Limed: Teaching with a Twist

Season 3, Episode 4 – Engineering Education: Maintaining Rigor, Fostering Empathy

Matt Wittstein (00:00:11):

You are listening to Limed: Teaching with a Twist, a podcast that plays with pedagogy. Hi everyone. This episode is a fun one as I got to jump into conversation with some early career engineering faculty, Blake Hament from Elon University and Siobhan Oka from Duke University about their upper level controls and robotics courses. Kay C. Dee from Rose-Hulman Institute of Technology, as well as one of my undergraduate educators and mentors, Bryan Dewsbury from Florida International University, and Tiffanie Grant, an Elon University exercise science student and Center for Engaged Learning Student Scholar provide some thought provoking ideas and insights on balancing rigor and empathy and how resilience and mindsets can be learning goals and courses. Spoiler alert, we might be asking the wrong questions. Thanks for listening and enjoy the episode. I'm Matt Wittstein. Hi Blake. Hi Siobhan. Welcome to the show. I'm so excited to have you on today to introduce yourself to our audience. I would love to know about a time when you were exceptionally challenged in a learning activity and then share out who you are, where you're at, what you teach, and what maybe you're hoping to get from this podcast.

Blake Hament (00:01:37):

Hey Matt, thanks so much for having me on. My name is Blake Hament. I just completed my first year as an assistant professor of engineering at Elon University. I have thought long and hard actually about this was a big moment for me, this hardest college course. I think it has a lot of impact on why I went into education and I think about this stuff, but I always loved math. I was always very good at math. I was on the math team in high school, so my first math class in college was linear algebra and there was a few other freshmen in the class, but the professor introduced himself and said, I haven't taught undergrad in about nine years, but they're making me do it this semester. And he started writing all these symbols and using all this jargon that I'd never heard in high school.

(00:02:21):

It wasn't on my radar at all. It was really hard for me to calibrate even the difficulty of the concepts because I would try to then study on my own and I'd be going to grad school mathematic textbooks and papers because I didn't understand the level of the course was supposed to be taught. Now, having used linear algebra for years in all types of research and applied projects, I understand that those fundamentals were so much more within my grasp than the way the professor presented it. I think that professor was kind of proud to be presenting something that seemed so complicated to people who are unfamiliar with the material. So that was a really important experience for me. It had to be questioning, am I still this STEM guy? Am I still good at math? Is this the right path? And it was a good kind of challenge where I had to push through and persevere. And I think I came out the other side understanding a lot more about education and that there's more to it than just presenting material. There's a lot of art and skill and maybe science too into how it all goes.

Siobhan Rigby Oca (00:03:28):

Well, I totally agree with that. I think there's a lot of skill and hopefully I'll get better at it with time. This is my second year. I'm Siobhan Oca as an assistant professor of the practice at Duke. I teach a lot of robotics courses when thinking about what the most difficult learning experiences I've had, well first I would say my first semester in college at MIT, I took physics and most people had taken calculus-based physics before and I had not. And so I had a pretty rude awakening after the first exam and I had done

really, really poorly. And I just think that was the beginning of a version of imposter syndrome. And I think similar to Blake thinking, am I cut out for this? Is this what I meant to be doing? And that was followed up by a course. That was a year later really inspiring.

(00:04:19):

I ended up going into mechanical engineering, which people would argue is the same thing as first semester physics, at least at the beginning. And so in both cases the teachers were very supportive. In the first case, I was ill prepared for the course compared to my classmates. But yeah, really brought the material to life, really made simple structures to understand complex concepts. And then I would say the course that I did the most poorly in my entire history of learning was controls. It was a full semester course that the teacher was required to make a half semester course for this flexible degree program. And he was like, yeah, so we're going to go through all the content in half semester. So yeah, I just didn't have enough time to catch up when I didn't understand the material. And yeah, I did poorly. And then I was lucky enough when I came to Duke, I TAed controls twice and I remember I went to the professor and I was like, can I do all the homework this summer so that I'll be prepared to ta? And I think that it really gave me this idea of redemption in academia. That's something that I try to get across to students is that there are simple structures to understand hard concepts and if you don't understand something, that's where everyone starts. And so it is just a certain amount of time and practice and different people, there are different ways to do that better, but I think it's just a matter of time before you can know anything if you really wanted to. Well,

Matt Wittstein (00:05:41):

I hope you all realize that we're talking about how to make hard courses more approachable with this month's episode. So I would love to learn a little bit more about what you are teaching now and why you think it's a difficult course for your students.

Siobhan Rigby Oca (00:05:58):

So I teach a lot of robotics courses and specifically a course that I know students find hard and I know because they tell me very often throughout and at the end of the course is intro to robotics. And I'm not proud that it's hard, but I am proud about the learning outcomes that happen throughout the course. And I think what they find most difficult is the time requirement that I expect 10 hours a week outside of the course to really get the content. And that includes things like homework and going office hours and working on their problem sets with peers. And that's just not what's expected of some other courses for them. And I think that it's hard for them to find that time and when they don't find that time, they don't have enough time to get through the concepts and then the concepts are difficult. They need to spend some time with peers or TAs or myself and office hours to get the practice that they need. And they're usually developing new skill sets, and this is even in their junior and senior year. It's a lot in a course, but I think it's required for the learning outcomes and that's why it's hard.

Blake Hament (00:07:04):

I'm teaching controls. A lot of it is kind of just physics and math proofs, but it is a very, I think engineers are the only ones who really look at it this way and bring in the physics, bring in the math, put it all together. And yeah, it's an infamous course. My students certainly didn't have an easy time of it this past year, my first time teaching it. But that's a big goal for this podcast is to chat more about what's the right approach. And Matt may have mentioned earlier how to prioritize, so I can't revamp the whole course right away, but maybe chapter by chapter or the projects, I'm not sure where I should start.

Matt Wittstein (00:07:42):

So Blake, can you tell me a little bit more about what the controls course is and why your students currently find it? Difficult?

Blake Hament (00:07:49):

Controls is everything from your HVAC system, your AC to aerospace vehicles, robots, anytime you're sensing and moving something, it's a feedback control class is really what we're focused on. So you have sensors that are sensing, taking in some information, and then actuators usually a motor and that could be spinning a fan that could be moving an air flap, but we want to model all that very precisely with physics and then develop basically mathematical proofs that guide us in how to apply these control signals. How fast should we move this motor to compensate for whatever we're trying to control? So it's very broad. Also, most students never go on to working controls is my understanding. There's a few students that they'll love it and they'll get some good on the job training and they'll do some of this work, but then most students will never touch it again. A few will go to grad school like Siobhan and myself did and study it much more deeply. And then that's it.

