

This interview with Darwyn Linder, Professor of Psychology at Arizona State University, took place on the campus of Arizona State University on January 25, 2001.

**Susan Ledlow:** I'm Susan Ledlow with the Center for Learning and Teaching Excellence at Arizona State University, and I'm here today with Darwyn Linder, Professor and Chair of the Department of Psychology. Darwyn, I'd like to start out by asking you, how did a social psychologist get involved in an engineering education project?

**Darwyn Linder:** Well, Don Evans, who is one of the original team members in getting the Foundation Coalition started here and at our partner institutions, went looking for someone who knew about group dynamics, and his research led him to understand that group dynamics happened in psychology departments. And so he called the psychology department, and I was the person who taught group dynamics, and the Chair of the department at that time recommended that he call me. I was very intrigued by the project and by developing ways of applying group dynamics in engineering education, and so it seemed a very attractive thing to do, and we talked and got started and it went from there.

**Ledlow:** How did your research interest in group dynamics though come to include an interest in cooperative learning?

**Linder:** Well, I think that group dynamics folks are very much oriented toward applications. We study group dynamics in scientific ways and develop theories, but most of us really like working with groups as well, and so finding ways to apply what we know is always attractive. Cooperative learning was being introduced at our university, and it struck me. And, in fact, I remember having conversations with you [Susan Ledlow] and then developing some workshops that we did together. It struck me that group dynamics was a natural tool to use when developing cooperative learning, because people do cooperative learning in groups, and the better those groups are understood, the better they are structured in order to function well, the more successful the cooperative learning venture would be.

**Ledlow:** So, are you now using cooperative learning strategies in your own teaching?

**Linder:** I started using it primarily in my group dynamics class, which was a natural place, and the students were very receptive. But I've begun to apply it in virtually every class that I teach. Actually, over the last ten years or so I think it's infused virtually all of my teaching. The hardest place to do it, oddly enough, is with graduate students, who have come through the educational process with great records and records of individual achievement. And so getting a group of graduate students in a graduate seminar to use cooperative learning is one of the real challenges, but I've been pretty successful with that as well.

**Ledlow:** Let's talk about how faculty can set the climate for cooperative learning. Do you recommend that faculty explain to students why they're using cooperative learning;

and also, how should [faculty] respond to a student who says, “I just hate working in groups. I don’t want to do this”?

**Linder:** Well, I’m a big believer in doing everything out front, and not necessarily hiding my purpose or intentions from the students. And I think treating them as adults and letting them in on what’s going on is very important. It builds trust between the instructor and the class. I often encounter students who are resentful about working in groups because of the experiences they’ve had in what you [Ledlow] and others have called “old-style” group work, where you [teachers] assign a paper to a team of students and give them no way of actually accomplishing that task other than [telling them that] somehow they’re supposed to figure it out. So I explain to students who are reluctant that cooperative learning is really different than group work; and we try to construct groups that are effective, that work together well, and that really produce, and that the learning then is enhanced for everybody. Usually they’re willing to give it a try, and if we have some early successes and people begin to enjoy the process, then that phase [of reluctance] goes away after awhile.

**Ledlow:** You’ve done a lot of work with engineering faculty on getting started with cooperative learning and forming teams. What are some of your recommendations for forming teams in the classroom?

**Linder:** Well, I think the most important thing is diversity on the team—diversity along a lot of dimensions. You certainly want diversity in terms of academic talent and preparation. You don’t want all of the “A” students forming teams and leaving [out] all of the challenged or less well-prepared students. And that’s easily justified because the students who are more advanced actually learn more by helping the students who are not as far advanced to learn the tasks, to learn the things that are important for that team to function. So, academic talent diversity is a very important part of forming teams. Gender diversity, attitudes towards school, towards the course [are also important]. I just try to avoid allowing people to form together in little kinds of cliques that mutually support misperceptions and non-functional attitudes or dysfunctional attitudes. Forming them at random is one way to do that, but often I will look very carefully at the dimensions of diversity in the class and then try to put teams together that are structured so that we have different kinds of people working together.

