member come into my class one time when we were trying to convince [him] to do this, and I met him afterwards, and he said, "There's no way. I mean, it's chaos in your classroom. You have no control." And I said, "But I have the ultimate control, because I can stop them anytime I want to and re-engage them, whereas you're just making everybody be quiet." And so the hardest part is being not afraid to try something different and to try it more than one time, because the first time you do everything, it never works the way you think it's going to. Either the students don't engage correctly or it takes a whole lot longer to do the exercise, so your classroom planning is way different.

I moved from a classroom where I thought I knew what everybody was going to struggle with to one where, when I made it be [a] more active, cooperative classroom, I actually listened to what they struggled with, and then we concentrated the class on that. . . . You'd have to go in with a whole repertoire of mini-lecturettes that you were going to do—as opposed to having this thought in your mind ahead of time: "Okay, I know exactly what I'm going to do." . . . And you go in, and they say, "Oh, no, no, we understand that," and so, now, you're kind of left with nothing, and you don't know what to do.

Ledlow: Do you explain why you're using cooperative learning to your students?

Imbrie: . . . One of the things I think we fail in is not explaining to the students why they're doing some of the things they do. In my classroom, I've started to move toward, "No, you'll never use this in the real world. This is for an academic exercise. You're doing this because if I don't force you to do it this way, then you're not going to act as a team." And they go, "Okay," and then they go off and do their teaming thing. When we first started this, we always said, "Well, we're doing cooperative learning and this teaming stuff because you're going to work as a team outside in the real world." The reality is [that by working together], they're going to be more effective. And I usually show data that tries to motivate them that this is the right way to go, that they're moving their model again from how they have been successful in the past to a different paradigm, and I think that's important for them to realize.

But, I think what we need to tell our students up front is that they need to move from [being] individualistic learners to partner learners; to move from a textbook, faculty-centered learning style to "my peers and everybody else can be equal contributors in this"; to move from a no-risk environment in the classroom, where it's very individual, to

a really public, high-risk type of thing. And those are some of the things I've never said in the past, but I'm getting ready to, because I think it's really important.

Ledlow: How do you set up your teams?

Imbrie: There are a bunch of different strategies, and it depends on where I'm at and also the level of the class that I'm teaching it to. With incoming freshmen, I can tell you what I avoid, and then I'll try to tell you what I do. I avoid, obviously, self-selected teams. When freshmen don't know anything about anybody, they select people for all the wrong reasons; they select because somebody looks good, somebody talks good, they seem personable—and those are generally reasons for a dysfunctional team. I also don't use self-reported data. I can use self-reported data in so far as, "What grade did you make in this class?" I can use that as self-reported information, but I do not use, "Are you a good reader?" or "Are you good at math?" because then it becomes an evaluation on their part, and their evaluation may not be the same as mine.

So, what do I do? One of the courses I teach is a problem-solving computer tools class. I ask them about things like their computer experience, and I'm very detailed. [I use statements like], "I can get on and play games. I read email. I can do spreadsheets. I write equations in spreadsheets." I try to go up the list, and then I take that information, I look at gender and ethnicity, and I look at the specific skill set that I want. And then I use those, initially, as the primary criteria for establishing teams. After that class has been together—maybe for the second set of teams—I won't use gender and ethnicity, because the class is usually a lot more familiar with one another, and one of the reasons you use gender and ethnicity criteria, at least from literature and in my experience, is because you don't want people to be overwhelmed with one another. And once they've befriended one another, then that tends not to be a problem. When I form teams a second time in the same semester, I'll use grades, and so I always use a heterogeneous team. In the second semester, I look at grades they made in the courses their first semester, as well as whatever the experience set is that I'm looking for in that particular class.

Ledlow: Do your teams stay together for an entire semester, or do you break them up?

Imbrie: If it's a first semester and a freshmen type of environment, I generally try to have two teams, unless I know ahead of time that I'm going to have a long-term project that will span longer than half the semester. If I have them for a second semester, generally when I do have a project that spans the semester, I'll keep them together the whole entire time.

Ledlow: Have you incorporated teambuilding activities into your classroom?

Imbrie: Positively. I go through formal team training. I usually span one to two lecture periods for that. It might also be part of a lab experience. We also go through and do exercises initially which are aimed specifically at just trying to bring them together to function as a team as best they can.

