TOPcast Episode 108: A Faculty Vision for Transformation of STEM Education

Narrator: When you know what you want for the future, you need the present to line up with your goals. UCF Online offers more than 100 fully online programs in healthcare, engineering, criminal justice and more so you can get to your future and beyond.

(musical transition)

Tom Cavanagh: From the University of Central Florida's Center for Distributed Learning, I am Tom Cavanagh.

Kelvin Thompson: And I'm Kelvin Thompson.

Tom: And you're listening to TOPcast: the Teaching Online Podcast. Hello, Kelvin.

Kelvin: Hello, Tom. How are you?

Tom: I am well. Thank you for asking. It is Friday that we are recording this, and it's late on a Friday. What reason do we have to not be grateful?

Kelvin: Well, depends on how long the to-do list is—

Tom: For the weekend?

Kelvin: —that hasn't been completed.

Tom: Yeah. There's a long list.

Kelvin: But other than that, I have my optimism mug. So, I'll keep drinking the optimistic coffee.

Tom: That's right. Be an optimist. And look, I know we talk about the weather a lot. It is deep in the heart of February as we are recording this, and there are people around the country who are hibernating for the winter and, man, oh man, is it nice out today.

Kelvin: It's maybe too warm for me right now for this time of year. We're bordering on it. I was enjoying the coolness, but who am I to complain just because it's bumping 80 degrees Fahrenheit outside?

Tom: It's like 75 degrees and sunny with little puffy white clouds. Oh my gosh, it was a perfect Chamber of Commerce Day.

Kelvin: Yes. Welcome to Florida.

Tom: Sorry, Minnesota, Buffalo. We love you.

Kelvin: But when we next have a job opening, you really should consider relocating to Florida.

Tom: I always put it in when I tweet and post around because it is a selling point. Of course, not in August. In February it is.

Kelvin: We don't tell people that.

Tom: That's right. That's right. Well, cool. Well, I don't think we want to sit around gabbing about the weather for the whole episode. So, we got business to talk about and maybe the first thing that we need to talk about is what's in my coffee cup? What came out of your thermos and into my Class Mob cup?

Kelvin: Yes. Class Mob. Today's coffee, Tom, comes to us from Black Gold Coffee Roasters in Venice, Florida, and this coffee is interesting. It is technically a blend, but it is all from Brazil and actually all from the same small coffee farm. They call those, I learned, "sitios" in Brazil. Like site. Sitios. So, coffee from all of these various sitios in Brazil is referred to as—I don't know how you say this—I would say "Legender" or "Lehend-er" or I'd say something… It looks like "legend" with an er. It's all one thing. But each sitio farms its coffees individually and might be identified in the name of the coffee also. So, this coffee we're drinking is called "Sitio Arari," and it's a mix of two different coffee varietals. We've talked about varietals before. This is Yellow Cattura and Yellow Catuai grown and harvested together, grown together by a coffee grower named Arari Bernardes; his wife, Sandra; and their two sons, Marco and Pedro in the Southeast of Brazil. Little farm, little family, all the way to your cup. How is the coffee? And can you find a connection in that dark coffee liquid to today's episode topic?

Tom: I like the coffee. Thank you. You do brew a strong-ish cup of coffee, but that's okay. It's good. I'm not as good with the connection. I know what we're talking about today, and it's not Brazil.

Kelvin: It's not Brazil. No. So I was thinking about the contrast between the large-scale Brazil Legender/Lehender/whatever versus individual components such as this Sitio Arari. And I was thinking of the impact of the individual on large-scale potential efforts. I was thinking about that. I don't know. Does that help?