**Ledlow:** As a follow-up to that, though, there’s some debate. When you’re in a content area like engineering where you may not have many women, do you take the ten women in your class and then scatter them out among ten different teams? Some people say absolutely you do; others say that they want at least two women on each team, at least initially. What are your thoughts on that?

**Linder:** I’d actually favor the scattering them out across the teams rather than [implying that] . . . women working by themselves, or working as the single woman on a team of males, would have some sort of a problem. That seems to recognize or maybe even communicate that this will be tough. I’d rather, I think, train groups so that they understand diversity, so that people are able to communicate with one another

effectively. And women, when they enter the workforce, are going to be in that situation anyway, and so I think it's a useful experience for them. But you do have to be aware of the issues, and there may be some women, who, for one reason or another, aren't quite ready to be alone in a group where there are some domineering kinds of males. And then pairing them up with another woman might be the thing to do. So I leave some flexibility, but I think most of the time I would prefer to construct the groups based on that diversity and have people learn the skills that they will need. . . .

**Ledlow:** How long should teams stay together?

**Linder:** I think they have to be together, if it's a significant task, for at least several class periods or several weeks. Some people say that you want to use teams that continue through the entire semester, and I think that's useful, depending upon the structure of the class. So there's not a pat answer here. If you have a class where there's a semester-long project, then semester-long teams make sense. If you have a class where there are many, many homework assignments and you want people to be in essentially support groups or teams doing that, you many want to set up those groups so that they last the entire semester. But there's also a benefit to having people experience, several times, forming a new team, working out the relationships and the communication patterns and the roles and the norms, and then beginning to function. Because the more often they do that, the more experience they have . . . the better they understand that process and realize that when you start a team, you don't just start working. When you start a team, you begin by developing the team identity and developing the ways in which you will work. That is, setting your structure before you just jump into the task.

**Ledlow:** Many faculty that I work with say that they shouldn't have to use teambuilding exercises. "I'm not a social psychologist," they might say, "So I don't know about teambuilding, and I'm not sure that it's necessary. After all, they're adults; they know how to work together." What do you say to faculty that don't feel that it's a good use of their class time to work on teambuilding and setting up that structure?

**Linder:** Well, first I would point out to them that they're making an assumption that I think there is a great deal of evidence to refute—the assumption, that is, that people know how to work together and work on teams. Our educational system, essentially after third grade or so, doesn't put people in teams. If you go to an elementary school, you see the kids sitting at tables, and they're in groups, and there's a lot of interchange and, in fact, a lot of cooperative learning. Some of the best practitioners of cooperative learning are people who teach in the elementary grades. About the fourth grade, you see now the kids are lined up in rows, and they get to raise their hands if they have the answer to a question, and it converts to some sort of individual competition. . . . The kids who have come to college now have been successful in that kind of a setting—competing as individuals—and they really don't know very much about working in teams. Actually, the ones with a background in scholastic athletics may have a better sense of how to work in teams and cooperate than some who have just been grinding the books. We had a great student here a number of years ago, Damien Richardson,

who was a strong safety or a free safety on the football team—a superb football player and also an excellent student in engineering. Damien understood teamwork. Damien was, I think, an exception. So first I would say, you can't really make that assumption that people know how to work in teams. Secondly, I think you can teach engineering while you're doing the teambuilding. You don't have to do teambuilding tasks that come out of the kinds of books that people have written about teambuilding where you build a house of cards or you try to build a structure with Popsicle sticks, although those are actually decent kinds of engineering tasks. But you can use the content of the course for the development of team skills by having relatively small, simple tasks that you can design that teach engineering content but also are used in this initial teambuilding phase. So I think you can accomplish both goals. But it takes planning, and it takes moving away from what many people have called the sort of "empty-head" model of learning, where you just sort of lift the skull, pour in the knowledge, put [the skull] back down, and send them on their way. You have to move away from that and help students be active in the learning process. Doing that while teaching, while having them learn what they need to know about working in teams, I think, is possible, but it does take designing those exercises.

