

## Interview #1

Interviewer: So as we're, um, doing this interview, we just want you to know we're not evaluating, judging, anything, we're just wanting to, uh, kinda just understand where you're coming from, so hopefully we can best help you.

Interviewee: I like it

Interviewer: [small laugh] So, to start out with, um, if you could just tell us a little bit about your teaching background, that would be great.

Interviewee: Yeah, um, as far as teaching background goes, I am a research scientist by training, um, spent a lot of time doing research, mentoring students in lab-type settings, research settings, um, but as a grad student, I would TA, I TA'ed [REDACTED] for I don't know, a dozen semesters or something, I worked with a program called [REDACTED] with the [REDACTED], and part of it was developing some teaching protocols, inquiry-based learning strategies for junior high and high school teachers here in the west, and that was a fun thing, and it made me think about all the the ways we were teaching effectively and how we could potentially improve it. So teaching background, I've taught a number of courses, graduate courses, um, some undergrad courses, and then coming here to BYU, there's a heavier teaching load than I've had in the past, but I love teaching [REDACTED]; I try to take kind of a constructivist approach where I want my students to take the reins in learning and deal with things that are relevant and interesting to them so like in [REDACTED], I don't focus a lot on memorizing the facts for the steps of photosynthesis, but rather providing them opportunities to construct their own understanding of things that are relevant to their perspective, so we have instead of like a traditional mid-term and final assessment, we have group projects that we use to assess the learning outcomes associated with the course. Um, but that's kind of it, it's kind of a work in progress, and I'm trying to figure out what works well for me and what I really have actually—what I really want for my courses, and then how do I assess if my students are meeting those goals, and like I said, I uh, I don't have a background in science education, so a lot of it is um, reading journal articles or trial and error—that's kind of where I'm at.

Interviewer: So going along with kinda what you're talking about with the constructivist approach, how do you feel students learn best?

Interviewee: It depends on the students, right? And uh, this is an ignorant perspective, or at least it's biased by very limited experience, but BYU students love hoop-jumping, um, and students in general, I mean, if you're in a college course, you want to know what you need to get to get a good score or score that you're comfortable with, and I think, like, a constructivist approach doesn't work very well with that because we're all so happy to do that minimum jump over that minimum bar to get the score that we're after, right? Um, so, I don't know what motivates students. Fear motivates BYU students, or the incentive of getting a good grade or the fear of getting a bad grade seems to motivate students, but I don't know if I've figured out how to -- to really work that into my assignments and my assessments. How's that for an ambiguous answer?

Interviewer: That's [small laugh] that's just fine!

Interviewee: K

Interviewer: Um, what do you feel your role as an educator should be?

Interviewee: Yeah, I like this. So, I feel like my role as an educator should be a facilitator: provide them the tool sets where they can figure out how to access information, develop those, the understanding of how do you evaluate information that we're consuming, and I

think at this point in my career, I don't want to be a source of all knowledge. I don't want to be kind of the one who stands in front of the class and says, "Hey, this is what's important. You'd better memorize it." But I want to facilitate opportunities for them to, as a scientist, for them to know how to deal with real data, how to be critical thinkers, how to engage in that messy work of—you know—how do we understand the role of the specific thing in our life where we have this controversial perspective on evolution, or or genome editing, so how do we come up with our own understanding that's based on rational and meaningful evidence.

Interviewer: And in a classroom setting, how –

Interviewee: How do you do that?

Interviewer: Yeah [small laugh] in your—

Interviewee: So, some of the ways that I do that, we spend a lot of time talking about, um, how do we assess information. There's a study that came out of Stanford I think last year that showed that students from high school to college, probably junior high, I don't remember if they were included in this study, but they perform abysmally when it comes to their ability to evaluate if something is a credible source. And it's a fascinating study and it, and the poor performance ranges from, you know, high-performing colleges to community colleges, so it's a universal problem. So we spend a lot of time talking about information evaluation; spend a lot of time working with with peer-reviewed literature, helping them, how do you read this stuff that's so dense and so terrible to read, um, and not spend four hours and get nothing out of it, but pick out those meaningful points, right? And how do you take, how do you take this information—this peer-reviewed information—and then synthesize an opinion that's meaningful? So this, we do this through group projects; they have to create what I call web story that's their mid-term assessment, where they take peer-reviewed literature and they synthesize it, they interpret it, they have to show what they're taking from the peer-reviewed literature, and then come up with some digestible, meaningful narrative of what it's telling us. And then for the final we do a group ----- project. Same thing based on peer-reviewed literature, and the idea is they have to go through—they have to go to the peer reviewed literature, understand that they can extract information from it, and then present it in a meaningful way. And the topics they can choose are wide open—it's their choice, um, but that's how I try to do it.

Interviewer: Thank you. What do you feel like the role of faculty-centered lecture is in science teaching?

Interviewee: I think it depends on the course. Like um, this certainly depends on the course. Uh, I come from maybe an older-school tradition where I loved learning at the feet of the masters, I mean it's really kind of an enjoyable thing where you think about this mind of information that some people are and their perspectives and their ability to communicate those perspectives really efficiently. Um, in biology we had people like Dwayne Jeffrey who were incredible. Bill Bradshaw who - just incredible and you loved hear him; Stan Welsh and ----- at the museum. And, I like that. But I don't know how relevant it is, except for maybe promoting interest and excitement and enthusiasm, I really don't know how much it helps the students. But, in some cases, that's the way that knowledge has to be transmitted, um, and I don't know, in [REDACTED], for non-major students that I teach, it doesn't matter—I mean, I don't think that's the way to teach it at all. I'll teach an [REDACTED] course this fall, and in these courses there are concepts, um, terms, very

specific things that the students need to know, and lecture-based approaches from faculty are probably a pretty good way, or a way of doing that. So. I don't know. [Laugh.]

Interviewer: Thank you. Um, what do you feel like the student's role should be as a learner?

Interviewee: Well, the burden of learning I think should be on the students, and I think our classrooms should be designed that, that the students are shouldered with the responsibility of getting information. And again, I'm really ignorant, but I think, like, our institutionalized education is really kind of messed up where it's like hoop-jumping, and students get done with college, and they had some cool classes, they had some fun, and they're not any smarter, they don't have any—they are a little bit; that's really cynical to say that—but a lot of it is just hoop-jumping. And I think that's - that plays a disservice to the students so, in my opinion, the learning should be, the burden of learning should be on the students.

Interviewer: Um, what specifically, like, should they be doing in class. What specifically do you feel like, as part of the learning process, that responsibility would look like?

Interviewee: Well, there's been like a little, some good discussion on like flipped classrooms, and what is the role of like that that classroom time, that social time. Um, and if I knew how to do it right, I think that students should be prepared to come to classroom where they have this general understanding of the concepts and terms and the classroom time should be used for those social interactions; addressing problems, you know, assessing shortcomings in what they understand or misconceptions, rather than teaching the material. Right? So again, from my limited perspective that flipped classroom approach has some some value, if you know how to do it right. Um, but there is something social about teaching. There's something social about learning, um, and I think the classroom can be really important in creating those social connections. Um, but ideally, if I knew how to do it right, it would be like, come to the classroom, let's fix the misconceptions, you know, let's reinforce um, the concepts that you understand, teach each other, and, rather than the classroom being the center of learning, or generating that original knowledge or or understanding.

Interviewer: Thank you.

Interviewee: You guys can correct me every time I say something wrong in terms of teaching strategies!—

Interviewer: No! [laugh]

Interviewee: --But again this is like how I try to piece it together.

Interviewer: No, cause this isn't, this isn't right or wrong, this is just—

Interviewee: Some of it probably is wrong—

Interviewer: --trying to understand. “F” – just kidding! Um, so, this one is totally—A typical day in your classroom, what does that look like?

Interviewee: So a typical day in my classroom, um, so we have, I mean, I try to generate a lot of discussion and interaction among the students; a lot of like, think-pair-share, a lot of hey, take a look at this data, come up with an explanation, and then, get together in a group of four people and talk about it. What do you see? Do your perspectives, are they similar? Are they different? Where are they different? Why are they different? Um, so there's lecture or think-pair-share stuff, or, I try to mix it up a fair amount, but always I try to get . . . I try to break it down and have them talk to each other. Um and other times I call on people you know—what do you guys think? And you have the same five students that always raise their hand. Um, but I try to let em talk amongst themselves and we don't

even necessarily address each specific group and their perspective, but give them time to talk about it.

Interviewer: Just kind of generally for these different activities, if you were to estimate like a percentage, that you kind of give, or like what kinds of subject matter you tend to do with the different activities . . . what would you kind of just estimate?

Interviewee: It's probably not as high as I'd want. I mean, I think I come from that lecture perspective and I probably lecture – I, you know, if I if I really had to think about it and think like let's break it down, it would probably be 70 to 80 percent of the time that's lecture. And maybe you know hopefully at least hopefully at least 30 percent of the time, but that maybe too optimistic. Um—

Interviewer: There's no right or wrong! [small laugh]

Interviewee: Yeah, but it's spread out but the hope is to have more of that interaction, but again I fall back to what I'm comfortable doing and and we love that—I like that control when you know the pace, you know the content that when you present it you know how it will be presented and lecturing is a really good way of doing that.

Interviewer: What do you feel like some of your strengths are as an educator?

Interviewee: Uh, strengths, I like to be open to trying new things. This semester is I think the fifth time I've taught [REDACTED], and it's kind of the fifth reinvention of it. So I'm open to try new things. I think I think I try really hard to facilitate a community in the classroom where they have chances to interact and learn together. Um, I think, strengths, um, also are the fact that the subjects I teach are inherently interesting—to everybody, even non-majors, and, my students might not say so, but I think a strength is trying to help them see it from that angle, like, this is cool stuff like, even if I've never liked [REDACTED], this is cool stuff and it's worth thinking about.

Interviewer: What do you feel like are some of your greatest challenges as an educator?

Interviewee: Um, figuring out appropriate assessments are really hard to do. Even well-designed assignments, um, that lead to to students meeting the learning outcomes are are hard to do. Organization I think is always hard, that efficiency of like, all right, how do I piece all these things together in the most effective way? And I think, for me the balance of of helping students learn, and then just trying to give them more and more and more and more and more and more and more and more and yeah, it's just easy to want to give them more and more and more and more, and they're not learning.

Interviewer: Um, could you tell us about a time that you changed something? I know that you mentioned, every time you teach [REDACTED] is kind of a new iteration, so maybe, along those lines, some other thing that you decided to change, and what, what that was and whether it was successful, why you wanted to make that change?

Interviewee: So a big change was I switched from doing traditional exams and I'd have multiple ch—like the exams I administered the first couple semesters were multiple choice and short answer, and then, you know, a couple essay questions at the end, I was trying to span this whole range of what I thought they should know. Um, and as I looked at the exams and as I looked at what I wanted to accomplish in the course and my course goals, I thought, you know, these questions are pretty meaningless in terms of their relationship to my course goals. So deciding--then I decided to scrap those traditional exams altogether and come up with different types of assessments to see how well we're meeting those learning outcomes. Um, so scrapping exams was really hard because students like exams because it's straightforward, it's predictable, um, you give em a study

guide, and they can go to a book and their notes and know exactly what they need to study and understand to be successful, and then switching over to things like creating a web story, or creating a group video project introduces a lot of challenges, you know, working with other people, and more ambiguous, or less well-defined, um, there's no specific, there's no specific, I don't define the topics so it's it's less defined in some ways, and that creates some anxiety for students, where they think, what do I have to do? What are those hoops? What am I shooting for exactly? And that may be a weakness too of mine, you know, these projects, these assessments should be well-defined, and they should know what they're shooting for, but I'm happy to have em open enough that it creates some—I don't know. So it's that challenge of having that structure verses less structure. Um, but as a switch from a a really structured exam, to less-structured assessments, it's been a big change, and I think, at least, in my opinion, I think we're assessing learning outcomes better, at least the ones that we have for [REDACTED], than the traditional exams.

Interviewer: That is interesting. That's a cool example. Thanks for sharing that. What is student-centered learning or active learning—do you feel?

Interviewee: Yeah, I think, I uh, I hear that, and I think of the saying “Telling ain't teaching and hearing uh, isn't learning” or something—I can't remember the saying, but it's just the fact that you try to involve the students in kind of that messy part of learning that they're the ones who are generating the knowledge actively, rather than having it presented to them and then they memorize it and regurgitate it. And, at least my understanding of active learning is, there's a million different ways to do student-centered learning, and if I interpret one of the studies I read right, it works well if if the instructor knows what they're doing, but it works really poorly if the instructor doesn't know what they're doing [laughing]. So, if you want to focus on like student-centered learning, I think you've gotta learn the approaches that work with your skill set and then really understand how to implement them to be successful in implementing active learning strategies in the classroom.

Interviewer: So we're kind of also wondering why you chose to participate in this STEMFI experience, um, yeah. [small laugh]

Interviewee: So, I think, I don't know if I was assigned to do this, I don't really remember being presented with like, would you like to do this, is this something you'd like to pursue? And maybe there was a time when they brought that up—

Interviewer: [laughing]

Interviewee: Um,

Interviewer: Uh, well, theoretically everyone should be a volunteer, um—

Interviewee: I was never coerced into doing it.

Interviewer: [laughing]

Interviewer: Yeah.

Interviewee: Maybe asked, will you do this, I thought, sure

Interviewer: Maybe that's what happened, I'm not sure

Interviewee: I don't re—I really don't – yeah. I don't remember, I don't remember them saying, hey, there's this good program—

Interviewer: No arm-twisting

Interviewee: There's no arm-twisting, but as like an [REDACTED] faculty member, I think, uh, this is cool stuff, this is, these are things that I'm interested in, these are things that I think

would improve, um, my skill sets as a teacher, um, and then like um in the department, [REDACTED] is super awesome, tons of great strengths, and uh, any opportunity to improve that what I do and learn from people with awesome skill sets is worth doing.

Interviewer: What do you hope to gain from the workshop?

Interviewee: A better teacher. [laughing]

Interviewer: What a good answer!

Interviewee: Yeah. I don't know. I mean, like I said, I – I can't remember even how I was recruited or volunteered to do this, um, and it's probably I'm forgetting things; it's probably a shortcoming on my end. But, yeah, just learn new skillsets, and, and contribute to how, to improving education at BYU I guess.

Interviewer: So, we have a question, and I'm not sure if this is super relevant, but what aspects of the STEMFI experience were most motivating to you: course-release time, financial, mentoring, gaining skill at student-centered teaching, but maybe you didn't really think about the option there?

Interviewee: I don't know how much I thought about it. I mean, I don't remember. Sometimes life is a whirlwind, like the first couple years, and

Interviewer: Yeah

Interviewee: and you're like, wha-? What? When did I talk about that? But I don't—I can't recall.

Interviewer: That's fine. [small laugh] Um, what barriers keep you from using more active learning approaches?

Interviewee: Oh, I don't know how to do a lot of em. Um, I think students . . . they're, BYU students are really awesome, and some are really willing to like, just jump in and do things, and then others aren't. So one of my barriers is like, how do I make, how do I help everyone be involved in active learning? Or how do I design active learning? Um, active, active learning activities that involve everybody in mean - equally meaningful ways, rather than just letting those, like, really vocal, ambitious, or, students that are comfortable, you know, become involved and dominate the conversation? And that's been a shortcoming with, I think, some of the ways that I've tried to implement it, is we hear the same voices, um, and have those same perspectives by these great students who love to be involved and they're willing to jump right in, but we have a bunch of other people, and I definitely would have been one of those students who are like, uh, I'm not doing this, or I'm – you know – more reserved, and their voices and their perspectives and their understanding isn't reflected in these, at least some of the active learning strategies that I've tried to do. Even in like a think-pair-share, you know, you can have one person who's pretty quiet and pretty reserved, and, you know, in spite of the fact that both of them are talking, the one perspective is really dominating in that, in that discussion, and the other person there—yeah sure—you know? So that's one, that's one of my big fears: how do you, how do you change the power structure so everybody has a more equal voice in these active learning strategies? Um, other ones are the fact that, like I said, BYU students love hoop-jumping. Um, and, at least the way that I've implemented active learning, um, those hoops are a little . . . they're not the traditi—they're just not as, they're not as easy to follow as traditional like study guide hoop-jumping type-things. Um, so, there's always students who kinda get a little bit uncomfortable feeling with it. But . . .

Interviewer: How confident are you in your abilities to use active learning strategies?

Interviewee: Moderately comfortable. Willing to try. Willing to learn.

Interviewer: You talked a bit about the, um, barriers in the classroom with the students—are there any external barriers that you feel kind of limit, or influence your ability to use active learning strategies?

Interviewee: Outside of, like, pre-class preparation—I mean, that’s an external barrier, and maybe it’s to find those expectations, you know, what do the students need to do to come in prepared and ready to do this? Um . . . cultural expectations. I mean, that’s kind of what we’ve been talking about, but it’s – those are external barriers where, you know, many of us, at least, and maybe I don’t know students as well as I should, but we come from a lecture-based learning structure, and then you come to something that’s heavily student-centered, and it’s a hard – it’s a hard shift. So those are, I think, external barriers to effectively implementing active learning. Maybe.

Interviewer: Can I ask a clarifying question about this? You talked about, um, that, I forgot the word you just used! You just used it a second ago – um, the cultural aspect? Do you mean, like, the culture of the students coming to the classroom? Or is that also the culture of the department? Or your colleagues or anything like that?

Interviewee: Oh, it’s probably largely culture of the students. And it may, there may be some department-specific cultures that that will influence that. But I think of my [REDACTED] department, and we have a lot of awesome instructors, a lot of people teaching these, you know, wonderful upper-level courses, so I think there’s a culture of, hey, get involved, get engaged in the messy part of it. But working, you know, I’ve taught a bunch of these [REDACTED] classes, these are freshmen, and, I think it’s more like, uh, student culture. And maybe it’s a GE culture, where they come in like, it’s a GE course, and I’m gonna sit here and listen and jump through the hoops, and I dunno exactly what it is.

Interviewer: Mm-hmm.

Interviewee: But I think our department in general probably wouldn’t fall into that category.

Interviewer: Thank you.

Interviewer: Do you have any other clarifying – anything you wanna ask?

Interviewer: Um, I don’t think right now [small laugh]. Usually, uh, what we do, I think this is, we’re near the end, we’re just gonna ask how we can help you now, but, um, usually what we’ll do is we’ll have the this first interview and we’ll go and transcribe it and think about all the things you said, and then we’ll probably have other questions that are gonna come up, uh, when we look at it again, that maybe we want some clarification. Um, so we’ll maybe contact you in a week or two, um, and maybe come back for just 10 or 15 minutes to talk about a couple of things. Is that okay?

Interviewee: Awesome. And everything I say is tentative. Subject to change.

D/Interviewer: [laughing]

Interviewer: Don’t worry! We’re not gonna hang it in the hallway.

Interviewee: [laughing]

Interviewer: If you, like, gave some wrong answers, we’ll just change it in the transcription.

Interviewee: Make sure they’re always right

Interviewer: [laugh] That’s not true. We’re not gonna do that – no. Um—

Interviewee: But I think that’s an important thing, and I—this, we talk about this, and I want my students to feel vulnerable in the classroom. We’ve talked about –was it, was it social vulnerability or something? And we hate feeling vulnerable, and I want my students, and I think part of my goal, and it’s like an unstated goal, but part of my student-centered

learning is I want my students to feel vulnerable! I want them to feel like, holy cow, I'm putting myself out there, and somebody might think I'm an idiot, or they might see my ignorance and know that I'm just faking it this entire time and I really have no idea what's [laugh] going on. But I think, creating those, those environments of vulnerability, where they're safe and they'll be respected are really valuable for learning. And that's kind of just like an ambiguous objective and unstated, but I think vulnerability in the classroom is really important.

Interviewer: Thank you. Um, the last, the last question we have is just how else can we help you as we uh head into STEMFI that's happening in spring – so hopefully it's on your calendar!

Interviewee: It is on my calendar.

Interviewer: Um, and, is there anything we can do to help you as we're going into that or other questions that you have about what's going on, or—

Interviewee: Well if you're open to me shooting emails when questions come up, I think that would be, that'd be a nice thing I can say, hey, you know,

Interviewer: Yeah

Interviewee: -what's going on, or, this is a question I have, but at this point, I think I'm in good shape-

Interviewer: Great

Interviewee: no specific questions.

Interviewer: Great. So, feel free to contact me, or contact [REDACTED] You probably know [REDACTED] better. Uh, and she's the PI. I'm a co-PI, so, she's my boss, sort of –hahaha! But um, thank you so much for taking time to talk with us today. We appreciate it.

Interviewee: Sure. Yeah. Happy. Thanks for coming by, and . . . you guys do cool stuff, I wish that, I wish that I could do education --

## Interview #2

INTERVIEWER: So, to start with, I'm supposed to assure you that we're not judging your teaching in any way; we're just wanting to understand where you're coming from and the challenges that you face. First question is just, can you tell us a little bit about your teaching background?

INTERVIEWEE: Uhh sure! So I've been at BYU for about 10 ½ years and that's really my only teaching background, is here. Prior to that, I was an [REDACTED] [REDACTED] so mostly focused on research. I did have some graduate students I mentored there. They would do research with me through a couple universities in [REDACTED], so I worked with students that way, but as far as teaching, no academic teaching background until I came here; kinda was a second career. I teach anywhere from 1-3 classes a semester depending on the semester, and at first I was doing mostly graduate classes and electives. Then last year, fall of '16 was the first year I taught a core



class, the one that I put down on here: [REDACTED]  
But before that, it was always either senior electives or graduate classes, which generally are smaller, also. I have about 40 students in this semester's class; that's generally high for me.

INTERVIEWER 2: And is, sorry, I'm just gonna interrupt; this [REDACTED] one, is that 40 students, or is it larger?

INTERVIEWEE: It's 40 for me.

INTERVIEWER 2: Okay.

INTERVIEWEE: We've got another section that has closer to I think 50 or 55, so it depends. But yeah.

INTERVIEWER 2: Okay, great. Thank you.

INTERVIEWEE: Mhm.

INTERVIEWER: That's an exciting background!

INTERVIEWEE: Yeah! It was a great career, I didn't wanna leave, so.

INTERVIEWER: Why did you leave?

INTERVIEWEE: I just uhh...they kinda recruited me and I kept saying no. I thought well, I'll come out for an interview, because I didn't think they'd ever hire me; I have no academic background. But I thought I might wanna retire and work at BYU someday, but they kept, I kept making it the next step in the interview, and eventually they made me decide, because I kept thinking they'd say no. So, I had no intentions of leaving and told them that many times, but fasting and prayer convinced us that this is where we needed to be, so here we are  
[REDACTED]

INTERVIEWER: Wow! Just pulled you out!

INTERVIEWEE: Yeah, yep.

INTERVIEWER: Can you tell us about a powerful or influential experience that you had as a student in a STEM-related learning experience?

INTERVIEWEE: Umm, yeah. I mean, probably some professors I had in my undergrad, just classes that I really thought were fun (2:48). They were generally hard classes. But that's what got me interested in going to graduate school and studying [REDACTED]. So I went and did a master's degree in that and then through that got the job at the [REDACTED] working on actually that I wanted to work on that I studied as a master's student. So I think I had a couple professors that were influential in helping me gain passion for a certain topic, a certain subject. That really helped me settle my career.

INTERVIEWER: Can you think of anything that the professors may have done or some aspect of their interaction or teaching that made it impactful for you?

INTERVIEWEE: I guess I just felt like I learned a lot and that it was fun subject material. It's been a long time ago now. I mean we did some experiments. I like hands on experiments and I could relate. As a kid growing up I always thought airplanes were neat and could relate some of what they were teaching to things I enjoyed. They were knowledgeable. I remember one professor in [REDACTED] was a former air force pilot and so he had lots of stories of being in the air force and made thermodynamics fun; although, he's one of the hardest teachers most people had in my generation who took thermodynamics here at BYU. Other teachers, they take time to mentor you and talk to you and help you. I always appreciated those experiences.

INTERVIEWER: Thank you. And I'm curious, what do feel like your role as an educator is?

INTERVIEWEE: Yeah we're actually debating that a lot in our department right now. There's not a common consensus to what the faculty role should be or how students learn. I think the way I learn is different than how today's students learn and whether or way is better or not, I don't know. But I think my role is passion for subject material. I think having worked 18 years in the industry prior to coming here gives me a background where I can say, "This is where I used this. This is where something really worked or something failed and this why and this is why you need to know this and this is how I used it. I like interjecting a lot of real life experiences in the classroom. I think, at least my bias, students need to learn how to learn and how to solve problems. And that is very different than getting an answer by looking online for a solution manual (5:27) or

someone who's already solved the problem because in the real world, at least in the world I worked in, there is no book answer. There is no way to google that answer. And if you haven't learned how to solve a problem, the technique to do that or some fundamental background, you won't solve the problem. And students don't always like that. They're used to, "I want the answer and if I can't get the answer, I want to know what I did wrong in a minute." Instead of failing three or four times or trying things and they don't work. So part of my plea to the students is to let me try to show you other ways to learn I guess. And I don't know if that's right or wrong, but it's something we're thinking about a lot in our department right now.

INTERVIEWER: Interesting, so as an educator not just giving them a clear path to the answer, but pushing them to explore there different.

INTERVIEWEE: We call it real world problem solving in our department. It's kind of an objective or goal of our department is to focus on real world problem solving, which means you learn how to solve a problem. And part of that is to have the confidence to think, "So I don't know the answer, but I have the confidence that I can figure out how to do it." So, I think instilling confidence in the students is also good.

INTERVIEWER: I might ask you more questions about that a little later. The next question I want to ask you is what do you think the students' role is in the learning process?

INTERVIEWEE: So my biased opinion is a lot greater than they think it is. So, I learn the most when I put forth effort and time. And granted, especially in mechanical engineering. Some of the hard sciences, we know they're overburdened. And it's very rare that a student can graduate in years and get straight A's in every class. So, sometimes they have to choose what class they are not going to put effort in. But I think the students' role is to not always look for the most deficient way. It's efficient to get things done in the quickest time possible. And I don't discount that as a motivator or even important. But when it comes to learning, trial and error and learning by failure and struggling with a concept...actually I've done some reading about how your brain synapses make really strong connection when you really struggle. So you actually learn better when you struggle. And I think the attitude is also what I see is the role of the student. What attitude they have towards learning. That's kind of a roundabout way to answer the question.

INTERVIEWER: That attitude of being willing to struggle, to be willing to fail, to not necessarily do the easiest, most straightforward...

INTERVIEWEE: Yeah, yeah. There's been some studies on grit. How do you learn grit? Do you learn it by getting the answer right away? Or do you learn it by struggling and failing and keeping at something? There are the kinds of things that students don't appreciate it until 5 years down the road. So all of us have been around a while. You know, when we run into students or I get unsolicited emails from students, "Now I'm really grateful for this experience even though I didn't like it at the time. Elder Bednar talked about this is one of his talks. He had a professor that he didn't like and was really hard. But it was the professor he learned the most from. There's a general conference talk based on that."

INTERVIEWER: Okay that's interesting that you bring that up because (9:32) I did want to ask you to tell me about a time when you felt successful as a teacher.

INTERVIEWEE: Oh okay. So I feel successful when it clicks for the student. And there's various things. I've had a lot of graduate students in these 10 years. So I feel like I have more personal relationships with more graduate students. And just last week a graduate student said, "Hey I got this paper accepted in this pretty prestigious journal for our field. I'm forever grateful for what you taught me about technical writing as a master's student." You know, he went on to get his PhD at UCLA and is doing great things. So things like that, when students value or appreciate. I guess I like feeling appreciated. And so when my student realizes that I've done something to help them and they're thankful for that, I really like that. I feel more fulfilled. When in your student ratings, a student says "This is a really fun class. I can tell his passion about it." I like that because I try to be...you know my student ratings aren't perfect by any means. It'll be the same class where one student tells me this was their favorite class and another student will say it's the worst class they've ever had. So you know, go figure. The students really share in the passion, share in the learning, and then value what they learn is what I think I feel fulfilled about.

INTERVIEWER: You mentioned sort of this idea of it sort of clicking for students. Can you remember a specific time in class when you were teaching when you had that sort of moment?