Tom: Yeah. The second part, I think I get maybe a little bit more. So, the power of the individual, and that makes some sense because we've got an interview with an individual today who's had quite a bit of impact around here, and you and I are both big giant fans of this person. He is a UCF professor. So, Kelvin, you recently interviewed Dr. Zhongzhou Chen. Dr. Chen is an assistant professor of physics here at UCF, and he's a frequent collaborator with us here at the Center for Distributed Learning. His passion for ensuring learning effectiveness in collaborative work with CDL has led to 13 peer reviewed papers and a National Science Foundation Career Award. Other aspects of Dr. Chen's work have been featured by the American Association for the Advancement of Sciences, improving undergraduate STEM education initiative on their website to disseminate his ideas more broadly. I'll also add that when we hosted Bill and

Melinda Gates, when they visited us a couple years ago, I made sure that we got Dr. Chen to be one of the featured faculty. And I stood him up in front of Bill Gates and had him give a presentation because he's just awesome. And the work that he's doing that—he'll touch on some of this in the interview—is just really thoughtful and, yeah, big fan. And I think Bill Gates liked him too as he should have. So, anything you want to add to that intro of Dr. Chen before we get into your interview?

Kelvin: No, I agree with what you said, and I'll save anything else 'til after we cut to the interview.

Tom: All right. So, through the magic of podcast time travel, here is your interview with Dr. Chen.

(musical transition)

Kelvin: Chen, so glad to have you join us on TOPcast today.

Dr. Chen: Thank you. Thank you for having me, Kelvin.

Kelvin: Oh, you're quite welcome. Now, we should probably comment for our listeners that I just called you Chen and that's kind of like your, whatever, *nom de guerre* around UCF for the last five years that I've known you. I've been practicing your given name but so few people use it because I think so few people say it correctly. It's, like, Zhongzhou Chen.

Dr. Chen: That's pretty good. Zhongzhou is my first name, but I tell everybody and my students to call me Chen. They call me Dr. Chen anyway, and it's much easier.

Kelvin: Yes. So that's hence the, "Welcome Chen." Glad to have you here, and I have been looking forward to joining us, as you know because we've talked about it. We've had occasional dabbles into conversations about the integration of digital teaching and learning, kind of the intersection of that with the STEM disciplines. And it's an ongoing conversation and I think several of the folks we've had previously have kind of all tilted toward engineering. You're from the sciences and physics. So, we're trying to diversify, cover the whole STEM acronym at some point. But if you don't mind, I thought I might kick us off with something—I think I get this right—something I heard you say just today in a meeting we were both in. I think you said something along the lines of, "I am the least physics-y physics professor you're likely to meet." And I was, one, I wanted to validate that that's what I heard you say. And two, yes. I wonder if you would just explain and expound what you mean by that?

Dr. Chen: Well, if you, you give any kind of high-level physics exam to the entire physics department, then I probably score the lowest. Unless you give exam specifically on introductory mechanics, then I might score high because my research is not in any real of physics field. I do learning analytics. I'm half statistician. Well, I'm a third statistician, a third data scientist, a third instructional designer. I'm a mix of multiple roles.

Kelvin: Yeah. That all rings true with me in terms of my awareness of your work. That all makes sense and I think there's probably helpful context for our listeners, but my experience of you has you care deeply about your students' learning and you are pushing that boulder uphill every day, trying to figure out how to innovate in persistent ways through all those areas you just touched on, right? Data and analysis of different kind of things, you work with our developers, all kinds of stuff. But you mind if I ask, how did you get into kind of that line of, that trajectory in your field as opposed to more of like a traditional physics or even just pure science kind of orientation?