Ledlow: Can you give an example of an activity that you really like that you do as part of your teambuilding?

Imbrie: Well, I'm an aerospace engineer, so I have them build a helicopter. That's one of them. They're given a piece of paper; the purpose of it is: what team can come up with this paper helicopter design that will take the longest to drop to the ground from a second-story building? I've also used—although I can't do this one anymore—I used to have this whole pack of computer cards, punch cards, and I had them make a bridge that spanned between two coke cans, and it would support the weight of a coke can. They were one-class period exercises that were simply aimed at "Can we work together as a team to come up with an idea?"

Ledlow: Looking ahead to when they're going out into the "real world," what sorts of skills do they need have?

Imbrie: I think the most important things are their communication skills, their decision-making processes, how to form consensus versus compromise. Those are the most important things. They need the ability to do time management effectively. . . . I do work on that a lot with students—being aware of their time and not necessarily just starting a problem and working it until they get to the end—but rather, "Here's the amount of time you should spend on this task," and having them go, "Okay, we need to divide this up so that we can get this to the end, or get a solution." I'll say, "If I give you ten minutes, then I want a ten minute solution, not an hour solution in ten minutes." And, a lot of times the students, especially when they're doing team things, always feel like you're not giving them enough time to work on it. And I'll tell them my goal is not to get a product at the end of it but just the best answer [they] can give me in the time that is allotted—not the best answer that [they] could ever get. I think that's the big distinction between how students are used to working and what they actually have to learn how to do.

Ledlow: Under what circumstances do you choose to use cooperative learning rather than some other teaching strategy?

Imbrie: The goal in my mind is always to present things in an active, cooperative, collaborative way. But when pinch comes to crunch, and I'm coming up on a test date, then I will start adjusting that, saying, "Okay, I've got to go a little bit more to lecture mode." Or I make students really aware of [the fact that] I'm not covering this material. I try to use learning objectives effectively, so students know ahead of time that I may or may not cover everything. For a given course, the more defined my learning objectives are, the more clearly I state that I don't necessarily cover everything that's going to be on the exam, then I do not feel compelled to go through and verbalize everything. If I'm teaching a course for the first time, and I don't have it all planned out in its n^{th} degree, then I find myself moving to lecture mode more often, simply because I'm afraid if I don't say it, then they're not going to get it—even though I know there's no correlation between those two things.

Ledlow: How is preparing for cooperative learning different than preparing for a lecture?

Imbrie: I don't think it's different at all. I think that when I would prepare for a traditional lecture, I would go through and say, "I'm going to write this on the board," and I would just start writing, and that's what would be written on the board. When I prepare for a cooperative type environment, I'll say, "This is all that I want to do. I'm going to cover this. This is what I'm going to write on the board, and then I'm going to have the students work on this part of it." So I don't see how I mentally prepare or physically prepare for this being different. The only thing I have to do differently is that I lose the timing element that I would have in a traditional straight lecture format. I know I can cover three pages of notes in a traditional lecture, or whatever the number is, or this number of slides, if I'm doing PowerPoint. When I do a collaborative type of environment, I put in the exercises, and I have yet to come up with, even after repeated times, a way of saying, "Okay, I know this will only take ten minutes." Now, I have gone to the mode where I tell students, "You don't have to get to the answer. I mean, the answer isn't the most important part. It's the process that you're going through that's the most important." And, to help that out, so that they feel more comfortable, I find myself giving them, not necessarily the answer, but going through the process really quickly afterward, so that if they didn't go through it all, they at least have a way of being able to reflect back upon it.

Ledlow: Have you used any pre-designed cooperative learning strategies like Think-Pair-Share, Jigsaw, or Academic Controversy.

Imbrie: Academic Controversy, I don't. I did a little bit when I was at Texas A&M when we did a little bit of ethics in class. But, primarily, I use Think-Pair-Share all the time. I use Jigsaw on an irregular basis—and it's not that I don't like Jigsaws, because I think they're great—it's just that the current classrooms I've been teaching in just aren't suited at all for being able to do Jigsaw. The students just can't move around to enough different places, and so that would be the only reason I don't use them.