INTERVIEWEE: Yeah. I mean, just this week as we are preparing for a test in the [REDACTED] class, students were asking questions about certain technical principles I guess. And I could tell it didn't click the first we had gone over it so it was this kind of review we did. You know I said, let's look at it this way and then comes the light bulb of, "Oh now I get it."

INTERVIEWER: You were mentioning having students come back and thank you. Was there maybe a theme or maybe just a specific example of something specific that they recognize you for? Something that you did that they were appreciative of?

INTERVIEWEE: (12:06) Yeah, so a lot of them are appreciative of what they do beyond BYU meaning whether it's the next degree or the job they get. I help a lot of students get into advanced degrees if they are not going to stay here for that degree or helped a lot of students get jobs. And then while they're in those jobs or working on those degrees, I think they've been really appreciative of kind of what I taught them about how to go about working or how to be a good grad student or something like that. Those tend to be the kind of general themes that come back and that they can tell I cared about them and wanted them to succeed. And I believed they could succeed and then as they succeed, they seem to look back and say, y'know, "You believed in me and now I essentially believe in myself because things are going well," or something like that. Yeah.

INTERVIEWER: That's gotta be pretty rewarding.

INTERVIEWEE: It is! That was one of the--it was a big struggle, like I said, to leave my, what was my dream job, but part of the reason I was willing to leave the [REDACTED] was if I could pass on to the next generation kind of what I had learned, I thought that was a neat way to go out, to be able to instill some passion in the next generation for [REDACTED] or something like that.

INTERVIEWER: Awesome, thanks. The next question that we have here asks what do you think learner-centered teaching is or how would you describe learner-centered teaching to a college? How might it be different from like--

INTERVIEWEE: Learner-centered teaching.

INTERVIEWER 2: We're also changing it; I think we decided to call it student-centered teaching.

INTERVIEWEE: Student-centered teaching. Well, I could see how they could be the same thing. Um, so to me, that's the difference between me getting up and lecturing, getting through a bunch of material versus do the students really learn something or understand, I guess. The focus is not what can I spit out and hope they receive, y'know, whatever percentage students receive. I've heard some pretty low numbers on what the average student gets out of a lecture. So I think it's focusing on what the student learns and does and gets out of the time, so that's much more than lecturing. It has much, much more than having people that are great orators or are great at powerpoint. Students like them, but then they also realize they don't always learn as much. They're entertained, and maybe I'm jealous because I'm not that kind of lecturer, but that's what I would think that student-centered learning is, is what's the student learning, what are they getting out of it, and are they getting out of it what the objectives of the course are. Was I right or wrong, or do you know the right answer? Because I'd be curious if there is a right answer to that.

INTERVIEWER: That's wonderful! We have this to ask just to kind of see what your understanding is and then if we feel like we need to clarify something, we will, but I don't think I could say it any better than you just did. That was fabulous!

INTERVIEWER 2: Yeah. Definitely, so one of the things that's important in the classroom, in the student-centered teaching, is like, also who's doing stuff. Are you doing things or are the students doing things in class? Like, how that sort of class time is used.

INTERVIEWEE: Yeah, I'm hoping to learn about that because just in my class today, my jet engines class, for some reason, this class, like, I had done a lot of studying on active learning after I first came here, but sometimes when I implement it, it just doesn't seem to go well. Like today, I asked--almost every period, I'll say, "You guys work on this problem and then in 10 minutes, I'll come back and we'll see where you're at." Not come back obviously, but then half the class doesn't even work on it, so, I'm kind of befuddled as...should I just do the example for them? I don't think so, but at the same time, I could tell half the class was not bought into working on the problem. I noticed that today as I was doing this.

INTERVIEWER 2: Well, we can help with this. We'll definitely talk about that at the workshop, yeah.

INTERVIEWEE: Good, good.

INTERVIEWER: Do you feel like that's often your experience when you try active learning things?

INTERVIEWEE: Generally not. This is a, y'know, each class is different, and sometimes if you've got a few leaders that lead badly, lots follow, and so generally, that's been a good method of teaching, is to say, "Hey, here's a problem. Get as far as you can in 10 minutes and then I'll answer your questions, I'll go over it, whatever." Generally, it's been a good model, but sometimes there's problems. I remember the first time I read about active learning, I changed my teaching a ton, and it backfired so bad I got really discouraged, but it was in...I forget which class, but I'd read some books on active learning in the sense that they should come to class having already done problems, and then I would pretty much just go over problems in class, and the students did not like that at all. They didn't like being responsible for having problems done ahead of time, and then the students that kinda, then the students that got it right didn't like the students that got it wrong working it out on the board. They thought they were wasting their time. "Why am I watching a student who got it wrong do it on the board?" or something like that, so...so I kinda backed off on that level of active learning after my first couple semesters here and did more of the example in class type of things.

INTERVIEWER 2: Yeah. So that was sort of like a flipped classroom thing where they're supposed to do a lot outside of class and then sort of had this problem solving session in class?

INTERVIEWEE: Right, yeah.

INTERVIEWER: So that's interesting. We actually wanted to ask about a time that you changed something and tried to make a difference, and so you did that.

INTERVIEWEE: Yeah, I did that when I first started because I was naive and I knew--I didn't know much about academics because I didn't have that background, and I'd read some books and gone to the new faculty seminars and learned about active learning and flipped classrooms and said, "Great, I'll try it!" and my student ratings were really bad that year, so...and in a new faculty position when student ratings are so influential, I learned not to experiment too much until I'm further along in my career. Then I don't mind experimenting all I can, but it's a little intimidating to try something

that people say, "This is the way to do it," and then have it backfire in terms of the students didn't like it. So it's probably honestly maybe I just didn't implement it right or maybe I misinterpreted how to do it, I don't know. It didn't work out really well.

INTERVIEWER: Interesting. Huh. In your classes that you're teaching right now, how would you describe the way you have it set up and organized, and if, when a student comes in, what would they be doing throughout like a typical class period?

INTERVIEWEE: Yeah, so I'd say the majority is taking notes of what--of a few principles, and I try to incorporate an example in the lecture, so a lot of it is note-taking, depending on the class. Then there's working stuff out on their own also as part of the example problem, and then question and answer.

INTERVIEWER: When you say depending on the class, do you mean like, which courses or what the subject is that day?

INTERVIEWEE: Different courses, yeah, different courses. Like, the senior elective, I generally do more of the 'work this out,' especially my graduate classes. I'll give them problems. The graduate classes are really willing to work things out. This elective, this semester, isn't going as well as usual, but generally, they are, so I'm a little less open-ended in the undergraduate core classes, mostly because I feel like the material we have to cover, I don't know how to cover it if I get too much active learning or too much flipped, because I know what they need to learn to get the homework done that week, and so I try to at least cover that much, and that seems to be more appreciated if I at least cover what needs to be on the homework.

INTERVIEWER: And that's determined that you set up the homework structure?

INTERVIEWEE: Yeah. Well, so this is our core [REDACTED] classes are certain objectives that we've decided--"we" meaning everyone who teaches that class--that need to be met, so it's kinda so many chapters out of the book, and like this semester, [REDACTED] [REDACTED] teaching the other section. So we're in a sense, almost synced, what we teach. We sync our exams and so we do kinda know what needs to be done.

INTERVIEWER: Awesome. And then you said there's like a question/answer, what...?



INTERVIEWEE: Meaning just like, y'know, I'll try to ask a question to see did they understand it, or I'll ask, depending on the class make-up, some students are really willing to ask questions, some are not, and so if I'm, if I say, "Do you have any questions?" and I can tell--sometimes you know they don't understand, but they're not willing to ask questions, so then I'll just, I make each student fill out a 3x5 card with their name and then something unique about them and I just go through and pick one and say oh, okay so-and-so, what's your questions, or do you know how to do this? Just to get some more engagement. And I do weekly quizzes. Not every lecture, but once a week, I do conceptual quizzes, so that takes 5 or 10 minutes, and that's a good way also to tell if they're getting it or not.

INTERVIEWER: Is that with an i-Clicker, is that handwritten?

INTERVIEWEE: No, just handwritten. It's usually paper quizzes. Y'know, I just hand out paper and say you have 5 minutes to--and part of it's to keep, to try to motivate them to keep up with their reading and to motivate them to be there in class, because I don't announce when they're gonna be, so.

INTERVIEWER: If you were to kinda say like, what percent of the class is taking notes, lecture, what percent of it is asking questions and answering...?

INTERVIEWEE: Oh, okay, so umm...would taking notes include doing example problems or working out problems?

INTERVIEWER 2: Are you working them out or are they?

INTERVIEWEE: Them first, then me.

INTERVIEWER 2: If they're doing it, then it counts as them doing a problem, but if you do it on the board, then it counts as lecturing.

INTERVIEWEE: Okay, so I would say average, maybe 70% me lecturing, 20% them doing something, and 10% question and answer.

INTERVIEWER: Okay. And the question and answer is just like at the end before they leave?

INTERVIEWEE: And, or they're, it's pretty open, so I'll get some questions just any time during the lecture, but then other times, I'll just stop and ask what kind of questions they have.

INTERVIEWER: Awesome. Thank you. What do you see as some of your strengths as an educator?

INTERVIEWEE: Umm, I think part of it's my background, is having worked outside of the academic setting for a long time. I think I know how what we teach in [REDACTED] is used, at least in my field. I think I know what it's like to work in the real world, which is different than an academic setting. I know what it's like to work out where no one else is LDS but you, and there's some good things to pass on about that. I try to lead by example, and I've had examples in my life of people that were excellent in their career, excellent parents and spouses, and excellent in Church service, and I try to instill that you don't have to give up one to be good at another; you don't have to sacrifice church if you wanna be great at a career, or sacrifice your kids, y'know. I try to instill a balance, and balance doesn't always mean time balance, but it means balance in priorities and things, and then, in most subjects, I feel like I know the topic really well, so I guess that's my strength.

INTERVIEWER: Yeah, absolutely, thanks. And then what are some challenges that you feel like you face? And you mentioned a little bit of that; um, like you talked about the way students react to things, but just in general some challenges that you face as an educator?

INTERVIEWEE: I know at the very beginning, I did not relate to students very well, and maybe because I had worked for 18 years. I was not very patient with the entitlement mindset, and the mindset that you push back, I guess. 'Oh, you're making me do something hard!' And I'm like yeah, I admit it! So what? You don't like this, why? So when you work in the real world, you realize certain things that you have control over and certain things you don't, but students still think they have control over a lot of things, and so I think it took me at least 5 years to try to relate to students again, and so...so I still may struggle with that. I think i have weaknesses that I don't know I have, and that's one reason I signed up for this--

INTERVIEWER: And not so much weaknesses, because that makes it--

INTERVIEWEE: Yeah, shortcomings, I dunno what you wanna call it--

INTERVIEWER: Just thing things that--

INTERVIEWER 2: Things that make it difficult.

INTERVIEWER: Yeah. And it might not have anything to do with--

INTERVIEWEE: Difficult to me is sometimes relating to the students. Difficult for me is like, I go to other teachers' lectures and I think I'm doing the same thing, but they get much higher student ratings than me, so I have no idea. I'm like, y'know, I do that...I *think* I do that, but I obviously don't. So is it my demeanor, is it the way I come across, is it...I really don't know, but when I do go to other faculty's lectures sometimes, I think I'm doing as good or better as them in terms of classroom management in terms of class, but they get much better ratings than me, so am I not connecting with students the way they do? I really don't know. Or maybe my mind and reality are not in sync. I don't know. (26:15)

INTERVIEWER: And what about maybe like external things...not so much with your personality or your teaching style, but challenges like any other individual in your situation.

INTERVIEWEE: Yeah, well the challenge of trying to get research funding, trying to have 5-10 graduate students, trying to publish, all those plus teaching are hard.

INTERVIEWER: Balancing and everything?

INTERVIEWEE: Yeah, the same thing I make fun of students...you can't put effort in every area every single class. Well, I am the same way. Some semesters I may sacrifice teaching because I have 10 graduate students and I'm just trying to keep them going. Or I'm trying to go for full professor so I'm really trying to ramp up my publications. And that's where more of my priority is right now. So that to me is a challenge for anyone in our position.

INTERVIEWER: Yeah, absolutely. And then also, we wanted to ask specifically with using learner-centered approaches in the class. What barriers do you feel like keep you from using more learner-centered approaches. So one that you've been talking about

is just the time commitment and maybe not having enough time to focus.

INTERVIEWEE: Yeah, so I think one would be if I feel like I have to cover so much material, I guess I'm not confident that I could do that. The only way I know how to do that is how I was taught, which a generation ago in the 80s was pretty much a teacher-lecture. And you took notes and you figured it out from there and you read the book. Students...I don't even know if even half of them buy the book anymore I've noticed. And so I guess I don't have confidence that they'll learn what they need to learn if I'm not at least giving some lecture, you know. So, I need to learn how to do that. Part of my apprehension is the experience I mentioned about active learning in a classroom and man that backfired so I can't necessarily get those kind of student ratings again. For me, part of what I do is I think is unjustly motivated on how much BYU emphasizes student ratings. I cannot afford to take risk, afford from a personal growth or my ratings or rank, advancement. I can't stand student ratings. The main reason is I still think I know more about learning than students do. They think they know a lot. And we've given up freedom to have power over the faculty by saying the class was fun or not fun. And those surveys don't judge learning in my opinion. They judge how much they like the class (29:15), how much they like the professor. So I think there's some intimidations there. Now other faculty in our faculty in our department get super good ratings. And I know the students learn a lot, not like I'm bad or anything. They're mid-4s to 4.1 to 4.4 I think generally. I really don't care for the emphasis. I think they're a very good tool. I think we overemphasize them. And so that keeps me from wanting to take risk,

INTERVIEWER: Thank you for sharing that. You're not alone in that field.

INTERVIEWEE: And maybe it's more in the sciences than I don't know. But I certainly have a rough time with student ratings sometimes.

INTERVIEWER: I wondered....you talked about this experience with this sort of flipped classroom that didn't go very well and backfired. And obviously you haven't done anything sort of that extreme. But have you had other experiences where you've used active learning in class? Maybe something simpler than the flipped classroom that you did feel like was a good experience?

INTERVIEWEE: Yeah so that's where I'll say, "Here's a problem."  
And we'll try to work it out for 10 minutes. The classes that have hands-on experience I think are really good for that. You know, where they have to run an experiment or we go run an experiment together. And we have figure out how to make sense of the data. I really like those kind of things. One thing I gradually have incorporated more and more. I started in a graduate class, but I'm doing this in almost every class. I make sort of a worksheet. Where here's a worksheet with bits and pieces where you fill in. Fill in what you can and then every 10 minutes I'll say okay, let's stop and see where you're at. And I'll help you fill in the rest and then we can go to the next point. I've asked some student in this [REDACTED] class if anyone liked that. I think it made a huge difference in a couple of graduate courses that were really hard to figure out how could I not just be the one lecturing there all the time. So having little worksheets that they do and stuff seems to help a whole lot.

INTERVIEWER: So it so sort of that guided note-taking.

INTERVIEWEE: Yeah kind of...except it's more problem solving than note-taking. But it is guided.

INTERVIEWER: Great. Thank you. What changes do you hope to make in the future in your teaching?

INTERVIEWEE: Well, I guess I would like to...I don't know what to change but I know what I want the result to be and that is students who feel like they're learning a lot and that they enjoy the class and enjoy me from the sense of a student-teacher relationship. I guess higher student ratings. (32:03) Like I say, 4.1 - 4.3 is fairly good, but everyone is good at BYU. So you know, not everyone can be getting 4.9s or whatever but just more consistent I guess. Or improve where I can. I honestly don't know how to improve or where to improve. I know I can, so that's one of my motivations for doing this workshop or program. Two, so I guess my motivation is I guess I want to be a better educator and to your point I'd like to have more skills and students that are learning. So that is what I'd like to change.

INTERVIEWER: More skills and student centered learning...and you see the result of that being what you described?

INTERVIEWEE: Yeah being that the students are learning more with less lecture I guess.

INTERVIEWER: Do you anticipate any challenges to that if you try to implement more student-centered learning? Do you anticipate anything that would make that difficult?

INTERVIEWEE: So I think it puts more responsibility on the student...or can. So then it's out of my control, right? And that's one thing about lecture, you're in control of a lecture. It takes things out of my control, so my roll might become a motivator or an enabler or something like that. Maybe I need to practice different skills to help enable students to also share in the student centered learning responsibility.

INTERVIEWER: Thank you. (33:44) Can you maybe tell me a little bit about the teaching culture in the department? And if there are any expectations that you feel exist in this department around teaching?

INTERVIEWEE: So teaching is highly highly valued in our department. You cannot progress in our department without being a very good teacher. I don't know if your rankings are the same...I don't even know if there's university rankings but I can bring them up what they are. But we are considered very good if you're between 3.7 and 4.0 or 4.1...you're considered excellent if you're 4.1 to 4.5 and you're considered exceptional if you're above 4.5 to 5. So it's very valued. We have excellent excellent teachers in our department. So I see it as extremely valued and the expectation is high in our department to be a good teacher and to spend time with students.

INTERVIEWER: And is the expectation high to get high student ratings? Is it more at looking at the outcome? Is there anything about what's happening in the class and what strategies or teaching methods you're using?

INTERVIEWEE: I think it's less that...that's one of the things about student ratings is like it or not it's one of the few metrics we have. So other than going up for rank advancement, we generally don't have people coming into our class to monitor our class or help us or see what we're doing. Sometimes they do that voluntarily. I'll switch with someone. I'll come to your class for two lectures and you'll come to mine and we'll go to lunch and talk about that or something like that. So I think it's more for being an effective teacher. But I think one of the few ways we measure that is with the student ratings.

INTERVIEWER: Thank you. And I feel like we've addressed this to some extent already, but the next question asks how confident are you in your abilities to use learning-centered strategies?

INTERVIEWEE: I don't know...50% ? Somethings I feel pretty good at, other things I'm just like "I don't know how I would do that." Or I don't even know what to do. (36:04) I'm going into this hoping to learn a lot.

INTERVIEWER: Great. And are there factors outside of your control that you think influence your ability to use learning-centered strategies in the classroom?

INTERVIEWEE: I don't know. Honestly, I would think that somethings are out of my control, but maybe I have more control over them than I think. And that's what I'll learn too, but yeah I don't know.

INTERVIEWER: Do you have any examples?

INTERVIEWEE: Well, kind of going back to student motivation and student desires...if I do all this student centered learning, but the student just hasn't bought into the concept, then that may be out of my control.

INTERVIEWER: Got it. We just have a couple more questions related to the STEMFI experience coming up. What are you most excited about or what do you hope to gain from the experience? Which again, you kind of mentioned.

INTERVIEWEE: Yeah, so part of that is just new ways of looking at things, new tools, new concepts, new things to try in the classroom. All that I'm looking for. Most excited to me, I feel like teaching something that I can improve at and I want to improve so this seemed like a great opportunity when I saw it come. So yeah.

INTERVIEWER: Is there anything that you're worried about in anticipation of the STEMI program?

INTERVIEWEE: Ummm, am I worried about...not really. BEcause I don't really know that it involves that much other than, what are we together for one week, two weeks? I forget. It's on my calendar in May it's coming up I guess so....I haven't thought a whole about it. I'm not opposed to someone being blunt with me, you know? So, that doesn't really bother me either, you know.

INTERVIEWER: Yeah it'll be a week of workshop. You'll have a mentor. You'll learn different learner-centered strategies. And then throughout the next semester, you'll have opportunities to have your mentor observe you, meet with your mentor, and implement those strategies.

INTERVIEWEE: I think I was ready on that sheet...so there's some commitment to meeting so I'm not worried about it, but during the spring and summer that's generally easy because I generally don't...I have enough research funding, I don't teach spring and summer. Next fall or winter when I'm teaching 2-3 classes...it'll just be a little extra work but, I'm not worried about it. But I know it'll be an additional responsibility.

INTERVIEWER: And you do get, there's a class buyout, right?

SANSOM: That's not always true.

INTERVIEWEE: I know I'm not getting it.

INTERVIEWER: Oh, alright.

SANSOM: Sometimes we've been able to negotiate. We've tried really hard to negotiate with the powers that be.

INTERVIEWEE: Yeah I think I told my department chair because there were two of us that wanted it. And I said, "You know, I don't care if I get a buyout or not. I just want to do it."

SANSOM: Awesome. (39:31)

INTERVIEWEE: So I said, if you'll let me do it, give the buyout to somebody else or you know so I don't think I'm getting - by buyout you mean I wouldn't teach one of the semesters?

SANSOM: One course less. Yeah.

INTERVIEWEE: Yeah, I'm pretty sure I'm not getting that.

INTERVIEWER: Alright, is there anything else we could do to help you have a successful experience with the STEMFI program?



INTERVIEWEE: Yeah, so I apologize if you've already given me this, but if there's anything that I should be doing in preparation for the workout, I'd like to know that. If you tell me hey that's in the email we sent you two months ago, I will go look for it. I didn't delete that I don't think. But if there's anything I should do to prepare for the workshop, I would like to know and try to prepare because you know once finals are over I'll have a week or two.

SANSOM: Yeah, so we'll probably send an email around about the time of finals. So hopefully people will take that little break between the end of the semester and the STEMFI to do that. But mostly we'll have maybe I think a short reading for you. And then, we'll ask you to think about the course you want to modify. And if you go back through your materials and think, "Yeah maybe this lesson maybe needs something" You know, that sort of thinking will help when you get to the workshop. But you'll have time during the workshop to actually prepare those materials for the class.

INTERVIEWEE: Has BYU done this before? Or is this the first?

SANSOM: It's brand new! (40:59) We got the grant from the NSF as part of this improving undergraduate STEM education program. So we'll be able to this for three years for sure. And then we have to think about what we do after that. When we don't have anymore money it makes it a little more difficult.

INTERVIEWER: But this is round one, so we're all really excited.

INTERVIEWEE: Yeah, so I'm excited. I'm pretty much open minded to whatever we do. Looking forward to learning a lot.

### **Interview #3**

INTERVIEWER: Just to make sure that you know, we're not here to judge or evaluate your teaching. We just want to know where you're coming from and how we can help you with STEMFI. The interview basically has sort of three parts. One is about like your background and what you think and another is about what you're doing right now and then the third is more about active learning or student-centered learning and what we're doing with STEMFI. So number one, tell me a little bit about your teaching background.

INTERVIEWEE: So, when I started grad school I did not want to teach anything. So that's my teaching background - no. I, as a grad student, never taught anything until the very last

semester when I taught a walking class. No, actually I did teach one class. One academic class. Anyway, so I got here and I was like, "Okay. I'll figure it out!" It's not my forte, but clearly I was interested. So it's pretty much been a "learn on the job" as very many faculty members do, I feel like. I've been teaching, since I've been here, the undergrad [REDACTED] class, which is the class I put in for this project. So I've been teaching that every semester unless I was on [REDACTED] leave. And so I've taught it a lot now. It's a required class for the [REDACTED] major. And then I have been teaching a couple - I developed a [REDACTED] class that I'm starting for the first time this semester. And then I've taught another [REDACTED] class that was already developed a couple of times over spring terms. So pretty much I teach [REDACTED].

INTERVIEWER: [REDACTED] - and how many people do you normally have in your classes?

INTERVIEWEE: So when I started I had like 40-45, and then it's been decreasing. I think the major is decreasing a little bit I mean we went from 1800 to 1600 students in the major. So now I have about 20 in my class. And it sounds like most, so there are four of us who teach the class, and it sounds like everybody's enrollment is down except for one. And his classes are always packed with long waitlists. But yeah, I think there is some trend of when you're decreasing enrollment- period. But there does seem to be an uneven distribution of students in our classes between the four of us. It's interesting.

INTERVIEWER: It IS interesting. Similar things happen in all departments I think.

INTERVIEWEE: Students talk.

INTERVIEWER: yeah. And you've been here at BYU for about 8 years, you said?

INTERVIEWEE: yes.

INTERVIEWER: great. So thinking back to when you were a student, tell me about a time when you had a really great learning experience.

INTERVIEWEE: Does it matter undergrad or graduate?

INTERVIEWER: It doesn't, but something in STEM.

INTERVIEWEE: Yeah, so as a graduate student, I feel like- well my advisor, I feel like he was just one of the best teachers I'd ever had. Kind of a strange guy, but a really good teacher. He took really difficult information and in class I felt like it totally made sense and then afterwards I'd have to be like- wait how did that work again? But he explained things really well, like it made sense to listen to and then I had to figure it out again on my own which maybe isn't? I don't know, I don't know if that's good or not, but I felt like he took a lot of really complicated things and made it make sense in class. So I feel like there were two classes as a graduate student that I felt like - I don't know, like a different teacher would not have gotten us through this. So I don't know if you need something more specific or

INTERVIEWER: well, and you said that you felt like you understood everything in class and then you had to kind of wrestle with it a little bit on your own.

INTERVIEWEE: Yeah, which I feel like isn't bad. I mean, maybe it's not ideal, but I feel like that's where you learn. I feel like the things I learned the most are things that I have worked through and figured out. They're also the things you understand the best. So I feel like maybe that's why I wasn't- like it was frustrating, but it wasn't unbearable, because it was like- I understood it when he explained it. So I should be able to get back to that. So I guess to me, that felt like a good learning experience. If I just read it on my own, I'd be like- I don't, I'm not, there's no way. But the fact that he explained it, I understood it, I've got to be able to get back there on my own.

INTERVIEWER: In some sense, he made you feel confident. Or capable of doing it on your own.

INTERVIEWEE: yeah.

INTERVIEWER: Did you have a thought Desiree? No, I just think that's really interesting. Now as a teacher, what do you think your role should be in terms of the whole learning process?

INTERVIEWEE: So I totally agree with- well the thing that I just said, students learn best the things that they have some hand in figuring out. So I don't want to- I have gone more and more away from: I am going to lecture you and tell you stuff. Because I feel like it's not really that useful, and it's so boring for everyone- and I don't like to do it either. So I feel like ideally, to me, we are facilitating their discovery of material, as cliché as that sounds, I guess. But I feel like that is how they- well, that's how I learn. I mean if somebody tells me something, I tune it out and then I have to go try to learn it or remember it or whatever. I guess that's the way I see it.

INTERVIEWER: yeah. That's great.

INTERVIEWEE: I want them to do more of the learning, not just of the listening.

INTERVIEWER: Yeah, so that's sort of our next question. What do you think the students' role should be? What should they be doing in class and out of class? What's their responsibility?

INTERVIEWEE: So for me, Ideally, I've tried to kind of get my class to this set up where I give them reading ahead of time and then there is a little knowledge quiz and participation quiz that they do before class. So this semester, and I don't know if this is getting ahead of us, so this semester, my class meets at 12, and I have the quiz due at 9 so I have a couple hours to look at it and they're supposed to tell me things that they learned, things they don't know, or that they are confused by any problems that they would have seen. And then they have a little knowledge quiz that tests a few of the things from the reading. More simply that they'll get later. So then, I go look at those, and then in class, ideally we do application of stuff. So basically, my class is a physics class, but rather than just repeat Physics 105, what I want to do is make it really human movement based, and that's what we're about. And so I really want to take the applications of

those principles and that's what I want to do in class, is talk about whether it's research, or have them do some projects, and collect the data and then do the analysis so I want them to read the principles ahead of time. And for a lot of them it will be a review, because a lot of people have had Physics 105, and then I want in class, I want them to be engaged and willing to participate in things. And discuss or whatever we're going to do that day. And then I usually have a follow up afterwards. Not always, but sometimes it's like did this practice problem in class, just fill in the answer you got. Because either they finished it in class, or if they didn't finish it in class, it motivates them to actually finish it and submit it. And then they just get a little bit of credit for doing that. Or sometimes it will be something we mentioned but didn't actually get to in class. It just kind of helps me make sure they are getting some kind of application afterwards. And if they were really on top of things and figured it out in class, then fine. Then they don't need that thing afterwards. So I feel like they- basically I want them to be engaged in the material somehow- you know. And those are the ways so far that I've been trying to do it. (9:11)

INTERVIEWER: That's great. Can you tell me a little bit more about the course? Like what is the course number?