Siobhan Rigby Oca (00:08:53):

I would say having TA controls courses, it's difficult because it's a little bit later in the curricula and you're relying on some prior knowledge. And so knowing when do you start is really hard because if you just assume they remember everything from the previous courses that sometimes are a year ago, whether it's linear algebra or dynamics, you could be starting too far ahead for most students and then they feel like they can ever catch up.

Matt Wittstein (00:09:20):

So I want to make sure I have this straight, that the controls course that you teach Blake is typically a required course at maybe the second or third year of their education at that point,

Blake Hament (00:09:32):

Third or fourth year for our mechanical engineers, it's an elective for other engineers.

Matt Wittstein (00:09:38):

And then Siobhan your robotics course. To me it sounds like that's probably almost always an elective and probably those students are interested in possibly pursuing robotics as a career pathway

Siobhan Rigby Oca (00:09:51):

A hundred percent. And I'm in a much easier foothold to be like, Hey, if this isn't for you, that's okay. I understand people in required courses don't have that benefit. It is a required course if they want to do the robotic certificate, but when I present hard ideas to them or hard concepts using coding more and things like that, I then show them the job titles that require the concepts that I'm going to ask them to learn for that reason. And many times, these job titles have higher pay than I get, so I'm like, look, I'm preparing you to make more money than me. This is one of the ways I try. I try.

Matt Wittstein (00:10:27):

So a lot of the times when we get feedback on our courses, they're usually coming in the anonymous form of our teaching evaluations. Y'all are both kind of earlier in your teaching careers. Are there any, I

don't know, maybe cringe moments where you realized that you did something not the best way? And how did you get that type of feedback?

Blake Hament (00:10:47):

I already knew this was bad, but I fell into it anyway. The traditional way of teaching, especially at university level, is just death by lecture, death by PowerPoint, just talking at people and you have no idea if they're with you or not when you're just lecturing for too long. And I did that a little bit too much the beginning of the semester. I built these beautiful PowerPoints with really pretty graphics and I was really excited to just talk. I'm passionate about this stuff, that's why I chose this field and kept going with it for so long. But slowly the eyes glaze over and it's sad. Students specifically asked a lot for worked examples in class, and that's something that I'm trying to do more. It requires more preparation. Sometimes I can just wing it and solve it on the fly, but especially if it's a more challenging problem, I need to have taken a look beforehand, looked at different solving techniques. Maybe the way I would default to solve it is going to take 40 minutes, but there's a nice little trick and you can do it in 10. It's just a lot of time preparing all those worked examples. But that's a big goal for next semester is less lecturing, more working problems and getting students to work problems too.

Siobhan Rigby Oca (00:11:56):

Yeah, I would say for me it's challenging when you get student evaluations, right? Because I think I've heard that students are the experts in their own experience and then this kind of gets into the rigor of classrooms is there's also learning objectives and they're not necessarily the experts on how to get to those learning objectives. So I've definitely gotten feedback on this is a difficult course, or I felt like I had to look up other resources to learn Ross for my specific final project in robotics where I'm like, yeah, that's a learning objective for you to be able to look up resources and repurpose them for your project. You know what I mean? Not everything is going to be spelled out. And so that's something that I've really struggled with. And so something that I'm doing this year as an adaptation for that is I'm creating a lab for the course, which is essentially homework office hours, but structured.

(00:12:58):

So they have to be present for those office hours. We just don't feel like we're having enough support in this. And so I'm like, okay, we're going to do the computational homework as a lab, we're going to make it a little bit more complicated and a little bit better, more directed, kind of leaving them through step-by-step. And then I try to study this. So I try to do pre-post testing to understand are students getting capacity to utilize these things and future projects or are they walking through a lab? Because some labs are like that where it's like, wow, magic happened at the end versus like, oh, I struggled and I understand how these basic concepts work. And so that struggling and understand the basic concepts is what I want, but I don't want them to struggle too long both for their enjoyment of the exercise and because they don't only spend 10 hours on something they could learn in 10 minutes, but it's a very hard balance. And understanding what to glean from evaluations is very difficult for me. But I also think that it is the major metric of our success. And so it's difficult because I feel like to increase the metric of success, I would need to decrease the rigor.

Matt Wittstein (00:14:11):

And I appreciate that you both are working through some engaged learning techniques that suit your individual courses. What I hear in sort of your bad moment statements though is that you know have sort of this historically rigorous challenging course, but you're trying to figure out how to balance empathy without just making the class easier without just handholding and giving the answer because

you're valuing the critical thinking and problem solving that comes with the struggle. And Blake, you even referenced in your story the resilience that you developed by being in a really hard course and coming out positively on the other side. So I imagine that you're trying to of ways to help your students share in some of that experience.

Siobhan Rigby Oca (00:14:55):

I think one of the questions is how can we kind of elicit this concept of resilience? So I recognize the first time I taught this course, I was still a graduate student and I told them at the beginning, I'm like, you guys, this is a journey we are taking together and we will get through it. And I think they followed me with that, you know what I mean? They were like, okay, I'm going to work my tail off and we're going to do something cool at the end of this. And I've seen since then that I get students in my class who are like, wait, I thought this was an easy elective or I thought that electives fit into this box and are just not willing to go on that journey of I'm going to work hard and I'm going to learn something really cool and do something really fun. And so getting them into that mindset, I think it's possible to change students' mindset. I don't think you just necessarily need the right student, but it is tough. It's tough.

Blake Hament (00:15:49):

So a really big point, and I think you have to build trust with the students. For me that meant owning my mistakes, especially as a first year professor. So sometimes I'd get negative feedback and I'd say, you're right, I didn't explain that correctly here, let me try again or I didn't show you that I forgot in our class last week. And the instinct is to be kind of egotistic about it, of like, oh, I'm the expert and this is my class, but that's not effective and that's not why any of us should be there. But yeah, that humility and owning my mistakes because I felt like there was a little mutiny about to happen. They know I'm a new professor and they were getting frustrated. It was very challenging material, but I just had a heart to heart, several heart to heart discussions with the whole class about their experience and their suggestions for improvement, but that built a lot of trust and that helped the students be more willing to sit in that tension of uncertainty and not knowing and that uncomfortable growth phase.

Siobhan Rigby Oca (00:16:58):

I just wanted to add to that. I think the trust is the most important thing and how to keep it in is really important. And I think that I had that my first year, I think my second year I almost ran into the opposite problem is that I still had this humility, but I'm like, you know what? I've done this once and I see what's worked a bit and I think this is the right track. And I had a couple students at the midterm project be like, you cannot have our midterm project due this week. Literally on our public student discussion forum. You cannot have the district due this week. You've not supported us enough. I understand here's what supports exist that you'll be able to get through this. They were really mad that it was due after their fall break, which I understand that's tough, but then it's not having the authority too, you know what I mean? And the importance of saying, Hey, I'm the teacher in this scenario. I know that this is an important thing for you to learn and sometimes you have to eat your vegetables. So I don't know, but that's the difficulty that I run into is trying to understand their feedback in the context of what's best for them.

