MODULE FIVE
Getting Results – Module Overview

(music)

Bransford: The old model was, well, we're going to have courses in, you know, how to use PowerPoint and how to search the Web and so forth, and I think that's being seen as much less motivating and much less effective in terms of learning than seeing how technology allows you to work smarter in order to solve important problems.

Instructor: Put a value in there. Let's see it. Remember you take the value and then store in the variable. That's just part of how the calculator works.

Narrator: Robert Cheney teaches his students to solve math problems using a graphing calculator to automate a robot.

Robert: Now, what would I do to make it turn?

Man: Call sim…

Woman: Put in your degree…

Chaney: Try something. Put an example in there.
I became very interested in changing the way I taught mathematics because of the students' questions, "What are we ever going to use this for?"
The robot pivots from the center. You're going to want to calibrate it so that it turns. It's stepper motors. The variable that the programs use to run the robot is "S." And whatever value you put into "S," that's how many steps the robot's going to take.
I really bought into the idea that if I could get the students motivated, if I could help them apply the mathematics to real-world problems, in particular, problems that they would be interested in their majors, I think that I would help them to see that it did have value.

Man: Now, what did you put in there? You put in 45 and you got… ten degrees.

Chaney: In the traditional sense, we learn about a variable and we learn to simplify expressions and solve equations, but in the activity, they will use the variable to automate a robot.

Man: We need to be able to get that wheel to turn that way. So do we put a negative value in there?

Man: We come from the classroom knowing formulas and portions and ratios, and that's one thing to know how to do that work on paper, but to come in here as a team and take that from paper and actually put it into motion, it really hammers the math home. That way, you see what your results are. It's kind of like if you take a recipe in your kitchen, you don't know what the result's going to be. Once you see that, you can adjust and make it come out, and you really see the result that way.

Chaney: Somebody else ready to try it?

Man: Yeah, we're ready.

Chaney: The group that gets down on the floor and gets the robot to go into the garage will show that they calibrated it correctly.

Woman: So far it's just perfect. Let's see what happens when it pivots.

Chaney: The idea of the calculator was important to me because the way to communicate to the calculator is through mathematics.

Woman: So far so good.

Chaney: The calculator becomes the brain of the robot. So they can take the brain home, program it and bring it back in, snap it into the robot and then run it.

Man: I like backing into my garage.

Chaney: Oh, okay. Okay. Added another… backing into the garage. Well, that's…

unique.
I think these things also help them to see mathematics in the context that when they see it in engineering and physics, hopefully there's a connection there and they're better prepared with the mathematics.
So that… that is not the only solution, but it's a good solution, right? It accomplished the task.

Man: The more you can see that these different kinds of technologies actually solve a problem you're engaged in so that they're all means to an end in many ways, I think that's a very powerful way to use the technology.

MODULE FIVE
Getting Results – Using a Range of Tecchnologies

Man: Today we're going to look at something that allows us to collect data from a distance, and that's really all biotelemetry is about, so "bio" for "life," "telemetry" for "information." So information about life from a distance.

Narrator: Wally Shriner introduces the students in his "Mammal Biology and Techniques" class to a wide range of biotelemetry and data collection technologies.

Shriner: In today's lab, the goal was to give them a sense of doing radio tracking to let them know what that's like, to give them a sense of the challenges and the things to be thinking about if they were to get a job doing that.
The transmitter in here has a battery supply. It sends out a signal through the antenna. That signal then is received by something and in our case, that receiver looks like this. So this is sending a signal, this is picking it up. Again, transmitter, receiver, and then both of them have antennae.
Also I wanted to expose them to data collection. There's a range of technologies that you can use here.
So what we're going to do is we're going to use GPS and we're just going to use these simple consumer-grade Magellan GPS to find our location when we're out there. So when you go to your stake, get your latitude and longitude. Now, we have some data sheets that you can record that on, but I'm also going to let you record those on another

little piece of technology that you might use. In this case, it's just a little Palm Pilot that is going to have a data sheet on it that you can write in the information.
We have on our campus areas that have many of the features that you actually need for a field trip. Today in the mammal class, we were in the parking lot.
You know, it's amazing there are somewhere between five and 20 satellites overhead right now. Yeah, in some ways it's a little scary, but they're all out there, and those actually… those are just the ones that are sending location signals.
The objective was to learn about radio tracking and you can do that with students with a collar on their head, or you can work around simply having stakes in the ground that are points that they're tracking to.
And do you have your declination set?
They have to use their compass which is one of those skills that we're trying to have them do throughout the curriculum.
Yeah, right over there. Toward that tree.
And so they write down the data for that particular siting, and what it's simulating is a radio tracking moment when they found the animal.
So this is your first location.
Whenever you use technology, you're taking a risk that it doesn't work.
So you only have one satellite right now.
You have to be ready to move with the flow.
You know even if this doesn't work, we're going to be okay because we have redundant technology here.
And you have to be innovative in terms of saying "okay, this technology failed," and turn it around as a teaching moment.
My alarm's going off. Low battery.
And we have the GPS, but because we have the aerial photo, even if all our technology fails, we still have that paper and pencil, and that always works.
So he's hidden?