INTERVIEWEE: So it's [REDACTED]

INTERVIEWER: And do they normally take it like as juniors or seniors? Is it a pre-req for anything?

INTERVIEWEE: It is not a prerequisite for anything, but we kind of get a mix. Some people will take it as their first [REDACTED] class because there's also no [REDACTED] pre-req's for it. The only pre req is like math 110 or whatever it is and then it is suggested that they have physics 105. And on the first day I will ask them if they've had Physics. If they haven't I will suggest that they take it. Like if they have the option in their schedule to either take it at the same time or go take it and then come back, like it will just make the class that much easier for them. But it is not required, it is suggested. So sometimes we will get people who do it first, and sometimes we get people who save it to the end because it has math and they don't wanna do math. So it really is a variety.

INTERVIEWER: So is there, at the end of the [REDACTED] program, like a GRE or a certification exam or anything like that where students have to use this course to prepare for that?

INTERVIEWEE: Umm, it depends on their major. A lot of students we have doing pre-med, pre-physical therapy, and I don't know about the MCAT like there's nothing specific to [REDACTED], I mean there's physics I assume. For PT School, I guess they take GRE's which wouldn't have anything specific to ours either. Athletic training, if they are athletic training majors, I don't necessarily know if there's super specific like, "calculate this" or whatever, but I would hope that there are some questions that relate to the movement type, or the stuff we have been talking about in class. But like it's not like here's your section on the exam about

biomechanics. But the AT certification is a whole other thing. They have to have volunteer hours or whatever.

INTERVIEWER: Like, clinical hours?

INTERVIEWEE: Yeah like clinical hours and stuff like that.

INTERVIEWER: So the course is also for [REDACTED] majors and [REDACTED] majors?

INTERVIEWEE: Yeah so it's for all of them. [REDACTED] We have three majors in the department, [REDACTED] students, I think they are going to be required to take it. In the past we have had a 2 credit version and a 3 credit version. They could take either one. So you had a lot of wellness students taking the 2 credit one. We are getting rid of the 2 credit version and we are changing the core classes and stuff. I am trying to remember... I think we decided to make this one... I can't remember if we made it a core or an elective. But anyway we get pretty much everyone in our department who comes through this class.

INTERVIEWER: Okay. Thank you for that clarification. Can you describe a time when you felt really successful as a teacher?

INTERVIEWEE: Um. Well yesterday, we did this activity. So last week I was out at a conference, and I had one of my colleagues fill in and he forgot. So then it was a little bit scattered. So I guess it was scattered, like I think he did fine, but like he got there, a few minutes late. But it was some material that I feel like when I rush through it, it is really hard. The students don't quite get it. So I was a little worried about what they would've gotten out of class last week. I mean I am sure he did a good job explaining it and whatever, but like when you rush it, it's just hard. So, (13:30) yesterday I wanted to make sure that we covered—we had like, a ton of new material to cover yesterday, so we did that, and then I wanted to kind of go back and make sure we got through that. So I have this activity that I do and he did part of it, but he didn't do the second part of it because I also forgot to send him the packet, so he knew the one part that he does in his class, but he doesn't do the second part. So anyway, so I brought it with me and I had the students work through it, and sometimes it's pretty, I don't know how much detail you need, but it's kind of nitpicky. We're figuring out where the mass of the center of a person is, and you have to take each segment and figure out like, where the position of the body is and how much it contributes in body weight to how much of the total body weight does each segment contribute, and then you do math and figure out exactly where the center of gravity should be, which should be probably somewhere around here, and it's just a lot of steps. It's a lot of things that like, tend to get mixed up or not completely understood, and for a while I hadn't been doing this part of the activity because I was like, it's so boring! And you sit down and you have a ruler and you have to literally go and measure from here to here and whatever, and are they really getting anything out of it? And then I started to think, y'know, maybe it is kind of tedious, but like, maybe it is really helping them to really work through it even though it's on paper and nobody ever does this anymore; we use computers, but like, maybe it is

helping them work through it. Anyway, so I decided to do this, brought it in yesterday and they worked through it, and I have one of the students who I feel like is not always super engaged in class. One of the students was like, “That was SUPER helpful! That made so much more sense! Because like at the end of the class, y’know, it was like, just multiply everything together and add them up! And I didn’t know what that was! And now I get why we’re multiplying and adding.” And I was like, oh yay! You just made my day! So anyway, I guess that was a moment where I felt like, “Oh, good! Success, you did something good.”

INTERVIEWER: Thank you. And as you know, STEM-fi is interested in student-centered teaching or learner-centered teaching. Just in your own words, if you were describing this to a colleague, what would you say? What is learner-centered teaching?

INTERVIEWEE: So, I would say it is more student-based in that I feel like it should be more, like you have subject matter you need to cover, but taking their experience into account—like, taking the students’ experience and their interests, maybe, like their potential applications and stuff like that, more into account than just, “This is the material I’m gonna give you.” I feel like it should be more applied for the students. But I also feel like it also should engage the students so that they are, y’know, if you’re having student-centered, it should be about the students, so then I feel like it really needs to engage the students and they need to buy into, right? Like, they need to be very active in this course.

INTERVIEWER: Awesome. What have you heard about active learning or student-centered learning? Have you used it before, what do you think about it?

INTERVIEWEE: Yeah, so I do, I think...it seems like a pretty nebulous kind of idea, so I’ve tried for a while, like I always, uhh, I would say since the beginning I’ve tried to at least like, have some activities every semester that we do where we go and collect some data and do some calculations and stuff rather than just read about ‘This is how you would do it.’ So I’ve always tried to do that at the beginning, certainly, I only had maybe two or three things that I brought from my graduate program and like, y’know, did. And now I feel like with one of the other faculty members, we’ve developed a lot more of these kind of activities and hands-on things that we can do, and I’ve tried to find more articles that are within, you know, that are kind of understandable, but also, y’know, current research that might help them see where, y’know, how you apply this knowledge or what people do with biomechanics or like, well why are we talking about center of mass? Who cares what it is or where it is or whatever? I’ve tried to do stuff all the way through, and I feel like right now I’m in the most kind of, y’know, with the “you guys read ahead of time, I’m not just gonna tell you all the information. You need to come in with some background of it.” I feel like I’m kind of at the—I’m doing the most right now of that kind of stuff, of kind of student-centered or active learning. And we’ve met with Mike Johnson a lot. We’ve met with him a lot trying to develop things and like, that’s one of the reasons I really wanted to do this. I feel like we have some activities, but we really wanna develop more. Like, there are still units—

INTERVIEWER: You mean you and this other professor?

INTERVIEWEE: Yeah, me and this other professor, who is not doing the STEM-fi. But I was like, I will take it on, that is fine. And I've wanted to, y'know, we've discussed how it would be great to have almost a full application-based course. This material is so applied, like, it's the perfect class for active learning because it's basic principles of physics, and we're not talking about like, magnetism and stuff like that. It's hands-on; it's like levers and it's stuff you can see. It's about how the body moves from outside. We're not talking cellular stuff, so it feels like we really should be able to do lots of activities and lots of different things to help apply the material, but developing those things and those activities and then the other issue—one of the other issues is off topic I guess, but it's having your assessments match what we're doing in the classroom, and that's super hard. We've been talking a lot with Mike about that because it's just, the more I get into like, let's do these activities now, I'm like, those multiple choice exams I've been doing? Like, I don't know how well they match. Anyway, so that's one of the issues I guess.

INTERVIEWER: Yeah, thank you!

INTERVIEWEE: Sorry, I know I got totally off-topic.

INTERVIEWER: No, it's great! You're doing a great job!

INTERVIEWEE: I feel like I talk too much for this like, I don't like to talk at people

INTERVIEWER: No, we want to hear all about it, and that's the point of this whole thing, is to hear what you have to say.

INTERVIEWEE: Good.

INTERVIEWER: And you're covering all sorts of things that we wanted to asked about.

INTERVIEWEE: Okay, great!

INTERVIEWER: Yeah, and we may come back to them, but yeah, you're doing great. So now we want to talk a little bit more about your current practices, and you've been talking a little bit about this along the way, but I wonder if you can describe a typical day in the classroom? So you've talked about how they have the reading assignment and then the quizzes and stuff and then they come to class and what happens?

INTERVIEWEE: So when they come to class, we will start with a prayer and then we usually will, I mean, I try to kinda chat with some people beforehand and stuff like that, y'know, whatever, and then we will cover any announcement kind of things, those kinds of whatever. And then I'll talk about if—either I'll start with things from last time and kind of make sure that they, y'know if they have any questions about the follow-up assignment if there was a follow-up assignment or anything that we covered last time. My class right now is pretty quiet, so they don't tend to

have a ton of questions, but I think they actually do, they just don't tend to ask a lot of questions, um anyway, for example, we went over our multiple choice exam—well, it's not all multiple choice, but anyway, we went over the exam, and I just went through to give them correct answers and stuff and they all had their exams in front of them and I said, y'know, usually what I do is I go through a page and then ask if you have questions on those four or five questions and then I'll do the next page, whatever, and nobody had any questions through the whole thing. I was like, that is, no, I mean they did pretty well, but that's totally weird. And then I got to the end of the exam and I was like okay, does anybody have any questions? And like one guy raises his hand then like, six questions came. And I was like, that's so weird! I mean, good, I'm that eventually the questions came, but like, clearly, I don't know what it's taking to get these guys to...yeah, anyway.

INTERVIEWER: Is it early in the morning?

INTERVIEWEE: No, it's at 12! It's weird!

INTERVIEWER: Huh. I have an [REDACTED] class this semester and I look at them and they're all like...

INTERVIEWEE: (laughs) That is hard!

INTERVIEWER: Yeah, and I don't know, like, do you understand what we're talking about? Or is this tiredness like, what's happening?

INTERVIEWEE: Yeah, I totally understand. Anyway, so yeah, we'll go over anything from questions before, and then I will usually tell them like, okay, so from your reading reports, I saw that you have a couple of questions or that most of the material looked pretty good, or whatever. So then I've picked out a few things to talk about based on their questions, or if it looked pretty good, I might just say, like, we'll just go over these points because I wanna make sure that you don't have questions about them or make sure that we cover this. And so I'll usually use some slides for that, and then I try to have some sort of activity or discussion depending on what the material was, and sometimes the activity is like, a practice problem. It might be like a couple of problems or something like that, and through that like, we're gonna cover this material. Sometimes it's, y'know, here's some of these things that you might have had questions about, and I saw that a bunch of people had questions on the practice problem 4, let's go through that, or and here's another one that you guys can work together in groups, and stuff like that. So that's kind of the way that class usually goes. We'll cover some material and then do some, either throughout it or afterwards, do some activity. On the days where I have like, a full, y'know, hands-on activity, then it's like, either I schedule a whole class for it or we'll cover highlights quickly, depending on how long that activity should take, I guess. Sometimes I have two activities because it's something that only part of the class can do at a time, and so the rest of the class is doing something else, so...

INTERVIEWER: And where do they teach the class?



INTERVIEWEE: In ■■■ right at the end of the hallway in here.

INTERVIEWER: So is it sort of like a lab?

INTERVIEWEE: It's a big room, um, it's not a lab. I know people—like, it's desks, like, y'know, the moveable desks, and I know they're often in very different places. I think sometimes it's used for like, modalities teaching or something like where they all get out treatment tables and stuff, so I think the chairs get moved around a lot. But it's a pretty big room and I just have 17 students this semester, so that's fun. (25:36)

INTERVIEWER: You have to tell them to come to the front. Don't stay in the back corner over there.

INTERVIEWEE: They actually do pretty well. But you know how they sit down on the first day and then like that's where they all like end it? So they actually did pretty well distributing across the classroom. So basically like two or three rows of people. But that room is super weird. Like there's a huge space between where the white board is and the tech podium and where the first row of seat is. Because the door comes in in a weird place. And so they have all the seats set up behind where the door comes in. But then you have like, I don't know like, further than my office from where the white board is to where the first row students sit. Not that it's a big space – but you know. It's just kind of weird. And so it feels like a really big space and these like two rows of student spread all the way across it (26:36). It changes every semester.

INTERVIEWER: And do students roll their desks away for certain activities?

INTERVIEWEE: Yeah, so sometimes we'll do that and then our lab is down at the end of this hallway. And so sometimes I'll just reserve out lab depending on what equipment we want to use. With 17 students, I'll just bring them into the lab. When I have around 30 or 40, I won't.

INTERVIEWER: It's not possible.

INTERVIEWEE: We can't take them into the lab. But with under 20, and variably one or two missing, so with around 15 I feel pretty good about getting them into the lab. So we'll go out there or we'll go out the pathway outside and do some walking and running stuff or whatever so. We go places, I like to get out of the room. Or like do stuff.

INTERVIEWER: What do you see as some of your strengths as an educator?

INTERVIEWEE: I think that I think about this a lot. I mean not my strengths, I think about like how can I improve this? (lots of laughter) I think about how wonderful I am. And I think I'm awesome. I do try to figure out, you know, hey so what can we change here and how can I make this better? Or how can I engage the students more. So I feel like that's a good thing. And I think one of my colleagues told me when I first got here, he was like- students are pretty forgiving usually. If you tried something and it doesn't quite work out, they generally aren't going to

mock you for it forever- I mean maybe, but don't be afraid to try a new activity. And I feel like that has stuck with me a lot. And I've really tried to keep that in mind. Let's just try this thing! Which is not necessarily my personality. I like to be overprepared for everything. And so I try to be very prepared for it- but I also am like- you know what? They might like this- let's see how it goes! And come up with stuff- different things to try. Different applications of the material.

INTERVIEWER: And is this the same colleague that you also teach the class to-

INTERVIEWEE: [REDACTED]

INTERVIEWER: Great. So this is kind of an aside. I'm a little like- not focused. But I wonder, you said there were four of you that teach it, so do you guys ever all of you work together. Is the implication sort of, you can do whatever you want in this class. How does that work?

INTERVIEWEE: A little bit. Yeah, so we've come up with learning outcomes together. We have- this is material we think should be covered, and I would say about  $\frac{3}{4}$  of the class is material that should be covered. But then we each kind of have- there's a little bit of material that we each may cover differently. And then we also- we all use our own expertise in applications. [REDACTED]

[REDACTED] performance enhancement. I'm into [REDACTED] prevention and I use running a lot for that. So we both theoretically will use running as examples, but he goes at it from a different perspective than I do. And then another one is, he does a lot more clinical things- he focuses his research on the knee and osteoarthritis and that kind of stuff. And so he brings in that. So we all kind of bring in our own material even to cover the stuff that is the same. And then we've tried to- I feel like in the last few years, we've tried to share materials- like, Oh, this was a good article that the students really liked and it worked well for this thing. And so we do a little bit of that, but it pretty much is, cover this how you want. And then there's the other, the faculty member that I work with on trying to do some of these applications. He is also very much like, I really want to do this learning base, I really want \_\_\_\_\_ (31:05). And so we have, we probably collaborate the most on material. And then there's one other guy that will sometimes use some of our stuff. But he kind of runs his classroom differently. He uses a lot of articles and has a lot of article discussions in class and he generally has bigger- he'll offer one big section of the class where we'll tend to offer two smaller sections. So they are just different. And so even within the same class, it's a little different. And then there's the other one that gets all the students that everybody loves. And he - I don't even know. We all kind of- I don't know. I know he does like applied stuff in class, but...

INTERVIEWER: He's not very collaborative really in terms of working with others.

INTERVIEWEE: I feel like he, I mean it's not a bad, if I ask for help, or I ask for something, he totally gives it. I think, he's been teaching the longest- and clearly what he's been doing has worked for him. And so I feel like he just has his thing. And I feel like me and [REDACTED] [REDACTED] is the other one that we work together a lot- and I feel like we're the newer ones and

I'm constantly worried about my student ratings. And so I feel like we're really actively trying to make something better. And then the other one is kind of like- it works for me, what I'm doing works for me. Not that he doesn't try to improve either. But I feel like they are more content with how their classroom works. It seems to work for them and the students- so, there are still the two of us who are like, I want to make this better. So I think that's probably why it falls the way it does. We all get along just fine and everyone is-

INTERVIEWER: everyone is a little different.

INTERVIEWEE: Yeah, we all teach it a little differently and have different priorities to it, I guess. Different comfort- like I don't love to stand in front of the class and talk. Somebody else is fine with that.

INTERVIEWER: Great. And we also wanted to touch on what you think are some of your challenges as an educator and we don't mean your weaknesses. We mean like- what makes it difficult to be a good teacher.

INTERVIEWEE: I think that one of the things specific to this class is that Physics is not required, but it's suggested. That makes it really hard. You end up with a couple students who HAVE to take the class right now (33:52) who haven't had Physics and are really afraid of math. And then you have the bigger group of students who get it and want to move more quickly. But you have this small group and sometimes they're very vocal- and sometimes they're not, which could be another problem. And so I feel like to me, the challenge of the variety of backgrounds of the students that are specific to the material- I feel like that is something I have struggled with since the beginning and I still don't necessarily have a great way of dealing with that. I'm trying to think what else. And engaging the students and getting them to buy in. The more active you do- I've had a couple student ratings over the last couple semesters that were like, "I had to teach myself everything!" And I was like, part of me is like- GOOD. Good for you! That's great. That's what I want. They say I'm terrible, I have to teach myself everything. But I'm also like, Yeah. I kind of want you to do that. So getting them to buy in and understand and be okay with it I feel like that's the challenge. And I get it, they've got all these other classes, right? I understand you can't just dedicate all of your time. I dedicate all of my time to one class, but - no. So I feel like those are- I can't think of anything else off the top of my head. There are things about me, but. As far as general class stuff, I feel like those are the biggest things.

INTERVIEWER: Okay, thank you. Tell me if you can about a specific time that you tried something new in your class. Why did you do it, what did you change, how did it go...?

INTERVIEWEE: Let's see...we try a lot of new things, and it was successful or not successful?

INTERVIEWER: Whatever you wanna share, yeah.

INTERVIEWEE: Okay, so I guess I've tried to bring in like, I feel like the activities, when they're not successful, it's mostly either lack of planning or lack of good explanation or like, "Oh, I didn't

know this thing would happen,” and that’s relatively easy to fix. It’s usually like, some mechanical type thing where it’s like, you need a longer board for people to lie down on or something like that. Those are not so bad, right? But I feel like one thing that I have tried and I feel like I struggle with is bringing in literature to the classroom and like, what to do with it. Like, it’s fine to have people read it and then I might like, bring it up, but having them like, trying to get them to talk about it is hard, and so I’ve tried a couple of different things and sometimes it’s more successful than others, and sometimes with one class is successful and then the next semester it’s not. I feel like that’s something I kind of struggle with, is this idea of “Okay, you’re gonna read this and I don’t wanna just hit on it for like one sentence. You spend time reading this paper and I thought it was important, so I wanna talk about it.” But figuring out how to do that...so I’ve things like I’ve split them up into small groups and had them each take a section of the paper and present that back to the class, like, talk about why they were doing this study from the introduction and talk about what they did from the methods. And then sometimes, I’ll have them come up with some questions about the other sections to like, try to engage them when the other people are talking, and sometimes that’s successful and sometimes it’s not. I’ve had them do a debate format. Like, one of the topics we talk about is whether runners that are amputees should be able to compete against able-bodied runners, so I get them articles ahead of time to read and then they come in and I have them split into “Yes, I think they should,” and “No, I don’t think they should,” and then they have to explain why, and sometimes it works really nicely and sometimes it doesn’t. So I feel like that’s something, and I’m often trying new things like, within that to like, maybe we should try this thing. Maybe we should not split up into small groups, maybe we, I don’t know, discuss it this way.

INTERVIEWER: And what made you feel like you wanted to do more of this literature focus?

INTERVIEWEE: Well, I think it’s important for students to learn to read scientific literature. In our major, there’s no research methods class. I don’t know how much they get it in other classes. I think that wherever they’re going after this—a lot of them will go to professional programs, um, or even if they don’t, I feel like there’s so much out there that’s misrepresented these days that like, to be able to go—first of all, know where to find good information, and then know how to interpret good information even if it’s not specific to biomechanics, right? Like, lots of it won’t be specific to biomechanics, but like, that is something that we can’t cover enough. We should be giving lots of experiences of how to distinguish good information from bad information, and in our case specifically, as it relates like science, but anyway. So that’s why I want them to see the applications, like the more real-life applications than like, figure out how fast a pitcher has to be throwing--

INTERVIEWER: Rather than just like a problem, yeah, yeah.

INTERVIEWEE: Yeah, so I feel like one of the best ways to do that is, “This is what’s actually going on. These are questions that people are raising, these are things that people are spending all of their careers investigating, and this is why—because where the center of mass is actually matters, you know for such and such.

INTERVIEWER: What does it matter for? Out of curiosity?

INTERVIEWEE: Well it actually... so we actually calculate center mass every time we do any sort of motion analysis because we can't measure what's going on inside the joints. So we can measure forces outside, so we measure forces from the ground onto the person. But in order to measure how those estimate, how that's affecting what's going on at the joint, you have to know where the body is and where the center of mass is. And then the center mass of each segment, it just helps us to describe the position and then we know what the forces are that are acting on it. And then you can start figuring out – what are the muscles doing, they have to generate this much force, and things like that. So it's a descriptor of the position.

INTERVIEWER: Thank you. Haha. Okay um now moving into more talking about the active learning and learning centered approaches. What barriers do you think keep you from using more learner centered strategies?

INTERVIEWEE: At this point, the biggest thing is time for me to develop the material. Really like to come up with what are good activities that are not going to be busy work, that are going to be possible and doable, and you know what will engage the student and help them understand stuff. I don't know if this really – the whole assessment thing is really hard. I don't know if that necessarily, because if part of me was like, "I will just give them a test and we will just deal with it." So I think the biggest barrier is time and maybe even resources. Because we are somewhat tied down with like space. Or you know, when I have bigger sections, I can't take them into the lab which means I am limited to doing certain activities. Or I don't have... a lot of our equipment is really expensive equipment so we only have one of this thing. It might be in the lab, it's fixed and heavy. So if we can't go into the lab then we can't do these things. So there is a little bit of resource issues. I mean we have worked around a lot of it, but I feel like there are some things even within resources that are somewhat... it's hard to make better. But I guess it presents a little bit of a challenge. But I really feel like the biggest thing is time. It takes a lot of time to come up with a really good... like I came up with an exam question last semester and it was like a full day of... it wasn't a multiple choice one, those are impossible. But like a, "Okay I need to give them enough information, not too much information, I want this to be multiple steps but it can't be something that is like so far out." You know, all those things that like, it's really hard to come up with stuff that is controlled enough. But not just like Okay....

INTERVIEWER: Or like you just know it's going to work.

INTERVIEWEE: yeah. Or even if it doesn't quite work that they will get enough out of it that the explanation of why it doesn't work helps. And actually even along those lines, with the time I feel like back to assessment, ideally we do these activities and they write about them. But then I have to grade that. I am not grading lab reports. It's not something I've got time to do. So the things that they... like the follow up assignments or the things that they're taking away from these activities, I try to make it as open ended as possible. But a lot of them aren't super open ended. It's come up with this answer. And then think about, and we will talk in class about the application. But if they don't think about it, we are going to talk about it in class anyway. So

sometimes there's not really much incentive for them to really process it afterwards. If that makes much sense.

INTERVIEWER: And the assessments may not reflect the things that you're doing in the activities. They are more about the stuff they read in the book?

INTERVIEWEE: Right. Exactly. It has been hard.... I've recently started to do... I had all multiple choice exams, and I've started to have a few free response questions on the end of exams now. That helps a little bit because it's a little easier to figure out, here's the situation, find the center mass. Or explain this thing. It can be a little more open ended. So it's like we did this thing in class, and remember we talked about this relationship, explain that relationship. So that has helped a little bit I think. But yeah, to me when I think of my undergraduate classes, I learned a lot by having to do the write up and having to process the information. I feel like I'm just lazy or what, but I'm like, "I don't have time to grade all that stuff!" I also have to research and write papers. So grading is hard and takes a lot of time. So ideally coming up with some... another thing is like coming up with assessments that they can help with, like in class almost. That would be a way around it too. But planning of that, and thinking of how to make that work. It comes down to time.

INTERVIEWER: Yeah. What do you think would enable you? What things would be the most helpful to help you do more learner centered teaching?

INTERVIEWEE: I mean I think one of the reasons I wanted to do this was because it seemed like in the one week that we were gonna have blocked out, I can probably come up with a couple things. And I kinda feel if that's what my impression is that's what this is for, is to be able to have people to talk with about it and hear some suggestions. That to me, to kind of have some time, whether that's in this case where you know, that will work great. But for other things, where maybe it's a semester where I don't teach the class, y'know, something along those lines where we're given some incentive, first of all, and time to work through these issues. And I feel like, 'cause other than "I wanna fix this," there's not a whole lot of incentive, quite honestly.

INTERVIEWER: Can you talk about that a little more?

INTERVIEWEE: Well I mean, I feel like as the rank and status process goes—well, so for me, when I started, when I kind of committed to flipping the classroom or however you wanna call that or whatever, my student ratings actually went down that semester, which was a risk that I maybe shouldn't have taken, I don't know. But I feel like because we are evaluated for rank and status using student ratings, that is a risk that I take. Like, by trying to change my teaching, it may not go super well and then I may have this dip in my student ratings for a semester, maybe two, I don't know what it's gonna take. And it's a buy-in of my time to start that and then I don't know what the reward is, do you know what I mean?

INTERVIEWER: Yeah, you may get punished.

INTERVIEWEE: Right, and in fact, it may be worse. So I feel like that's one of the things with the incentive that's hard because I'm spending all this time doing something to improve, but maybe it was fine to just skate along the way it was going, and in some ways, y'know, from an external perspective of looking at ratings, or something, that would even be better. So I feel like I'm not super clear on—like, I know that when we, again, with the rank and status, like I know that when you submit it, you can explain what you've been doing and stuff. So I assume that when I explain that this is probably the reason that that will be understood. But anyway, I feel like it's a risk and I'm not sure what the reward is necessarily.

INTERVIEWER: So you said your ratings went down, but you chose to continue with that.

INTERVIEWEE: Yeah. Well, and I met with Mike about too and—Mike Johnson—and I was like, I don't know what I should do with this because they went down and they're not super hot. I'm not in a place where I can afford for them to go down. They're not like, terrible, but like, y'know. And so, and he was saying that often happens, and then they start to come back up, and maybe they'll be where they were before, but likely, as you work through these kinds of things, they'll come back up. So I was like, alright! Yup, I'm gonna do it! And another reason I chose to do it was because I liked that semester a lot more, even though the ratings went down and clearly there was—they felt there was disorganization and whatever, and I was like yeah, but I am doing the teaching, I looked forward to going to that class a ton more than I have for previous semester. Which I mean, teaching the same thing for eight years, it gets old, but like having the students engaged is a much different experience and I like it a lot more because it is a lot more variable and it's not just me telling the same old things.

INTERVIEWER: Yeah. And so have you seen that result? Like, have they started to go back up?

INTERVIEWEE: Last semester's were the highest ratings I've ever had. Now, I also had two sections of 10 students each, so there is that where they were really small and the students were really awesome, like, they just got along really well. Y'know, just really nice classes but like, sometimes you get these classes where students just...y'know...

INTERVIEWER: Yeah, you get a bad attitude, and you might just have one kids that's got a bad attitude, but it just like poisons the well.

INTERVIEWEE: Yep!! This semester, I felt like I was starting the semester and I felt like I had like a hangover from last semester because it was so good that I came in and I was like, alright, you're all new people that I have to get to know, y'know? And it's kinda like, I gotta get the chemistry of this class together and figure out how to get these students talking to each other. Because I do feel like—I think I'm kind of off-topic, but I do feel like, if you can get the students engaged and talking to each other like, in a few weeks, they'll kind of...I dunno, in some period of time, they'll kinda start developing their own relationships and stuff and it just eases the classroom, I feel like. But you have to get through that, and that's where I felt like I was like, hungover or something. I had this great class who all got along so well and now here I am like, I dunno how

to do this again, and I just felt so out of it. But anyway, so, this class is kind of starting to gel I think. Anyway, that's all I'm gonna say.

INTERVIEWER: Oh, good! And I have another question about the sort of expectations around teaching in your department. So can you tell me a little bit about the culture of teaching in your department? What do your colleagues expect about your teaching, what do you think students expect about your teaching?