Blake Hament (00:18:10):

I heard a really good metaphor and it takes me back to that linear algebra class about when we're teaching, we are asking students to reach for this new target or whatever, and our job as educators is to place it at an appropriate height above them if it's too far, if it's out of their reach, if we've set them up

for failure, that's so frustrating and that's going to really turn people off. You could go the other way too and say, I'm really empathetic. I'm going to nuke the rigor here. And you place the learning objectives so low that there's no stretching, there's no growth happening, and so we're trying to calibrate and it's different for every student, which makes it even more difficult, but where to place those learning objectives so students grow, but also they're set up for success. They have all the support they need.

Matt Wittstein (00:19:03):

I mean it seems like you both are really thinking through this very thoughtfully and one of the things that I'm wondering is what are the things that you feel like you can't change or what are the fears that you have about making some changes that you're thinking about or what are the barriers that are holding you back from making the course the way that you envision it?

Siobhan Rigby Oca (00:19:26):

I would say the biggest fear is that I don't have enough time to make it what I want it to be, but also the fear of when you make a drastic change. Because if you're trying to change your outcomes, you got to change what you're doing, but it could backfire, it could go the opposite direction. And if you do something that's kind of new and unique, I know this is the case when you flip classrooms initially, students really dislike it even though they learn a lot more. And it's so sad, especially as a new professor who outcomes are in part evaluations, that fear makes it so that I don't feel like I can do drastic change on a year to year basis. And so I'm trying to do incremental things. I'm trying to address things that address the needs that students see first before maybe more structural change, making the whole thing flipped. But yeah, I'd say that's my biggest fear.

Blake Hament (00:20:24):

I exactly agree with Siobhan the time, and I just want to acknowledge this is my first year after almost a six year PhD program and I'm trying to find good work-life balance. I'm trying to be healthy, and so there's only so much time beyond my normal job duties that I have available for this and time. And then also, yeah, we're rocking the boat. It's much safer to just be the classic stem death by PowerPoint professor and maybe students get educated, maybe they don't, but that's safe. It's a lot more risky to change things up and ask more from the students and make them uncomfortable and risk this negative feedback going to other professors and deans or whatever. So time and risk and knowing how to make appropriate gambles there with our time and with the risk.

Matt Wittstein (00:21:19):

I'm really excited to bring this to our panel. I think they're going to have some really good advice for you both, and I can't wait to see what they have to share for newer faculty just to think about how to balance that rigor and empathy and student success that I think we find important if we're really being great educators.

Siobhan Rigby Oca (00:21:37):

Thank you.

Blake Hament (00:21:38):

Thanks so much for having us. Yeah, this was a great conversation and I can't wait to hear what they have to say back.

Matt Wittstein (00:21:54):

Hi, Tiffanie. Hi. Kay C. Dee. Hi Bryan. I am so excited to have you on the show. I got to speak with a couple of engineering early faculty about how they're balancing rigor and empathy in the class, and I can't wait to get some of your perspectives on this to introduce yourself to our audience. I would love to know how, when it's too hard, when a course is too hard for students when we're getting pushed too hard. And as you're doing that, make sure you share with our audience who you are, where you're from, and what you are all about.

Tiffanie Grant (00:22:26):

Yeah, I can start first. So my name is Tiffanie Grant. I am a rising junior at Elon University. I'm majoring in exercise science with minors in psychology and neuroscience. I am also a Odyssey scholar on campus as well as I'm a student researcher for the Center of Engaged Learning. But to answer your question, how hard is too hard? I think that that is a very difficult question to start with because difficulty can be subjective for student wise, something that can be difficult to one student may not be difficult to other students. I've taken classes where people are easily breathing through the course and I'm here. I'm just like, my goodness, I can't even get a breath up. It's very difficult. But then for other students it could be easy. I feel like the importance of that is a balance of rigor and support. I've taken easy courses where it was very easy for me to take, but it wasn't as meaningful and I lost that track for what did I learn in those courses. There have been also easy courses where I've actually taken stuff from it and I still have remembered it to this day. And I think the difference between those easy courses was the fact that it was more relatable.

Kay C. Dee (00:23:43):

Thank you so much, Tiffanie. Lemme me introduce myself. My name is Kay C. Dee, I'm a professor of biology and biomedical engineering at Rose-Hulman Institute of Technology in Terre Haute, Indiana. Empathy and resilience are things that I work to incorporate in my classrooms, and I just wanted to thank you for your first response. That is a hard question and the thing that I wanted to respond to was that I heard a lot of different themes in your comments about rigor. So rigor is a trigger word for me because I've noticed that when different people use it, they tend to mean very different things. So some of the things that I heard in your response was courses that seemed relevant to your interests in your career seemed easier to you. I'm willing to bet that you were motivated and interested. And we know that adults tend to do better in courses when they see utility and usefulness and they're motivated to study. I heard some elements of difficulty, like depth of knowledge required. I heard some elements of amount of work required and how much time is required. If you had to sort of go and navigate all these different elements of rigor, can you as a student identify one element that really has been a major barrier to you in terms of these kinds of courses?

Tiffanie Grant (00:25:07):

I think for me it would be that sometimes the professors isn't cognizant of how rigorous the course is because sometimes of course professors have studied, they got it down, they have the material down, but as a student coming in, we're here trying to learn and everything is new to us. So it could be assumed that, well, you guys should know this already, or you guys should have the background knowledge. And sometimes even though we are supposed to have the background knowledge, maybe the course that we were supposed to take as a prerequisite didn't execute the information properly in the way that the professor's class that we're in now is teaching the course. So that could also play a role in that.

Kay C. Dee (00:25:47):

Recently I've been teaching a lot of first year students and one of the things that I've been doing is coming in early to class in listening to what they're talking about, just so I can stay informed, making small talk, chit chat so that we have those conversations about what's going on. And the other thing that I've been doing a lot of lately with my students is asking them to write a very short, reflective, respond to a very short reflective prompt once a week. I use our learning management system to do this, so it's very easy for students, they can do it anytime, and I ask them to reflect on their learning and their challenges, and I have learned a ton from reading those very short 10 minute reflections from my students when they are nearing their breaking point, they tell me it's so useful and I can respond. Again, I'm a learning management system. I can type back encouragement, I can point out resources I can offer to meet. If anybody's looking for a practical means of communications where students can communicate to you how they're feeling about your course and it's load compared to the rest of the things in their lives, I highly recommend just weekly short reflective essays.