Dr. Chen: Yeah, well, it was a long story. So, I always had this passion for teaching, had the passion for student learning. I was lucky enough that back in the University of Illinois when I first went to pursue my PhD in biophysics and didn't really like it, there was this burgeoning group of physics education researchers. They were researching multimedia learning back then, and I immediately liked what they were doing and convinced myself that you'd rather do something that you like and is passionate for, than do something that looks glamorous but you actually hate it. And I told myself, "Look Chen, you are not very successful in biophysics anyways. Why not try another direction?" Truth is that my talents, you only can have this amount of talent and my talent is not all in computer simulation of molecules. I'm very good at standing up and doing public speeches and talking to people and explaining things. So, I decided to switch in that field. And then after that, I was doing physics animation. And after that I went into, I was fortunate enough to have a postdoc position at MIT which was back in 2011, 2012 when MOOC became a thing (massive open online courses). And I was involved in all of that which got me into big data, educational big data. And a lot of the ideas of the one course for a large scale and sharing of learning resources, which I think is the most valuable, one of the most valuable things that you can do at that time. And then I landed at UCF and found out that there's Center for Distributed Learning that occupy the giant underground space of the library. And I met wonderful people like you and Francisca and instantly started. The chemistry was instant.

Kelvin: Yeah. I mean, our developers love you. I think they've adopted you into the extended family. You've guided the work of some of our, the development of some of our learning platforms and every challenge you throw at them, they sink their teeth into it. It's great. It's a great collaboration.

Dr. Chen: I hope I don't cause them too much problem.

Kelvin: No, I don't think so. I think they'd be happy to work with you full-time, but we said no. You're going to work with other faculty as well. I wonder—Tom and I've talked about this in past episodes—the, I don't know what the right word is, the disconnect maybe I'll say, that we have perceived and maybe some others kind of in the, I don't know what we'll call online education professionals space, the disconnect that we sometimes perceive between work of intentionally designed online or blended digital courses and the priorities of STEM faculty. Do you think that's a real thing? I mean, do you see a disconnect there? I mean, you are like this prototypical example of somebody who is in a STEM field and integrally connected to teaching and learning and digital teaching and learning,

but when you step back, do you see that kind of a disconnect that some of us see? And if so, why do you think it is? And if not, why do you think we perceive it?

Dr. Chen: Now, let me ask a quick clarification question. Do you mean the disconnect between online learning platforms in STEM fields or existing online learning resources and how we teach in the STEM classroom?

Kelvin: Well, that's a good question, and I guess I was particularly thinking about the, I don't know, people like me or Tom or some of our core audience and kind of our work that we do every day, instructional designers and some of our developers, what we're trying to aspire to with digital teaching and learning and STEM faculty who—at our institution and in many others that I've talked to—you don't see as many STEM faculty engaging with folks like us, like online courses, online programs. That's the kind of disconnect that I mean.

Dr. Chen: Right. Well, it seems to me personally, I think the core of the problem is not that people don't want to talk to each other. The core of the problem is nobody has any time, especially in STEM fields, because everybody is so busy with reinventing the course. And if—this is the one thing that I keep telling people—the efficiency of the education system, regardless of whether it's STEM field or not, is very, very low because the barriers for collaboratively designing instructional resources and sharing instructional resources is really, really high. So ideally, I've developed all those materials and I wanted to be perfecting them over and over again. But first what I had to do, I had to record all my lectures. There are lectures all over the place, but they're so disorganized that I have to, the easier way—rather than finding different videos on YouTube and putting them together—is to record my own video lectures. And then once I get rid of lecturing, do I have some time to say, I'm going to come back, going to come back and develop those learning resources and have time and motivation to collaborate with instructional designers, collaborate with developers and that kind of things could happen. Otherwise, instructors just have so little time. They're so busy create this quiz, designing, answering students' questions and all that kind of thing. So, we really need to improve the efficiency. I don't know if I brought the topic in a direction that you weren't intended to, but I think that is the core of the problem right now.

Kelvin: Yeah. That's helpful. Thank you. So, time and efficiencies that would maximize that time.

Dr. Chen: And collaboratively coordinated creation of instructional resources. That's probably one of the most valuable things that I think could happen to transform STEM education using digital technology.

Kelvin: Well, let me pull on that thread just a little bit. If you were to, I don't know, have some sort of magical powers or superpowers and the ability to manifest your kind of ideal vision of digital teaching and learning in your own teaching practice and in your field, what would it look like? What would that ideal state look like?