INTERVIEWEE: I don't know. (52:29) I mean, I kind of, I feel like in general, with colleagues, it's y'know, your class is your class and you do your stuff and I don't know...like, I can't think of what they expect for me—

INTERVIEWER: Or maybe in terms of rank and status, is it mostly just the student evaluations?

INTERVIEWEE: Yeah, I think it seems to be mostly that. I mean, we do try to have, so we'll have faculty go in and do peer reviews. We don't have a real, like—there's no real process for that, and so most of the faculty are like, "What am I doing? What do you want me to review?" And right now, it's been a lot of like, eh, just go in and see how they're doing and write some stuff down and tell us what you think, and so it's really very loose. So yeah, I don't know, I don't feel like it's very well-defined, I guess. I feel like the general understanding is like, everyone's trying their best, or trying hard, or y'know, whatever. And they're doing their stuff and we're all kind of...leave each other alone for the classes and then um, yeah...

INTERVIEWER: And then in terms of student evaluations, is it sort of like, you don't really have to be excellent, you just have to be adequate? Is there like a cut-off, like "You need to be at this level, like how does that work?"

INTERVIEWEE: Yeah, I'm not aware of a number that you need to hit. And the thing, like, I also feel like this is relatively unclear, like, what is great or whatever? I mean, I guess I know like what is excellent, but then like, where that middle ground is, I don't really know, because we tend to have—I mean, students tend to really like a lot of these classes, and so you have, and even actually, I guess it's like within faculty, they guy who gets all the students and the long waitlist, his student ratings are like within the 4-8, 4-9. Like, super high. And to me, I'm like, I don't need to be 4-8, right? Like I think that shouldn't be the bar. But there are enough faculty in our department who consistently get the 4-7s, 4-8s, that I'm afraid that that is the bar, but nobody's...I don't know what the number is. Like, I don't know where it is, so I don't know if it's like, 'You know what, if you're consistently above 4, you're fine. Or if you're consistently in the high 3's, you're okay.' I don't really know, and that is challenging.

INTERVIEWER: It's unclear, yeah. Okay, thank you. Okay, what changes do you hope to make in your future teaching?

INTERVIEWEE: Of this class, or general?



INTERVIEWER: Yeah,

INTERVIEWEE: General, this class? Um so I think it's mostly the assessments and then developing some more activities and then the—if I can figure out some of the literature discussions and stuff. Those are really, like if I were to say these are the things I wanna work on, I don't know what order I would put it in... 'cause the assessments are pretty high, but the activities are the things that like, take so long to come up with and work through and stuff like that, that I feel like it should be higher, so I don't know. Somewhere in there with those three things.

INTERVIEWER: Thank you. What do you think are the pros and cons to this strategy of having the activities?

INTERVIEWEE: I think that...I think I've discussed the pros a lot. But I think some of the—I think the students participating and like learning their stuff and having some application, I think that's a benefit. I think one of the hard things is making sure that the activities are kind of challenging enough that it's not just like...I remember taking a physics class in undergrad and it was a workbook, and it was like 'Do this and write this number down, do this and write this number down,' and you actually didn't really learn anything from that either. So like, somewhere between, 'Do this,' like, y'know. Sometimes it might be nice actually to just throw them in.

INTERVIEWER: Exploration

INTERVIEWEE: Yeah, and just see. But I get nervous about that, because I'm afraid they're gonna get annoyed with just, not... "Well what are we supposed to do?! I don't have any direction!" So finding that balance, and then the other thing that, y'know, if a student decides that they're really not gonna do it or engage in it, they're just gonna kind of get their group's information, that's their problem. But it also is...the fact that they...I don't know, I guess you could do that no matter what, right? Like in a lecture, you can just sit there and not listen, too. But I feel like that is a challenge that, y'know, there are students that are just gonna have a bad attitude or be annoyed that they have to be doing something, not sitting there listening. And I guess one other thing would be that I, like, going back to the first semester where I really kind of tried to do this more was students' comments on disorganization. Which, to me, it didn't feel like it was disorganized, because what I was trying to do was respond to their input, but I think they saw that as disorganized because I wasn't coming in with "We're gonna do this, this, and then this." It was, "Well, what questions do you guys have?" And I tried to get them to ask me the questions that they might've put on their quiz, and so I stopped doing that and I just started coming and saying, "I saw you had this, this, and this question." And I kind of liked the idea of having them ask the questions, because it gets them talking and whatever, but they said it was disorganized, so I felt like, "Well, a quick change, kind of an easy change, whether it's good or not, an easy change is, I will come in with stuff that I know they have questions about."

INTERVIEWER: Yeah. But it's a challenge when you have more student-centered, right? If it's teacher-centered, you can control what happens, and if it's student-centered, there's some

variability there.

INTERVIEWEE: Yeah, uh-huh. And then making it like, function neatly, y'know, and like, I dunno, it can be challenging.

INTERVIEWER: Yeah. Thank you. How confident do you feel about using learner-centered strategies?

INTERVIEWEE: Well, I guess since I'm doing it now, I mean, I really like it. As I said, I thought, like, I just like it a lot better. I do feel like for the most part, students are more engaged, and so to me, that makes my job more fun if I can see them getting it or like, y'know, being interested in stuff or not just staring back at me like...y'know. So I feel like, so I guess I'm confident that I will continue with it, and y'know, and I really feel like it can work; it can be very effective.

INTERVIEWER: Thank you. And coming back to factors that you think are outside of your control: Are there any factors outside of your control that we haven't talked about yet that you think influence your ability to use learner-centered strategies?

INTERVIEWEE: I don't know. I don't think so. I mean, I feel like, to me, it really seems like making the commitment to develop your course in this way and then, y'know, I mean I just, I dunno, you just figure it out and make it work. And besides those things of where are we gonna do this or how are we gonna do this or, y'know, whatever...

INTERVIEWER: You figure it out as it comes.

INTERVIEWEE: Yeah, so I feel like you can make it work. There aren't a whole lot of things standing in the way, other than, as I said, like, the time. Potentially motivation, and some resources maybe.

INTERVIEWER: Yeah. Yeah, thank you. Okay, now just a last couple of questions just about STEM-fi: What do you think you're most excited about, about participating in STEM-fi? What do you hope to get out of it?

INTERVIEWEE: So, I'm hoping, I guess I don't really know what the format is gonna be like, like, I can't, so I don't really know. But I guess in my mind, I'm hoping to really work on developing some activities and getting ideas from other people who have done this and people who are more knowledgeable about like, or just have different ideas about like, "Oh, you can do this kind of thing, or have you heard of this thing?" Y'know, like, I dunno. And even some of the like, some of the resources, like, "Oh, this website has questions and answer things you can use your phone with." I feel like just having other people to pull resources and ideas and things with, I think that'll be really cool. So I really want to, as I said, I have like two real priorities, and one is the developing the assessments and the other one is developing activities. So I feel like with this, I would imagine more of the focus would be on the activities. But I can work with Mike on the assessments other times, so that's kind of like, that was very real motivation. It was like, "Oh

my gosh, could I have like a week and a real motivation, like, I signed up for this thing, I'm doing this thing! And I'm gonna have people to help me come up with activities and maybe follow-ups or y'know, whatever." So yeah, that's the biggest thing.

INTERVIEWER: Yeah. And we have like three hours every day set aside as like, work time, and then also, you'll have a mentor during the year as you're trying to do new things that can help when things maybe don't go well, or...

INTERVIEWEE: Yeah, so the whole, yeah, I was like, this sounds great! And it gives some accountability and just the like, yeah! Move this along, let's do it!

INTERVIEWER: And also thinking about STEM-fi, what do you think you're most worried about in terms of participating?

INTERVIEWEE: I don't know, I don't think I have anything that I'm really worried about.

INTERVIEWER: Okay, okay.

INTERVIEWEE: Umm, yeah. I dunno, I don't have anything.

INTERVIEWER: Great. And how else can we help you have a successful experience, or what can we do to make the workshop good for you?

INTERVIEWEE: I think—so right now, as I said, I don't really have any clue about like, what it's gonna look like. I feel like if you can send some stuff out, y'know, a couple weeks beforehand or whatever, that's like okay, we're gonna be doing these things, think about this, like, we'll have time to do this. Or these are the people, like, the resources that you'll have, or, I don't know, just information so that, I guess, I would like to think ahead of time about, so maybe these are the three activities, maybe I've got these three subjects that I really wanna come up with something for. So that it's not like I'm coming in with like, I dunno, and just like a general...so yeah, I just feel like, being prepared for "let's make use of this week as best," yeah, and you can be best, can make best use of this by, or best prepared for by, y'know, we'll have this time with these things and so in those three hours, y'know, these are the kinds of things that we're thinking, or how it might work I guess.

INTERVIEWER: Mhm. That's great, thank you! Those are all of our questions. Do you have any other questions or things you need to know or want to know?

INTERVIEWEE: I don't think so. I think, yeah. I will wait to hear more about what we're gonna do!

INTERVIEWER: Well, thank you so much for your time today; we really appreciate it!

INTERVIEWEE: No problem.

#### Interview #4

INTERVIEWER: We of course just want you to know we are not evaluating your teaching or judging you in any way in this interview. Just trying to get a sense of your experience in how things are for you. To start out with, can you tell us a little bit about your teaching background?

INTERVIEWEE: So my teaching background is that...I started teaching as a graduate student. I was at [REDACTED]. It would have been in... when did I graduate? I graduated in '98 and so it was in the mid 1990's that I started teaching. My advisor there was pretty progressive in her approach to teaching. Nothing was formal; there wasn't any sort of formal training. But I observed her as she tried to do more active learning in her own introductory [REDACTED] classes. I didn't do any teaching there. I moved to [REDACTED]. They had almost no faculty training for teaching anything like that. From my graduate training, I recognized that there were better and worse ways to teach. So I was constantly experimenting with my teaching. I taught intro courses in [REDACTED] and upper division courses as well. I sort of adopted an engaging lecture versus lots of small group activities. Other things like that. Both in graduate school and as a young faculty member, I published a couple of small papers in how to [REDACTED] to engage learning. So I started out collecting data, super engaged in that. But didn't get any feedback, just sort of was doing it. Then I moved here nine or ten years ago. They did the new faculty seminar series, which is great. And they talked a lot about teaching. Worked a little bit with the faculty center on teaching and had students come that, I forget what the acronym is, but they have undergraduate students come in and observe teaching and got some feedback that way. Started doing a little bit more formal stuff. Went to the [REDACTED] for a workshop for a couple of days on scientific teaching. Just being around Jamie, right you pick up some of that. But interestingly, I've sort of stopped doing much assessment in my class. I'm not collecting data anymore. I sort of moved into a place where I was comfortable with my teaching and that's where I am not. Sort of a lot less lecture than others probably more lecture than some. Really focused on everyday in class that they're engaged and doing something that it's never needed to lecture for 75 minutes. Small group breakouts, uhmm (3:17) think, pair, share as much as I can. And about once a week we do something hands on in class that's small scale science. So that's my background

INTERVIEWER: Awesome! And when you say less assessment, you mean not so much subject matter for the students and their grades, but for you in evaluating your own teaching,

INTERVIEWEE: Yes, exactly. Early on I was doing lots of, "If I do this, what are their scores. If I do that, what are their scores? How well are they learning?" And I've done much less of that.

INTERVIEWER: How do you think students learn best?

INTERVIEWEE: I think students learn best when they are challenged, when it's something that is engaging and interesting, I think they learn best when they are actively participating and sort of engaging in material. And so I think there has to be some degree of active recall soon after

they're taught a new topic. So there has to be some sort of test, not even test, but some way of forcing them to independently recall and apply what they've learned.

INTERVIEWER: What do you feel your role should be as an educator? (4:57)

INTERVIEWEE: At its basic, create an environment where that's possible. Where there's opportunities given to provide meaningful, interesting, and engaging topics where they can be confronted with those things. And to support them through the process of eliminating misconceptions and adopting true conceptions.

INTERVIEWER: And in that where do you feel is the place for faculty-centered lecture?

INTERVIEWEE: Oftentimes, just presenting the context, sort of say okay we are going to talk about infectious disease let me tell you why infectious disease is interesting, and now let's explore together data or case studies or something else.

INTERVIEWER: So as kind of introduction and now we're gonna-

INTERVIEWEE: Yeah, introduction and then the support that they need to actually explore a case study. In the time that we're given they're not gonna find it easy to go out and say okay you guys go find something about cholera. Like I can tell them about cholera and then we say okay now you're presented with this problem. Is cholera caused by tainted water or tainted air? Right, everybody thought it was air because it's found in places that are stinky. How would you distinguish between those things? How would you think logically about those? What would the data look like in order for you to assess one vs. the other? And then we say here's an interesting data set that was collected in the 1850s. What does this show you? Does this support one vs. the other? So that's what I think is sort of at appropriate places introducing the information that allows them to access their understanding. (6:53)

INTERVIEWER: Mm. Thank you. What do you feel the students' ideal role should be as a learner?

INTERVIEWEE: Oh, I think the students should be committed. I think they should be engaged. They should bring their understanding and be open to refining their way of seeing the world. That's their role, and to be actively participating, right? One other thing—so I teach [REDACTED], that's where most of my really creative teaching goes, is to [REDACTED], and sort of the one place that I run into issues is students who show up and are really passive and says, well I think this student's role is to be active and to be engaged and challenged.

INTERVIEWER: Thank you. I want to ask you about a typical day in your classroom. Are you using the [REDACTED] class for this?

INTERVIEWEE: So for this I'm actually gonna, I guess was presented an opportunity to completely revamp our capstone course. So, I found lots of ways to do this in [REDACTED], and what

I found is that I don't do it in my upper division classes, and so the [REDACTED] course was just approved through a project-oriented course that, um, so up until this point I've been team teaching it with another professor and it's a very sort of conventional—well, it's never conventional, but it's sort of a textbook based course, right? Like, here's all the things that a [REDACTED] needs to know and we're gonna lecture and we're gonna teach you about [REDACTED] and about "\_\_\_\_" (8:41) services or whatever, and I don't wanna do that anymore. So the class that I want to do this for, I wanna take this sort of active inquiry application approach into an upper division class, and so what we're going to do is we've got a single village in Samoa where we've got a whole bunch of data streams that are coming from it that I'm going there next week and we're gonna have data on reef biodiversity and reef structure and function, on proximity of, and we're gonna have some drone-derived data that we can identify every human structure in the village and its proximity to the seashore, and its vulnerability to sea level rise. We're gonna have climate data from their agricultural fields and we're gonna have slope data that looks at their vulnerability to erosion, right? So these multiple things, and we're gonna put it all together in an assessment that says, "Here are the vulnerabilities and opportunities that exist in this village with climate change." So that's what I wanna do, but nobody's done it before, right? And I don't know how to do it, so that's why I wanted to be involved with a step-by. (??)(9:53)

INTERVIEWER: Awesome! Oh man, that's exciting. So I guess, what in your [REDACTED] class where you feel pretty comfortable in the flow of how it's set up, can you describe a typical day in a [REDACTED] class and what activities those students are doing and then maybe how is that different from what's happening in your upper division classes and how you want to change that typical day? (10:24)

INTERVIEWEE: Yeah, so in a typical [REDACTED] day, this is like the ultimate BYU thing, but I actually start every lecture with a hymn, and I do it largely because I wanna make sure every student has given voice to something every day. So, how do you let 200 students talk? Well, one of the ways to do it is you make them all sing, right? And it's goofy, but I think that's symbolic of what we're trying to do in the class, is sort of everybody share at least one thing every day. So typical day, we start with that, a little bit of business, and then normally I will set up a case study or a problem, and then we'll do five minutes of breakout as a group and they'll have a guided question that says okay, how do you come up with the solution? And then we may sort of add to that and sort of elaborate on that case study and so it's sort of this sequenced we talk, they break out, I talk, they break out. A lot of the time, I'll show them a video and say okay, apply what you just learned to this new circumstance, so it's a combination of lecture and video and small group breakouts, and then for five or six topics that we have, y'know maybe thirty or forty minutes into the class, we'll do a hands-on activity, so for example, tomorrow, we will have been talking about cell signaling and cell chemistry, and then we break and they extract DNA from strawberries, right, so hands-on, engaged, manipulating something that we did. Another example of that is we were talking about sort of logic and dichotomous thinking sort of a how do you separate one idea from another in a way that uses that attributes of what you're looking at to separate it, and this is sort of a broader, how do you think like a scientist sort of thing. We had fruit fest, where every group was given 12 different types of fruits and said okay, ask me

yes, no questions. How can you separate these into groups that are similar and different from one another? Sort of the tendency is to put blueberries and strawberries together because they're both berries, but they are very different types of fruits, right? And it forces them to kinda think oh, a plum and a peach, right? Those are the same, and a lemon and an orange are the same, but a strawberry and a blueberry are different, right? So those sorts of activities that may take—I always think they're gonna take 15 minutes; they take 30, and then we come back and we deconstruct that and we tie it back into where we started. So that's a typical day. In my upper division classes, what has historically happened is we pick a topic and we sort of end up and say, okay, well we're gonna do a student-led—a student is gonna do something on a paper, and they talk for 20 minutes, but it's really a student lecturing and then we tag out and I lecture for the rest of the time, and it's almost as if—when I reflect on it, it's like, I'm willing to do all this hard work, A) for students who are never gonna see science again, so I wanna make it engaging and it to be a good experience, and because it's justified when I'm doing it for 200 students. Whereas, when I'm doing it for 18 students, I'm like, y'know, you can suffer along, and I can see you, and you should be engaged, and y'know, it's not all lecture; there's some question and answer and response stuff, but it's not nearly as creative or as engaged as... I just sort of assume you're an upper division student, you should be engaged, and I think that that's a wrong assumption. So I have progressively become less enamored with my upper division teaching as I've become more excited about my fun “\_\_” (14:59) teaching.

INTERVIEWER: Hmm. Thank you. What would you say are some of your greatest strengths and greatest challenges as an educator?

INTERVIEWEE: My strengths are, I think, organization, right? Like, I can think really systematically about 75 minutes and say okay, here's how I have to sequence things. I think my strengths are that I'm pretty diverse in what I'm interested in, so I can find examples to teach about almost anything. My weaknesses are, I don't think I'm particularly charismatic. There are people who, by sheer force of charisma, can stand up for 75 minutes and be engaging, and I know that I can't, and teaching still makes me nervous, right? I've been doing it for 20 years and I still don't know day-to-day if today's the day I'm gonna get up and completely fall on my face, right? And so I'm still really nervous about my teaching, and not very confident. I mean, I'm kinda confident, but I know that I can sort of sequence things and make it interesting, but you just never know.

INTERVIEWER: Can you tell me about a time, and you're kind of doing this right now; you're in the process with your upper division classes, but maybe a time in the past that you've decided you wanted to change something about your teaching and like, why you wanted to make that change and how you did that and what the outcomes were?

INTERVIEWEE: Yeah, so, I think a good example of this, it's sort of a major decision that I made, is about 6 years ago, I decided to not use a textbook, right? I just set it aside, in part because—so, when you ask a student to buy a textbook, it's a major investment, and there's an expectation that that textbook will serve as the structure for the course, and if you look at most biology textbooks, they sort of start at biochemistry and they end at ecosystems and there's 37 chapters and it's like, oh, there's about 37 lectures, and that's about a chapter a day, and it sort

of forces you into a structure that, for me, didn't give me the freedom to actually meet the learning outcomes that I really wanted. So my learning outcome in my non-majors course is to get them literate in biology, reasoning like a scientist, and applying their newfound reasoning to be a good citizen, right? And that's actually the learning outcomes that are established by the [REDACTED] group, and there's nothing in there that says "biochemistry, cell biology, evolution ecology," right? So for me, five or six years ago, I said, y'know what, it turns out that I am missing opportunities to do scientific reasoning in particular if I force myself to spend all my time on "memorize cellular respiration." So what I did instead, I said, "We're gonna completely set aside the textbook." In fact, the ultimate skill I want them to be able to do is, 20 years from now, pick up an article on science, assess whether it's good science or bad science, see how it fits in with broader questions related to science, and decide whether or not they need to change how they're approaching life because of what they read. And so what I did is I set aside a textbook and got started using essays from Best American Science & Nature Writing, so these are the types of readings that they can get typical person, whether they're a poet, an engineer, y'know, the diversity that is [REDACTED] would pick up in their lifetime, right? So, National Geographic, Scientific American, New Yorker, something like that. And so I pick readings on a topic, and so the first 25% of the class is infectious disease, right? And with infectious disease you teach virus, bacteria, eukaryote, you teach membranes, you teach cell regulation, you teach ideas of risk and ideas of causation, right? So, scientific reasoning, but also scientific literacy, and we just spend the first three and a half weeks of class doing infectious disease. It's a really cool topic that is relevant and you can talk about ebola and cholera and you can talk about influenza in the middle of a major flu outbreak, so that's what I do. So major decision was I'm not gonna be a textbook guy, I'm gonna be an essay guy. Why is because, sort of looking closely at what I thought my learning outcomes were and ultimately deciding cost benefits push me towards sort of a radical change in my class, and with that change, what it means is you get no support from publishers, the lectures aren't prepared, it's a lot of the literacy stuff is that left up to me, as opposed to looking to Pearson to give me the pre-packaged lectures and visuals.

INTERVIEWER: How do you feel about the outcomes of that?

INTERVIEWEE: I love it! It's one of the best changes I've ever made, but it makes me a little nervous too, right? Because my guess is that if they took a science literacy assessment, they would not necessarily perform as well, but I don't know...if they took a scientific reasoning one, they would do much better, and I've just decided that that's the learning outcome I really wanted to teach to.

INTERVIEWER: Awesome. Thank you! Earlier, you used a word, I think you said "active learning." How would you define that?

INTERVIEWEE: So, it's interesting because I've actually thought about this a little bit. I think there are sort of two metrics: there's active and passive and then there's engaged and disengaged, so I think that you can do things that are engaging but passive. And so early on in my career as a teacher, I get lots of engaging but passive things. Like, showing videos is very engaging, you can sort of bring the class together and they're present—intellectually present,



but they're not doing anything. I think you can do disengaging and passive, which most lectures are, right? They aren't engaged and they aren't doing anything. And so ultimately, my goal is to do as many engaging, active things where the students are actively engaging their brains to produce something, whether that is a discussion with someone, talking out loud, solving a problem individually, practicing, taking a practice exam is, I think, engaging and active. So engaging and active is sort of the corner of that matrix that I think most quality learning occurs in.

INTERVIEWER: I like that, thank you. You mentioned with changing your upper level class that why you wanted to use this STEM-Fi program. What was most motivating to you about the program that made you want to be a part of this?

INTERVIEWEE: That it gives me an excuse to stop my other stuff and actually—because my biggest fear is that if I don't preload my effort into the class, then I will start the semester, and absence of time, absence of support and feedback, then I'm gonna end up giving assessments and activities that are not productive to where I wanna go, right? And so ultimately in this course, I want to be in that active, engaged box, and I don't think I've been there for a long time in the upper division class.

INTERVIEWER: So what are you hoping to gain from the workshops?

INTERVIEWEE: At the end of the workshops, I want to have my assessments, sort of the projects and assessments clearly defined, I want to have a well-resolved schedule that will sort of, the plan for that class that allows me to sort of take incoming students—so, I've been trying to add new assessments and activities to this upper division class, and it's fascinating because these are graduating seniors, right? Many of them, this is the last class they take, and they know almost nothing about data analysis. They know almost nothing about data visualization—how to ask a question and come out with a supportable outcome, and then to write about it, right? And they're graduating without an understanding of what it means to be a scientist. And so what I want to be able to do is to have a set of sequenced projects, experiences with feedback that will allow them to develop these skills. So lots of them have taken tools-type classes where they've taken a GIS class, all of them will have taken biodiversity classes where they think about community ecology and theory behind ecology and evolution, and so this is the class I want them to look to as “Here's how I'm going to apply it.” So for me with this class, it's like, okay, what does it look like to have an assessment where I say, “Here's a data set, come back with an analysis.” I don't know how to do that, right? And how do I create a project that says, “Okay, now how do we write an MRAT paper from these data that you've now visualized.” And even the, “How do we share data in a meaningful way? How do we share a literature review in a meaningful way so that we”—the other thing I want them to learn from this class is how to collaborate, work in a collaborative group. So, that's what I'm hoping to do in one week.

INTERVIEWER: Awesome. It'll be a packed week! I wanna ask a little more about what you were talking about with the active learning. What barriers do you think keep you from using more active learning approaches, or do you feel like you're satisfied with the amount you're--

INTERVIEWEE: No, so there are topics where I think I've got exact or really close to the right balance of me being able to present a topic and supporting information and then them going and actively doing things. I think that one of the limitations is A) my creativity to give me an [REDACTED] topic or whatever and I can just absolutely give you something active to do (28:08). Give me central dogma and it's like ughh, right? And so I can steal ideas from others and that's what I've ended up doing, but what I've ended up with is things that I don't have full ownership of intellectually and I'm happy to be doing these active things, but I still haven't quite figured out how to do it in a way that... I dunno. I just think that ultimately in [REDACTED] where I've done the most of this, there are still sections where I'm like, clearly they could be doing more and I could be doing less, but I haven't figured out creatively how to do that. And then, just having time to transition them, right? Like, that it's really hard to teach [REDACTED] all the time and not just say, oh crap, what did they do last semester, right? And I'm gonna just pull that back and just have the time to say, y'know what, so much for biology! I'm not doing it as well as I could, let's figure out a better way to do it.

INTERVIEWER: So do you mean more preparation time for you?

INTERVIEWEE: Yeah, preparation time and just sort of figuring out—um, pulling DNA from strawberries, like, as an ecologist, I would've never figured that out, y'know, I got that from somebody else, but now that I've got that, I'm like, well, I can do that and it's really engaging, but then how do I leverage that to give them a meaningful question that they're answering, right? That's probably the ultimate example of 'this is just really cool to do,' right? And to see how it works out, how the specific chemistry of certain things, the properties of certain molecules allow you to isolate them, but I'm not really teaching central dogma, cell theory, anything with it. So I would love to be able to have the creativity and the time that would allow me to sort of take the places that there are gaps and sort of fill them with more meaningful, active stuff. Because it's easy to just stand up and say okay, DNA, RNA, protein, and you should get it, and I don't do that as much as I should.

INTERVIEWER: And how confident do you feel using active learning more than just standing up and saying those things?

INTERVIEWEE: I'm pretty confident. And so much of it is just *being* confident, I think. I think active learning works when you just sort of get up there and you say, you know what? Here's what we're gonna do today, right? And I have a vision for what we're gonna do. So here's one other change that I made that I think was really fun. So I don't have them buy a textbook, but I do have them buy a lab notebook that has carbonless copies, and so every day—so this is something that required some planning and this is where structure helps, is that every day in class, somebody from their group—they have to find groups—goes and gets a hanging folder that each one of them has a folder inside of, and they take their notes and at the end of the day, they pull out the copy of their notes and they put it in there. And that allows me during these active times to hold them accountable for something. So I say, "Okay, in your notes, I'm gonna have you take these data, draw a scatter plot, and from that scatter plot, make a conclusion, and then at the end of the day—and when you're done with that, put a box around it so the TA's can

find it.” And so every day, the students are turning in something where we’ve asked them to apply a principle, or most often, many principles, and been accountable for it. So once that structure’s in place, asking them to do active things is really easy because there’s accountability associated with it, and so that was just sort of structuring things. So at the beginning of the semester, designing the class in a way that active learning is possible. So I’m entirely confident to say “Think, pair, share,” but it’s not just think, pair, share, but it’s think, pair, share, and write your conclusions, right? So I know that when they’re sharing what they’re doing is actually deriving an answer and not just visiting, so...so I like active learning.

INTERVIEWER: Thank you. I feel like you’ve really well covered everything I wanted to ask about. Do you have any last comments?

INTERVIEWEE: No, I’m just looking forward to it, it’ll be fun.

INTERVIEWER: Thank you. Is there anything else that you can think of that would help us help you more in our preparation?

