*Website Case 4*

# Engineering Difference

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The EPICS* faculty and industry advisers lingered in the meeting room—several engineers on one side and a couple of liberal arts faculty advisers talking to one another as they put on their coats and gathered their materials together on the other side. Kathleen, the codirector and cofounder of EPICS, Engineering Projects in Community Service, started putting her slides in folders and placed her handouts and pens in a box for storage. She looked up and caught Trevor's goodbye wave. She smiled and waved back at Trevor, a project engineer from HP who co-advised the wetlands team with an environmental engineering professor.

Kathleen continued smiling as she watched the rest of the faculty and industry advisers leave. She thought back to the time years ago when she and some other engineering faculty, especially Colin, first thought about developing EPICS. She and Colin were convinced that creating multidisciplinary design teams to tackle real social and local community problems over several semesters would give their engineering students an incredible advantage. EPICS would enable students to appreciate the contributions of diverse work group members and help them see how their design work touched lives in ways that classroom lectures simply couldn't convey. She remembered the excitement that she and Colin first felt when they proposed their idea to their department, then the faculty, and finally the college administration. EPICS became a reality. Many engineering alumni and recruiters praised their foresight.

Foresight! She wished she really had some foresight. Kathleen was still convinced that this kind of service learning could have immediate and long-term benefits for her engineering students and for local nonprofit organizations. But she wondered how she and the two other codirectors could work around some of the contradictions that seemed to develop in each team. Diverse work teams were supposed to be valuable in the workplace because different group members had fresh ideas and nonredundant sources of information. She was certain that multidisciplinary teams were the right way to go. But she kept hearing about and seeing problems in her own and other EPICS teams, especially in integrating engineering students with students from other disciplines. What could she do to encourage team members to share information more readily? How could she get them to work together more effectively? How could she and other advisers point out the negative effects of stereotyping and in-group/out-group communication without causing students and their advisers to resent each other?

Kathleen was deep in thought when Joe, one of the EPICS codirectors, came up beside her. She closed the Ethernet connection to the EPICS website and turned to Joe. "So, how do you think the advisers' orientation went?" she asked.

Joe rubbed his eyes and frowned. He responded thoughtfully, "Pairing up returning and new advisers was a good idea. Opening the session with introductions and statements of best and worst EPICS experiences also worked well. The new advisers seemed to enjoy hearing the returning advisers talk, and they seemed to like the idea of sharing their reasons for getting involved in EPICS."

"But I don't know about the rest of the orientation," Kathleen interrupted. "I'm talking about the part about diversity. I guess it went as well as these sessions usually do."

Joe became more animated. "I *wish* I knew how to get *all* of our students and advisers fully engaged in the team processes. I wish I knew how to show the advisers that their behavior either facilitates or hinders the process, especially when it comes to stereotyping and all." Joe shook his head in frustration and said, "You did a great job with the examples today, Kathleen. And we always talk about advisers' expectations influencing design and product outcomes. And they just look bored. Their eyes glass over. You know the look."

Kathleen nodded.

Joe continued, "I guess they figure that it's not their job as adviser to monitor the students' behaviors. Too many of the advisers think it's the student leaders' job to keep their team members on track. But what the advisers don't see is that they are just as guilty as our students! I don't know. I feel like I am beating my head against a brick wall. I really do enjoy codirecting this program with you, Kathleen, but there are times when I think EPICS needs someone with some different skills to lead it."

"You're not going to start that again," Kathleen laughed. "Besides, I am hoping that our grant proposal to study our multidisciplinary team processes will go through. Having a team of researchers investigate how our teams work—or don't," she said, raising her eyebrows, "would help us structure EPICS more effectively, I think."

Joe mouthed "yes" silently in agreement.

Kathleen resumed, "If we get the grant, we can pull in expertise that we don't have. We definitely need some input from communication and psychology faculty, but we can't ask them to just donate time to us."

After a pause, Kathleen continued, "Joe, did you notice that some of the faculty actually paid attention to Bart's story about the team he advised a couple of years ago? Did you see the look of horror on Vanessa's face when Bart talked about the junior who changed his major from Computer Science to Communication and then the other students on his team acted as though he had no technical expertise? Even I had to start laughing when Bart recounted how the students wouldn't consult this guy even on technical aspects that he had designed just the semester before. And then the team members would say to him, 'Now that you're a communication major, you can write the team proposal and design our presentation.' They wouldn't even talk to him about anything technical.