**Ledlow:** Talk a little bit more about teambuilding. I'm not sure that everybody knows what we mean when we're using that term. So, what is teambuilding? What are the goals and how would one get started on a teambuilding process?

**Linder:** Well, the dimensions of a team—of a successful team—or the characteristics of a successful team are, one: they're cohesive. That means that people are attracted to the group. And so teambuilding activities are designed so that people get a chance to know each other, to find the attractive features of one another, and to become comfortable and attracted to being a member of the team. So that's one thing. Another is the development of roles and norms. Not everybody does the same thing on real teams in the real world. In fact, if you look at the kinds of teams that Ford Motor Company uses, people have different kinds of expertise and they come from different departments of the company in order to, say, design a new product that Ford wants to put out. So people need to learn the roles that they're going to play. They need to learn the norms of good behavior on the team or effective behavior on the team. Some of those roles are "Who's going to take a leadership position? Who's going to direct us toward staying on task?" There are other roles that evolve in teams. Generally there are two kinds: task-oriented roles and group-maintenance roles. It's an old, old dichotomy in social psychology. People need to explore those roles and help one another define the way in which they are going to fill those roles, because there has to be effective fulfillment of those role requirements within the team or it's not going to function as well as it could. They have to learn to communicate . . . they have to define the goals of the team. Now, the teacher, the instructor may have set up a goal of this is the project. The team has the ability to define additional goals: "Are we going to do the best project that we can?" or "Are we going to have more fun than work?" So they have to define those goals. . . . And then, finally, people have to realize their interdependence. Now interdependence is kind of a technical term. People are independent when they work alone and what they do doesn't affect anybody else.

That's sort of the western, frontier mentality. People are dependent when what happens to you is what somebody else determines—then you are dependent on that person for your outcome. Interdependence is what goes on most of the time, where what I do affects you, what you do affects me, and what we do together affects our joint outcomes. And so teams need to understand that concept of interdependence and that they have to work together in order to be successful. So teambuilding ought to be directed at that as well.

**Ledlow:** I want to follow up a little bit on the distinction you made [between] task roles and group-maintenance roles. In particular, I've heard some faculty say they like to assign someone the role of "leader," and I have a little trepidation about using that role in my own teaching. . . .

**Linder:** Well, if you look at leadership from a functional perspective, I think you can sort of demystify or take away some of the aura of that term, "leader." Being a leader includes a lot of specific behaviors, and it is not so much that someone has to be "the leader"—an appointed leader, an elected leader, an anointed leader—as that those functions have to be fulfilled. Now the task orientation and the group-maintenance orientation are, in many groups, divided between different people. One person will tend to focus on getting back to the task, keeping the group on task. Another person will be the one who relieves tension when they've been working hard for a long time and says, "Hey we need a coffee break," or "Has anybody heard a good joke lately?" to just relax and allow the tension to diminish and to sort of refresh the group. . . . There are many things that a leader has to do, but magically designating someone as the leader isn't necessarily going to bring about those behaviors. I think you have to look at a functional model of leadership, and leadership functions, and make sure those are performed. So some people do shy away from saying, "Ok, you're the team leader". Some would say, "You're the taskmaster, which has a little bit of a negative connotation but still defines what it is the person ought to be doing".

**Ledlow:** But what about a role like being assigned to check for consensus or to make sure that everyone was participating equally? That's also a leadership role.

**Linder:** Exactly. And those things that move the group forward toward its goals are all, or many of them [are], leadership functions. And they have to be performed—not always by just one person. So I think a functional look at leadership is very important to do rather than just saying, "You are the leader," and letting people figure out for themselves what that's supposed to mean.

**Ledlow:** What do social psychologists say about tasks, especially as [they] relate to cooperative learning? Is every task suitable for being done in a group, or are there specific kinds of tasks that are particularly good for group work?