INTERVIEWEE: No, so for me, it’s just sort of trying to...so I think I’ve had lots of support in the past, y’know, throughout my career in the non-majors courses that I teach, right, sort of the “how do you overcome misconceptions,” and so it’s really hard for me to think about an upper division population, and right, we sort of figure they get it. And this last semester, I asked them to analyze data, I realized that over 2/3rds of the students that were graduating have no idea how to be a scientist. They never had an authentic scientific experience; they sit in classes and learn theory, and they’re exceptionally bright and they’re good at learning theory, but when you say, “Okay, now what would you do with a data set that’s messy and ugly and may or may not allow you to come to a well-resolved conclusion, what do you do with that?” and they don’t know. And so for me, sort of figuring out how to engage to these majors at the end of their undergraduate experience is a very different question than the one that I’ve gotten support with in the past.

INTERVIEWER: Yeah, that makes sense. Thank you so much!

INTERVIEWEE: Well, thanks for coming over.

### **Interview #5**

Interviewer: And to begin, I’m supposed to reassure you that we are not evaluating your teaching. We’re just trying to understand what your current practices are, what you think about teaching, what you’d like to get out of [STEMFI], and how we can help you.

Interviewee: Okay.

Interviewer: So first, can you tell me little bit about your teaching background?

Interviewee: Typical as most [REDACTED], I think. I was a TA in grad school. That's about it. And then as an assistant professor, just started teaching. And based most of it of what I'd observed of people who taught classes that I had before.

Interviewer: Great. And you've taught at BYU and also [REDACTED]. And mostly the similar experience in both places?

Interviewee: No, the students are quite different. Yeah. Classes are similar, though.

Interviewer: So in what way are the students different?

Interviewee: They're much better prepared here. They're much more serious here. Oh yeah. [REDACTED] is a big state school, open enrollment practically.

Interviewer: Interesting.

Interviewee: You know some people are [REDACTED] that are in chem ed, I'm sure.

Interviewer: Yeah, there are some great people! (Talked about people they know). They do great stuff. They work a lot with engineers. Obviously.

Interviewee: Yeah. Half the students are engineer majors at [REDACTED].

Interviewer: So the first group of questions that we have here are sort of about what you believe about teaching. How do you think students learn best?

Interviewee: Obviously, being exposed to the material. Both in lecture and in reading. But they learn best when they actively participate and really work enough of the problems to get experience with it. So especially organic chemistry, being able to draw structures and interact physically with the molecules. See structures. I think that process of following along, taking notes, and following up with working the problems is the best way they learn.

Interviewer: And you are doing little hand motions. I assume these are arrows?

Interviewee: Yeah. So special organic, the structures are very diverse and they get more complicated. The reactions are diverse. So they have to interact, you know, with the compounds physically. Pass it through their mind, follow it along with their hand, and then it begins to stick in their brain a little better. There's no way to substitute around that. I think if you just click through slides, there's no way they will retain the material. They might think "Oh Gee! This is kind of cool." Or whatever. But they haven't done it, and done enough homework.

Interviewer: So mostly you said you want them to interact physically. Do you also encourage the use of models?

Interviewee: Oh yeah. Sure. Models yes. And following along on the mechanisms. There are three parts of organic chemistry. The reactions themselves... well structure, reactivity,

and mechanisms. So all three kind of go together. You really have to master enough about physically... drawing these things. If they can't do that, it's really going to be a problem.

Interviewer: Great. As an educator, what do you think your role should be? Or what is your responsibility be in the learning process?

Interviewee: Cheerleader. I think that's the main thing. Enthusiasm and showing them why it's important. Showing them applications of it. Delving more into mechanisms and getting more into theory. That's one idea. Hopefully engaging students that way. I am a little more on the practical side. Showing them applications, and why it is important. Reminding them. I think that's an ongoing process, so it's not just the first day of class. The enthusiasm part is I think a big part of it. Once they see the process, it is their responsibility. I am not holding their hand that way, or you know. But each lecture and each class time hopefully reinforces that idea of why it's important, what their role is, and you know.

Interviewer: Can you help me understand a little more about what it means to be a cheerleader. Does that have to do with encouraging them?

Interviewee: I think reinforcing good behavior. So pointing out what works for different people. Preparing for exams. What is the best way to approach this. I have chapter outlines. I keep that outline on the side board during lectures. I try to make connections of how things relate to different things. And how working the problems will reinforce different concepts. Then performance on tests and quizzes - giving them feedback on it. Pointing out in class what people did who did well on the exam.

Interviewer: So trying to point out, "this is helpful behavior that will help you". Do you find that people have sort of negative attitudes about [REDACTED] coming in? So some of the cheerleading is helping them see how it's....

Interviewee: Right. And sure this subject is horrifying, there is no way to sugar coat that. It's probably the hardest class that a lot of them will ever take. Most of them are pre-med and pre-dent and are getting ready for those exams. So they have heard horror stories, a lot of people have flunked out, or changed their emphasis of their major because they have heard how hard some classes are. And they have already weathered the storm in Gen. Chem. So when they get to organic they are like "what? A whole other year of this? Why?" You've gotta overcome that somehow. Showing them why it is important. Leading them onto [REDACTED]. We are doing a better job of that now I feel like. (7:07) You know, connecting it on to [REDACTED] and into the MCAT and classes they will take later on in pharmacy or med school. We see more life science people now. So we see a more people who are a little more diverse maybe.

Interviewer: Great. Okay and what do you think the student's role as the learner should be? Especially in class, what should they be doing?

Interviewee: They should be taking notes, like a mad man. Yeah some kids get a little too caught up in that. I ask a lot of leading questions in class, and hopefully they are following along enough to pause and see what is really going on. See the big picture.

Interviewer: Can you give me an example of this, like a leading question?

Interviewee: So leading question about the structures. If we change the structure this way, will that change the reactivity. You know, why did the reactivity change? And how does it actually work? What's the mechanism? How does this relate to a previous thing we have already covered?

Interviewer: So when you ask a question like that, then do your students respond to it?

Interviewee: Sure! Yeah. I don't use iclickers anymore. I used to, for a couple years I tried out iclickers. I went through different ways of doing that. But, you know, just little activities of posing a question or presenting the material a little bit different. "Here's the next reaction" or "Here's the product", "why", "here's a couple follow up examples", "this one changed a little bit, why did it change?". So it's a lot of chances to do that. Or "If there are two products, which one's major?" So you know, just ask the whole class. Then say, "this one's major". You know give them their answer and then ask "why do you say that". So yeah, that gets some things going. It kind of depends on the material and how it comes up in class. I can get the feedback. I can tell just by looking at their faces whether they are getting it or not, or what the problem might be. I can kind of pause and go through that.

Interviewer: Good. What about a typical day in your classroom? We talked a little bit about this but sort of, beginning to end, what is going on?

Interviewee: Of course it's me presenting the material. So there might be some follow up from a previous lecture. Like "We had this one problem, does everybody see that?" But at the beginning of class, of course I do quite a few minutes in just business things. What's coming up, a quiz or a test, what's due when, I will write review sessions on the side board, if they have questions about that. But then the material it's on the outline, so this (10:29) next reaction has this relevance, and so I might plow right into the structure and then the reactions, y'know, what's being formed.

Interviewer: And is this at the chalkboard?

Interviewee: Yeah, it's on the chalkboard. I might have some overheads on table material that might come up or applications, so there might be some different things that way that would be overheads, but most of it's on the chalkboard.

Interviewer: Great. And how often, or what percent of the time do you think the students are responding to your questions or working on problems or something like that?

Interviewee: The percentage of the time?

Interviewer: Or how many minutes, or...

Interviewee: Yeah, that's probably a big part of it. I dunno, I'd say at least half. They have to, y'know, follow along and y'know, sure...

Interviewer: So to be involved. It sounds like it's sort of like a conversation?

Interviewee: Yeah, hopefully!

Interviewer: Great! What do you think are your strengths as an educator?

Interviewee: I'm pretty organized, and I think I'm pretty clear about expectations on what they need, y'know, the outlines and the tests--I try to make them reasonably straightforward. I tell them that; I try to write the simplest test possible, but I have to cover all the material, so, y'know, so you know what's on the test; it's all this material. If you've worked with all the problems, it should be an enjoyable experience, actually, to take the test. And some kids do give you that feedback, but the ones that have fallen behind or for whatever reason haven't done enough of the homework, they're not gonna get it that way, so...I try to keep it straightforward. The difficulty of my tests is probably in the middle, or maybe on the easier side. I have sixty percent of the points as multiple choice, forty percent is write-on. Multiple choice, y'know, there are good ways to write questions for multiple choice, and that's how all their standardized exams are gonna be--the MCAT and the DAT, so they need to see that. Plus, it's nicer on the graders to have more multiple choice. But I can write a couple harder problems; I can write two or three hard mechanism problems and flunk most of the class. What does that prove though, y'know? So I try to show them one or two mechanism problems that are relatively simple--ones that they should've seen before, or little variations of it, and then maybe one or two harder ones that might differentiate the class a little bit. And they get used to that; I put sample tests on Learning Suite for all the exams, and so they study my sample tests. And I warn them that those may have been last year's problems or whatever before, y'know, so you're gonna have to study broadly and have a good feel for the overall concepts, so...I dunno. Yeah...

Interviewer: Other strengths that you can think of?

Interviewee: Umm, no that's probably good. I dunno, strengths compared to who, y'know? The other people in the department, or...? (laughing)

Interviewer: Or just things you think that " \_\_\_\_ " (14:04)

Interviewee: I show them a lot of applications of why it's important. I think that's good and I spend a lot of time finding new materials, some overheads of different things of why it's important, and some of them have worked. I'm always surprised, y'know, I think, 'Oh, this is a great application that they'll all really like!' and sometimes it'll bomb completely, and another thing will be kinda crazy, but they'll latch onto it for some reason, so, you try to find things that are medically relevant or even dentistry-related and hopefully that catches their attention of why organic chemistry...but showing them the process, it's a whole approach of chemistry in general. Do we show them just a step by step through all the principles, or do we show them how things really evolved and developed as a science in an area, and I think it's more engaging to show them a little bit, at least, of the history and the development of how different ideas lead to different discoveries and try to throw that in once in a while. But a lot of times, kids aren't curious; they could care less about that. They just wanna know what's on the test, so I think the principles-based approach kinda feeds into that, but it's a lot of principles, so okay, good--you're not curious about the subject, you don't really wanna know why it's important; you just want the principles, well, then it's gonna be dry and harder in some ways, so, I dunno.

Interviewer: What do you think are some of your greatest challenges as an educator?

Interviewee: Keeping students engaged. Well, that's why you're doing the STEM thing, right? You know what the problem is. Yeah, that's always the challenge. And they're changing, y'know, students are changing, I think. We've tried to respond with the e-book now, making that available for a lower price, whatever, so they have access to the book anywhere via whatever media they're using, and I kinda joke about that from time to time: "You can look at all of my stuff on your smartphone anytime, anywhere! But don't just click through it or, y'know, thumb through it; you've gotta work the problems ON PAPER, like we did in class!" But that's probably the challenge; getting them to really see, y'know. But they follow along, y'know, I make a big point of saying this, a connection between the hand and the brain, y'know, that mechanical interaction, that really reinforces the thought process, and some of them think that they can pass if they just sit through a class. And maybe that works in some classes on campus, but not in ours. No way.

Interviewer: Yeah. Um, tell me about a time you decided to change something about your teaching. What did you wanna change and why?

Interviewee: Well, we're kinda forced into from the book. Our kind of ball and chain is the book, and we try to pick the best book we can that way, but what I'd like to change is, well like I said, showing more of the practical examples; why it relates to other things. The book, and y'know, it's doing a little better now, but the books five, ten years ago were just all theory. Here's the mechanism, here's how it works, it's done, y'know, and there's nothing else to learn here. Well, there's a lot of empirical things about [REDACTED]. Here's a reaction where the mechanism's NOT very well known, but this process is important for this, and here's how this might evolve and be applicable to that--none of those ideas come through in this very dogmatic mechanism "this must be the result" approach. And that's what a LOT of books are going toward. Some professors like to be really proud about that-- "Oh, we know the mechanism of every reaction!" Number one, no we don't, and number two, we don't know what future applications are gonna be, so I prefer more of an empirical approach: Here's some observations, and here's the theory that appears to be consistent overall with what's been observed from this, and none of that comes through in the textbooks. Textbooks are very black and white, so I like to show them some of the ambiguous things, so I'll show alternative mechanisms when we first start mechanisms in [REDACTED]. I'll draw three or four possible pathways, and which one would be right and why? So, I try to lead them along that way, but, yeah, so I've changed my approach. When I started at [REDACTED], I was probably really really strict that way, just mechanism only, just plowing through them one after another, but that doesn't really engage the students at that point. I dunno, I was okay, I got good reviews early on but...

Interviewer: So you're changing to add more of these applications and sort of real world things?

Interviewee: Yeah! The big picture approach. There's some articles recently in ChemidT(sp) (19:35) about that, we've got tunnel vision teaching chemistry--here's all our reactions we're gonna cover, and that's it! Y'know, well great, why? What do they relate to anything and what's the point, okay? You've got the mechanism figured out for these few simple, typical reactions, but that doesn't relate to anything big picture-wise. (19:55) I think most students when they sign up for [REDACTED] they go "This is important because [REDACTED] people have to take it and it will relate to [REDACTED] and some drugs I have heard about are organic... maybe that's why they want us to take it." That's probably the background of most students. But we show them why it's important and how the



principles lead to new discoveries. Something that at least they can feel good about like, "Oh that's why I took [REDACTED]!" Maybe none of that was on the test exactly. That's a challenge, I need to put these applications on an exam. A lot of that can seem kind of contrived. So my exams are mainly just on principles. So I'll show some little thing maybe of some drug synthesis or whatever. But I'm not gonna present a big case study as an exam. "Here's this drug and that drug" You need a lot of different areas of chemistry to fully explore something like that. So that's a challenge I think.

Interviewer: Mhm. Great. So the next little section is more about Stemfy, the program. One of the things we are focusing on is active learning or student centered teaching, both of those are sort of used interchangeably. What do you think those mean, just right now, in your own words?

Interviewee: So keeping in mind the needs of the student all along the way, you know. Why are they taking this class and what are their needs in the future? So, I'm okay talking about that. Most of them are MCAT and DAT people. Fine, you know. That's great! They're aspiring to a career that's going to be challenging that way, great. I'll try to open their eyes to some other aspects of it you know. Here's grad schools, here's what chemists do. And it's kind of an eye opener. Some of them will argue with me when I say things like (22:01), "Well you know MDs don't discover drugs. Organic chemists do." Some of them are like "Woah-ho. You know I'm becoming a doctor because I'm gonna cure a disease." No you're not. As a doctor, you're gonna be in the clinic looking up peoples' noses all day. That's what you're gonna be doing, you know. So in way it's kind of a self-discovery thing. But keeping that process in mind - and I never try to offend them in any way or you know. I tell them that's great. Med school, you know, knock yourself out. It's gonna be great. But you're gonna have to get through these classes.

Interviewer: Yeah and organic chemistry is one of the big hurdles.

Interviewee: And half of them need to flunk out because they view these classes as just hurdles. And so we don't want people like that to be doctors. We want them to be in other careers. And that's fine. If we're the ones that need to deliver that message, great. Not offending them and working with them and helping them out. And some really latch on to it and it gets them excited about things. And those are the people we want to launch in their careers, you know. But worrying about what percentage of kids we push through STEM classes, we gotta be careful about that because how many STEM jobs are really out there? Do we want all kids to get in to STEM? That's something the ACS has done a lot of research on. Do we really need a lot more chemists?

Interviewer: Well, it's an interesting question. (23:43) I think they're is certainly a need nationally. But maybe not in chemistry specifically, but in related fields.

Interviewee: But as evolve and new information in the future evolves, we need people who are technically trained and grounded in a background of chemistry. And that's part of the reason of showing them applications of o-chem in class. They can see why these adhesive materials, these polymers were developed to stick teeth and crowns and onlays and how those materials relate to what they might be doing. And so there are little things that can be pointed out that will catch their attention. And whether or not that ever comes up in their dental or medical training, it might be a stretch because you know the general practitioner or the guy just working in a clinic may never know or care what the

structure of aspirin is or what its properties are. But at least they've gone through that and they can at least know what that material is and how it relates. But the people who work in research, MDs and PhDs programs...in fact, even the routine MDs and dental people, they want them to be involved in original work. It may not be traditional lab research but, if they're involved in a big group you know looking at the effectiveness of some new procedure, their ochem could come into play and really be helpful to them. So I try to point that out.

Interviewer: (25:24) Why did you want to participate in this STEMFI?

Interviewee: Oh I don't know. [REDACTED] sent out the thing to the whole faculty. I tried to be a good citizen and respond there. But I think it's a good initiative campus wide to finally talk about that, you know. The dogma is "oh these are great jobs and they're high paying" and it's a challenge to get kids into them. Well, how come everytime I go to the graduation ceremony, I open up that booklet and most of the kids are graduating in Family Life. And I'm wondering, are there really 2,000 jobs for family life majors out there? And what did they come to a university for? To learn about how to deal with kids and change diapers, you know? I think we kind of pick that up as moms and dads along the way, right? Why are they coming to a major university and majoring in something like that? And as a chemist, a scientist, I'm thinking why aren't more kids considering these harder degrees? So seeing the STEM things, I'm thinking, "Great! Finally, something campus wide where they're saying yeah this is an important area and maybe we ought to push kids into it." That's why I responded.

Interviewer: And so knowing that we have this summer workshop, I guess the spring workshop, what do you hope you'll gain by participating?

Interviewee: Well, I don't know. I've done some work shops. I came here as a new faculty orientation thing and I've gone through a couple of research things. But I've never gone through this teaching through STEM stuff so...it'll be interesting to see what you guys do. I'll try to keep being a good citizen.

Interviewer: And so there are a few aspects of this STEMFY program. Having time to focus on teaching. There's a small financial reward for your participation. There's some mentoring that's gonna happen. Thinking about those aspects of the experience which do you think are the most motivating to you? (27:47)

Interviewee: Just new ideas for class activities, yeah.

Interviewer: And you mentioned being a good citizen.

Interviewee: Yeah.

Interviewer: That plays a role probably.

Interviewee: Yeah. So that's probably where the potential is...to retain more kids in STEM classes. Just looking at chemistry, you're aware of how many kids show up and declare themselves chem majors when they're freshman. And it's like 200-300 kids a year. And then by the time we get to ochem, we are down to 60 or so kids. Where do they all go? I think this retention of kids in STEM classes is a big thing. Whatever reason they're leaving to family life or whatever degree they end up in. We need to figure that out I think

as a university. I've never seen anybody, even attempt to deal with the problem. Whether they view it as a problem or not. Do they like the idea of 50% of the kids going downhill into this family life program? I don't know. Maybe they don't view that as a problem. But you know we should be training people at a high level. They don't have those kind of degrees at a lot of other places. At [REDACTED], even though it's open enrollment, a lot of the kids weren't well prepared, you had to declare a major before you showed up at [REDACTED]. They went to [REDACTED], most of them, to become engineers and work in industry at the Bachelor's level. So it was a real pathway for that kind of degree there. But even though they weren't that prepared coming out of high school, they stuff with their degrees more or less. And [REDACTED] has it pretty rigid. Once you're in that degree you have to petition and really jump through some hoops to change out of that degree. But here, it seems like we just let them flounder around for a couple of years. And I know enough of these kids over the years to see that doesn't make sense look term for them. And the amount of money and investment we're doing here could be better spent really directing them towards something that's gonna pay off career wise. And the STEM things should be right up at the top. You want a career that's really going to be meaningful in society. Why waste your time five years getting a family life degree? When you're needed in a more technical area. Great we can bring in people from China and India to do these things and to fill our graduate programs but why aren't we emphasizing to domestic kids this is a degree you should be in to. Maybe it's a political correctness thing and administrators don't want to appear like they're favoring one area of the campus over another. At least they shouldn't be making fun of science programs. Oh chemistry, that's just really hard. Why would you want to take that? But that's a lot the attitude that comes through campus. So if there's anything STEM can do to help redirect that or influence kids, I think. (31:23)

Interviewer: I mean certainly that's the goal that we have. Improve the teaching and hopefully have an impact that way. Would you like to use more active learning in your teaching?

Interviewee: Yeah sure. I'm not sure how else to do it. I'd could go back to iclickers or one of these online type quiz things I think is even easier. iClickers...I think they're...well, the claim is their real simple and easy to use but it's a seperate device. And the kids have to show up with the batteries ready to go. And then they're paranoid, do I just get participation points? Or do I actually get points out of this. And I think there is a lot of anxiety over that. I like these online things now. What's the one called? It's a free thing. And it's online. And you just give the things the access code. And you already set it up. And with whatever they got, over telephone line, we're not worrying about broadband issues and you know if they all have to be logged in. (32:36) And I think that's what's holding us back from some of these more convenient online things. But if they've got a smart phone at least they can just use their phone line to get into this quiz and just take it for the fun of it. So I've heard of that and I've heard of other departments that use it. I don't think anybody in our department has been using. We had all these crazy electronic homework packages. Mastering Chemistry was a disaster. I tried it for [REDACTED] It's just too clunky, too much of an upside, there's always 20-30% of the kids who can never figure out how to use it right. Significant figures and then drawing things is a problem. So we don't need to rely on the publishers. There are these free quiz things that can be set up and they're easier and cheaper, I think. And they can be used creatively. So I don't know. Something like that might spice things up. I do homework and I have them just upload it and take a picture of it on learningsuite. And the TAs like and the students seem to like that. Very few problems with that. There's always a couple of kids who don't know how to scan something or put it on learningsuite. But they figure that out pretty

quick. (34:00) So I think the smartphone tablets have opened up a lot more possibilities that we've haven't really tapped yet. So, I don't know. If they could come up with something new there, it might be fun.

Interviewer: What are some barriers that you face in terms of doing more active learning? It sounds like maybe technology-

Interviewee: Barriers are the book and the material. We gotta plow through a certain amount of material so we can't do too much stuff that might be taking away from that time we need to have to go through the material. If we don't get through the material, then we will rush to try to wrap it up. Because we are kinda restricted by what the ACS and the MCAT and DAT content is. We gotta go through enough topics. And then there's the issue if it's [REDACTED], you've gotta finish a certain chapter before you pass the kids off to [REDACTED]. And they may not be in your section so. But y'know, a scenario we try to keep 'em on schedule there. [REDACTED], we have a lot more flexibility, so a lot of us cover different topics in different ways there, so, yeah. And that's what I'm teaching this summer, so I've been thinking about how I'm gonna do that a little different, I dunno. But that's the limitation, I think, is just the material; you've gotta get through the content.

Interviewer: So how do you balance trying to do these more active or engaging things, but they take time?

Interviewee: Right, and that was the iClicker--that was my frustration with that. Y'know, oh, I've gotta get my computer going, oh no! We'll just leave it on! Oh yeah, as soon as you get it back up and then you've gotta get thing thing, y'know, up there, and then the screen, y'know, and then the box, and then you've gotta record the data. I'm thinking, hey wait a minute, I've got like three devices going up here! My laptop, the projector, the podium computer, and I'm thinking, this is nuts! I can just look at them and have them raise their hands, y'know, who picks this one, who picks that one? I never saw the point of it. I did it for a couple of years, 'cause that was the trend, and the publishers had 'ready-to-go questions' about it, but they were horrible! They're well done, y'know? So, I've heard about these other online quiz things where you just put up the code and they go to the website, click in the code, and boom--they're already there. And then they participate just by hitting their smartphone, y'know. And boom! After each question, boom! Here's the results of the class, y'know? And then you could have a follow-up question, oh, how's it a little different? And the graphics are completely your own discretion, y'know, you can create it however you want, so. My wife teaches French at the American Heritage school and she does all these crazy online quiz things. I forget the name of the program; there's a couple of them out there.

Interviewer: Yeah, I knew, well, Poll Everywhere is one, and then there's another one and I can't remember, it has a funny name and it's like, it has music and—

Interviewee: Yeah! Yeah, it's really entertaining and it's really fast! Y'know, it's the game-playing mentality, and it's all set up, there's all these automatic (37:27) templates for it. You can enter whatever graphic you want and so I think there's a lot more possibilities there for that kind of stuff.

Interviewer: How confident do you feel in your abilities to use active learning strategies?

Interviewee: Like I said, some things you plan and they bomb completely. But other things are a little wacky but it hits a nerve for some reason. We talking about engaging everyone or just the subset of the kids who are highly motivated? I don't know. That's hard to say how confident I am. Every semester I try something different, so I look at it each time. I don't just recycle through the same stuff. So I will go through and each chapter I will revise my outline to try to hone it a little better. I will try to think through the stuff that did go well. Maybe emphasize that a little more and downplay some things. I don't know. Yeah it's an ongoing experiment. That's part of the reason why I think teaching is fun, because you do have that process. I don't know... I keep trying new things.

Interviewer: Sometimes they work and sometimes they don't.

Interviewee: Yeah. It's a mix of things! I do demos, I do a lot more demos than most organic people. I bring in things, I bring in a bottle of... you know if we are talking about acetone or ketones (?) I will bring in a bottle. I will let them smell it or whatever. I like the hands on. Anything that can make it more physical, more tangible to them, I think, the better. So I started a few crazy things, with orbitals, you know the stationary way with the rope. I got this big rope that people borrow. I started that at [REDACTED]. "How does shawm (???) (39:38) orbitals and constructive overlap and higher energy orbitals. The standing waves of the rope, it's perfect for it. You kind of spin the rope, and you get the different modes. So that kind of carries over. But then a lot of books can (???) (39:54) out of o-chem. So I am with [REDACTED]. I show a little more o-theory. But not too much. If you go too much out of the book, then you risk half of the kids wondering, "what class am I in now?" or "This isn't in my book!" So there's kind of a fine line there. How much stuff to bring in that's not in the book.

Interviewer: And also things that you talked about like the applications. Do you bring in any that maybe are on the test?

Interviewee: So I warn them, hey anything about these applications I could put on a test. I will have maybe one multiple choice problem that's related to that. And maybe one on the write on part, where they've got to remember something about those applications. They will see the routine. They will see my same tests. "Oh yeah, there's that thing about Aspirin. I better remember." At least the functional groups or something about the properties of it could come up. But yeah I try to emphasize these are principles that can lead you to solve problems in the things that we haven't covered in class. Can you apply the principles to something you haven't seen before. You know. A lot of the problems on the test are routine things that they have seen. But hopefully there's enough there that challenges them and rewards the kids who've mastered the principles. You know and we talk about this all the time. I like looking at different people's tests and quizzes, what they are doing.

Interviewer: One last thing about using active learning. Are there any external factors? Things that are out of your control that you think influence your ability to influence active learning in the classroom?

Interviewee: Yeah so it's are they reading the book, or following along in previous lectures enough to get this next concept. So that's why I spend so much time reviewing the previous concepts and showing them how things are linked together. But that is kind of out of my control if they haven't been following along. You've seen it. There's that lower 20% that just fall further and further behind. The first task, they're all bunched up at the

top. But then it becomes this elongated distribution of points as we go along. That's my goal. I mean I will say that the first day of class. My goal one day is to teach a large class where everybody gets an A. If you're all bunched up right at the top, at the end of the semester, I will give you all A's. I am trying to do that. That is my goal. Then I will tell them, the first day I go through quite a bit about study habits and what they should be doing. But whether they follow up on that, that is a little beyond my control. We have done a lot better. We have the TA, the recitations and the specific TA rooms now. We didn't use to have that. We didn't have any recitations, we didn't have those TA rooms. So we would have 20-30 kids outside your office for office hours. You can imagine...

Interviewer: I still feel like I get that many haha.

Interviewee: There's still a lot that come in to see ya, but in the old days it would be overwhelming. Especially right before a test. So I would always do exam reviews, I still do. I schedule at least two exam reviews. I will do one and maybe a TA will do the other one. But to come in and get help and work enough problems... You can't force some to follow the program that way. That is probably my biggest challenge, I don't know.

Interviewer: What about recognition of your teaching work? Do you feel that teaching is valued here?