Bryan Dewsbury (00:26:55):

Can I take a slightly broader view of that question? Thanks so much for everything I've read so far. Bryan Dewsbury, I'm associate professor of biology at Florida International University, and I can't believe I'm about to enter my second decade teaching and I see that in the most excited way possible. I think it's a hard question for the following reasons. It might actually be the wrong question because there are a lot of assumptions sometimes. Let me back up a little bit. I would need to know what we are talking about when we use the word hard because it is actually not a word that maybe comes up in my teaching. It's not that things aren't technically difficult, but there's a fine tuning to how the curriculum is developed so that I am aware at every moment of the class where everybody is on their learning journey.

(00:27:42):

So if within a course there is a feeling, there's some evidence maybe through exam scores, maybe through the way the students respond that the level of the material is it's above where you think the students are, then some bigger questions have to be asked about what scaffolds are present within the course itself, what scaffolds were present before the students arrive for that course, right? And so because without asking those kinds of questions, it's easy to sort of pivot to the student, are they not ready? Are they not good enough? Are they cut out for engineering? And to avoid that, you always have to train yourself to step back and look, did this system do the job that it was supposed to do to put the students in a position to be their best selves? That's the question you want to answer. And to me, if you answer that question, then you are a lot less likely to get to a point where it's surprisingly hard because you are very clear in the moment because you have formative assessments, because you are always in dialogue with the students because you know their history, you know exactly where they are as they get more and more technically advanced.

(00:28:55):

And I know it's a big response and this is not, I don't want to put this response on the conversation Matt had with the two individuals for them to solve. I think it's a big response because it's a system that needs to address that. It's not just them too. So I appreciate Tiffanie's response in terms of the things that she's seeing from the student perspective, but for those of us who are the political capital in the room to make these changes at a bigger level, those are the questions we have to answer.

Kay C. Dee (00:29:29):

That was so well put. Thank you so much. I'm 100% with you on the scaffolding question. And in the case of brand new faculty who don't have the political capital to speak out when they discover something's lacking, it's a really good question then to say what can they do where they are with what they have in order to provide some of that scaffolding that may not be present where you would expect it to be.

Bryan Dewsbury (00:29:55):

Let me also add the elephant in the room and conversations like this. I mean, I know Elon's Center for Engaged Learning. I know it's wonderful and will be people involved. So the I Center for Engaged Learning could be a little bit of an exception in this, in what I'm about to say, but by and large, in higher education we have a culture where people are not actually trained to teach before they teach college classrooms. It might be one of the most fundamentally ridiculous misalignments of a preparation model and what you're actually asked to do when you show up to do the job. Until we really, until are willing to say the ugly part out loud, we sort of doing a little bit of a patchwork by hiring people and then trying to do rehabilitation on the backend when you already are giving them salaries and appointments and oh by the way, do this PD in your spare time that you don't have. So if you're really interested in attacking this problem at its root, all of these conversations, including the ones that we are having right now needs to happen before people are awarded job letters and there needs to be evidence that it took place and the training took place, right? And that is how the systemic change will occur. But KC, I'm curious at your institution in Indiana, what have you seen in terms of a cultural shift of the importance of teaching in classroom compared to other aspects of the job?

Kay C. Dee (00:31:27):

So I'm at a special place. Rose-Hulman is an undergraduate focused school stem school. You can only major in science, engineering and mathematics here. All of our faculty were hired and teaching as our primary job. So I'm fortunate enough to be in a community with like-minded colleagues where our annual evaluations, the primary thing we're evaluated on is our teaching and the learning that happens in our classes. So here's an example of a practice that might help shift the culture in other schools. When faculty come to interview here at my school, they give a research presentation or a professional development presentation, but they also teach a course for us, a pretend section of a course ahead of time. We tell them what level the course is, where it fits in the curriculum. We ask them if they're comfortable teaching, giving us some examples, giving us some content, and then students and faculty in the department go and pretend to be students. I like to be the student that sits in the back and asks questions and hasn't done the homework just to see what kind of responses we get. We learn so about our candidates for faculty positions by asking them to do that teaching. It doesn't take very long out of the day, it doesn't require a ton of preparation, but it's really, really insightful.

Matt Wittstein (00:32:51):

We have a similar practice at Elon, we also have candidates do both a sort of scholarship talk and a teaching demonstration, whether they're actually in a live classroom or we've brought together a group of students to be a participant in that. And I agree, it's completely insightful. So what I love about your answers to that question is one you were like, it's kind of a dumb question Matt and I can always appreciate there's no such thing as a dumb question because it gave us some great conversation. But what I really liked about your responses is that it points to the challenges at different scales of this problem that there's sort of that things that you can do as an individual, things that you could do as a

department or as a university and things that the whole system needs to change. And so I really love that piece.

(00:33:38):

So I want to briefly recap my conversation with Blake and Siobhan. So Blake is a faculty member here at Elon. He's starting his second year in engineering, and Siobhan is starting her third year at Duke in engineering as well. They're both very aware of being newer faculty members with teaching prioritized positions. They're very excited about working with students in both teaching and in creative and research scholarship pursuits. But they sort of realize some of their own limitations as well, that they want to be great teachers, but they're not necessarily sure what's the best way to do that. And one of the things that they sort of brought to this conversation is that they teach hard courses. They teach courses that are traditionally known as being difficult in their experiences. Siobhan shared that her controls course specifically was very difficult until she was able to TA for it a couple of times and then kind of clicked a little bit better.

(00:34:37):

Blake talked about his early math courses being exceptionally difficult and what I think I heard from their conversation is that they want to figure out how to embody the resilience that they built in those challenges and their teaching practices and not have the mentality that this course is supposed to be hard, you're just supposed to buckle down and get through it. Some of those colloquialisms that are, I think unfortunate. So with that in mind, as I think about sort of the educational development and curriculum development, very often we think about what are the right changes to make, where to start that process. I think we typically recommend making really small changes. So I want to ask you all as a panel, what's one small change? What's the starting point when you realize you have some sort of specific challenge?

Bryan Dewsbury (00:35:27):

One of my things with the faculty development and thinking about the classroom is that the questions we ask of this experience matter as much as the solutions we're trying to get out of it. And I understand that in the culture of low bandwidth, too much to do, too much classes to teach too much things on your plate, every faculty member is doesn't encourage to look for the place to start. The three things that are best practices, the list of 10. And I think it's important that we push back a little bit against that culture and understand the soul and the spirituality of what it means to teach what it means to have the privilege to lead and be in a classroom and be among other humans. And what that experience is, even in this challenge that is being described, a lot of it's still focused on the technicality of the course, the difficulty of the course, but teaching content is, but about a half of what teaching really is, there's 15 weeks that students get to spend with you and they are evolving, they are developing, they are interrogating themselves, they are trying to find their places in the world, they're asking themselves constantly, if not implicitly, what's the right thing to do.