Ledlow: If you're not using a pre-designed strategy, how do you go about planning an activity?

Imbrie: Actually, I can go through one and maybe that will give you a little bit of insight. In a lab class that I have taught—it's actually a lecture class that has a lab component; it's a computer tools class—we're very product-driven. We wanted them to use computer tools to solve engineering problems, which was one of the points of the course. We'd lay out a problem, and then we'd say, "Okay, as a team, go in and do your team thing and give us a product at the end. And, by the way, you're going to be held individually accountable for this, for however it was laid out." And we found that they were very product-driven because we forced them to be, because we said, "We want an answer to this problem."

. . . Now I structure that same class so that . . . we have five or six tasks that we'd like them to complete. The first two of those tasks are really the meat of what we want them to learn. Everything after that is embellishment. And then the students go through that at their own pace as a team. So, the first component says, "As a team, work on this. The meeting coordinator should figure out how much time you want to spend." . . . Some teams may take more or less time. They go through these tasks at their own pace, as a team. There's nothing they turn in during the lab, but, at the end of the lab period, we give them a check for [a level of] understanding that we know should take "so-much-time". Sometimes we have them turn [the tasks] in individually; sometimes we have them turn them in as a team; sometimes we have everybody work on it, then we randomly pull one student's, and that reflects the team grade. And so it forces them now truly—although there's no product that they have to [produce]—to know that they have to learn along the way, or else they're going to be in trouble. I try to do my homework assignments that way; I try to do my in-class assignments the same exact way.

Ledlow: A lot of people who are new to cooperative learning wonder, "What are you doing while your students are working on things in the class?"

Imbrie: I don't stand there and just look around. That's part of what makes it hard . . . from a faculty perspective; because you're going to go in and see what the students are actually learning, and, a lot of times, you don't like what you're seeing, because they're way off, doing something totally wrong. But that's what I think is one of the neat things about having a cooperative classroom. You actually see what the students do and don't understand. You're able to spend time with the students that are really struggling. And the students that are doing fine . . . I actually use them to go off and help other teams and students that are struggling. So, I'm going in. I'm asking students how they are participating. . . . Also [I am] re-engaging students. There will be students that are off reading the newspaper, reading a book, surfing the Web. And it's those students I go up to generally and say, "Okay, where are we at?" and the team says where they're at. And then I'll ask a particular individual that I know has not been engaging [with] what they're doing, and, generally they have to say, "Well, I was reading the newspaper. I wasn't paying attention." And then they re-engage, and they stay engaged then. So, I'm running around, trying to keep things moving along. If the class is small enough, I'm doing it by myself. If it's a typical freshman class, which are large, then I use other facilitators. I either bring in my teaching assistants or I have peer teachers that come in and help facilitate the classroom.

Ledlow: How do you debrief teamwork? For example, do you call randomly on teams to present to the class?

Imbrie: I do several different things. I do randomly call on teams and on individuals to come up and present whatever their team has done. I will, at the end, sometimes give a quiz. I might first do it as a team, and then do it individually. Sometimes, I do it individually followed by a team quiz. I do it every which way that they think I'm not going to do it, to keep them engaged in the process. As I tell people, if you do it the same way

every time, then students are going to know what they can and can't do. So, I constantly change my mode of operation to keep them off-balance, in terms of what I'm going to do, because that's how I think I hold them accountable. That's probably the thing that they dislike most. Students don't like that level of accountability.

Ledlow: Well, that also answered part of my next question, which is about tips for ensuring individual accountability in teamwork. In projects that they might do out of class, how do you know that one student didn't do all the work?

Imbrie: I'm not a really big fan of peer evaluations, but I'm coming to learn that I have to use peer evaluations. I don't like students to have to evaluate peers, at least at a freshman level, which is primarily what I teach right now. Students aren't at a level where they can actually evaluate, or we ask them to evaluate the wrong things. We have them working on a team project, and they are very product-oriented. [They say], "No I was not a big contributor of this, but I showed up at every meeting," "I didn't understand what was going on, but I showed up to try to contribute." They evaluate themselves in a bad way because they feel like they're not helping with the product. We're asking the wrong questions. I just learned this as I continue to evolve here. What we really need to be asking the students is how did their presence help or hinder the process of producing whatever it was that they were doing. . . . As an example, we say, theoretically, that there is no competition; everybody can get an "A." Well, then, how do you evaluate? How do you distinguish? How can I use that as a mark of saying that this really helped students learn, because everybody got an "A." I think that part of what we want to look at is: "How satisfied were you with the learning process?" To me, that's a much more important element. If a student is very satisfied with the learning process because of the teaming environment, then we're doing a better job.