Dr. Chen: Ah, that's the question that I've been trying to get you to ask me.

Kelvin: Success!

Dr. Chen: Well, my vision is this. So, there are three parts. One is collaborative creation and sharing of learning resources. Instructors who teach the same course form a team and we build a library of instructional resources. I think the right granularity would be your learning modules, and we each put them together into our own course like LEGO blocks and have students enjoy that. And we ourselves sit back and teach, not in the classroom, but in a coffee shop. My dream job is to teach students who went through the learning modules and had problems and come to me, and I sit in a coffee shop to have coffee with them, just engage in physics discussion. And then after the discussion, I go back and I add learning modules, I perfect them. This is one thing. And second, what needs to happen is assessment reform, which means that they don't need to come into a big classroom at a given time at a given place. It's almost like you are being called to testify before your faculty, before your professor, as if you had done anything criminal. No. Whenever you're ready, you should go in, whenever you're ready on a topic, you should go in and there should be a proctored test—a very short, proctored test—and data driven test that we only need to test you on these things and boom, you're done with that topic. And you have some flex, you have a much larger amount of flexibility because every semester, I got people whose family members pass away, who had real difficulties, and we've been through COVID. And all these people are dedicated and want to put in the time, but I had to go through so much trouble giving them the proper assessment. Assessment reform. And the last piece is hierarchical student feedback, by which I mean, I can only teach like ten, twenty students well. If it gets to fifty, there are some people that I'm going to lose contact with. But if I can teach these ten, fifteen people and then these people go and spread out and give human feedback to another ten, fifteen people and exponentially grow, that we can build a system that is really scalable and effective. And if we get all those three: shareable learning resources, flexible assessment, and hierarchical human feedback, let's call it, that's my dream world. I will start opening a Chen's Physics Coffee shop and enjoy my... I'll quit research. Just do this coffee shop, quit research as a full-time job.

Kelvin: I'd come for the coffee and—

Dr. Chen: Not the physics?

Kelvin: I might learn something about physics along the way.

Dr. Chen: Yeah, exactly.

Kelvin: As long as the coffee's good. I think that's good. I mean, what a cogent articulation of an aspirational vision. How far away do you think you are, we are from that? What's the next step toward that vision?

Dr. Chen: Yeah. I really don't know. Sometimes I feel frustrated because what I can do as a faculty, as a single faculty, even with the excellent support from Center for Distributed Learning is fairly limited, which is one of the reasons I really wanted to be in this podcast to make my voice heard. And I really wanted to find other ways to make my voice heard and find people who have similar visions and come

up with a bigger, more coordinated vision to make those fundamental changes. We're making bit by bit progress. I design learning modules, and I'm trying to demonstrate that the learning modules is a better way than creating a whole online course, and we can really analyze student data and now track students' performance. And we're doing it bit by bit. But a critical piece that needs to happen is that we need to be in this bigger effort, more and more people. I hope more and more people can join the effort.

Kelvin: Well, as we wrap up, do you mind if I ask this. If our listeners were intrigued and/or if they were to share this episode with their physics or other STEM-related colleagues who were intrigued by that vision, would you be open to people reaching out to you via email? What would you like?

Dr. Chen: Absolutely! Any method. Email, LinkedIn, I don't use Twitter that much, but if you really want, I handle that. And also let me say, it's not just instructors. We have instructor. You mentioned instructors, you mentioned STEM faculty. The other important thing, developers. I'm going to sound like Steve Ballmer in that famous video, Developers. Developers. We need people who know how to code, who can build the infrastructure that let STEM education faculty and researchers realize their design. We have a lot of great ideas and those require a certain amount of computer coding knowledge and skill. And coder and programmers are really getting expensive these days.