(00:36:47):

And there are several things that we can do as we engage them that not just gets at their technical development but also gets at their social development. So to take the controls class for example, I think it was mentioned earlier that it's a difficult class, but it's also a class that every engineering discipline sort of needs lean into that this is be explicit with the course as to here's the relationship that the material we are going to engage in has for the entire field of engineering, not one type, not this particular strength, the entire field. And you get to be part of that community. You get to understand why that connection is there and why it matters. So it's a technical environment and just like any

technical class, like any difficult class, the way in which you get comfortable with it is you spend as much time as you can with it.

(00:37:39):

So you will find that you'll have to spend a lot more time in the material of this course than you might on other courses. And that's okay. That's just what it takes for you to get to the bar that I know you can hit. So if you lead into that sort of language, I think the aim is to de-stigmatize and just sort bring the temperature down in this notion of hot classes difficult. It puts it in this sort of unattainable space, which I think is not fair to the discipline, not fair to the students and not fair to the faculty member. It just sets everybody up immediately for this impossible, impossible outcome. When I was an undergraduate, my biochemistry professor would start the class when I took this class three times. He would start the class by saying, 90% of you will fail. And to be fair to him, he was right. He's a good predictor. If anything, 90% of us and I took that bad boy three times, got a C, and I don't remember a thing. Right. So I don't know. Tiffanie, I'm curious. I mean, you mentioned earlier about having easy classes that didn't really impact you, but in easy classes that sort of stuck with you. Maybe tell us a little bit about classes that were difficult where it was difficult, but the professor had an asset based approach, but then there's difficult as in you got to get past me.

Tiffanie Grant (00:39:12):

I personally dislike when professors do that as in already just speaking it into existence saying that, oh, 90% of the class is going to fail. I feel like if we come in with a positive thought process as in we're going to get through this, this is a difficult course, but I'm here for you. I've had professors like that, like my anatomy professor, and that's why I was able to just able to go through and pursue what I needed to go through with that course. With that, I think we should shift away from the thought process of survival of the fittest rather than we're training up the new generation in this field. So not trying to pick out who can fit in this discipline, but helping those who actually genuinely want to and train them up so that they can actually pursue what they want to pursue.

(00:40:03):

But for my difficult courses, I've had professors, like my anatomy professor, he was able to have videos for us pictures. It wasn't just only lecture based. There were games, there were study sessions, there were study tools for us. There were things outside, of course, outside of the classes, he had office hours. And during his office hours he would say that, Hey, I know this is a difficult course, but there are ways to study for this course and actually making a study plan for their students. Now, some professors would say that that's extra, that's too much time, but it really does pay off when a professor actually puts in the work for the student and that's when the student will be able to put in the work as well. And then also for my difficult classes that I didn't really feel as though I had the support, it was mainly, I would say it was probably me when it came to not asking the right questions and seeking the help that I needed at that time. But it's also when just if it just feels as though that it's a lecture style where it's only I'm talking to you, that's the time period for the class is up and that's it, then that feels more transactional where it's just like, Hey, I'm doing my job, you do your job, and that's it. Rather than we're spending time providing the tools for the student. So there is, I feel like the support aspect in difficult courses definitely matters in all of that.

Kay C. Dee (00:41:30):

I like how not asking the right questions is coming back again and again. Bryan, you talked about it in terms of we all look for the three big practices or the list of 10 because my response to the original

question, what would you recommend for these two young faculty members would be to ask them more questions. And the first question I would want to ask them is what strikes can they bring to be more authentic in the classroom and open themselves up to their students? Because when you're teaching a technically difficult course or a course that requires just a lot of work to master the required content shifting from it's the students versus the professor and the subject to the faculty member and the students are a team and we are going to beat that subject. We're going to, I'm here as a faculty member to help you master it.

(00:42:19):

And here are the ways that feel right to me that are genuine, where students can feel my genuine personality and know that I'm being sincere when I offer assistance and when I listen to what they have to say and reflect it back, what can I do? Maybe I'm really good at those one-on-one conversations where we could talk about something like the imposter phenomenon and how we're feeling and what signals are punch shoulders are sending us when we bring our exam in to talk about it. Maybe we could do that. Maybe someone who depends on PowerPoint all the time, which I understand why someone, especially someone young might depend on PowerPoint. It's a lot safer. The problems are already worked out. I'm not going to make a mistake in front of the class and then flail around and try to find it right. Maybe I could take one PowerPoint problem example a week and turn it into a worksheet where the class works together in small groups and I circulate around and we do something more informal. Whatever it is that I bring and that I feel is authentic and real is a way that I can demonstrate my caring for my students. That's the small change to start. Bringing one small change per week might be a good pace to try.

Bryan Dewsbury (00:43:37):

KC, could I pick up on that real quick? Tiffanie, I know I was going to bring you in a second just because I love that bringing your authentic self are not words. I hear enough in conversations like this, and again, I'm going to blame the, we weren't taught to think about our craft, the teaching part of our craft in a soulful, spiritual way. And when I've had the pleasure of leading faculty development, the first question we ask on the first day is always is your, why do you do this? Why do you walk in the classroom? Because your why, knowing your why and having clarity around that is going to drive every activity, how you grade, how you ask questions, how you design your curriculum, it's coming from there. Everything is motivated by that. And so the rush to get to how do I make this change and what is the one tip and how much exams we'll get to that, let's, let's first ask you to look in the mirror and say, what is the thing that makes you excited to get up and be in front of these students? Because if you're not clear on that, all the other stuff actually kind of doesn't matter that much.

Tiffanie Grant (00:44:43):

And honestly, students can tell as well when the professor cares and when they don't care. So it's very important whenever they walk in and say, Hey, we're going to get through this. No, this is a difficult course, but I'm here for you. And them showing genuine interests in the students, they can definitely tell. But I wanted to add on to what Kay C. Dee has said with flexibility and adaptability. If a professor is willing to adapt and very flexible in their classroom style and not just sticking to that traditional norms of lecture style and that's it. And breaking those barriers as in just being able to incorporate other things as well. Because students, there are different learning styles in a group of students. Not everybody's going to have the same learning style. So being open to when students are, or whenever students learn best by either lecture style videos, hands on, I feel like those are very important as well.

(00:45:38):

So having the flexibility and adaptability inside the classroom is very important for difficult courses. And it helps also with retaining information as well, because for me personally, and it can be something different for other students as well, but for me, I find that if I can relate to something that the professor is speaking on or whether it's secondhand hands-on, I'm going to remember that knee exam where it's like, okay, I remember we did this. I'm going to apply that and remember it. And even when it's studying as well, it helps if I can relate something when I'm studying, when I see that word inside the exam, I'm like, okay, I remember we did this hands-on activity or we watched this video, or he show this picture and made a particular joke in the lecture. I'm going to remember that. So I feel like it's very helpful.