Ledlow: Do you have any tips for classroom management? Are you using team folders? Are you using any sort of class management software like Blackboard or Web CT?

Imbrie: Actually, we use WebCT, number one. We're just in the process of trying to deploy what we call a virtual classroom. The idea behind it is that we could have a lab-like, classroom experience, without the students actually having to go to lab. It uses a program like Blackboard where I can deploy stuff to them over the Internet in a real-time fashion, and they can be in their dorm room, or in Kalamazoo, Michigan, and see the same thing. We're trying to do that so they can meet as a team and work as a team and also get help as a team, albeit via the Internet experience. Everything they do is always turned in, in teams. Even if it's an individual assignment, they turn it in as a team because that's how we keep track of the grades. When I hand back exams or collect exams, or hand out homework or collect homework, it's always done as a team. I don't think my teaching assistants specifically use folders, but it's just that everything is grouped out of the team.

Ledlow: In general, is it a different enterprise to manage a cooperative learning classroom?

Imbrie: I think that it takes a lot more coordination. Training the people that you work with is probably the biggest thing that I've noticed in what I have to prepare for. When I did this with a group of people where everybody was already familiar with active, cooperative techniques, there was already "buy-in" by those that were involved; it was a really easy process because everybody knew what their role was. When I started doing it with people that had no idea what this was, or how to experience it, it was like pulling eye-teeth because they struggled with some of the same issues that students struggled with in terms of teaming. It's the individual, "I know I can do this on my own." Once they saw that it was better and that students could learn more, then I started to get buy-in from them, and it became easier. From an operational perspective, it took more to overcome that initial resistance. Once you get up to speed on it, then I actually find it a lot easier. They know what to do. They know how to do it. They know what's going on.

Ledlow: You touched on this a little bit, but I want to talk more specifically about assessing, grading, reflecting. How do you assess student performance in terms of individual versus group grades?

Imbrie: In general, I always try to make my class have a large enough teaming component to the grade that they want to engage in it but not so large that their grade would be devastated should their team be totally dysfunctional. In that vein, I don't have any team exams; I just have individual exams. Projects are always done as a team. I have both individual and teaming homework assignments. Their labs are always done as teams, but they are held accountable by the various methods I've talked about—individual and team random selection.

Ledlow: Every time you have your students do an in-class assignment, do you necessarily grade it?

Imbrie: No. In fact, again, this is a transitional issue for freshmen. When I started the process, I would just do like I've done before for sophomores, juniors, and seniors—[I say], "We're going to work on this," and they just naturally engage. When a new freshman found out that [the assignment] didn't count for anything, it didn't matter what you were doing—they were not engaging in the process. So I found that I always had to start out with it counting for something, and then, later on, they would ask, "Well does this count?" and I would say, "I'm not telling you. I mean, it may or may not. You just do your work." And once you get them weaned off of this "I'll only work on it if it's for a grade" kind of thing, then they tend to engage in the process really well.

Ledlow: How do you get feedback on whether or not a lesson that you've designed and implemented is successful?

Imbrie: Actually, this is one of the areas that I'm weak in. I don't listen to the students enough in terms of, I have not put together specific evaluation criteria at certain points throughout the semester to say, "Are we doing this right or wrong?" Since I've been at Purdue, I've just waited for the end-of-the-semester evaluation. And I should have

known better from my experience at Texas A&M. There, we did this on a regular basis—got feedback from the students.

Going back to one of your earlier questions, I think that's probably another big difference between a lecture and cooperative learning. In a traditional lecture framework or set-up, you do the same thing the whole semester. You do it the same way. You give homework the same way and tests the same way. Waiting until you get to the end-of-the-semester evaluation is a reasonable way to figure out whether you're doing it right or wrong. In the cooperative classroom—where you're constantly using different techniques to engage the students—if you don't get regular feedback from them, then you'll never know whether you're being effective or not. So I think it's important.