**Linder:** I think there are differences among tasks. Something like learning to play the Rachmaninoff Third Piano Concerto is definitely an individual task. Now you might have a teacher and a mentor, but one person is going to learn it and one person is going to

perform it. I think the best tasks for cooperative learning, and in fact the tasks that then are in the natural environment that we most often confront, are tasks that are called conjunctive tasks. That is, where everyone's effort has to come together in a certain way in order for the group to be successful . . . running a nuclear submarine for example. On a nuclear sub people have very well-defined roles. In fact, I have a nephew right now who is assigned to a nuclear sub, and he can't tell us very much how it operates. But we also know from ONR, the Office of Naval Research, a lot about how submarines operate. Everybody has a task to do. Everybody has to do that task effectively in order for the entire group to succeed in its mission. Mountaineering expeditions are the same way, [or] a football team trying to run an effective offense or an effective defense. So, tasks that require everyone to produce, and not necessarily the same thing, I think, are very useful in cooperative learning.

Tasks that are much more individualized and tasks that a single person can do that are artificially split up to make them a group task often don't work well because people will figure out, "Well, one of us could just do that" or "We can all just do the same thing." [Faculty] have the experience of assigning a paper to a group, and they want the group to work together. What happens very often, if you don't do something to change this, is that they write the different sections and paste them together and hand it in as a group paper. That's not what my goal is when I assign a paper to a group, so I have to try to structure that task so that there is genuine cooperation: "How can you take what is a collection of individual tasks and make it into a group task?" And it's not an easy problem to solve all of the time, so it requires some thought on the part of the instructor.

**Ledlow:** And it is the instructor's role to structure the task in that way, you think?

**Linder:** I think it's very important for instructors who want to use cooperative learning to think very carefully through the structure of the task they're using and very carefully through the way in which the members of the team are going to work on that task. You have to be a kind of social engineer as well as a civil or mechanical or electrical engineer in order to set up good, effective cooperative learning.

**Ledlow:** What are the advantages of using pre-designed tasks like Jigsaw, Academic Controversy, Think-Pair-Share, or Roundtable? We've all heard of those. Is it good to start with those?

**Linder:** I think it's an excellent place for people to start, because most folks who teach in college don't have a lot of experience, or a lot of training actually, in teaching per se and not in cooperative learning [specifically]. So having, in a sense, a recipe that you can follow, like the Jigsaw classroom, is a good way to start with a fairly high probability of success. Then, as you get comfortable in those settings and understand how they work and appreciate the need for those kind of structures, you can tailor-make some structures that will work for you—work in your own classroom, work with the kind of material you're trying to teach. But I always tell people to start with what looks like it will be simple, because it's not. Running an effective cooperative learning classroom is a complex task. In a sense, it becomes an individual task for the instructor, so building up

your repertoire and building up your skills before you try to design something entirely on your own, I think, is important. And those structures work; we know that they work. If you put the right materials into the right . . . slots in those kinds of structures, they're going to produce a good learning outcome. And that gives the class a successful experience. It gives the instructor a successful experience, so I think those are very useful.

**Ledlow:** If a teacher isn't going to use a pre-designed strategy like Jigsaw, what advice would you give them for getting started designing their own lesson or activity?

**Linder:** Well, again, think of tasks that are genuinely conjunctive—that really require people to work together. Just splitting up what is really an individual task and trying to make it into group work is not likely to get you the result that you want. So the task is important. Design something that requires people working together and doing different things and bringing those different contributions together at the end. But you really have to be attentive to the way you structure the whole sequence of activities. So, telling people that, “Okay, here's your group task” (even if it's a good task) and “Here's what I want at the end,” really probably will not get you a good result. You have to think about the steps that the team would go through, unless your goal is to have them go through that planning exercise; but then you can say, “The first thing I want from you is a plan for how you're going to accomplish this task.” But designing steps, or a sequence of events that have to happen so that the team knows how they have to move through those, rather than making it up on their own, I think is really important. The thing that people often [think] about cooperative learning is that it looks like chaos. If you walk into a cooperative learning classroom, all kinds of stuff is going on; people are doing all sorts of different things. It may look like chaos, but it's really—if it's effective—very tightly structured; and I think people don't understand that enough. And so I would tell people, really think about how you're going to structure this so that you break it up into steps and you get the result that you want, rather than letting groups flounder around trying to figure out how to do it.