Bryan Dewsbury (00:46:30):

And just to add to that real quick, Tiffanie, I definitely don't want to come across as anti lecturer. I hate when people get into that sort of, you wouldn't, right? But sometimes there's a group out there who sort of gets into that binary. I'm not really interested in that per se, but the word lecturer comes from the word ura and it comes from lecture in which you might know lecturing in a church. And so a lot of the higher ed we know today, the model of it came from, well not so much divinity schools, but people who are preparing for that and that origin, there's a hierarchy when a pastor or minister is at the lecturing that is somebody historically speaking that is somebody who is unquote anointed by God and then everybody else at the congregants. So in that scenario, there's sort of this big difference in specialness or whatever you want to call it between the individual who's acting, lecturing and everybody else.

(00:47:28):

And there's a sense in which without, again saying the dark part out loud, that hierarchy exists in some traditional classrooms that people internalize, right? I'm the PhD and I'm here professing to all of you lowly undergrads. When, and don't get me wrong, I actually do believe that the fact that we've had several years at the bench in the field studying the minutia of science, it does give us a right to come in a class and be able to share and engage in the beauty of science with students that I do believe in that. However, if you sort of minimize that, if you kind of bring the two stakeholders a little bit closer together and say, yes, okay, I have things of value to share with you. So do you, right? And for us to get that value, I need to get your hands dirty. I need to get you doing problem sets. I need to get you talking to your neighbors and duking it out over a case study that I gave you. I need you to be actively engaged in your learning. So there's space to hold both my expertise and your engagement. And I think that's, without trying to mansplain Tiffanie, that is sort of my internalization of what you're saying and I appreciate that.

Kay C. Dee (00:48:50):

I'd like to follow up on Tiffanie's comments about flexibility. No matter what techniques you use in your classroom, I'm going to suggest this is the heresy part of the quasi religious discussion we're having. Now, I'm going to put out a heretical idea that it would be okay if we were more flexible with our due dates and deadlines. I think it would be okay for a student to be able to have an automatic do over one, two, maybe three during a term, no questions asked. Maybe an email, maybe a Microsoft form. Dear Dr. So-and-so, I can't get this done right now. I will take your offer of 48 hours extension. Thank you very much. Maybe there are lots and lots of different ways to incorporate flexibility in due dates. I would just want to say it costs us nothing to be flexible with a due date, unless you are someone who takes your assignments and runs back to your office and grades them all immediately, it really does not significantly inconvenience you. Flexibility in due dates has nothing to do with rigor, however you're choosing to describe it, probably it doesn't reduce the amount of work that ultimately has to get done. It doesn't

water down the level of work that has to be done. It costs us no money, and it's a sign of respect. This is one of the things that I'm out there trying to promote these days. This is one of my things. So thank you for that opportunity.

Matt Wittstein (00:50:14):

Tiffanie. Something you said struck me as really interesting of that. This is sort of a different generation, and I think I read something on LinkedIn recently of, oh, my father got a PhD and he didn't have Google or anything to look up anything. And then I got my PhD before the Gen AI boom. And now in the future, what will we be saying that there's sort of this idea that generationally we are changing? And then Bryan, what you brought in there a little bit was how does the intersection between our expertise and the students' learning and experience that space in between, how does that line up with their development as a human? Because that's going to innately look different in a first year student, and I'm just using that as an example compared to them in that same student in their fourth year. So I'm curious if you all have some thoughts on some of these ideas about how generational shifts in teaching and learning and how to align it with what's sort of naturally happening in their cognitive social development.

Bryan Dewsbury (00:51:25):

There's a really great paper read sometime ago by a guy named something Bennet, I think, and it's called Emerging Adulthood. It's a theory that comes out of psychology that essentially says that what we have today in westernized societies of traditionally age college students is a phase called emerging adulthood. Because unlike say when in my mother's generation, I'm the last of three and she had me at 30, I had my first child at 34. So a lot of people, a lot of individuals are putting off things like marriage and childbirth to their thirties to finish school, to get additional degrees, to change jobs, to become more stable, however that's defined. And so then as opposed to previous generations whereby now actually they might have had a child already, et cetera, so they're no longer adolescents, but they're not in this sort of very subtle phase of adulthood, emerging adulthood is kind of characterized by this phase of exploration, figuring yourself out, dealing with a certain sense of freedom for the first time.

(00:52:42):

And there's some interesting data that correlates with this. Things like I think 60% of people who publicly identified their sexual orientation do so in the first year of college. So it's a time when a lot of psychological changes are happening mostly for the good. And I explained that at length because I teach first year students math, so I am particularly sensitive to your question. When they're walking into Dubai, they're walking into a space where they are doing a lot of psychological transitions that not even they might be aware of. And you see it because a professor you see, you see 'em scan the room, you see them awkwardly trying to find which seat aligns best with the learning they think they might need. It's actually a really fun and crazy process. But the thing I have to be mindful of, just to your question, Matt, about teaching and learning, is when they're taking exams, when they're answering questions in class, there are a whole lot of pressures that they might be experiencing that if my curriculum structure is not cognizant of those pressures, then their performance could be more reflective of the psychological state, then the actual ability to do science.

(00:54:03):

So this is why I don't do the three exams and that's it. This is why there are a lot of quizzes. This is why there's very explicit and detailed feedback. This is why I meet with them. This is why I don't call my office hours, office hours. I call 'em student hours. This is why I hold them in the dorm, not in my office.

This is why students say, oh, I need to drop this class because it's too difficult. My next question is, well, why? Well, because Tiffanie got that question. So you beat your decision on one student. Well, everybody else nodded. Well, of course they're nodded. That's what he wants do. That'll mean they understand it. That's just them making them. So if you understand the psychology of the behavior because of their developmental stage, you can make teaching and learning decisions that are responding to that and allow students a better onboarding process into the discipline.

Kay C. Dee (00:54:58):

I was reflecting on the differences between the environment in my current engineering classrooms and the environment in the engineering classrooms. I experienced, it was a while ago, but I would be willing to bet that in a lot of schools, the bootcamp mentality and the weed out courses and the idea that if we're going to get students engaged, it has to be a competition. So there can be a winner that's going to force us to strive. I would be willing to bet that all that still exists out there. And I don't think that speaks to our current young people. I don't know that it necessarily spoke to most folks in my generation either. I think it spoke to a very specific segment of folks who were very comfortable in that environment. So I'm sort of reflecting on the idea that collaboration and not competition and supporting each other, and again, not competition, not grading things on a curve.

(00:55:56):

So there's only going to be so many a's and so many F's guaranteed. I hope that's mostly gone in our higher education system, but I'm probably wrong on that. We tend to do things the way we were taught to do things. We tend to say, well, this worked for me. It's hard for folks to take a step back and say, okay, just it worked for me. It might not work for others. And I feel like that's where we are at this time. In many ways, in higher education, more of us are saying, okay, I need to take that step back. I need to rethink what this environment should look like. We need to be having these conversations.