"Vanessa looked as though she couldn't decide whether to laugh or cry. I am sure she is wondering why she decided to join this crazy bunch of engineers and advise a team with me. If I don't see her later, I'd better call her. I don't want to lose our *one* communication adviser before this team even begins!"

Bonnie, the EPICS administrative coordinator, came back into the room with an empty cart, and obviously overheard what Kathleen and Joe were talking about. As she separated out team project brochures into different piles, Bonnie interjected, "Oh, Vanessa

will be fine. Watching her sit there with her mouth open was more fun than I've had in a while."

Bonnie grinned and stacked the EPICS pamphlets and advising manuals on the cart to return to her office. "I meant to tell you, Kathleen, that I walked Vanessa through the labs and signed out a digital camera and a laptop to her. Do you want me to do anything else?"

"I think that's about it," Kathleen responded. "Vanessa is on our email distribution list, right? You know, Bonnie, I can't imagine directing EPICS without you. Joe and I simply couldn't handle all the details and the traveling that we do."

"I'll second that," Joe remarked.

"Well, if I'm so valuable, why don't you help me load the laptops on this cart," Bonnie replied. "By the way, you didn't tell them my favorite story. That's the high point of these orientations for me."

"I know which one that is! It's the one about the woman with the power tools," Joe exclaimed.

"Nope. Try again," Bonnie said.

"Wait, let me hear," Vanessa called out as she came into the room. "I want to hear about the power tools."

"Have you noticed how everyone seems to be talking about power tools? Must be all those home improvement shows," Joe laughed. "What are you doing back here?"

"I was walking over to the liberal arts building when I realized that I must have left my keys here. Has anyone seen them?" Vanessa asked as she scanned the room for her keys.

"Ah! This is a familiar question! I remember the first time we met a couple of months ago. You, Joe, your department head, and I talked about your involvement in EPICS for about an hour—then you left for another meeting. But you returned after a couple of minutes because you thought you left your keys in the conference room. And the keys were in your laptop carrying case. You amaze me—you never seem to be worried when you misplace your keys. I'd be frantic!" Kathleen said.

"Well, I know that I'll locate them, so I don't panic! And there they are!" As Vanessa grabbed her keys from a nearby table, she turned to Joe. "I still want to hear about the student with the power tools. What happened?"

Joe got a big grin on his face and replied, "This female visual design student signed up for a team a few semesters ago. Of course,

the male engineering students figured that she didn't know a thing about designing or building stuff. So they were going to have her facilitate the team's brainstorming and write parts of the team report—you know, the usual *soft* stuff that every nonengineer is supposed to be good at!"

Vanessa rolled her eyes and brushed a strand of hair from her face.

Joe went on with his story. "Well, the guys were saying that they didn't know where to get their hands on certain tools. She listened to them for a while, then finally said that she not only had those particular tools but an entire set of power tools. The guys almost fell out of their chairs. Then it occurred to them that she might actually know how to use the tools. They were in shock. She ended up being the only one who could actually construct the project they designed."

Joe stopped for a moment and said, "Bonnie, do you want me to stack the PDAs over here?"

"Sure," Bonnie said. "But you still haven't guessed what my favorite story is. Talk about engineers."

"Talk about engineers . . . that's for sure," Vanessa interrupted, then added, "I was talking to some other advisers as we were leaving the meeting a little while ago. I found out that one team really started to produce some terrific results when the audiology and sociology students decided to pick up technical expertise. Now they are fully involved in programming and website development. Before that, they were assigned report writing and bringing in snacks for their meetings on Wednesday afternoons. Only the engineering students remained . . ."

"Okay, okay . . . doesn't anyone want to hear what I have to say?" Bonnie asked.

"Do we have a choice?" Joe laughed.

"Sure you do," Bonnie said. "Just don't expect your equipment orders to go through on time."

"We'd *love* to hear your story, Bonnie," Kathleen quickly inserted.

"That's what I expected," Bonnie replied, and turned to Vanessa. "Vanessa, you wouldn't believe this one team a few years ago. It was the team setting up a database for homeless people in Lafayette and surrounding areas. Colin was co-advising it. You know that Colin is one of the cofounders of EPICS with Kathleen, and that he's the other codirector?"

Bonnie waited a moment for Vanessa to nod, then went on. "Anyway, it must have been around 1995 and the team started with all engineers. Then they got some sociology students and a sociology professor as their adviser. You remember, Kathleen? It was Eric Martin who advised the team with Colin.