**Ledlow:** When we're thinking about tasks, I think, usually most people think about “Oh, it should be something that's more complicated than one person can do on their own, or it [should] require multiple skills, multiple perspectives.” Is there ever any benefit to assigning more simple tasks to students in groups? Is it motivating, for example, for students in a group to practice skills and get feedback on how they're doing those skills?

**Linder:** Well, I think so. You can take something like a series of mathematical problems or exercises that are pretty much individual tasks, and if you structure it correctly, you can make that into at least a two-person task and so people can practice those skills and get feedback. And having someone be the coach and someone be the learner, so that you have a structure there in which they work, will enable them to, in a sense, have more fun doing the task—spend more time at it, be more actively engaged in it. I think developing those individual skills in that kind of a context is a useful way to use cooperative learning.

**Ledlow:** The big issue, the controversial issue, is individual accountability in groups. What can a faculty member do to ensure individual accountability, or at least be able to check for individual accountability?

**Linder:** Well, there are a couple of aspects of individual accountability—one is the kind of accountability that is characterized by everyone participating, sharing in the process, and understanding the group solution. You can ensure that by having a random selection process so that when groups are to offer their solution to the class in a wrap-up session at the end of a cooperative learning task, you call on people at random from a group. Actually, Don Evans showed me years ago to set up a little Excel program that, when you run it, randomly selects a group and randomly selects a person within the group; and you can put that up on your computer screen and punch the button and it comes up, “Group four, Person one.” Person one has got to stand up and provide the group solution. If students understand that that’s going to be the process, then you’ve created a force toward individual accountability. I think testing is another way to do it, and you can have a component of the class be grades on tests that are individually administered. And people are then responsible for knowing the material and performing well on that test.

**Ledlow:** But individual accountability is a particular problem with these large, lengthy, semester-long, out-of-class group projects. How do you ensure individual accountability in that situation?

**Linder:** [Whether or not] people are going to participate effectively and fairly and equitably is always a problem—the free-rider problem in group work and any kind of collaborative project. I like to develop norms of participation that the group agrees to. This is a strategy that I’ve used in my group dynamics class many times. The group comes up with a group code of conduct. They discuss it; they lay it out; they all make a public, verbal commitment to it; and they all sign it. And then groups can enforce that code of conduct and point out to people when they’re not living up to it. I think that’s one of the effective ways of, not ensuring, but at least creating some forces that move toward individual accountability and effective participation. So I would recommend that [code of conduct contract], and it’s a good teambuilding exercise as a matter of fact, because as you put the team together you can say, “Okay, your first task, or one of your first tasks, is to come up with a code of conduct or code of responsibility.” And, in that process, always this question [of individual accountability] comes up, because most students who have had the experience of working in a group have had the experience of somebody being a free-rider, and they’re all very sensitive to it. It comes up virtually every time in every group. And if they talk about it, and talk about what the consequences will be—whether there is simply social disapproval or some groups will set up a series of fines or other ways of punishing non-cooperative behavior— it is a very good exercise and it’s pretty effective. It’s not perfect of course. Somebody who is determined to free ride will try to free ride. And that’s life.

**Ledlow:** That's a good segue into talking about classroom management. A lot of faculty that I work with talk to me about, "What am I supposed to be doing while my students are in teams? I knew when I was a lecturer that I was supposed to be standing up there giving the information, but what am I doing while they're doing their group work? Am I out in the hall drinking coffee?"

**Linder:** I think you have to be in the classroom, and I always just move from group to group and stick my head into whatever is going on at each table or each workstation and see what the process is. Sometimes it's important to be there and correct the process, give a little nudge in the right direction, if the team is not using good group processes. If someone is domineering, you may need to sort of nudge the person who is supposed to be responsible for making sure everyone is included, and saying, "You have to make sure everybody gets a say in this."