Tiffanie Grant (00:56:35):

Well, I would say that it's a different wave of generations are coming in. And even myself, I realize it especially, it's different. My sister is an incoming freshman. It's a different group of people coming in and a different mentality, emerging adulthood. Jeffrey Arnett, I believe I learned about him in lifespan and development. I do know all about the emerging adulthood, and I do feel as though I have seen this meme on Instagram about how things that our parents were doing during our age is totally different than what we are doing our age right now. So 20-year-old me, my mom was probably doing something totally different way out there. Generation is just shifting. So certain things that worked before won't probably, or not saying it won't work, but there should be have to be a little bit more open to the fact of not everything that worked in the past may work now. So I think that's the best way I can put it.

Matt Wittstein (00:57:38):

I want to shift to something that came up with Siobhan and Blake is how do we actually make students' mindsets to be more about building resilience or framing that another way? What would it look like if resilience were a learning outcome?

Kay C. Dee (00:57:57):

So I actually have learning outcomes, resilience learning outcomes in a couple of my courses. So for me, first year students, step one is that students will be able to identify and articulate the negative feelings that they're experiencing. I find in my experience that we have either been explicitly told or we have

learned to push a lot of stuff down. We just have to get over it. We have to move on. And so when I teach my students about resilience, we start by identifying where in our bodies we carry stress and what does that feel like and what kind of behaviors do we tend to get into when we are avoiding something unpleasant and what can we do, what helps calm us down? So I'll just throw out that very first learning outcome. It sounds very basic, but I don't think we should skip over it.

Bryan Dewsbury (00:58:55):

Yeah, I mean I think there are two questions being asked. One is about resilience being a leading outcome in and of itself, but perhaps more importantly, what do you do as activities in the course to help cultivate that ethic? And it's a really good question and I think there are various, it could be its own podcast to be honest, Matt. So I just want to maybe offer one example of how we discuss it in Introbio. And I think it's important because right now there's a lot of rhetoric around discussing certain topics in classes, political rhetoric, discussing certain topics in classes and if you should or shouldn't do it because to some doing it, you are making a certain population of students feel bad. And I'm certainly not here to discuss that in a political sense, but I would say this education is a beautiful thing, man.

(00:59:52):

We don't say that loudly enough. It is a beautiful thing. And what's beautiful, one of the things that's beautiful about it is we can take the darkness of our past, wrestle with it, sit with it, be uncomfortable with it, but talk about use it to learn how we do better going forward. And so there's a discussion of resilience that's sort of embedded in that not every discussion of doc history means that the students themselves are being resilient, but it can be used as an example that, hey, in the moments when you really, really can't get this and it took you two extra days, then perhaps everybody else to figure out how to differentiate on a curve or whatever it is. But then when you got it, you got to a new stage of learning and what are the third tenet? The third stage of self-regulated learning is self-reflection, and the point of that is so that you don't just learn it, okay, now you're learning and now you move on. It's like, no, you actually think about, well, what was the journey to that learning? What were the things that I had to do to become proficient in that? Because that is the information. That process is what you will take to the next stage, and that's how the resilience develops. It develops not as a automatic effect of just happening to be in class. It develops as a very intentional, careful stage of reflection and identifying what works for you to get better at something, and I think the specificity of that process is really, really, really important.

Tiffanie Grant (01:01:27):

I would even add to say that it's all about the mindset as well. One thing I wanted to add probably way back is that even coming into a difficult course, setting that mindset and saying that, Hey, this is a difficult course. I'm going to put forth more effort than something that I've told that, oh, this is an easy course. You barely got to try this. I'm coming in, I'm chilling. But if you have that mindset and say that I can do this. I can push forth and go forth and succeed, and regardless of how hard something is, if I can just change that mindset and go forth and start with the initial thought that it's something as hard, something that may seem as hard, may not be as hard as it's supposed to be, it may come as easy because you came in already with the mindset that it was hard.

Kay C. Dee (01:02:20):

A couple of things that I think instructors can do to help facilitate that powerful mindset is to provide formative assessments that allow students to try them again and again because that adrenaline and rush, when you mastered it, you got it. This time, even if you're doing the same thing, you're trying it

again. You're trying it again, you did eventually get it, and that proves to you that you are resilient and you can persevere and the next challenge is going to be just that much more. You've done this before, now you can do this.

Bryan Dewsbury (01:02:56):

It's not just the formative assessments, it's the quality of the design of that. Because what the assessment is supposed to do in theory is provide information to both you, the instructor and the students as to where they are in their learning journey. That's the way to think about it because a lot of times traditionally it's just sort of, it's a way for you to get a grade or I wonder how many instructors actually themselves reflect on the results of the formative assessments, and here's where it could be really, really important. We have a process we do in intro bio, I think third or fourth week, we call it intervention week, and what it is is I look at the bottom 30, 40% of my roster and I have one-on-one meetings with them, and then the one-on-one meetings I will ask a question like, okay, I see we do really well on the recall questions, but you struggle when I say synthesize.

(01:03:55):

You do really well on the summative exam, but you seem to be struggling in group work. In other words, I have a very diverse suite of assessment types that is done deliberately because they're giving me different information about different aspects of the students' learning. So when I have the conversation about them, about where they are, it's a very sophisticated conversation. It's not just, Hey, you need to study harder because if I just went with the study harder route, it either tells them that they might be studying hard and they might just tell themselves, well, I guess if I'm studying hard and this is all I can output, then I'm not cut out for bio. And then if the other unfortunate outcome is sometimes to just double down on the same bad strategy subject firstly, so we need to actually have a dialogue about, okay, how are you approaching becoming proficient in this? And to which I can then say, okay, I see what you're doing, but you don't really need to read the chapter over and over. You just maybe cut that by half and then talk to your remit and say, I want to explain osmosis to you. Can you listen for 10 minutes? Because that's the only way the synapsis are going to form, and so you're giving them an actual activity in response to the evidence that you've pulled out, right? That's a different process or you need to try harder

Tiffanie Grant (01:05:22):

To add onto that, I would say that constructive feedback is so important, especially to me because I've received assignments where it's just like it'll be an X mark on it, and I'm just like, what did I do wrong? There's no explanation of how I could have done better. What were you looking for? It was just like, it's wrong.

Matt Wittstein (01:05:41):

Well, I want to thank you all for your time and your wisdom in this conversation. I can't wait to share this with Siobhan and Blake.

Tiffanie Grant (01:05:47):

Thank you for having us.

Bryan Dewsbury (01:05:49):

Thank you so much, mayor. It was great to be here and to have this conversation. Good luck to them.

Kay C. Dee (01:05:54):

Definitely. Good luck to them. It was delightful to meet all of you,

Matt Wittstein (01:06:10):

Blake and Siobhan. I'm looking forward to telling you about my conversation with your panel.

Siobhan Rigby Oca (01:06:15):

Awesome. Thanks for having us back.