Kelvin: Well, that is a great aspiration and a great call to action and maybe a good place to leave it for right now. I think we ought to have you back, Chen, and talk more about related topics and not even just how we're doing on this—although that would be a good follow up as well—but other things. But it's been a delight as always to talk with you and to have you on the podcast today.

Dr. Chen: It's been great talking to you and thank you so much for the opportunity.

(musical transition)

Tom: Well, Kelvin, that was your interview with Dr. Chen.

Kelvin: Yeah. He's great, right?

Tom: He is. He is great, and we've been working with him in various capacities for a couple of years and have gotten to kind of know him and his work and his emphasis on kind of physics education, which just really resonates with me. And I think all of us here at CDL, he's got a lot of fans—not just with you and me—but you already touched on this with some of the team that wouldn't mind working with him a lot more than they already do. And he's got grants. He's actually funding some of them.

Kelvin: Yeah, he's great. And we haven't even touched on… He's advised us on different groups and helps evaluate projects and he's wonderful. He's just… You couldn't ask for a better collaborator, but can I throw an interesting—I thought I remembered this right but I looked it up earlier today—here's an interesting point. While Chen is credentialed, technically, to teach fully online and reduced

seat time blended courses at UCF, do you know that he's only taught in-person or face to face courses here up until recently, I think this very semester? So, I would call that an example of digital learning that is not being contained to online and blended modalities. I mean, everything that he's talked about, all that passion, all that vision for doing things differently, transformatively via digital learning, does not involve online and blended per se. It's fascinating.

Tom: Yeah. I don't know if I realized that. I thought he taught blended but maybe not.

Kelvin: You know, he's got one what we call an M course here this semester. Everything else, technically not. Isn't that interesting?

Tom: It is really interesting.

Kelvin: He's credentialed. He could do it.

Tom: Good. He's been through the training, yeah, and he gets it certainly. In a deep molecular level, he kind of gets it. And he's pushed us to improve the tools that we've made because he's used them in these face-to-face classes. We've got kind of a learning object development tool that we've built. We've talked about it before. It's called Obojobo, and it's pretty robust. When he got a look at it, he said, "Let's make it more robust." And so, he's really helped us to build out sort of the reporting and the data analytics that are behind it, and that's part of what he's funded us through grant work to keep pushing the envelope on it and it's been amazing. He's been great.

Kelvin: Yeah. I mean, it's hard to know what else to talk about. I mean, we could talk all day about him. Do we want to talk a moment about this vision that he said he'd been trying to convince me to ask about for a while? If I understood it correctly, there were three major components but then there was sort of a soft fourth component, I think. He talked about these reusable and collaboratively developed learning modules. He talked about assessment reform, changing the way that assessment takes place and tied to that, his coffee shop conversations. And then he talked about this hierarchical student feedback, which I thought of as kind of like "train the trainer," like instructor provides feedback to ten or fifteen students who then pass on individually feedback to another ten or fifteen students and so on and so on and so on. So, those are the three. But then he clearly talked about the importance of developers, which I think is a secret sauce kind of a thing. We have another faculty member who said—I forget exactly how she said it, but she said something like CDL, the Center for Distributor Learning brings faculty dreams to life, and she meant our developers. She meant our developers.

Tom: Yeah. I thought that was interesting too because I don't know if I'd actually ever heard him articulate that like that.

Kelvin: He's been trying to get you to ask, Tom.

Tom: I guess so. I mean, I'd be happy to ask him that question. We could go have coffee with him and just listen to him for a while. I thought that was a really interesting kind of picture he painted of what could be, and I think we've got

elements of that, obviously, maybe not in the complete package that he's talking about. Another thing that he talked about, too, that I think is kind of wrapped up in this is this idea of faculty collaborating to build these reusable assets. I mean, that was the first one you mentioned, these reusable modules, but it wasn't just for him, it was for the department. And having faculty work together on that, I think that that could potentially, has the potential to scale a lot more than, "Hey, there's this cool thing that Dr. Chen is doing in his three courses this semester." But it's a way to kind of expand that goodness out across maybe a whole department and maybe across a whole major which would be really cool.