"Anyway, I went to the first meeting to bring along some team member forms and pass out lab keys and software we purchased for the team. I walked into their meeting room and all the technical types are at one end of the table and the sociology folks are at the other end. The students were all talking among themselves, but separated into two distinct groups. The engineers were all guys. There were two females and one male in the sociology group. This not-talking-outside-of-their-own-little-group kept up for a couple of weeks. Colin tried everything he could think of to get the two sides to talk to each other. In desperation, he finally paid for a team party out of his own pocket. The party helped—but not much.

"It turned out that the male sociology student actually had been homeless at one point in his life and was pretty mature—he was in his 40s. His name was Bob. Bob was really interested in making a difference for homeless people."

"The women were another story. Eric didn't really like to intervene. He thought that an adviser should be a passive observer, not an active facilitator. In the meantime, Colin was pulling out his hair. Because they were sociology majors, Colin suggested that the women look at some legal issues and do some research on social policy issues. But the women weren't interested. One finally admitted that she just wanted an A so that she could keep her perfect GPA. She thought EPICS would look good on her résumé. We never did figure out what the other woman was doing on the team. Neither of them ever spoke at meetings outside of the sociology subgroup.

"So the technical types gave all this trivial work to the women. And then they'd ignore them. In fact, the guys started this little clique that would go out drinking. They invited Bob, but he declined because he was a recovering alcoholic. Even though he wasn't part of the engineer subgroup, the techies considered Bob one of the gang. I guess because he was a guy.

"Bob really took charge of things. He ended up doing stuff that no other team had done. He started a web-based newsletter to keep all the agencies posted on legal issues and other changes relevant to the

homeless project. He ended up working for one of the agencies. He really made a difference in the community.

"But Colin never did figure out what he could have done differently to get that team integrated. And Eric was no help."

"That's interesting. I can't imagine *not* getting involved as an adviser," said Vanessa. "When you showed me all the stuff that EPICS students built for kids with cerebral palsy, Bonnie, you sold me on the program. I'm really looking forward to working with my first team. And thanks for setting up today's meeting. It made a huge difference to me to meet our community partner and some of the returning students."

Vanessa glanced at her watch. "You know what? It's getting pretty late and I'm starved. I could go for a pizza right now. Any chance we could charge it to EPICS, Bonnie?"

"Not a chance! Good try," Bonnie responded. "I'm ready for pizza, too. Are we done here, Kathleen and Joe?"

"I think so," Kathleen replied as she finished stacking her notes. "I agree with Vanessa about involvement. But I still don't know what we could have done differently with the homeless team. The same issues are there in other forms on most of our teams. We could really use your expertise, Vanessa, to help us figure out what we can try to do to improve team communication. Our students do well with their presentations after some coaching. It's the internal team and adviser-student interactions that we could use some help with."

"Yeah, I'd like to work through a new team dynamics exercise, if you have the time in the next couple of days, Vanessa" Joe said.

"Sure! I can handle the *soft* stuff. You know us communication types," Vanessa joked. "But seriously, at some point can we talk about how teams' internal dynamics are being influenced by the nature of the problem assigned to them? I can't just wave a wand, and students aren't going to transform their interaction because of one exercise. You know that."

"Yeah," Joe sighed. "I wish it was that easy."

"Your saying that, Vanessa, reminded me of something," Kathleen said, "we had our meeting with the senior design students. Four of them admitted that they signed up for EPICS rather than a regular engineering design class because they thought it would be an easy A with all this teamwork."

"We can do what we did last semester," Joe responded. "We went through everything to make sure that every student who signed up

for senior design credit contributed something technical and unique. That seemed to work."

"Yes, it did seem to work," Kathleen said slowly, "but we do need to be careful." Kathleen turned her attention to Bonnie and said, "Bonnie, I talked to the student whose adviser gave him a C last semester."

Kathleen glanced at Joe to get his attention and said, "I think you should hear about this, Joe, in case you have to handle it when I'm out of town."

Kathleen continued, "The kid was not a mechanical, computer, or electrical engineer, so he did the team leadership and project management work. *All* the peer evaluations from other team members said he did a great job in facilitating the team and helping the group produce its outcome. His design notebook was in good order. His lab attendance and other assignments were fine. But he got a C.

"You'll never guess what the adviser—it's Dick, you know—said to him. Dick told this kid that he didn't think that he did what was required because he didn't do any *real* engineering work. Dick literally said to him, 'All students must be evaluated on their technical contributions no matter what other team functions they fulfill.' Anyway, Dick gave him a C. And the student is upset. Can you believe it?"