Man: I think he's on the move.

Shriner: I wanted to give them enough experience that if the job calls for experience with radio tracking, they can speak intelligently about that technique. If we show them that range of options, then they can have that experience.

Man: Good job!

Man: I'm doing this on my dog.

Man: I found you.

Man: Yes, you found me.

Man: Bad dog.

MODULE FIVE
Getting Results – Making Internet Connections

Narrator: Leslie Barber uses the Internet with her biotechnology students to extend classroom content and make relevant industry connections.

Barber: A lot of the course material is organized on our course Web site, and that's supplemented by a blackboard site. So on blackboard, what we have is a discussion page and a link so that you can get directly to our course Web site. What we have here is most of the course material—the syllabus, the course schedule—sort of the everyday housekeeping stuff is here, and then here are the course contents—protocols. These are actually probably the most important thing here. This is where the students access the information for what we're going to be doing in the laboratory. Objectives, tools—this gives you a list of what they're going to be using in the lab. Here's the protocol itself that tells them what to do in the laboratory. Usually we have some sample results and then analysis questions that they can use to guide them through the writing of their lab reports. The other thing that they can access is the National Center for Biotechnology Information. The NCBI site has an extraordinary amount of stuff on it—all kinds of tools for mining data, description of projects, educational resources—all kinds of stuff. It's not sort of a little educational site that somebody put together; it's the real site. It's where scientists go, too. And so for students, I think that gives them a sense of being on the scientists' side of the curtain, which I think is important. It demystifies all of this to some

extent, that they're using the same Web site that a research scientist is using. So we try to use that whenever possible because it makes us all part of the same team.

MODULE FIVE
Getting Results – Visualizing Concepts Through Technology

Duncan: Today in operations glass we're going to run the glass distillation column. Before we do that, I want to give you a real brief orientation on it, and in a week or two, I'm not going to be the one running this thing. You guys are going to be running this thing.

Narrator: Jerry Duncan prepares his students for the chemical processing industry using a scaled-down version of a refinery operating system.

Duncan: This is a partnership with industry, local industry—our refiners and chemical plants in the area—and they have a huge need for employees, people to run the process, to run the big columns and the pumps and the compressors—all the stuff you see when you go by a chemical plant. The population is aging, people are retiring and there are literally not enough people to fill that need anymore, so we teach them basically how to do that.

Instructor: Okay, so when we go start the unit up, what's the first thing we do?

Man: Well, we turn on the feed pumps and make sure our levels are… are up.

Duncan: Good. Good. We'll turn the feed pumps on and get the levels established. I'd probably turn the cooling water on first. We have a small scale-operating unit. It literally is like an operating unit in a refinery or a chemical plant. I'm going to bring on the bottoms pump, the cooling water pump, the temperature indicator, I'm going to bring on the heater.

Man: You see it in class and then you kind of transfer that over out into the field, and then you, you know, you really see what goes on but it's a bigger picture. You know, in the class you have just these little projects that you do, like these little mini simulators,

and so when you really see, like, a distillation column, you know what's going on inside there.

Duncan: It's coming out of the bottom of the column into the re-boiler, out of the re-boiler, circulating back to here, coming back here, feeding the column. It's making a big loop. It's a great teaching tool because the students can see exactly what's happening inside the equipment, whereas when you go out to industry, you can't because it's all metal, whereas this is all glass, of course.

Man: This is our boiler house over here. It's the number three boiler, number four boiler, and what it does, it makes 450 pounds of steam for the refinery that the refinery runs off from.

Narrator: Students also have the opportunity to visit a nearby working processing plant, where they can engage with both industry professionals and state-of-the-art equipment.

Canales: When you go out there in the facilities, I mean, they're huge. I mean, you have so many things going on at once, but in the classroom, it's kind of… it's boiled down and it's right there in front of you to where you can just understand the basics of it.
Okay, so you're feeding… feeding it in below the reflux, then actually what comes out of the bottoms is…

Man: What it is, it's washing the heavies out of the acid that has impurities in it, knocking the heavies out to the bottom of the tower.

MODULE FIVE
Getting Results – Learning Online

Man: An online course is very similar to the live course in that the students do the same amount of work, they take the same questions on tests, they do the same kind of homework, the reading is the same. They're very similar in that respect.

Narrator: While online learning does require careful preparation, it can provide an array of benefits for community college learners.

Woman: There's a textbook for the online courses, and you also take your quizzes and your finals online.

Helm: So I like to have my syllabus online, my class exercises online, including assessments, and also lecture notes online—a place the student can go to now when they're in my class, and later when they're studying for their certification they can revisit my site, refresh themselves. It's online forever. We also have forums online, interactive forums where students can post messages to other students.

Woman: You check it to see if there are new homeworks, if other students have posted, you know, new emails or, you know, to talk about a topic that you guys are going through in class.

Man: Online doesn't mean less work. It means as much work or more work because you have to make up for the physical component. I think the plus of distance learning might be the fact that you can, you know, learn in your bathrobe. I mean, you don't have to be in class. You can be anywhere, and at any time have access to the learning materials.

(end transcript)