And also, if you're not there, you don't know what's going on. So you really have to be aware of how things are working. You've designed these structures [that] you've given to the students, and now I think being there and experiencing what the students are experiencing is very important. So you can't just disengage. It feels awkward at first. You feel like a fifth wheel or that you really don't have a role. But remember—I forget which of the gurus it was who said this—but "You're a guide on the side; you're not the sage on the stage." But the guide on the side has got to know what's going on, and so being there with the groups as they're working and seeing what's happening is very important.

**Ledlow:** A minute ago you mentioned something about debriefing at the end of class. What do you mean by that and how important is it?

**Linder:** Well, I think the larger class is also a group. In large classes it's a pretty unwieldy group. But there are often things to be learned from the other groups in the class who may have approached the problem differently, and maybe [there is] a general conclusion that you want to reach. And so it's important at the end of a class session, where teams have been working separately . . . on the same problem (let's say in a Jigsaw classroom that you've set up) to hear from each team, or at least a representative sample of all of the teams; and then be able to provide some integration and closure for that class session. Sometimes it just pops right out in what the students say. Other times you have to draw it together, and maybe deliver yourself of a short sort of summary: "What's the take-home message of what we've done in class today?" But I think that part is very important. You want to make sure that the groups that maybe didn't get [the main idea of the day], do get it in that wrap-up session. So I think the learning outcomes are very important there.

**Ledlow:** Another hot topic: group grades. When and how should they be used?

**Linder:** Boy, that one is hot. And there's a lot of diversity of opinion about that. I think that giving group grades can be legitimate if it is genuinely a group task. I'll tell you what I do in my group dynamics class: I give them a project—they have to design a

project to experience some aspect of group dynamics. Now they'll do things that interest them, and they'll do a wide variety of things. One of the really interesting ones was they decided they wanted to observe skydiving and see what sort of group dynamics went on in a group that was learning how to skydive. A couple of the students actually went through the process and did the skydive. But they have to produce at the end of the semester a report on that whole project. So it's a big thing; it requires them all to work together—it's a conjunctive task. And I think it's legitimate to give a group grade based on that—for me. Now other instructors would have a belief that they never want to give a group grade. But I think you also have to balance a group grade that you give with individual participation or individual responsibility and reward people for individual efforts as well and particularly for individual learning attainments. And so I always have some testing that I use in conjunction with the group grades that I give. Giving a group grade for a task that can really quite easily be accomplished by only one person, that someone gets a free ride on, is something I try to avoid. You don't always know that that's going to happen. But I think if you look at it from a structural perspective, and try to give group grades for things that are really genuinely group tasks, and avoid giving group grades for things where free riding is a real possibility, or where a person can duck their responsibility and not really learn what they're supposed to learn in that process— that's important to do.

**Ledlow:** Within a group task, though, would you let students assess each other's performance?

**Linder:** Not the intellectual performance, not the educational product that comes out. That's my job as the instructor. I'm the content expert. But I think it is possible to let them assess one another's performance as group members, so, "How well did you do in the role that was assigned to you?" And some people use a rating scale and use that as a feedback mechanism. I think factoring those into a course grade is problematic, so I wouldn't do that. But I think it's a useful learning experience for the students to get feedback from the other members of the group as to how well they performed as group members. And the other members of the group are fully capable of evaluating that performance, maybe not along the kinds of dimensions that I would use, but they can let you know when you're doing well and when you're not. And that's something that they're capable of doing. In fact, they're the leading experts on how you've been behaving in the group, because I haven't been there. So I think those are things where not necessarily grades, but feedback from the students to other students is important. But it is the instructor's responsibility to judge the quality of the educational or scholarly product that comes out of the group activity.

**Ledlow:** A lot of us have the problem that students won't necessarily give each other feedback about slacking off in a group, but then they'll come to us in our office hours and say, "You know, I just hate that guy, and could you talk to him?" What's your response to that? How do you handle that when a student comes to you and says, "I'm having a problem with my team"?