Interviewee: uhhh.. Sure! Yeah. I don't put any value in any of the little awards they hand out. Campus wide, those are pointless. The satisfaction of knowing enough of the kids in the class and seeing how they've responded, seeing how they've done well. That's, in my mind, the recognition. It is nice they pay me, and I guess it's nice they hand out these plaques of pieces of wood, that say different things on them from time to time. I've gotten some of those awards for research, but I've never gotten one for teaching. That's completely mysterious to me how they come up with who gets a teaching award. How do they do that? Do some kids nominate you? I guess, I have never told kids to do that if they like my teaching. I've never seen the administration come around and say anything in the department about teaching. I think there's a real disconnect there but that's fine they've got their jobs. You know. But when they meet with us and talk about things, it is clear they have no understanding of what goes on in the classroom. And no real interest in it, which I think is amazing. I've been around some other administrators where classroom stuff is much more important to them. And they are real scholars and they really have things to say about the process of higher education. But I have seen none of that here at BYU, which is kind of a disappointment. But I don't know. It doesn't really matter. My satisfaction is the interactions with the kids I know. It would be nice to see some participation, at least some recognition from people who are supposedly running the place, but I've learned never to count on it.

Interviewer: Well great. The last question we have is how else can we help you as you are getting ready to participate in stem 5. Do you have any questions or anything we can do?

Interviewee: Um.. no! It's good that I'll be able to go to the workshops before. You know, we will do it with a class. In summer term that will be good I think because it moves really fast. It's two hours a day and over in eight weeks. But yeah, you can come in any time. Will you be doing the observations?

Interviewer: Probably some of them, yeah. And we have some students who have been trained.

Interviewee: Oh yeah I've seen observers before.

Interviewer: Like the Scott's? They're kind of like Scott's.

Interviewee: Yeah. I've done that. And I've done the freshman academy people, that's when I did [REDACTED]. They would always come. They come to [REDACTED] sometimes, because there is always a bunch of freshman kids that jump right into [REDACTED].

Interviewer: Oh do they? Okay.

Interviewee: Yeah if they've had AP or high school chemistry. And there's more. The last time I taught there was like 30 freshman. Some of them were way at the top of the class. They were good. But the freshman academy people would come and be their mentors. You know, make sure they're doing good. They may give me feedback, you know on different lectures. "Hey freshman kids may need a little more of this or that." Okay.. Good. You know they were upper class men. But they were still undergrads. They were like seniors or whatever. I never saw the main guy. There's a freshman academy guy.

Interviewer: Like a director, yeah?

Interviewee: Yeah. I never saw... I get emails from them but yeah.

Interviewer: Very good! Well thank you so much for your time.

Interviewee: Oh sure.

(48:01)  
COMPLETE

#### **Interview #6:**

INTERVIEWER: The first thing I'm supposed to do is reassure you that we are not here to judge you or evaluate you. Just trying to understand who you are, where you're coming from, and how we can best help you in STEMFI.

INTERVIEWEE: Oh, I think a lot of evaluation is useful! But you're not here to do that.

INTERVIEWER: Yeah yeah. So the first part of the interview we're just gonna talk about some of your background and what you think about teaching and learning. So can you tell me about your background as a teacher?



INTERVIEWEE: Okay. I started at the [REDACTED] and then came here to BYU. I taught in the department of [REDACTED] there for 5 years and came here to BYU in [REDACTED]. And I've been teaching [REDACTED] at the graduate and undergraduate level for...how many years is that? 22 years?

INTERVIEWER: And before you started teaching at the university, did you have any experience as a TA or any other teaching opportunity?

INTERVIEWEE: Yeah in my undergraduate I was a grader and a TA a little bit. I was fortunate to have scholarships and research positions that I did mostly and so I had very little exposure to teaching in a college setting.

INTERVIEWER: And since you've been a faculty member, have there been any sort of professional development things that you belong to or have participated in with regard to teaching?

INTERVIEWEE: Yeah in the [REDACTED] they had some seminars that I thought were really good and at BYU. I mean I went to the new faculty seminar. [REDACTED] was the director at the time and I thought he did a great job with that. I've attended - you know in the college they have regular teaching seminars almost on a monthly basis. And I attend those whenever I can and also I did attend a "writing across curriculum" seminar one summer and that I thought was extremely beneficial. (2:42) Delys Snyder, she ran that pretty much. So those kinds of things.

INTERVIEWER: And you said that you teach both graduate and undergraduate courses. Which course were you thinking of reforming with STEMFI?

INTERVIEWEE: Some of the undergraduate courses I teach. And one that I had the visitor come to, the [REDACTED] which is a heat transfer class. And also the [REDACTED] are the ones I'd really like to...

INTERVIEWER: And how many students are enrolled in each of those sections?

INTERVIEWEE: 40? I guess. My sections tend to be a little smaller.

INTERVIEWER: Smaller than other courses?



INTERVIEWEE: Than other sections of the same class. Yeah I think 60 is typical for the department.

INTERVIEWER: You must teach in the morning.

INTERVIEWEE: No...

INTERVIEWER: Or the afternoon. There's like a sweet spot in the day when they like to come to class. And none of the other times.

INTERVIEWEE: I'll say I'm fortunate to have smaller sections.

INTERVIEWER: Yeah, that's nice. Now thinking about you as a student, think about a powerful educational experience that you had. What was going on? (4:18)

INTERVIEWEE: As a student, I mean I think for me...well, the one that immediately popped to mind is the qualifying exams when I was a PhD candidate. Because I learned how to learn on my own and I think that was a very very useful thing. And so, other than that I think we've been hearing a lot from Elder Clark about inspiring learning and from President Worthen about...well I guess Elder Clark talks about deep learning and President Worthen talks about inspiring learning. There were many times, and I did my undergraduate here at BYU, that I felt inspired to learn but I think it was more like particularly in engineering where you follow examples, it was all about getting the answer and putting a box around the number at the end or filling out the right bubble. And I've become much less inspired by that I guess as I've moved along here. And so I've tried to really get away from those kinds of things. I know as a student it was when I really accomplished something, when I completed an assignment and I could say something about what I did. What value would this analysis have? Could I draw a conclusion or make a recommendation based on my analysis and results? And that is something I've really tried to do; to incorporate into my classes.

INTERVIEWER: Like what does it mean in the real world?

INTERVIEWEE: Yeah like what does this mean? Was this just a mathematical exercise or am I just jumping through a hoop? Or could this be applicable to engineering practice? And if so how? And so when I could make those connections as a student...and what I'm trying to do as a faculty member is to help students to see that the work that they're doing - there's not particular value in them telling me an answer I already know, right? I know answers to the hw problems I assign. And so there's

not a whole lot of value in telling me something I already know. So I hope they will focus on the value to them and being able to get to that point. And so I'm confusing what I do now with what was inspiring back as a student. (7:35)

INTERVIEWER: Thinking about the oral exam...or the comprehensive exam

INTERVIEWEE: Yeah. It was the qualifying exam. It was more I had to study you know a wide range of topics independently and figure out how to really master those subjects in a relatively short amount of time and when it really mattered. Taking responsibility of myself and having to know that I'm accountable to myself for what I learn. BEcause there was no deadlines for homework that I had to get things done at this time or this time. I mean there was a deadline if a test was scheduled and I had to be ready by then, but that was way in the future. And I was accountable to myself for that preparation. I felt that was just a really good exercise. A really good learning experience.

INTERVIEWER: Yeah, thank you. And as an educator now, what do you think your role should be in terms of the process of learning? What should your responsibility or role be? (8:59)

INTERVIEWEE: I read "How Learning Works", there's a group of authors. I can't think of who they were. I was when I did "Writing Across Curriculum". I don't know if you're familiar with this. They had a quote in here that said, "Learning depends on what a student thinks and does and nothing else". And so I see myself as having to do those things that - I mean I guess there's also a paper that go circulated widely. It was about the paradigm shift between the learning paradigm versus the teaching paradigm. Bar and Tag I think, were the authors. And they talk about the importance of not so much what a teaching does, but what the students do and think. And so I see my role is to create an environment in which students do and think productive things that help them learn.

INTERVIEWER: That's great.

INTERVIEWEE: That's hard to do though. Students really don't like it! I mean, they want to be told what to do and exactly what they have to do to get an A (10:37). That's a real generalization to say that students don't like it. Some really do, but there's many who don't. They want to be told exactly what they need to do. I'd like to find ways to really help them assume responsibility for their education and for their learning. And be a resource for that.

INTERVIEWER: And so thinking about students, what do you think the students are responsible for in this learning process?

INTERVIEWEE: To really engage, to not see it as hoops that they are jumping through but that this could be life altering and enriching experience and not something that they're checking in a box.

INTERVIEWER: So sort of having like a good attitude?

INTERVIEWEE: Yeah well definitely a growth mindset and thinking that I'm not here to show how much I already know. But I'm here to learn and to develop and to increase my understanding and skills and things like that. And so to have a growth mindset attitude and not be afraid of failure. I think that's one think that I've noticed - and even in the years that I've been teaching it seems like the students are coming in more and more afraid of failure. And I mean, President Worthen has talked about it quite a bit. It seems like he talks about failing successfully...that was a great talk. I think to help them see that they shouldn't be afraid of trying things because they might fail. But to fail and to learn from it...I mean they don't have to fail. But normally you do. To be willing to stretch yourself and try something new or different in order to maximize the value of their education for themselves and their investment in it and all tithe payers of the church who subsidize their education. We owe it to them to make it a real transformational process.

INTERVIEWER: Yeah, thank you. Now thinking again of yourself as a teacher, can you think of a time when you felt really successful...like as a teacher? (13:26)

INTERVIEWEE: Well, when class goes well and you see students engaged in class and you know making comments. Those are really good experiences. But I think what I've liked the most is years later. You know, to get an email from a student. I think I feel most successful when a student will email me years after they've graduated or taken a class from me and are saying "Hey, something you taught me in class...the material or the problem solving strategies was valuable to me." And I guess I get the greatest satisfaction out from that. And that's delayed though, right? And it doesn't always happen. And you hope the thought crosses their mind a lot more than it happens. It's not as common as I hope, I guess. There was a student who, and a colleague pointed this out to me, was applying to graduate schools and in his statement of intent you know to graduate school admissions and he wrote about the impact of a class...the applied thermodynamics class I talked about, has shaped what

he wanted to do. And so I don't think he ever intended that I see that or anything but it got back to me through a colleague or the grapevine. So even though it wasn't sent to me directly, it was something that I saw that something I taught in a class helped motivate him to do good things in the world. I would've been really impressed to have read that if I was on the admissions committee in the graduate schools he was applying to. And so those kinds of things...so what was the question? When have I felt the most successful as a teacher? I feel most successful when years later when I can see what I taught had an impact. And that's very much delayed response to your teaching. So it's hard to make changes in response to that (16:20) too, so it's not prompt feedback that allows you to adjust.

INTERVIEWER: Sometimes even people who at the end of the class think, "Wow, this is the worst class. It was so hard. And all of those pointless things we did." And then later on they realize that' it was actually really valuable.

INTERVIEWEE: Exactly. A month and a half ago, I got an email from a student. We had a rocky relationship I guess. He thought I was expecting too much. I'm not sure exactly. But I'm pretty confident that he didn't give me high teacher ratings after the class. He sent me this email and said, "Wow, what I learned in heat transfer is really making a difference in my life now. I just wanted to let you know that."

INTERVIEWER: That's nice.

INTERVIEWEE: Like I said, it doesn't happen often enough. I need to find a way to have students do it more often. But that's the most successful I feel I guess with a student who didn't see the value then so much but he learned enough and learned it well enough that it was really valuable in his career.

INTERVIEWER: Thank you. Thank you so much. Okay, you may remember that STEMFI is interested in student centered teaching. And how would describe student centered teaching if you were just using your own words, talking to a colleague? What do you think it is?

INTERVIEWEE: Yeah I guess the focus is on what students think and do. We focus on what we have control over, right? I know I'm gonna go into class and I can discuss this problem and this problem but I think student centered teaching is really focused on the student...what they're thinking and doing and responding to that as it's needed. And you give up a lot of control when you do that which is hard. We often talk about asking each

other “What class are you teaching?” And I think I’d rather say, I’m teaching the students. To teach students and to not teach material or a class. I teach students. (19:36)

INTERVIEWER: Great. And have you used any student-centered teaching strategies in the past?

INTERVIEWEE: I hope so!

INTERVIEWER: And what have you heard about it?

INTERVIEWEE: Yeah...well and like, active...the seminar--one of the seminars that I attended early in my career at the university of Arizona, we had this chemical engineering professor named Richard Felder, and he’s kinda established himself in the engineering education community, and he came and talked a lot about active learning, and activities you could do, y’know, the Think, Pair, Share, all those kind of things, and I tried to implement those, but really have the class open for discussion because it’s hard when you have classes of, y’know, much more than 20 to do those activities and make sure everybody’s engaged is hard. And so I think that I, in trying to implement that, I’ve found that if I can ask good questions and wait long enough and really make sure that, y’know, if I see somebody who’s not working on it, if I ask a question and say okay, work on this for a minute and see somebody’s not engaged, I can go and talk to them and try and bring them along, but then, y’know, that has to be really quick because you’ve got the whole class that you’ve gotta keep moving. And so those kind of things that are, y’know, are...I definitely try to avoid lecturing for extended periods of time, but I do...I try to avoid it, but there’s some times I do fall into it, y’know I use slides, and I’ve done things like, I post the class presentations before class, and so the students have access to it before and after, and so they aren’t focused on trying to write down...although now, they don’t take notes anymore; they take pictures with their phone when they see something they wanna make sure they have. But yeah, just to have students engage with me in more of a conversation during the class, and that’s hard in a big group, but that’s the goal.

INTERVIEWER: Yeah. And you mentioned this issue of having to keep the class moving forward. Is your concern about the other students that maybe weren’t struggling with the problem?

INTERVIEWEE: Yeah, that is, because I ask--I have assignments that relate to, y’know, students need to come to class prepared, and it’s actually, I’ve tried to adopt the BYU-Idaho student learning process’s

model, where you have expectations of what the students do before class in preparation, what they do during class, and what they do after, and have that. And what I've found is that there's a real disparity between students that are preparing for class, right? Because they're ready to go, and you can...y'know, but they're on a different level than those who haven't come to class prepared. And so balancing the, y'know, because I don't wanna just leave those who haven't come prepared behind, but then I also feel like, well that's a sure way to tell them "You don't need to come to class prepared," because if you remove the incentive, like if there's no value in coming prepared, why should they do it? And so, and I definitely wanna reward those who do come prepared and make class really meaningful to them, and so when you have that--striking that appropriate balance between those that are prepared and are ready to cover more material at a higher level and those that are not, y'know, how do you balance that? And I oscillate between thinking, y'know, it's their fault for not coming in prepared, so I'm gonna focus on those who are prepared, and but sometimes maybe it, y'know, life happens, and there are reasons why they're not prepared, and y'know, it shouldn't happen all the time, but I don't wanna leave anybody behind at the same time.

INTERVIEWER: Right. And do you also feel a sense of, y'know, this is the day that we have to cover this material because we have to cover all of these objectives during the course?

INTERVIEWEE: Well, yeah, I think that is something I really try to focus on--the course outcomes, and say, y'know, have my grading rubrics are based on demonstrating mastery of course outcomes and not getting, answering any particular question right, so that's, uhh, so...yeah, I mean definitely with accreditation, there's definitely a need to cover the material that's, y'know, assigned, but I'm teaching students, not material. They're students, not a class, and so yeah. I mean, most definitely, there are times when I know what they need in order to complete an assignment and I wanna stay on track with completing the assignment because it just gets so messy if you get behind and it's chaotic and students don't understand expectations or when...so, y'know I most definitely feel pressure to make sure I prepare them for the upcoming assignment and I know what they'll need to do for that and I don't wanna get just sidetracked from that sometimes, which runs counter to being really responsive to the students if somebody's behind. But I do invite students that I see really struggling to say hey, I can see you're slipping behind here; why don't you come talk to me and set up appointments outside office hours and stuff like that. But y'know, I think that is really really hard. How do you not leave students behind who are unprepared but make

it--make coming to class prepared worthwhile and beneficial? Can you help with that?

INTERVIEWER: Yeah, that sounds like a challenge. Umm, maybe!

INTERVIEWEE: That was something that I--y'know, strategies for, good techniques for doing that would be immensely beneficial.

INTERVIEWER: Yeah. Well you're definitely not the only one who's had that experience; it's pretty common that people are concerned about that, and when they've tried to do--especially people that've tried to do more active learning, things like a flipped classroom, sort of on the extreme end, well if somebody doesn't watch the videos before class, there's no way they're gonna be able to do what they're supposed to do in class, right? So it creates a problem. And it's a different paradigm for students, y'know? They're not used to that, so you also have to help them understand what you're doing and why.

INTERVIEWEE: Yeah. I don't think I've flipped the classroom necessarily, I mean, to me that seems like, well, that's sort of what a reading assignment is, y'know. I do want students to come prepared so we don't have to deal with the surface level things; get to the higher level thinking skills and have time to really see how to develop and apply those problem-solving strategies or to interesting problems and not superficial ones, and you can't do that in the 50-minute lecture if you're covering all the mechanical kind of things that they needed to pick up in their reading, but yeah, I don't know. That is, I think, the biggest challenge right there, because--or at least for me, is how to meet students where they're at but at the same time to, y'know, well you can't meet students where they're at because that's a really individual thing, and when you're standing in front of 40 of them, you have to meet the group where it's at.

INTERVIEWER: Yeah. Well, we'll think about that and work on good solutions for you. Hopefully we've got something. So now thinking about the courses--was it [REDACTED] you were thinking about reforming? Thinking about that one, can you describe sort of a typical day in your class? What would it look like if just someone came and watched?

INTERVIEWEE: Umm okay well, I come in and I always show like a Dilbert cartoon or something that engineers tend to think are funny and have that up so when class--and I try to be there early so right as soon as the bell rings, I'm gonna start. And that again says that you need to come to class on time because I'm starting when the bell rings, and then I have--it's one of the uh, as part of their class preparation assignments, I

ask students to, y'know, based on their reading, to ask questions about the reading material or example problems that I've assigned, they look at before class. So I try to, if there are some of those that are, y'know, like, I often try to start with one of those, but I incorporate them throughout the, what I'm doing in the class.

INTERVIEWER: And do they submit those online or something?

INTERVIEWEE: Yeah, they submit those through Learning Suite. I have a class--

INTERVIEWER: Like a little quiz?

INTERVIEWEE: Yeah, I guess it shows up under the exam thing, and it's the same for every class period, and so some students, they get into the habit of doing things by rote and it becomes much less meaningful, but I think some of them really do use it as an opportunity to help them focus on what we're gonna cover in class. So I think I spend most of class trying to address the questions that they've come up with, but y'know, it's not always--behind the questions, there's other material that they need that foundation, so it'll often look like I'm lecturing, I think, and for those periods, um, by saying okay, this is what was in the reading, but we need to make sure we clarify that and to address the questions. And then I, um, so that's the beginning, and then I usually try to talk about either example problems that they should've looked at, or they had their choice of which ones they'd look at, but example problems and their homework assignment that they're gonna do after class to talk about issues with that to prepare them for doing that, y'know, and I try to make it clear. The expectation is that they, y'know, three hours for every hour in class that they spend, y'know, roughly an hour before class preparing for class, 50 minutes in class, and then 70 minutes on the assignment after class and tell them that I'm asking them to do it within that time period, because that's what the tests are. They're gonna get problems very similar to that, and they'll have less time than that to complete those, so I ask them also to make sure that they're being efficient in how they're solving those problems because they don't have forever to do these, and that way try to keep the time spent on the class to the appropriate amount of time. But at the same time, they are, y'know, developing the skills and learning the material that they need to. So it's, I guess class, the summary is I try to address questions and then, based on the reading, and then I try to get involved in talking through, working through example problems or homework problems that, the things that they need to do outside of class.

INTERVIEWER: And for these example problems, do you normally do



like, you're at the board and you're sort of talking through "This is what I'm gonna do next," or is it something that they're working on...?

INTERVIEWEE: Yeah, I sometimes, well, and that's...it varies, right? Like, I will, sometimes I'll show like, schematics or something like that instead of me trying to take a lot of time to write them on the board, I'll show it on, I have a powerpoint up, and so I'll just display it on the screen, and then I will write on the board or ask them to, okay, do this next step, and sort of walk around the class and see how they're doing, and then come back and say okay, well if you've done this, this is what it looks like, most of you got this, and then go to this step, and um, a combination of those things, I guess, and try to vary it. Although, y'know, when I do feel a time pressure, I'm, I often--more than I should, I often end up saying okay, we're doing this and this and you can see how to do that okay, then this next step, and so it does, that is definitely an area that I can improve is making sure that they're with me and they're working through with me.

INTERVIEWER: Mhm. And the time pressure, again, is this issue of like, preparing them to do the assignment that's coming up?

INTERVIEWEE: Yeah

INTERVIEWER: Uh-huh, making sure that you, that they have the skills they need?

INTERVIEWEE: Yeah, because I don't want them to--because I've said, you should be able to do it in this time period, right? Well, you can do it in this time period if you have this knowledge and this skill down, and if you don't, then it's gonna take a lot longer. I do try to emphasize to students that they shouldn't do things that are a waste of time, and y'know, or just jumping through hoops. Make sure that that time--because if, y'know, I say you're gonna spend three hours for every hour in class, y'know, including the time in class, I wanna make sure that that's productive time. I often worry that students count time as they're sitting in a TA lab with their hand up and they say, oh, I spent all this time on my class, but they actually didn't spend very much actual time. There was a lot of time spent trying to get the homework done, but they weren't actually--

INTERVIEWER: They were waiting for help

INTERVIEWEE: Yeah, they were waiting for help instead of moving forward, and that's...

INTERVIEWER: Yeah. We have the same thing in chemistry. It's a

common problem.

INTERVIEWEE: Yeah, so like, when they report how much time they spent on the class, is that actually time spent on the class or time waiting for help.

INTERVIEWER: Or time worrying about how much stuff you have to do for the class, right? All of that.

INTERVIEWEE: Yeah.

INTERVIEWER: And what do you think are some of your strengths as an educator?

INTERVIEWEE: I think I really care about whether students learn or not. And I mean, in that...I'd say that that's my strength. That I care that they learn and that, and that it not be superficial learning or surface learning.

INTERVIEWER: It's gonna be useful for them.

INTERVIEWEE: Yeah.

INTERVIEWER: And what do you think are some of your challenges? This doesn't mean weaknesses, but like, what makes it difficult for you to do a good job?

INTERVIEWEE: Oh, I think that um...I think that we've told students or somehow, we, the academic enterprise throughout their, y'know, all their primary education and secondary education, is that we've told them that they can do too much at once, and so they come in with expectations that they can sign up for way too many hours of really challenging classes and have a part-time job, and a family, and I mean, it's good they have families, I mean, a lot of our students are having children at this point. Just this last week, I had a student who his wife had a baby and that put him in a really difficult spot because he's also signed up for, y'know, my class and the senior design capstone, and he's gonna graduate in April, and just the whole world is crumbling on him right now just because he signed up for too much at once, and I think...well, not just because of that, but it's...that's what I think we've told students that it's okay to over-commit, and it'll be okay and they find ways of making it okay when really what happens is they bypass the real education. They're checking boxes essentially. My biggest challenge, or...?

INTERVIEWER: To helping people learn, yeah.

INTERVIEWEE: They can't work 23 hours a day and survive. Y'know, they can't. If they over-commit, it's challenging. And you can't...yeah, I don't know.

INTERVIEWER: Yeah, that makes sense. Tell me about a time you decided to try something new in your class.

INTERVIEWEE: Okay, well, I mean we recently introduced a, like, what we call the writing thread in our curriculum, and it's where we're trying to help students develop writing skills, which engineers aren't generally known for, and to help them improve their ability to communicate. And I tried it this last semester in my [REDACTED], which is the other class that I'd like to improve, and I thought well, okay we're already asking so much. Is there a way to incorporate this into what we're already doing? And so I asked them to think about when they're writing, y'know, solutions to homework that they take a different approach to it, they think of it as "I'm actually writing an argument to, y'know, using evidence and reason to support my claims," the conclusions or recommendations that they make, and to do homework that way, which is very different from the process that they're used to that's been successful in all their other classes where they, y'know, they scribble a bunch of stuff--equations and, so now they get a number at the bottom and put a box around it and that's their homework. So instead of adding a real writing assignment, to turn all their other assignments into writing assignments, and that didn't go well at all, so...

INTERVIEWER: Tell me about that.

INTERVIEWEE: It didn't--it was--the expectation, y'know, that they were so used to the system, the academic--and what they'd been successful, and so I wasn't able to persuade them that they should have a different approach to homework, that this is, they're writing an argument here, not finding the number that matches the number in the back of the book or in the solution manual.

INTERVIEWER: Mhm.

INTERVIEWEE: And I think I didn't present in a way that was convincing, persuasive, so I didn't write a good argument myself to help them do that.

INTERVIEWER: And did you change any of the questions so that they were more like, asking them to make a claim?

INTERVIEWEE: Well, yes, I do, and particularly in that class, I use what I call supplemental homework problems, which are, they're former test problems--I mean, test problems from the previous semester that I, and those, and my test problems in the--I always have it. I've added--and it's relatively easy to do, to take homework problems and y'know, it's just a minor little tweak to it. Instead of saying "what's the efficiency of the Brayton(? 42:03) cycle," you say, "What is the efficiency of THIS Brayton cycle and how could it be increased?" or something like that. It's really relatively easy to do, to take the textbook problems and just give them a little twist that they end up having to support a claim and so yeah, I do that a lot, and the other thing I've taken to is we're also very concerned as a department about the availability of solution manuals to the textbooks we use online (42:44) and how much students are accessing those, and so I've tried to help them take a critical...like, I show them solutions out of the solution manual and show them how according to my grading rubric, it's focused not on the answer but on the process. This would not score very well. And sometimes, I mean, it's unfortunately very very easy to find solutions that are really not well done at all, so we go through and critique those and help try to commit students that, y'know, this is the solution manual but it's really not that good and it wouldn't score very well according to the rubric that we're using, and so to help them to develop those critical thinking skills of just 'cause it's in print and written down by an authority figure, it doesn't mean it's right and to challenge them to look at things that way, and frankly, to make them afraid of using the solution manual.

INTERVIEWER: And do you think you'll continue using these sort of writing-styled homework problems?

INTERVIEWEE: Yeah, that is actually what I'd really like to do, somehow to, well so and then, so this semester, I mean, this stack right here, I've gotta grade all these; I just haven't...y'know, this is basically just a homework problem, but I'm, now I'm having them where they have to write up a formal report and things like that, and we have, we've developed for our writing threads and examples and say "this is the format you use," and I've kinda bit the bullet and said okay, you've gotta do this, but now I've gotta grade all this, and y'know, how do you give effective feedback that doesn't...

INTERVIEWER: Bury you

INTERVIEWEE: Yeah, bury me. So that's where this learning--writing across the curriculum, they gave us really good advice on how to do that

and I have these grading sheets where I can, yeah, so...

INTERVIEWER: Sort of like the rubric

INTERVIEWEE: Yeah, I have the rubric, and I'm using that, and--

INTERVIEWER: Sometimes you focus on like one section of it as opposed to the whole thing, or...

INTERVIEWEE: Yeah, well, yeah, and it's also, it's kind of like this little project that builds, this material that we cover earlier in the semester, we use that, and then what is this--analysis of the solar water heater, right? So it involves, we cover conduction and heat transfer first, and so we do the conduction aspects of that and then, so I evaluate that and give them back to them and then ask them to...and I add convection heat transfer to it, and so, to the analysis, and so they have to do that, but it gives them a chance to rewrite the conduction part 'cause it's also important, so you have this write, read, write, y'know kind of a thing going here, too. And I tell them that, y'know, the first versions that will, y'know...

INTERVIEWER: They'll change over time.

INTERVIEWEE: Yeah, you can, you're, it won't affect your grade, right, if it goes poorly, you didn't understand what I was asking for, or whatever. But when you tell them that, they'll also turn in garbage sometimes. I mean, some will, they say, "Well, it doesn't really matter; I just have to do well on the, at the end," and yeah, and so, they're really passing up the opportunity to get good feedback though too.

INTERVIEWER: Yeah. Yeah, they get better feedback if they turn in the best they've got, y'know?