Kelvin: Yeah, for sure and I think he's absolutely serious. When I asked him if he was okay with our listeners or with STEM colleagues that our listeners passed us along to, if he was open to being contacted about this and trying to figure out how to move it forward, and he said yes. He means that. So, we'll put his biographical sketch which contains his contact information. We'll put that in the show notes. So, you all should reach out to him if you're interested, for sure.

Tom: Yeah. Maybe have coffee.

Kelvin: Digital coffee.

Tom: Digital coffee. Now I thought that was interesting too that he sort of has this vision of learning beyond the classroom in many ways, and that is very much attuned to the kind of the digital learning ecosystem that we're a big part of.

Kelvin: Yeah. I was thinking, Tom, that having post remote instruction during the ongoing pandemic response, we've talked about on here, we've talked about the other colleagues, other places that there's a more interest it seems like, from folks who had eschewed online or blended before coming into that fold. I've sometimes more recently started referring to as newcomer STEM faculty. There's STEM faculty who've been around for a long time, but newcomer STEM faculty to online and digital, but a lot of that has been, "Okay, I started using these digital tools during remote instruction. I'm interested in doing more, continuing that." But that's lightyears different from Chen's aspirational vision. He is on a whole other plane from that, I think. Would you agree with that?

Tom: No, I would. I just can't of help but keep thinking back to the kind of the presentation he gave to Bill and Melinda Gates, and it was sort of framed in what he called the kind of—in a catchy sort of way—a 4K vision into student learning. I'm probably not doing it justice. I'm sort of paraphrasing, but 4K was part of the title. And his idea to just leverage analytics to really understand what worked, what didn't work in the instruction and iterate on an almost real time basis to just make sure you're being as absolutely effective as possible leveraging the data. And I was just so impressed by just the way he was thinking, because not all faculty have the—I don't want to say that they don't think like this, but a lot of them just don't have the time to devote to that kind of exploration. But because he's in charge of physics education, he can sort of. That is his research, and he can really dig into it, and I just thought it was fantastic.

Kelvin: And he's got those data skills. I mean, he does think that way because even though our platform that he's helped influence the development of is, as I've called it before "datalicious," even though it is, it's not dashboard data friendly. He's got to pop the hood and extract data and manipulate it himself, but he's done that. I mean, I've seen his papers and poster sessions which have gone into all these analyses that he's done. So, he's working it but he's squeezing that fruit to get the juice out every bit of every drop that he can and that's impressive. He's really quite passionate about student learning.

Tom: Yeah. So, may you, dear listener, have a Dr. Chen on your campus. I hope you do. I'll give him credit, too, in that he recognizes how awesome we are.

Kelvin: Obviously a person of impeccable judgment.

Tom: Obviously. Yes. So, I will say that with all humility that early in his tenure here at UCF kind of recognized the resource that CDL is and jumped in with both feet and said, "Yes, let me get the most out of thing that I possibly can," and we'd be happy to do that with every single faculty member who wants to do it.

Kelvin: Yeah. No doubt. Well, should I try to wrap this up and get us on the ground?

Tom: Let's do it.

Kelvin: So perhaps in closing, we'll say there is power, not just in the individual faculty visions, but in a collective faculty vision and digital learning, the people, the tools, all this. Digital learning can add further momentum to the power of such vision. So, STEM teaching and learning can be transformed for the better if we all work toward this common goal. How's that?

Tom: Sounds good. Agreed. Amen. Thank you, Dr. Chen, for agreeing to be on TOPcast, and Kelvin, thank you for the coffee. I did go to Brazil once for a conference and I learned how to say thank you. So, it's *obrigado*.

Kelvin: Oh, very good. You're welcome.

Tom: So, until next to time, for TOPcast, I'm Tom.

Kelvin: I'm Kelvin.

Tom: See ya.