"That the student's upset or that Dick gave him a C?" Joe responded. "Don't you remember the *other* Dick issue?"

Vanessa looked puzzled, but Kathleen and Bonnie just groaned.

Joe explained, "Dick is the same faculty member who got into a heated argument with one of the social work faculty at an advisers' meeting because he thought that this adviser wasn't qualified to lead the students in a discussion of ethical issues. Dick said that it wasn't within the other adviser's expertise and that a faculty adviser shouldn't lead a discussion on an area in which he had no background. There are an awful lot of engineers who have very one-dimensional views of advisers' and students' capabilities. It gets old."

"It sure does get old," Kathleen agreed.

"While you ladies try to figure out the answers to all our student and adviser problems, I am heading home. Enjoy your pizza thing. I'm coaching soccer tonight," said Joe as he turned to leave.

"Wait a second! You need to give me your travel form before you leave for Chicago tomorrow afternoon," Bonnie reminded Joe. "I'm not covering for you if you forget. The business office will be after me

if you don't start getting those travel forms to me early enough for them to process before you leave."

"Do I ever forget anything?" Joe asked. "I'll stop by your office tomorrow morning with a completed and signed form. I'll come early so that we can start processing the forms for the other million trips I'm making this semester.

"And to show you what a good guy I am," Joe continued, "I'll even hold the door open for you ladies while you push Bonnie's carts."

"Such a gentleman," Vanessa commented as she grabbed some PDAs. "Have a good trip!"

Joe said goodbye and started running down the hall.

Vanessa turned to the two women. "Now, Kathleen, what are you going to do with the team members who won't talk to each other?"

"I'm hoping you can help me answer that," Kathleen grumbled. "If they continue with this behavior this semester, then I'm going to write an order to have the facilities and maintenance people come and bolt the chairs down in a circle formation. Bonnie, do you think I could get approval for that?"

Bonnie shook her head "no" and said, "I haven't heard about this team. What's up?"

Kathleen explained, "The subgroups continued to sit in separate bunches despite my telling them every week for an entire semester to move the chairs into one big group. I think that they just figured that there was no reason to talk in the large group since they split the task into subparts. The subgroups had no clue what the others were doing, and it showed in their presentation to community partners. I hope it changes this semester. I am still so irritated with them. And I'm so tired of trying to think of ways to convince them that they actually need to talk to each other.

"But," Kathleen brightened, "that's enough about my team. You know what? I could really go for a beer with my pizza. Let's go to the Brewmeister!"

"Sounds great!" Vanessa agreed. "I love their deep-fried beer-battered pickles. Kathleen, if it's okay with you, I'm going to write up some of our discussions as a case. I'm teaching our undergraduate organizational communication class this semester. We're just about to get into team processes and related issues."

Bonnie asked, "Am I going to be featured in this case?"

"Absolutely," Vanessa said.

"Good! Make me the tall, gorgeous, blonde administrative assistant who drives a fancy red sports car," Bonnie laughed.

Kathleen laughed too and said, "It would be a big help for me to find out how we can do the multidisciplinary part of our teams better. Some advisers think that getting everyone involved just isn't their job—especially if the team makes some engineering advances on the project by the end of the semester. They consider the multidisciplinary part a nuisance. You know the problem, create a great bridge that takes you nowhere. So whatever you and your students could suggest would be a great help."

"Okay. Let me think about it and get back to you," Vanessa responded. "Maybe my org com class can make a formal presentation to you with their ideas and the theoretical background on group process. They are a good group—smart and motivated. Simply a joy to teach! In the meantime, let's go for pizza, pickles, and beer! But—on one condition."

"What's that?" Kathleen and Bonnie asked.

"No more EPICS talk—unless it's talk about all the good stuff that is going on with the teams," Vanessa replied.

"Agreed," said Bonnie and Kathleen.

As she turned to leave following Bonnie and Kathleen, this time with her keys in her hand, Vanessa wondered what she had gotten herself into. ✦

* EPIC stands for Engineering Projects in Community Service, cofounded in 1995 by Leah Jamieson and Ed Coyle, professors in the School of Electrical and Computer Engineering at Purdue University. All the names of people and teams in this case have been changed. The EPICS website at Purdue University (<http://epics.ecn.purdue.edu>) lists current team projects, goals, descriptions of the unique course structure, and other details. On this website, under the "About EPICS" button, readers can locate a bibliography of publications about this program.

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