INTERVIEWEE: Right, and so then you can help them from there and improve, but...

INTERVIEWER: Sometimes I get stuff from students and I read like, the first paragraph, and I'm like, I don't wanna read any more of this, and so I just tell them, "I'm not gonna read the rest of this. These are the like, 5 things I found in the first paragraph. I assume there are other things like that later on, so you probably wanna fix those," y'know. And I don't know whether that's a good approach either, but sometimes I get frustrated. It's hard.

INTERVIEWEE: Yes, it's really hard. Well but "\_\_\_" (47:03). If they bring

their best, then you can really help them with it and it's not frustrating at all. It's when you know they're capable of so much but more but it just, it doesn't, they know that they can fix it later, so they just think, "Ah, I'm gonna fix it later." You just gotta let them do it though, I guess. They're in charge.

INTERVIEWER: Yeah. Um, okay, so now we have a few questions about sort of using more student-centered approaches. What barriers do you think keep you from using more student-centered approaches?

INTERVIEWEE: Um, well I think, for me, it's the frustration over how do I deal with students that aren't ready, aren't prepared to engage in those kinda things and those activities in class. Y'know, what's the appropriate response? Because I mean, one response is to say well, you made your choice, right? For those who are prepared, this will be a really meaningful exercise, and if you're not, it's gonna be a waste of time. I'm sorry it's a waste of your time, y'know, and, but then you lose those students who have life going on and sometimes there might be actually really good reasons for them not to be prepared, and I don't wanna compound their difficulties, but so, and that's what I said before. But if you stand up and you say, "This is what you need to know and here it is," and they can write what you write on the board or take a picture with their phone, or whatever, and get that down and then look at it as they go through the homework, you have control over that. So that's the biggest barrier.

INTERVIEWER: Can you tell me a little bit more about control? Because you've talked about that a couple of times, like saying, like stuff that you have control over versus stuff that you don't have control over.

INTERVIEWEE: I mean, I can, I have control over what I do, what I say, what problems I'll, or questions I'm gonna address in class, y'know, that they've submitted, but I don't have control over the students of whether they're gonna pay attention, whether they're gonna, y'know, really have done the reading or if they just flip through the pages and looked at the words. Y'know, those kind of things that I don't have control over whether or not they'll meet me where they should be at and for that class period, I guess is what I mean, and that's--

INTERVIEWER: Yeah, that makes sense.

INTERVIEWEE: So that's, y'know, and so but I do have control over what I say and model and behaviors I model in order to motivate them to come to class prepared. I guess that's what, y'know, I do have control over those things. And that's, I try to talk a lot about, y'know, pick out parts of

the book that are really challenging and say, "Okay, when I read this, this is how I would approach it," and thinking--It's hard, it's really hard, but this is how you can, if you're just thinking "wow, this is hard," and "I hope I don't have to know that," and kinda skipping by, then that's not a real productive use of your time and this is how you could, if you, just--

INTERVIEWER: If you're willing to sort of engage with it, yeah

INTERVIEWEE: Yeah, engage with what you're reading, then that will--and it doesn't take--if you're practicing enough, it doesn't take that much more time than just reading it, but--or looking at the words, I guess. Gotta be careful how you use the word read! So I guess that's what I don't have control over; whether students come to class prepared, and that's what I struggle with the most. How to make it valuable for students who do come prepared at the same time as not leaving people behind, and that's where I feel like I don't have a good handle on that or good control over that.

INTERVIEWER: Yeah. What do you think would enable you to use more student-centered practices?

INTERVIEWEE: Well, maybe I guess...I think if that was more widespread at the university and in the department that students realized that that's what's being done.

INTERVIEWER: The expectation.

INTERVIEWEE: Yeah, the expectations. Because we see our students--we see them in their junior, I mean, by credits, they're seniors by the time we get them more often than not, and so they've already had a lot of exposure to college classes and they have expectations for what it's gonna be like, and so when you vary from those expectations, I think it's--they go "Hey, wait, I'm really good at this other way. Why aren't we still doing this other way?" So I think that would have, um, more uniform expectations that students come to class prepared to engage in those kind of activities that are active learning kind of exercises, things like that I think. Y'know, we've been talking about active learning for longer than I've been a professor, I'm sure, at least, so for as long as I've been a professor. So 20+ years, and so, but I haven't seen it really take off or change in the sense that students know that that's the expectation--that they can't come to class and be passive receptors of information that they have to engage in, and be obtaining knowledge, not receiving it, I guess.

INTERVIEWER: And sort of like, the culture of the university or the college to say, "This is what's expected when you're in an engineering class."

INTERVIEWEE: Yeah. Well, I think it'd be good--

INTERVIEWER: Across the board--

INTERVIEWEE: Yeah, across--like, I think the writing across the curriculum is really good, and we heard that, and so we're, in engineering classes, we're trying to make sure students know that writing is important, and writing a complete sentence with appropriate punctuation, and no typos or misspellings, or all these things are important, and yeah. So I think that--

INTERVIEWER: It's sort of funny because I feel like a lot of people go into science and engineering because they think, "Oh, I don't have to write," and then like, what do you do? You're always writing grant proposals and papers and technical briefs, I imagine, for engineers.

INTERVIEWEE: Yeah. Well, and that's where they think that--the other thing is they think, "Oh, it's a quantitative science," right? And so there is a right answer. Well, in engineers, I mean, we design and build things that--

INTERVIEWER: That don't exist yet.

INTERVIEWEE: No, they don't exist yet. Y'know, they could work, and there's multiple ways of doing that, and that's extremely important. \*Knock at the door, conversation about him having an appointment.\*

INTERVIEWER: Okay, I'll go as fast as I can here. What changes do you hope to make in the future in your teaching?

INTERVIEWEE: To...what I came back to, finding a way to balance. To help those that are getting left behind while still making sure that those that are coming prepared and doing what they're supp--that they're getting value out of that. Y'know, so I'm not taking the whole class back to meet the few that the...whatever the percentage is that aren't prepared and not ready to move forward, but at the same time, not leaving them behind.

INTERVIEWER: Mhmm, that makes sense. Okay, thinking about STEMMFI, what do you think you're most excited about or worried about



when you think about STEMFI?

INTERVIEWEE: Well, I guess I'm most excited to have an opportunity to talk about these things with people from other disciplines across--well, I mean, they're all science I guess, but that's broader than y'know, chemistry. And y'know, to interact with people on this topic from different disciplines is, I'm very interested in that.

INTERVIEWER: Yeah. Anything you're worried about?

INTERVIEWEE: I guess I'm not. What should I be worried about?

INTERVIEWER: Oh, nothing! Nothing. And is there anything else--you've talked a little bit about finding this balance and like, how do we deal with student preparation, I know that's really important. Anything else that we can help with STEMFI particularly that you would really like to learn, or...?

INTERVIEWEE: I guess like, I think...well, it's tied together, preparation that students are accepting responsibility for their education. How do you convey that message and require it of them, I guess essentially have it be that that's the expectation, but still have a safety net for those that, when things happen, that there's a way for them to not be completely devastated and get so far behind that they're hopelessly lost and unable to catch up? So that balance. Knowing that--'cause the students, there's a variety of students and they all have different talents and abilities, and struggles, and so how do you really meet people where you're at and how can you move them as far forward as possible?

INTERVIEWER: Okay, thank you so much. If you have any other questions, feel free to contact me.

### **Interview #7**

Interviewer: OK.

Interviewee: Now I feel the pressure to say interesting things.

Interviewer Haha! No pressure! Um, so uh just to begin we want to thank you for being willing to participate and have an interview with us. And uh we're supposed to reassure you that we're, we're not evaluating your teaching, and um, we're just trying to understand uh what your experiences are

Interviewee: Ok.

Interviewer And how we can help you with the STEMFI program.

Interviewee: Yes.

Interviewer: Ok, so uh to get started, tell me a little bit about your teaching background.

Interviewee: So, I mean I've been teaching here at BYU for [REDACTED] years. I've sort of taught everything from [REDACTED]

[REDACTED] Um, honestly before teaching at BYU, I had experiences as a graduate teaching assistant in graduate school. I had some church-based volunteer teaching. Which actually, that teaching music to young children probably taught me more about teaching than anything I've done professionally. Learning how to manage attention spans, learning how to mix up activities to keep people interested, I learned a lot about very practical teaching. Um, you know as a faculty member, I've done a fair amount of um, joint teaching. So for our [REDACTED], we specifically have our 2 or 3 instructors working very closely together, with common homework, common exams, and we spend a lot of time talking about how it is that we teach concepts, how it is that we demonstrate them in class. So that we're doing a lot of sort of peer-to-peer development. Um, yeah.

Interviewer: That's great. Thank you. Um, how do you think students learn best?

Interviewee: Well, in the end, by doing it themselves. I mean I joke that I'm up tap dancing on the front counter to keep them entertained long enough that they'll go back and actually do the work. So, actually in my first week of class, I usually talk about the example of musicians and athletes. That, if you're a musician, you don't learn anything in your lesson. You get direction in your lesson, and you learn when your fingers are on the strings or when your mouth is on the mouthpiece or your fingers are on the keys. And that there's feedback that you get from your teacher, but that the actual learning comes from actually doing things. So I make the point the first week that, you know, if you're pencil's not moving across the piece of paper, you're not learning. Um, and so what I try to do is scaffold the activities so that I'm providing a combination of deeper background about concepts, and then examples of actually doing things. And that balance depends on the class. So for an upper division [REDACTED] class, I spend more time on concepts and less time on examples because I have a little more mature student population and I count on a smaller class, so my 462 class is 20 students. I'm assuming I'm going to talk to each of them individually over a period of a couple of weeks. Vs. 250 people in a [REDACTED] class, where I've outsourced that to my TAs. And my TAs are specifically instructed to use a combination of them at the board demonstrating good problem solving techniques, students at the board, helping each other out at the board, and then working in small groups. But, you know, I do see most of what I do as a teacher in a large general education class, about accommodation of scaffolding and then demonstration of problem solving.

Interviewer: Great. Um, so you sort of have addressed this a little bit already, but uh, what do you think your responsibility is in the learning process, so as the instructor?

Interviewee: Yeah, so I mean, in the perfect world, and I will happily admit I was not a perfect student, they have their initial introduction to the material before they ever show up to class. That I'm there to provide foundational knowledge and to start to demonstrate the problem solving technique. Um, how to disassemble a problem, see what's important, um, and then send them off to start playing with what they've learned. With the assumption that then, once they've had their initial exposure and know I spend a lot of time early on, especially in my 105 class, saying ok, when you read it through, your first reading should

be quick and you shouldn't understand it all. Hopefully when you see it the second time with me, that deepens your knowledge. I encourage students to, as quickly as they can, go to the book, start doing the example problems, start working through homework, so that they can understand what they don't understand. 'Cause I've seen among students there's kind of two behaviors that are problematic. One is the students who assume they understand everything, and don't discover that they don't until they take the test. And the other is the students who assume they don't understand. And either waste lots of time, staring at a book, or kind of just get frustrated and give up. And so, you know, I want to say, ok here's a template of what these problem solving things look like. Encourage them to as quickly as possible try things out, so that by the time they get to office hours and recitation, they now know what they do and don't understand. And now can start to ask sensible questions.

Interviewer Uh-huh.

Interviewee: And I come back to this musician model, which is you go to your lesson. Your teacher assigns you tasks. The learning happens as you do those tasks. Now you come back to your teacher and your teacher provides feedback on your success at those tasks, and helps modify your approach until you start to converge on doing things well.

Interviewer Great. Um, can you describe for us a typical day in your classroom? Let's assume, you're going to be doing 105 in terms of STEMFI, so let's ask about a typical day in your 105 class. What would it look like?

Interviewee: So, if I've constructed it well, there'll be 2-3 sort of reading review questions at the beginning. Intended not to delve deeply but just give students the reason to be there on time and to have at least looked at the book enough um, that they're getting something out of it. Um, try to take a few minutes just to get business taken care of. I've been the student who missed an exam because he didn't keep track of his calendar, and I don't want students to have to live through that.

Interviewer haha!

Interviewee: Um, and then I try to organize so that something different happens every 10 minutes or so. So I like to have at least one demo that happens halfway through class. That doesn't always happen, I will admit. And I'm working on trying to be better at that. I try to not go more than 7 or 8 minutes without having some example problem that shows up on the board. Um, and I go back and forth greatly. Philosophically, I would really like all of those problems to be worked live on the chalk board. And the reason for that is that that slows me down enough that the students have a hope of keeping up. The reality of it is there's some added time doing it live, more than I'd like. So powerpoint's a little too fast, pure chalkboard's a little too slow. Um, and there are legibility issues, and I wrestle with that. I try to at least once in a class stop and do something live with them.

Interviewer uh-huh.

Interviewee: Show them the actual process of problem solving. And I've spent some time thinking through, um, how it is that I solve problems. So, you know years ago, I went with the youth group skating, and I grew up on skates in Canada. And so, you know I went over to talk to them and did a hockey stop, and everybody's like "wait, wait, how did you do that?" And I realized I had no idea. I learned to hockey stop when I was six years old. I don't remember not being able to do it. And so to teach somebody a skill that is so engrained in you is hard. And I had to find a way to make it difficult for myself, so that I had to think through the mechanics. So that I could explain that. I think often one of

the faults that comes about in teaching in general, and maybe teaching science and engineering moreso, um, is that so many things are automatic to us. You know, so I look at a chemical formula and immediately that's rendered in my head in three dimensions. And I don't even think about that. I, when I balance a reaction, that's a thing that happens pretty much automatically. Unit conversions pretty much happen automatically. And so I have to force myself to slow down and say "wait a minute, what is my process?" And so I try, like I say, at least once in a classroom to actually get down to chalk. And I try to do more than that if I can, so that I'm saying ok, now what is my thought process, how am I breaking this problem down.

Interviewer uh-huh. And in one of these typical days, what would the students be doing, during this class?

Interviewee: So, generally, I'm having so, I have the initial reading that forces them to be, that you know encourages them to be present, anyway, that hopefully encourages...

Interviewer encourages

Interviewee: them to be present. Um and I try to have again, you know 3 or 4 problems, usually what I will do is have and this is, I mean I didn't make up all this material. But I try to have then, a paired, me do an example problem, and then them doing something similar. And so on a regular basis I'm stopping, saying ok it's time for you guys to solve this problem.

Interviewer Great.

Interviewee: So I'm not, I will admit, and this is I realize educational heresy, but I'm not a big fan of flipped classrooms in the sense that I view the course as a whole as being three hours of lecture plus two hours of recitation, plus 5-8 hours of homework, some of which will involve office hours. And I think if students see the three hours in class as their only interaction opportunity, that's overloading our three hours pretty thoroughly. And so while I think there need to be interactive activities, to force students, you know, as a chorister of a kids choir, I recognize they've got to stand up and have big muscle motion, and I don't make my uh students do "Head, shoulders, knees, and toes", though I will threaten them on occasion if they're looking too quiet. Um, there needs to be some opportunity for them to be engaging in the problem solving process. But, that's so much more efficiently done in recitation and in homework. I'd rather push that as much as possible to where it is most effective. And then, what is effective I think in the classroom is demonstrating a problem solving skill, giving them a chance to, a low stakes chance to, recapitulate that. With then the expectation that they'll go back and continue that practice.

Interviewer Great. Um, what do you think your strengths are as an educator?

Interviewee: Whew, you know, this is one of these questions that keeps coming up (laugh). Um, honestly, for a lot of students, a combination of an entertaining, charismatic personality and confidence is worth far more than it should be. And yet, you can't underestimate the fact that students want to feel like things are exciting, and they want to feel confident in what they're being told. Um, and I guess I happen to have a personality that's entertaining enough and confident enough that it works for students. Um, I think that one of my strengths as a teacher is that I'm not necessarily the smartest person in the building, and I've had to spend a lot of time thinking about what things really mean. I mean to the point where just the other day I had to go to a colleague's office, and say ok, explain this to me in your words, because I'm struggling to really understand it. And it's not that I didn't understand it. I mean I understand it perfectly well on the student's level. Um, but I keep

always trying to go back and make sure that I really understand enough. Really it's paranoia that sometime a student is going to ask me a question and I'm not gonna know how to answer it. But it's also that I want to **really** understand how things work. And then, I'm relatively fast at problem solving, which means I can be a little more free form in the classroom because I can afford to take chances. Because generally it works out.

Interviewer haha! Good. Um, what do you think your greatest challenges are as a teacher?

Interviewee: Um, So I'm not the most organized person in the room. Sorry, I'm looking around my messy office right now.

Interviewer Haha!

Interviewee: Um, and that shows up in my teaching. Occasionally, I'm not as fast as getting assignments back to students. Um, occasionally, I get more interested in the implications of things. So students have complained that I get off topic a little bit. And largely it's because I want to connect what we're talking about to things that they should care about. And students sometimes want that nice, straight path through it. Um, I do suffer from the problem that I think every teacher suffers from, which is that I always assume that students are interested in the things that I'm interested in, and in the way that I'm interested in them. And I have to remind myself that I'm thinking different thoughts than they're thinking. So, occasionally remembering my audience is an issue.

Interviewer Uh-huh. Um, tell me about a time when you decided to change something about your teaching. Um, what did you want to change and why? Did you think it was successful? How did it go?

Interviewee: Hmm. That is an interesting question. Um, I mean I suppose the most recent, modern effort was in the honors freshmen class when I specifically, I realized that I tend to be a story teller, as is given by the length of these answers.

Interviewer Haha!

Interviewee: I mean, I am a story teller. And in fact, there are times with the right subject and the right group, where I spend very little time on visual materials because I'm telling a story. But I realize that that doesn't work for a lot of students. And so, I specifically made it a goal that twice during every class, I would stop and work a problem. Stop and make it practical. Um, and it screwed up my flow on a number of occasions. And I didn't always keep to it. But, making it more about the students, and even if I'm not always, I'm not always am, but even if I'm a captivating story teller, and they're being interested, and even if they're learning, if I'm not changing what's happening on a regular basis, you do start to lose connection with the students. So, it was hard to force myself to remember to stop the story for a minute and actually get out the chalk and work a problem with them. And make it about them developing skills and not about me telling a story. Um, and it meant that there were some things that I didn't get to say, that I liked saying. But I think the students did get more out of it for being more actively involved.

Interviewer Great. Thank you. Um, we have a few questions now that are more focused on STEMFI. So now that we have a better sense of what you've done and what you do currently. Um, so the first question is, in your own words, what is active learning?

Interviewee: So, I mean active learning is when you have a pencil on a piece of paper. I come back to students. If they're not generating new knowledge, in whatever limited sense, then, it's not active. So.

Interviewer What do you mean by limited?

Interviewee: Well, so I'm saying it may be solving a problem that is relatively routine, but if they're. So, I read somebody writing about this. They said even when you're reading, you should be stopping yourself partway through the paragraph and saying, ok, how do I think this paragraph is going to end? And now going ahead. He said, you know, if you're not surprised, if you're never surprised, you're not learning. And so, I mean active learning means the students have to generate something. Whether that's an answer to a quiz question, whether that's the structure of a problem, whether it's a prediction about how a demo's going to go, um, it needs to be generating something in advance. Something that I haven't told them.

Interviewer uh-huh. Great. Um, why did you want to participate in STEMFI?

Interviewee: Huh, well because I recognize my limitations as a teacher, and you know, I have this great debate. I mean I grew up sitting through hour-long lectures, and I was good at it or I wouldn't be sitting in this chair right now. I mean that's the truth of the matter. But I recognize that while there's some advantages, and I'm more a fan of the one-hour lecture than most people, that that was partly because when I sat through the lecture, I was trying to figure out what was coming next. I was actively engaged in a passive lecture. But that that's uncommon. And given my role, coordinating our general chemistry courses, I need a sense of, of what are the different effective approaches because not everybody's gonna teach like me, and I need to learn to teach better because I need to be able to support the program. And be a better teacher.

Interviewer Thanks. Um, thinking about hwat you know about the STEMFI sort of program, like all the things that you're going to participate in, and the things that you'll get from the program, which do you think were the most motivating to you?

Interviewee: I, you know, as much as I've said I don't like flipped classrooms, I do recognize that I need to learn different ways to set up active learning things. And I just don't see myself going sort of all the way to a sort of Eric Mazur, Learning Catalytics kind of thing. It's some combination of it doesn't work with my personality, and I'm not certain I believe in it.

Interviewer Uh-huh.

Interviewee: And I don't know where I really actually fit between those two, but somewhere between that. But I do recognize that in a Chem 105 class, at any given time, half the students aren't engaged. And I've sort of run up against my, the easy things I know how to do, I already know how to do. There's this other set of things that I think are not reasonable, given my time to develop curriculum materials, and other stuff. I mean, so it's really forcing myself, when I've made good changes, it's been because something forced me to make changes that were uncomfortable, but turned out well. And I, you know, I'm a strange teacher in that, for instance, I actually like to teach off of other people's powerpoints. Because, it forces me to do something different than I would do on my own. So, you know when I fill in for people, I always use their powerpoints, because it force...and even if I hate them, it forces me to think differently about how I'm teaching. And so this is a good opportunity to kick myself in the pants and try some new different things.

Interviewer Great. Um, ok. Um, we have a couple of questions now that are essentially, um, getting at what barriers keep you from using more active learning approaches in your classroom. So, um, the first has to do with your sort of attitude towards active learning, like do you think that active learning is effective or good?

Interviewee: So, active learning is such an open term, that I do think that one model of active learning, which I see around, which is the you know, the sort of the end of it is the flipped classroom model, where students essentially watch a video and then come to class to work problems. Um, I think that's a fantastic high school model, though, I saw it completely and utterly fall flat on its face with my daughter's chemistry classes in high school this last year, and in fact for multiple years now. And, you know, there the problem I think is that the professor didn't provide the support during the developmental time. So, they had the initial exposure time, and it wasn't enough, as I mean initial exposure time should never be enough. But the developmental time, when he should have been there coaching and mentoring, wasn't happening. And so the students ended up seeing it only as frustrating.

Interviewer uh-huh.

Interviewee: And I think at a college level, there comes a point, and I, you know with my upper division classes, I usually tell them, you know for the rest of your life, if your boss assigns you a new task, he's not going to give you a three month chance to be touchy-feely, he's going to give you a book and he's gonna tell you to go read it and be ready to do it tomorrow. And at some point you have to transition to a self-motivated learning style. And if you can't do that, you're very limited in what you can do in life. And, Chem 105 is not all the way there, I recognize that. Even my 462/467 classes are not all the way to self-directed learning. Um, so I mean I think there needs to be an active component. That is, if students are sitting there, they will zone out, despite their best intentions, even without a phone, even without a computer. And so there needs to be something that forces them to engage every 5-10 minutes. And I think that in the end, clicker quizzes are a great start, but they're not everything. Demos are great, but they're not everything. And you know active problem solving on the board, where I've got, now this is, this is the dilemma I always have, and it's the, the active learning dilemma. Which is that my favorite thing to do is have the front row with their calculators, and I get through and I say, ok, what's the answer to this. And then I get the answer from their calculators. In fact, with my honors book, I actually don't use powerpoint at all, I actually use the wolf vision camera and my textbook. And all of my visuals come from the textbook that they have, and much as I don't think my 462 class is the best example of my teaching, at least not in a anyway, there, and especially when I've been observed, rather than writing a gazillion things on the board, I actually project the e-text. And during derivations, I'm not interested in writing out the whole derivation. It takes too long, and there's very little learning there. But if I can go through and say look, here's the derivation you read that's an exact reproduction of what's in your book, that you own, and look, here's a complicated section, so let's talk about what this means. And what's the overall structure, and what assumptions is that drawn with it. The hope is that with a reasonably mature set of students, that becomes an active experience. That they're looking at it saying, ok, now I can see how you make it from this step to this step.

Interviewer Great. Thank you. Um, so uh, it may help us at this point to sort of define active learning a little bit more precisely. So in terms of strategies that you would use as an instructor that sort of scaffold that engagement opportunity for students. Um, so if you were going to tell us about your confidence level, how confident do you feel in your ability to use active learning strategies? You've mentioned a couple already.

Interviewee: Right. I mean with the ones I'm used to using, I'm fairly confident. I know I can get up at a chalkboard and solve a problem. And I know I'm pretty good at turning around and saying ok, what am I going to do next? Ok, what, you know, with that I'm fairly confident at. Reading type quizzes, demos including predictive demos, that is I'm gonna tell you how, what the setup is. You tell me what you think is gonna happen. Now we see what happens, and if it's a surprise, how can we explain. You know those sorts of things I'm very good at. I, I guess I would say low confidence in some of the, you know, the, I haven't done a lot of the, ok turn to your neighbor and the three of you do this, and then we'll come back together. Um, I haven't had good experiences with it. I haven't. I need to go see it done well...

Interviewer uh-huh

Interviewee: ...in order to build my confidence that hey it's worth the effort and b) that I know how to structure it in a way that's worth the time.

Interviewer ok Great. Um, what about uh, are there any external factors that you think affect your ability to use active learning strategies in the classroom?

Interviewee: External to the classroom?

Interviewer Things that are out of your control.

Interviewee: Well, I mean certainly, for a set of things, we have technology issues, though those I think have finally been resolved. That is, we now have the ability to use smartphones/tablets in our big lecture halls. As of two weeks ago. And that does open some opportunities, um, you know the biggest, the biggest external factor, although I don't know if it's really external, is we have this time limitation. We have 150 minutes a week and, you know I remember, coming back to non-science teaching, at one point, preparing a Sunday school lesson about all of the Psalms, which was one lesson. Um, and so I assigned groups to talk about very specific ones, and talk together about very specific ideas. And then come together to discuss it. And basically, everybody said, that was really amazing how at the last second you put together a lesson without having to do much work, and whatever, and there was not a realization that the cognitive work of picking out groups and picking out specific things for them to discuss, and the structure of that took me far longer than if I had just stood up and given a monologue.

Interviewer uh-huh.

Interviewee: And that's the, that's sometimes the way it is with students. That is, if you create real learning opportunities, that they don't perceive as being appropriately authoritative, they question whether they've been cheated out of a learning experience they should have had. And so, um, not at the 105 level, but often I'll set them a task. So [unintelligible] in 105 we do a specific question where, basically, they cannot answer this homework question unless they talk to a TA or talk to the professor. There's knowledge which is not in the book. It's a question that's in the book, and it alludes to how to do it, but it's a little bit beyond what their capability should be at that moment. And we use that to force them to come and be active. That is, they gotta come stand in my office, and if they stand in my office I will totally help them see how to do it. They see that as cheating. They say why don't you just stand up and tell us? And the truth of the matter is, I could, and they would still have to come into my office, because they still wouldn't appropriately internalize it. Getting on struggling, and then coming asking for help transforms it from a passive experience to an active experience. And so, there is that sense in which the very thing the students want is the thing they don't want. They want the passive experience. I



as the authority figure tell them what they need to know for the test. They parrot back what I told them they needed to know for the test, and I put a gold star on their forehead. And so, it's scary for me because it's a different set of experiences. Actually kinda scary for them because it moves them out of the, authoritative and into self-directed learning. But, that's where they think they want to go anyway.

Interviewer And so, when you're talking about these sort of student perceptions, is one of the concerns that you have potentially their student evaluations? Or how those are perceived by your colleagues? Or uh, anything like that?

Interviewee: I'm luckily old enough that, and well-enough respected in my teaching that that doesn't scare me any more. I do worry about providing...the problem I see is when students start to lose confidence in the course, it decreases their ability to learn.

Interviewer uh-huh.

Interviewee: And there are certain things that I do that I recognize are not of particular intrinsic educational value, but they, they're a crutch for the students. It makes them feel better. And building their confidence then gives them space to start looking around and actually doing the learning. And we had a big, um, debate a few years back, about our molecular modeling lab that we do for our honors course. And it's a ton of work to set that up. So this is kind of the ultimate act of learning thing. Not a classroom active learning, exactly, but we debated, you know, would it be enough for students to simply go and look at the pictures, rather than actually building the molecules, doing calculations. And we spend a fair amount of time with them, holding their hands, helping them, "no, no, really, if you just read the instructions, it tells you exactly how to do that next step." But, it's amazing the difference for them building the molecule, and then doing the calculation, which is really just pressing a button, and then visualizing the results. And they have a chance to be wrong. They can make a mistake and if they get it, they make a mistake, they get the wrong answer. But in the end, that means that they feel like they own it. And we finish that exercise with a really interesting one where we talk about ok, um, under Lewis, for like SF<sub>4</sub>, there are two possible configurations you could imagine. A see-saw type configuration or a square planar type configuration. And so we then have them calculate both configurations and then the lower energy is the preferred one. That idea, first of all the idea alone that the lower energy one is the one that exists, is really foreign to them. Their belief is the one that I say is correct is the one that is correct. They don't really recognize that there exists truth in the universe, independent of me. So forcing them to actually develop that independent of me, I think is important.