One of the things that I did when I was at A&M was develop what I called interaction groups. A select number of students from within the class met with me on a weekly basis. That was where I got most of my feedback about how we were doing in terms of the kinds of exercises we were doing or how we were assessing them or what they were having to work on in class. And we could really easily guide or redirect our efforts because we got really instantaneous feedback and very candid feedback. The students that presented that, were accountable enough because they were sitting face-to-face with you, and you could actually listen to what they were saying to you. It's something that I am going to implement now, because I need to get more regular feedback.

Ledlow: I want to follow up on what you said about the interaction groups giving you feedback. Was this some random selection of students, and was it the same group each week all semester?

Imbrie: Yes. It actually depended on the number of times we formed a team. We had set it up so that a faculty member would meet with one representative from each team. We asked if there was anybody that didn't want to volunteer to do this, and they would obviously be discounted or not used. Then we just randomly picked one person from each team, and they met with a faculty member once a week to say, "This is what we like," or "This is what we don't like." What we also found is that this was a really good way for us to be able to make students aware of why we do certain things. Going back to one of your earlier questions—"Do we make students aware?"—we never did overtly say in the classroom, "We're doing this because—" But when we met with our interaction groups, we'd give them the reasons why we were doing things, and then that would get disseminated through each of the teams.

Ledlow: How do you expect students to work together outside of class?

Imbrie: It depends on the class. For projects, positively, I expect all of that work to be done out of class. I would say that in a typical semester—for homework kinds of activities—probably a third of their homework assignments are out of class, where they're expected to get together as a team to work on it, in addition to whatever their project time is. Experience from the past indicates that if you ask students to do too much work outside the classroom, then they start to resent the teaming experience;

because they try to juggle their schedules, or they have to make their schedules match so well. And so I don't try to eliminate it, but I try to minimize it.

Ledlow: You mentioned that using peer assessment is a way of having students be able to deal with the complaints of “One student did all the work,” or “One student dominated the process.” Are there other ways, besides peer assessment, for avoiding those complaints about problems happening outside of class?

Imbrie: I've actually been trying to do this now for two semesters, and I think I'm finally going to start to get results. I've put together a survey that they fill out on a weekly basis. It's five questions. It's web-based. I used it a while back, but accumulating and getting all the data, and putting it to a form where you could actually use it, took so long. Now, there are good enough web-based tools where you can ask students how they're doing as a team and get feedback and sort that with a macro. Now you can identify pretty quickly whether teams are being functional or dysfunctional. I will use that in the future for projects where students go the whole semester saying, “Everything's fine,” then at the end they say, “Well, I did all the work.” I'll have documentation for that. Even when we do peer evaluations, students don't document things well enough for you to be able to follow what's actually going on.

Ledlow: Team conflicts—how do you handle them? Do you get involved?

Imbrie: I'm very specific about what I do. I do not talk, and I advise my teaching assistants not to talk, to individuals on a team that are having problems. I ask them to forward their names and e-mail addresses to me, and then I ask the team as a whole to meet to talk; and I go through facilitation with them. I have really specific things that I do. The first part of it is all written, and I explain to them that they do the writing because I don't want them to change their answers as they hear what other people have to say. I ask them (1) What are their goals for the semester? (not just “coming to class”), (2) What are their goals for the class? (3) What are their Plus/Deltas toward their goals for the class and semester? And then I have them bring their Code of Cooperation. As part of their team formation, they developed a Code of Cooperation. I ask them what they have individually violated on their Code of Cooperation. And then I ask them to write down the elements of their Code of Cooperation that each other member of the team has violated. And then we just start a Roundtable type of discussion, where we generally find that they've either misunderstood or misrepresented—that they didn't really hold one another accountable to their Code of Cooperation. Or that one person violated one thing, so someone else thought they could violate something else, and it just kind of started from there.

Ledlow: Class size—how large are your classes?

Imbrie: I teach an honors class that is a hundred and sixty-five students. We implemented, for the first time at Purdue, use of teams in our large class, which is a four hundred person class. The hard part in the four hundred person class is trying to do it on your own. I said, “We've got to have facilitators in the classroom; we can't do this by

ourselves.” So now we're going to bring in and have more of our teaching assistants and undergraduate peer teachers in the classroom.