Matt Wittstein (01:06:16):

Great. To be back, Matt, so I spoke with Tiffanie Grant, an exercise science major and center for Engaged Learning student scholar at Elon University, Dr. Kay C. Dee, associate Dean of Learning and Technology and professor of biology and biomedical engineering at Rose-Hulman Institute of Technology and one of my engineering professors and mentors from my undergraduate experience and Bryan Dewsbury, associate professor of biology at Florida International University and an expert on the social context of teaching and learning. I tried not to bury the lead and led off by asking the group how hard is too hard for a course, and Tiffanie and Kay C. Dee went right into the subjectivity of difficulty. Tiffanie gave two examples of difficult courses, the ones where you check out because it doesn't seem useful or it's unnecessarily difficult, and the ones where you rise to the challenge because the material or process aligns with your values and goals.

(01:07:08):

She described the professors that are in the former, the checkout type courses that they tended to be disconnected and unaware of the student's needs Kay C. Dee focused on instead of trying to understand the difficulty, trying to understand the barriers to student success and honing in on that. This quick intro had Bryan wondering if we're even asking the right question that instead we should be questioning how the engineering programs might be systematically not preparing students equally for the upper level or difficult courses. A brief aside had me rethinking some of our hiring practices, graduate student preparation and affirming to me the importance of ongoing educational development within higher education. Fascinating commentary, but we also acknowledge that as newer faculty it isn't really your responsibility nor have you acquired the political capital at your institution to implement system level changes. We shifted back to your teaching context and especially about where to start making adjustments as newer faculty members.

(01:08:03):

Bryan wanted us to push back a little bit against claims of low bandwidth only so much to acknowledge the positive experience and career that teaching is to remind us that content is only about 10% of the job, but social connection is really important. His suggestion is really to focus on that value piece for your students, help them see why this course and content is interesting and relevant to them and their different goals. Kay C. Dee encouraged you to consider what strengths you can bring to connect with your students and the panel acknowledge that authenticity is something invaluable to high quality teaching. As we continue talking about authenticity, it was obvious that understanding your why for this profession and being relatable and willing to adapt to students and circumstances will be helpful in your context. There seems to be little evidence to support really rigid deadlines, strict policies against resubmissions or similar accommodations that are associated with actual learning outcomes.

(01:09:01):

In other words, it's okay to accept an assignment late or let them retry a learning task until they are successful. Tiffanie brought up a great point that we're actually training a completely different generation than our own. Bryan and Tiffanie directed us to Jeffrey Arnnett's work on emerging adulthood and the idea that students probably aren't aware of all of the changes that they're experiencing. It does seem that generationally students of 50 years ago were possibly more motivated by competition in winning than the students of today, and things like bootcamps might not work as well today as they did back then. Instead, young learners tend to value teamwork and collaboration, so there might be opportunities for meaningful group work, perhaps with altruistic outcomes to help learning engagement. Finally, I felt this sense that we're really trying to discern how to develop intentionally resilience with our students.

(01:09:53):

Kay C. Dee shared that she actually has resilience as a learning outcome in a first year course, being able to identify and articulate negative feelings. She also recommended having lots of formative assessments over and over and over to celebrate success so some students can feel and experience the adrenaline and joy of success within their learning even if it takes a few tries. Tiffanie shared the importance of stating that as a goal and that it is a shift of mindset sometimes rather than a shift in actual learning activities. And Bryan pointed us to models of self-regulated learning in which our assessments typically focus on sort of forethought and performance when we really want learners to develop self-reflection. So our discussion was really insightful and I'd love to hear what your initial reactions are to their ideas.

Siobhan Rigby Oca (01:10:42):

Thanks so much for reaching out to them and having this awesome conversation. I think first and foremost, I agree with most of the things that they discussed, especially when it comes to developing resilience in students. I guess one thought that I had to push back on was the idea that although I agree that there might be this generational change between maybe a more competitive mindset would be better to tap into encourage learning versus a more collaborative mindset that maybe there's more of today. I think bootcamp is actually the perfect way to address that change. Bootcamp is actually a great concept, I think when it comes to engineering and the idea that it can actually be quite collaborative, although I guess one could see it as competitive and that you're trying to do something really hard and that there's this goal. I think that engineering can be difficult, but we need to give certain training to help students get through it and that if they feel like they're going through this difficult thing together, that can actually be a really collaborative and beneficial experience for them to develop the resilience that I think is essential to not just get through an engineering curricula, but also tackle new forms of engineering problems in the future.

Blake Hament (01:11:56):

Yeah, it sounds like a lot of really great feedback and the 10% content that definitely strikes me, but I need to let it marinate a little bit more. I think content seems so important in engineering. I don't want to send students out into the world to their careers where they might make mistakes that end up hurting people, but I think a lot of how I think about that and the context for thinking about that and what that looks like is framed in all these very traditional methods of teaching and learning, and so I think there is, it's inspiring. Yeah, there's a lot of ways where we can update or change this and tailor it to this new generation of students, so there's a lot there I think for me to think on.

Siobhan Rigby Oca (01:12:36):

Yeah, I think another thing that I really connected with was the idea that students, they need the tools to get through the content, and that's kind of the structure of our class, but that we also need to be intentional with that structure to develop connection. So I think that developing the connection so that they have buy-in to generate that resilience and extra effort that it might take to get through the content, I think is very essential.

Matt Wittstein (01:13:04):

That's a great lead in to my question for you all is thinking about balancing the content and learning outcomes. How will you actually make time to make the material relevant intentionally for your students in the upcoming semesters?

Siobhan Rigby Oca (01:13:19):

This is something I've been thinking about intentionally and it's so easy with robotics to do, but some things that I do is I actually look up their job titles that they would be getting outside of once they graduate and saying, these are the skills that they're asking for and these are the skills that we're trying to develop in this course, and you get this fantastic salary that even I don't see as a professor right now. So that's one way that I try to generate interest, but also I think seeing the end result as we're developing the skills before then understanding what they're capable of doing in the future and what really cool stuff is happening in the field right now are some things that I try to do and I hope to do more of.

Blake Hament (01:14:03):

I guess there's two things I'm thinking about. One is sharing more about my own journey and ways that this content served me or I found it fulfilling or useful, and this past time I taught controls. I did a hands-on project at the end of the course. Maybe I'll introduce that earlier in the course or even at the beginning. Have students thinking about real world examples of systems that they want to understand and control better, and maybe they can connect what we're learning back to that throughout the course.

Matt Wittstein (01:14:33):

Well, Siobhan, Blake, it was a pleasure having you on the show and I wish you both the best of luck in the upcoming semesters.

Siobhan Rigby Oca (01:14:40):

Thank you so much.

Matt Wittstein (01:14:41):

Thanks,

Blake Hament (01:14:42):

Matt. And to all of our panelists,

Matt Wittstein (01:14:52):

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