**Linder:** Well, first I try to circumvent the problem by doing a session during the teambuilding phase on giving feedback—giving and receiving feedback. So there are some exercises you can do that help people learn that process, because not everyone has experienced it and not everyone is at all comfortable providing direct feedback to another person. That's why they come to your office. And largely it's because they don't know how to do it. There are some exercises that I think can be helpful. If it gets to the point where a student comes to my office, I try to coach them to develop a way of giving feedback that will work for them and let them do it. It doesn't really enhance their learning about how to operate in groups if I go in and fix it—if I go in and fix Joe because Joe's not doing what he ought to be doing. They learn much more about how to be effective in groups if they learn how to give effective feedback and how to communicate directly to Joe and hope that they change Joe's behavior. And very often direct feedback, and particularly if it's the consensus among the other group members, will have an effect on poor ol' Joe's behavior.

**Ledlow:** If a faculty member came to you and said, "I've been thinking about using cooperative learning in my class, and up until now I've been pretty much a lecture and lab kind of teacher," what kind of advice would you give them for getting started?

**Linder:** Well, I'd send them to one of your [Susan Ledlow's] workshops. And I would tell them to start small. I would tell them to use the structured lecture as a starting point, and that, simply, is breaking up your lecture into smaller segments and setting short group tasks between the segments of the lecture—Think-Pair-Share kinds of structures, Pairs-Check problem solving—if you happen to be teaching something in mathematics. But there are a lot of structures that you can use for between three to five minutes between the segments of the lecture that get students to process the information. So it's kind of a baby-steps approach. Start with some changes that still use all of the stuff you've got in your lectures, and communicate that, but communicate it more effectively and engage the students in it by structuring the lecture with those breaks and with those group activities. . . . Once you're comfortable with, in a sense, letting go of the learning process and letting the students become active, you'll feel, I think, a greater sense of comfort in moving to [more complex] structures. So there really has to be a period of growing into it and developing those skills yourself, because, just as the students come to us without necessarily the skills to work effectively in cooperative learning teams, we don't come to the task of being instructors with a fully developed set of skills running a cooperative learning classroom. And despite sometimes the chaotic look of a cooperative learning classroom, it's not easy. There are really a very, I think, pretty well-defined set of skills that you have to have, in order to do that effectively. So, start small and build up as your comfort grows with using those structures.

**Ledlow:** It's not easy, but you choose to do it. What are the benefits? Why are you a cooperative learning teacher?

**Linder:** The learning process is so much more dynamic for the students and then for me, because I see them enjoying the learning process and learning in a way I just don't see if I'm just up there giving a lecture and tests and showing an occasional video. I

really got tired of watching the eyelids droop as I gave what I thought was a brilliant lecture, but from the students' perspective, clearly, it wasn't. I think the excitement of seeing all of the students in the room, actively engaged in the process of learning, is what captures my interest and my enthusiasm for cooperative learning. It's more work. It's a lot easier to just pull out the notes and give the lecture. But I think the learning outcomes and just the dynamic aspect of the learning experience—the learning environment that you create is a much more attractive place to be than in a classroom where I'm bored, and they're bored, and nobody's learning very much.

**Ledlow:** Any final thoughts for engineering faculty who might be watching this video?

**Linder:** The thing that I often hear from people in any discipline, and I heard it from the engineers when we were working with them, but I've heard it from my own faculty in psychology, is, "Well, you know, that will work in discipline X, but it won't work here." The principles that underlie cooperative learning are really discipline free, in the sense that they weren't developed within a particular discipline like English, or like physics, or like psychology, or like sociology. If you use those basic principles effectively, you can create effective cooperative learning environments, cooperative learning structures, in any discipline. And I am witness to that, because I've seen it all across our university. So, [to] that sense that "It will work in English, but it won't work here," I would say to engineering instructors across the country, "Yes it will, if you do it well." So, learn about it and then do it well, and I pretty much guarantee it will work.

**Ledlow:** Dr. Linder, thank you for sharing your expertise with us today.

**Linder:** It's been fun.