Ledlow: So obviously you think cooperative learning is appropriate for large classes?

Imbrie: I think you can use it—and I stand by this—for any size class that you want to. What's the limitation? The number of facilitators that you have. I think that you need to have about one facilitator for seven to eight teams of students—a team size being four students in my definition. If you have that, you can go any size that you want to.

Ledlow: Do your methods or strategies differ though, depending on class size?

Imbrie: No.

Ledlow: As you've gotten more skilled as a cooperative learning teacher, what has changed? You mentioned the word "evolve." What are you doing differently now than when you started?

Imbrie: One, I'm making students more aware of why we're doing an active, cooperative classroom. Two, I'm trying to lay out their expectations, or I'm trying to get them to realize that their expectations and my expectations don't necessarily coincide; and that they have to move from what they expect, to what I expect, if they want to be successful. Making students aware of that expectation, I think, is really important, especially in the active, cooperative classroom, because it is so different than what they are traditionally used to.

As a specific example, I use Bloom's Taxonomy, and I point out the lowest level. That level is knowledge: it's memorized facts. . . . I put up a slide, and it says, "How many of you will be successful if you attain this level of learning?" They don't know where I'm going with this, and ninety-nine percent of them will say, "That will get me an "A" or "B," if I can do that in class." And then I unfold, saying that this is the lowest level of learning that there is, and that in this class you have to be able to get up to whatever the higher level is.

I think it's the expectations that we fall short of, as faculty members—what we expect of our students versus what they expect a classroom environment to be. "If I do all my work, and I do it all perfectly, I deserve an 'A.'" And you're saying, "No. If you haven't learned how to work with other people, then you're not going to do well." Course objectives need to include being an effective member of a technical team. . . . If everybody in the university did it that way, then you wouldn't have to do that. But because, generally, you're the only one that's doing it, and you're doing something different than what they've done before, you have to get more buy-in from them.

Ledlow: If an engineering faculty member who wasn't familiar with these methods came to you and said, "I'm considering using cooperative learning," what advice would you give that person, in terms of both the good and the bad?

Imbrie: I would say, "This will be a life-changing experience for you." We had a physics faculty member, as part of the Foundation Coalition project, that said, "You know, I was getting ready to retire. I'm on the tail-end of my career, and teaching class was just no fun. I got involved in this, and this has re-energized my desire to be in the classroom." I could say that to anybody that teaches. It will invigorate. You actually see why you're there. You're not just getting up and being a talking head. It can be very exciting.

On the flip side of it, it can be one of the most depressing things that you've ever experienced. To walk around after you've gotten done doing the best ten minute presentation of material and for students to be totally clueless as to what you've just talked about is very, very disheartening. So, we can live in our own little world thinking we just did a great thing, and the students walk out the door. Or, we can actually try to figure out what it is they're not understanding, and try to address those issues. I think that's what the active, cooperative classroom does. You start to see what they really do and don't understand, instead of waiting until mid-semester, giving them an exam, and saying, "Oh, yeah, all these kids are stupid," and then going on. That's generally how we always have done it.

Ledlow: Could you share some of your best experiences using cooperative learning . . . one of those moments where you said, "This is why I do this!"?

Imbrie: That should be an easy one to answer. I don't know if I could necessarily share an experience, but I could share student comments, and, to me, that is more important than what my experience is. When a student comes up to you, and they say, "You know, I'm finally starting to understand what's going on," as opposed to never hearing from anyone about anything, other than, "Why am I getting this bad grade?" To me, that's what the active, cooperative classroom does. It has given a voice to the students, and it enables them to be able to come to me and say, "This is working," or "This isn't working," or whatever the case is.

Ledlow: Any final comments regarding cooperative learning?

Imbrie: . . . The most important thing that we have to do as faculty members is helping students learn how to learn—or, another way of saying it, preparing them for this idea of lifelong learning. Through a traditional lecture class, we teach them how to be stenographers, and to go memorize whatever it is that they have to memorize, and to regurgitate that on an exam. In the active, cooperative classroom, students actually have to learn how to learn, because they have to learn how to communicate their ideas to other individuals while they're in that teaming environment. I think that's what this is all about.