Interviewer uh-huh.

Interviewee: And the chance to be wrong, to make a mistake, and to have to go back and correct it. It raises the stakes, but it gives them a stake in the outcome.

Interviewer Ok. Well thank you. Um, our last question is, as we're getting ready for STEMFI, is there anything we can do to help you? Or how else could we help you?

Interviewee: You know, I mean in some ways the most useful thing for me at this point in my teaching life is to specifically look towards implementing and trying different things. I said earlier, I actually enjoy teaching off other people's slides to see how it goes. In fact, a stupid example, I was teaching Chem 101, and had a colleague fill in one day when I wasn't there. And I came back and there was a miscommunication, and so I was prepared to teach something he'd already taught. And so I taught a course, and this is a course where I had three weeks notice, before I taught the course. So I found out about

December 15<sup>th</sup> that I was going to be teaching in January. And so I had no time to prepare. It's a course I had never taught before, though it's 101, it's not like it strained my chemistry knowledge. Not that it's unimportant, but I've taught 105 and 111 and PS 100, so 101 slots in there quite nicely. But so I'm standing up in front of a classroom, with somebody's powerpoint slides that I have never seen before. And I will admit it was kind of fun.

Interviewer haha!

Interviewee: 'Cause I could imagine what was coming next, but I didn't have time. I mean literally we were three minutes into class and I'm like ok, I'm gonna open this next powerpoint and see how things go. And I will admit it was kind of fun. Because it's hard to force yourself to try new things. Maybe it's not hard for you to force yourself to try new things. It's hard for **me** to force myself to try new things. And so, I mean, for me, the best thing I can get out of it is a bunch of new ideas of things to try, and the excuse to actually get around to putting them in and seeing how they work, and then getting a little feedback on how they worked. So that I now know, as I work with other instructors, how to suggest how to do things.

Interviewer Fantastic. Well thank you. Do you have any questions, uh, that we can answer for you?

Interviewee: I don't think so.

Interviewer Ok. Thank you so much. We appreciate your time today.

### Interview #8

Interviewer: Just as a reminder, we're not here to evaluate you or anything like that. We're just here to understand what you're thinking and uh, hopefully it makes stemfi a good experience for you. So to begin, can you tell me a little bit about your teaching background?

Interviewee: Um, like in terms of training or classes that I teach?

Interviewer: I think more in terms of training. Both is fine.

Interviewee: I don't, I don't really have any formal training, I guess in life. I don't have any training in pedagogy or anything. I've done various workshops that have been offered on campus over the years, but I don't have any formal training in education or pedagogy. So I'm a terrible teacher.

Interviewer: And so before you came here, I assume you were in graduate school, were you a TA or anything like that?

Yeah, I mean as a Grad student, and then as a phd student I did TA. I taught an [REDACTED]. Um, I've taught, um, at one point I taught a doctoral class for an online university. I taught Sunday School Gospel Doctrine. Then here, um, I've taught an undergrad program with about 600 undergrads, and I have taught various courses and our undergrad program. Then we have a small masters program, um, [REDACTED] program and I've taught for the last 10 years in that program.

Interviewer: And so you've been at Byu for about 10 years? Great, thank you.

Interviewee: Yeah

Interviewer: We just changed the questions we're asking. This is a side note I have to like read them carefully. So, uh, thinking about a time when you were a student, when you had a

sort of powerful or effective learning experience in a science class, can you tell us about an experience like that?

Interviewee: When I was an Undergrad I did research with a professor, um, and I remember and I had sought him out because I had switched my major. I was a biology major and I was like everybody was going to go to medical school and uh, and then I thought, well, I'm going to switch because if I'm not going to medical school, and I have a degree in biology. I wasn't sure that, that I wanted to be a biologist so I switched. I was in the process of switching my major and I took a class about, about, um, basically the science of human behavior and uh, and I was sitting in his class and, and um, and this professor was really, he was an old guy and he was really direct and really seemed really have this caustic, you know. I thought it was awesome. Just sitting there as a student thinking this is, this is odd. Like he will just call people out. Like, you know none of this? does anybody know? because there's just points since then. If you don't know then, then he was just like, what are you here for? you know? How do you not know? I just remember thinking, you need to be really confident. I remember thinking like he's, he's so confident, he's just some guy that you thought students probably don't love him, but he's really confident and uh, and, and so I, that was my first experience. I mean like first class period and then in this class to see if I liked it and I just, I loved it. It was probably more for the, the professor then for the content although I did end up loving the content, which is really why I'm where I'm at now. Um, so I, I mean, I don't know that that was a moment where I felt empowered as a student necessarily, but where I, I saw that like teaching can really be powerful if done well. I don't know that he did it well, but it was very impactful.

Interviewer: Yeah. Maybe having high expectations for your students, right?

Interviewee: Uh, there was, uh, there was, uh, a few years ago, and now I'm going off topic, There was a talk at one of the fall meetings saying we should start expecting more of students. And um, so we went back and reevaluated my classes. I thought, you know, like, uh, we just, we have these low expectations for students because it's like, oh, you're all so busy, you know, it's just, just so we have really low expectations, but why not just ratchet up the expectations and demand more out of them. They're capable of it and, you know, so long as it's useful. Um, so I, so I changed my class and require them to work on a research project as part of the class with me. Um, and ever since then we get like two to three legitimate peer reviewed publications in that class a year, because we expect more and demand more out of them. They're capable. They'll rise up. Some will complain, but most will just rise up and do it. So I think you're right. You can expect more.

Interviewer: Thank you. Um, so as an educator, what do you think your role should be or what's your responsibility in the learning process?

Interviewee: Yeah. Um, I, um, my response will be my opinion about a university specifically. Um, I think that our role is to teach students to evaluate, to make critical evaluations of the content in my class. I don't think that is to just push tons of content on them anymore. I think that was where I started and a few years ago. And, and I guess it caused me to reevaluate what is my role in as an educator. So like you could walk out and you know, build a widget or something, then you should be going to an applied school. And I think at a university, my responsibility is to walk them down the path of being, you know, very critical about the discipline where we're currently at, um, the technology, the widgets, the content it's going to change and in five years it's going to be different. What won't change is your ability to evaluate based on standards and you know, the kind of best practices

and the discipline that won't change if you can learn to be a critical evaluator of how we do things and what works and what doesn't work. Then as new content or technologies emerge, you can critically evaluate those and find a place for them. And I feel like that's my role to help them learn to be critical evaluators of best practices and how we do things.

Interviewer: Great. Thank you. And what about the students? What do you think their role should be?

Interviewee: Turning things in on time. I think that they should, um, uh, I think they should be inquisitive, I think they should ask lots of questions. Um, I think that they should be, um, they should be willing to step outside the, you know, kind of their comfort zone. And um, I, I think they're, there to just suck up a bunch of content. I think it's their role to figure out and to work with the instructor or teacher to apply what they're learning and not just to, you know, get a bunch of content in and just spit it back out on the exam. That's really not all that interesting as a professor and also as a student. I think that should be last priority. Um, and unfortunately that's what we spend most of our time and doing, that is evaluating, and that's hard. I think that we have somewhat screwed up truthfully, in terms of testing. They're all worried about grades, which then causes us to spend most of our time worrying about how to get them to not worry or to get them to worry. And then that's really distracting from what we all should really be doing. And that is focusing on application.

Interviewer: Good, good, good. Can you describe a time when you felt really successful as a teacher?

Interviewee: A couple of years ago I had a student, um, I saw several semesters after he had taken my class and he looked totally different and uh, so I didn't even recognize him truthfully and uh, and he came up to me and we, we spoke for just a few minutes about what was different, what was going on in his life. And he said, yeah, just like I learned in class, I've just changed my life. I'm more healthy now. And so, um, has nothing to do with any type of like, hey, I took what I learned in your class, I got a job. It's like I took what I learned in your class and I changed my life. I certainly care more about that experience and what that taught me.

Interviewer: Yeah. Great. Thank you. Um, as you know, stemfi is interested in learner centered teaching. Um, so just to make sure we're on the same page, I wonder, could you tell us what you think learner centered teaching is in your own words or how you would explain it to a colleague?

Interviewee: I have never thought about it. I don't know, maybe that you're identifying what the needs of the learner are and how to engage the? and the teaching is tailored to that? I know that's wrong.

Interviewer: Yeah, I'd say it's a good answer. Good answer. We're using learner centered teaching as a way to say instead of focusing on what it's like coming out of your mouth, you're focusing on like getting into the students. Does that make sense? So focusing on what's learned and not on what's taught. Um, and yeah, it does involve paying attention to the needs of the learners and it involves having them be active in doing things and being engaged in class and everything. So good. Um, have you ever, now that we have this sort of like a definition on the table, have you ever used learner centered teaching in the past?

Interviewee: Never, never in one semester. Never like, you know, like this kind of adaptive approach where it's like, oh, you didn't get that. Well let's change that. I mean, I think to

some extent, um, you know, as you change things from semester to semester based on student feedback, but, that isn't necessarily evaluating what they learned and then changing things. I've made small adaptations and changes but never, you know, like within one semester.

Interviewer: Okay. And, um, what have you heard about active learning or learner centered teaching? Anything like this? Are there other people around using it? Have you heard of it in other contexts?

Interviewee: No.

Interviewer: Okay, great. Okay. Now we're gonna move on to the second part of the interview, which is about what you're currently doing in your classroom. And you've talked a little bit about this already. Um, but I wonder if you can describe a typical day in your classroom.

Interviewee: Yeah. Um, so when I spoke on the phone with Jamie I explained a little bit about my classes, which are really different from most classes. Two years ago, I was in class and I was teaching, you know, it's just me talking the whole time, it's boring for me, it's boring for students. And um, and I was like, you know, this is not fun, it's not fun to teach like this. So, um, so I went and I created a bunch of videos and I put them on Youtube and I told students there's a bunch of videos on youtube, just go watch those because that's where you're going to get all the content. And then let's spend our time in here doing application. That morphed into independent study. I got a film crew and then we made better videos. And so now most of my class is taught online in an online format. I have a whole bunch of videos and kind of modules that students go through and then in class then on Tuesday nights each week I do an open lab. So then I have students come, because I want students to come and get students from lots of different majors and I want students to come to my class that want to come and learn more about how the content is applied. Students who want to discuss it more in depth, who want to learn more about it, students that have questions. And so on. A typical class is me sharing examples from my own work, from research, I'm answering questions, just having more in depth discussion about a real world setting.

Interviewer: And the open lab, how many people, like what percentage come?

Interviewee: Just a few because it's optional. the beginning of the semester it's, uh, I'd say 50 percent of the students come, um, by the end of this semester. Two, three, four, five. It depends. I'm not like, I, I've chosen to not be offended by it. If you don't want to come, great. I mean, if students are happy and they feel like they're learning. I send three emails every day to students in the class and just say, hey, just checking in on you. How are you? Uh, are you happy? Do you feel like your needs are being met? Do you, do you have concerns? Um, so, uh, I send a weekly email on Mondays where I say, here's what we're learning this week. Here's a little bit about the application. Um, here's how I think it relates to the Gospel. Um, I don't know how many students read it, but I send out every Monday and then every night I send three emails to just, you know, different students, um, to get some feedback.

Interviewer: So, by three emails you don't mean you're emailing the whole class?

Interviewee: Students email me.

Interviewer: Okay, interesting.

Interviewee: I don't see them as much face to face. I want them to know that I'm here. But um, like I said, I get a lot of students from different majors. Some don't want to see me ever,

they don't care. I'm on the list of classes they could take, but they don't want to talk to me. I'm trying to create a structure that allows students to reach out, um, to use me as a resource if they want to. I'm here all the time. I'm emailing them, um, but then it gives them the flexibility and to use me in any way that they would like.

Interviewer: And can you tell me about how you've integrated the research? You mentioned that you have a couple of publications that come out of this every year.

Interviewee: so the publications come out of another class, a different class. I teach in the fall and I pick a topic. The purpose of that class is to teach health behavior. So we use a theory and do some type of applied project. We collect some data, we analyze the data. It's like a two-minute drill in football smashed into one semester. We're going really fast. This past year we did it with an organization called Iron World Health. They work in various places, but we worked with their Indonesian office and we got some data, we used theory, we analyzed data, we wrote reports, we've got several that are under review right now.

Interviewer: In terms of stemfi which of these courses do you think you want to focus on more?

Interviewee: Online

Interviewer: online? Is that crazy?

Interviewee: It's a little crazy.

Interviewer: Why do you think that? Why do you want to do that?

Interviewee: Okay. Um, so what I like to do is figure out a way to build some labs. When I talk about labs, I'm talking about an opportunity structure and opportunity for students to apply something in a real world setting. I'm envisioning self-paced labs where they do a lot of research with health apps for changing behaviors and things. I'd give them enough instruction, enough guidance so that they get the theory and an outline for what an APP would look like that would be able to promote physical activity, for example. I'd like to come up with 10 to 15 of those exercises or what I call labs.

Interviewer: Sort of like more authentic experiences?

Interviewee: Yeah. Yeah. Yeah. So I've been trying for the last couple of years to come up with a bunch that I use in another class that I teach and I like it. It's cool. I think students like it, I just haven't figured out what those labs would look like for this class.

Interviewer: I think it'll be interesting because I think you're the only person that we've met, so far anyway, who teaches online. So what the heck? Let's see what happens.

Interviewee: Yeah I would say that my relationship with online is good. I love Byu online and I love what they're doing. This teaching style just really works for me and allows me to teach a lot of students each semester and not have this class be a bottle. It's very comfortable for me. There are some other kind of dimensions that let me get her law students from other majors. It was hard to find a teaching medium that met everybody's needs. So I feel like this is the best thing that I've been able to come up with. I'm not married to it, although, I really appreciate it.

Interviewer: I had a question. How did you come up with the idea to move the class in that direction? to change in that way?

Interviewee: Um, because students seemed to really bored and I seemed bored. I was like, this is exhausting. I felt like every class they wanted a better experience. Like I'm not, I'm not an entertainer. And I felt like I just had to go on and be really entertaining and, and you've got students on, on their phones and doing other stuff and it's hard. Do you take that personally that they don't like you if they don't seem interested? Is that because you don't like me, you don't like the content, the activities aren't engaging, like what's, what's

the issue here? And so I figured, you know, let me just put the focus on you then to get the content. I'll make the content available to you. You digest or consume the content in, in a way that is comfortable for you and at your time and place. I'll do is the stuff that I'm trained to do and that is to help you apply the material. I created a bunch of what I call an application assignments. So each week they take a [REDACTED] scenario. And you're using this theory and here's, here's the behavior I need you to change. And then they, they basically do a fake intervention. And so I've created these application assignments that I then give them feedback on. I figured I'll do the things that I can do and, and, and in a way that feels comfortable for me. You do the things that you are going to do because you're a student, so you digest the content and you do it in a way that's comfortable for you. So that's why I came up with it.

Interviewer: That's great. Um, okay. Um, what do you think some of your strengths are as an educator?

Interviewee: I got student evaluations. I don't have any. I really, really care about the topic. I'm really passionate about it. I love talking about behavior change and researching it. And I'm working with, um, you know, non-research organizations on stuff like this. If I get feedback from students, it's always like, wow, he really cares about this. So I think that's maybe one of my greatest assets is that I care about it and it's not an academic exercise.

Interviewer: Great. Um, what about some of your challenges? We mean like what makes it difficult to teach the way that you want to teach?

In [REDACTED] we get a lot of exercise science students because we're in the same college and some of our classes are elective, so I get a ton of the students. We have, within our own major, a lot of health science students and even though we all know that we don't have a pre-med program, that's exactly what it is. Health science is premed. Then we have some epidemiology students. And then we have a lot of health promotion students. I would say the greatest challenge I have is I'm offering a class that meets the needs of all those students when their interests are so diverse. I get health science students who truthfully couldn't care less. They're like, "I don't need to know this as a doctor". They're over there doing estate planning. And I've got exercise science students that are like, "I don't even see how this is useful."

Interviewer: That doesn't make sense to me at all. What little I know about your class, it seems like it would be very relevant in both professions.

Interviewee: If you have a mature perspective, then that's entirely true. I love non-traditional students. I have a couple of each semester and I love it because they're like, this is relevant. I can see how would be useful. But if you're an Undergrad and you're like, "I want to be an orthopedic surgeon, this is stupid." I'd say that's one of my greatest challenges. If I could, I think I would just kick them all out and honestly just keep it public health. Yeah. And I've actually tried that so limited at one point to just majors but I got so many emails about how I need this class to graduate and so I just let them in to be nice about it.

Interviewer: Sure. That makes sense. Uh, the next question is about a time that you decided to try something new in your class. Um, so why did you want to change? What did you want to change? And we talked a little bit like about moving in online. Is there anything else that you've tried maybe, uh, when you were trying to create these activities that you talked about?

Interviewee: Does it matter because it could be other classes? Anything?

Interviewer: Yeah. Have you tried something new?

Interviewee: Um, yeah, so when I changed my graduate level class I changed from just kind of having a kind of didactic approach to a we're going to do a research project and it was really rough. It was hard because students, they get into this and, and well, I value research and think that you guys should be grateful because you're doing a real project and in the end you'll have a publication. I realize they don't value the same things I do. I'm not standing up talking to you anymore. We're working together. We're going to go through this, we're going to learn all the models and theories. I thought it would be this blissful experience. But I think the pushback was pretty telling. They value different things. The experience overall has still been positive. I would say one of the things that makes it positive is that we partner with an outside organization to give it a more kind of realistic element to it. They often get to present their research somewhere. The first year I did it took a bunch of students to Florida and they presented somewhere and one student was going to present this spring in Bali. One of the projects got interviewed by Good Morning America because it was kind of an interesting study they did. So those things really helped in the end to create a sense of like accomplishment. Okay. That was pretty cool. But, um, that was the change and I guess that was the overall experience. It was pretty hard because I value different things.

Interviewer: Yeah. And when you were deciding to make this change, did you talk to anyone else, like with colleagues or anyone else when you were doing it or was it mostly just your idea?

Interviewee: Um, yeah, it was my idea, but I ran it by a couple of people and they're like "that's really dumb." I talked to a colleague and I told him the idea. And he's like, "no, that's not even possible. You wouldn't be able to do that in a semester." I'm like, "Oh, I've got good students. I think we could do it." So I left feeling bad but I'd already committed to it. So it's been interesting. I would say since there have been other people in my department that have adopted it. I know of two other faculty that now kind of do the same thing. I don't know.

Interviewer: Have you talked to them about it or they just sort of heard what was going on?

Interviewee: They kind of heard and then they asked questions. I think they feel dirty doing it because they're supposed to be doing research anyway and now you're getting students to do that as part of your class? I don't think they need to be competing objectives.

Interviewer: Yeah.

Interviewee: That wasn't my intent. I mean, yeah, it's great that we get a bunch of publications each year. I think it's even better because you're helping the students gain some value at the end. I mean, you know, you submit a paper and it's not accepted on the first submission almost ever. So it is a little challenging then because students are not in the class anymore and so six months later and you're like, hey, we got some feedback on this paper and they said it stinks, so now we need to revise it and resubmit it somewhere else or revise and resubmit it here. And then it's like, "who's still interested?" So there's some of those logistical issues, but in the main is it's a good experience.

Interviewer: Great. Thank you. Um, okay. And now we want to talk, actually we're using the theory of planned behavior, which you probably know better than we do. We want to ask some questions that are about barriers that keep you from using more learner centered approaches. What are some of the barriers that you experience and also what do you think would enable you to use more learner centered approaches?



Interviewee:Um, so based on my understanding of learner centered approaches the issue would be “how I would be able to kind of rapidly assess students.” Things like what they're learning. That's one part of it.

Interviewer: Yeah.

Interviewee:Um, so I just don't know how to do that. I mean I have 10 different assessments, like I do quizzes and I can assess what they're learning, but there's no feedback loop because I quiz them on canvas and I've created a bunch of questions and so I don't have a system for going back and saying, “Hey, you missed these questions, so let's revisit these and let's, let's, let's maybe try a different approach.” I don't know how I would do that in a class like this that's really large. I'm concerned about students cheating and stuff like that. So I don't know how I would do it. I guess that's my biggest barrier. I guess if there were a mechanism or a way to evaluate that has more informative assessments during the learning process to see like are you guys getting this? If not, then you know, we can take this in a different direction. I guess it would be nice if I had a more individualized kind of approach to teaching and learning so that it was like, well Rebecca doesn't get it, but you know, the other hundred and 73 students, they're fine. So I can push, I can push pause over here while, while you know, we, we get caught up to speed here. I don't know, that'd be awesome if there were a system to do that. Maybe I'm not even talking about learning center and approaches now. My very limited understanding now would be if there was some type of a system to be able to do that to kind of evaluate where you're at right now. Does that make sense to you?

Interviewer: Yeah.

Interviewee:So like some people use clickers, right? Or other things like that to get sort of instant feedback that way, but in an online format, I don't know. It's an interesting question. We'll think about it and see what we can come up with. My guess is that there are probably lots of tools, lots of strategies. I'm just not aware of them.

Interviewer: Yeah. Okay. Awesome. Um, and can you tell us about, you mentioned that you wanted to make some of these labs, right? Um, is that sort of the, the first change that you want to make in your teaching or what other changes maybe do you want to make in your future teaching?

Interviewee:Yeah, I think that's probably the first thing I want to do is come up with the content for each lab. Just like a, what would it be, approach that would work and would be useful to students. So it's not just like, here's another assignment, just treat it like the other ones. Like how could I have an assignment that would, you know, in like what would it look like, what would the format look like? What did you want every week? Um, do I have to give feedback on it or is there something, you know, is this like you do some self-reflection or evaluate, you know, I don't know, peer evaluations? Yeah. So that'd be the first thing that I would want to do. But again I'm not necessarily concerned right now about all the content for each lab, but just with a general approach or strategy for doing it.

Interviewer: Great. Um, so what do you think is going to make that change difficult for you?

Interviewee:I don't know. There aren't really good models at least that I'm aware of in my department, maybe not in the college, I don't know if there even are across campus. I feel like going and building something from scratch now? Maybe, maybe they're other universities or maybe a university that's exclusively online. Maybe they would have a good approach. I taught a class in university like that years ago and I thought it was pretty stagnant truthfully. So I don't know, I don't think there are good models, at least that I've

seen. So I feel like I'm kind of starting from scratch. I want it to be engaging. I want it to be interesting. I want it to be useful. I don't want it to be just another, like instead of a quiz, you're going to do this and it's, you're going to hate it just as much, but you got to go do it. If I could nail the approach then plug and play and I can add in the content after that.

Interviewer: I think that we will have some strategies for you at the workshop that we'll go over here.

Interviewee: Okay.

Interviewer: Um, can you tell me a little bit about the teaching culture in your department? Like maybe what expectations are there around teaching?

Interviewee: Um, there's um, just in like in terms of load, you're expected to teach, you know, a couple of classes. We are very old fashioned. We're kind of a two to one approach. Most people in our department think that you shouldn't have any more than about 30 students in a class, which is almost impossible with the number of students in their programs. When I came 10 years ago, we had 217 majors and now we're at 600 and has nothing to do with me. So it's just not possible. I would say the culture is still very much values a small class size where you teach in a very traditional format. You fire up powerpoint and you go through 72 slides because it's the same fifty-minute class. You do all the talking and anything other than that means you're probably not teaching, right? So you can imagine what they think about me. I'm going, I don't do any of that. So people have a hard time with me as a teacher because they're like, "but that's not really teaching". And I'm like, "well, you don't view it that way, that the culture is very old fashioned in that way".

Interviewer: So as you've started to make changes, like moving things online and making things more about these sort of applied projects and activities that you've kind of with, um, have you felt sort of push back from colleagues?

Interviewee: Um no one is trying to prevent it. My department chair is awesome, is totally supportive. But there are definitely colleagues that are naysayers. They're like, "um, what's you're doing isn't teaching." I am kind of over it. The research says that this isn't all that great of an idea, you know, that type of thing. There were some of those comments early on but that's really died down now and we don't really talk about it anymore.

Interviewer: We talked a little bit about the expectations that students have, like the to value different things, but in general, if you were talking, let's say about a, maybe we'll just say your whole like clientele of students. Do you think that they have particular expectations about your teaching?

Interviewee: That's a good question. I'm not sure. I try to set expectations up front and say, "just so you know, this is how I run the class and if that's concerning to you, I'm happy to meet with you." Um, the other reason that I do this Tuesday night thing is because I want to meet students' needs and expectations and I realized that there are some students that prefer face to face class and they want that type of in class experience. In fact, we'll go one step further and we'll get rid of all the other students and it'll just be us. I feel like I'm trying to meet their needs and expectations. There are those that prefer flexibility, those that prefer that format. If you like the face to face format. It's also there. Um, I've had just maybe one or two students over the years that have said I would have preferred a face to

face. I'm like, "why didn't you come to class?". "That just didn't fit my scheduling." "But you signed up."

Interviewer: Yeah,

Interviewee: But it's rare that I've had a student that didn't prefer that format.

Interviewer: Okay. Do you have a sense of how this, all of the changes that you're making would be perceived? Like when you submit your portfolio?

I don't really. Haven't even done that yet for full professor.

Interviewer: A year out?

Interviewee: Yeah.

Interviewer: Do you have a sense of how sort of like the college or the university will view any of this?

Interviewee: No, that's a good question. I'm really curious to find out. Um, I'm curious to find out how my colleagues truthfully feel. I mean in the end I don't know that it matters. It matters because I'm evaluated on student evaluations and other sorts of things. I do think some will be critical of it, but their criticisms don't really have leverage, you know what I mean? So yeah, you can be critical of it, but if student evaluations are within ranges that are considered to be acceptable then kind of don't have any argument. I mean there's really nothing else I can say. But it is a question I've thought a lot about truthfully. People are going to be critical of me because I teach a different format. But I guess that's what I've concluded is my student evaluations and there within a range that's accepted so I guess there is nothing they can say. They might say something still. We'll see. We'll see. I'll tell you next year.

Interviewer: Yeah. Okay. Um, how confident do you feel in your abilities to use learner centered strategies?

Interviewee: Uh, I really would say not very confident.

Interviewer: Mostly because of a lack of knowledge. Right? Like you're not really sure what they are.

Interviewee: I have probably almost no understanding of what it is and what it would look like and how I might apply that.

Interviewer: Okay, great. And then are there any other factors that are outside of your control that you think influence your ability to use learner centered approaches?

Interviewee: No, not really. The departments are really supportive. The university provides a Byu online independent study that I've worked with over the years to develop these materials and they're awesome. They've been very supportive and um, they have a lot of resources and capabilities. So I don't think that would be an issue. Um, I think it's like squarely on me just being a loser and can't figure out how to do it.

Interviewer: You better.

Interviewee: Um, I don't see any kind of external factors limiting my ability to do better at it.

Interviewer: Great. Um, and just a few questions about stemfi. What do you think you're most excited about in terms of participating in the program and what do you think you're missing?

Interviewee: I'm most excited about learning some new strategies and techniques that might be able to help me teach in a more learning learner centered approach. So, um, yeah I would love to learn more about how we can do better. Um, I would say my greatest fear is that I don't fit in a typical box in terms of how I teach and that that is going to cause me to do some gymnastics. I'm like, okay, so how do I take this and then adapt it for this learning

format? I've really committed to this format. So it would be hard for me to leave this behind my back because I'm far enough down this road. I allow a ton of students into my classes because I know I can manage it this way. So I would say that is my greatest concern.

Interviewer: Okay, well we'll do our best to be aware of that. And um, we, I know we definitely have some strategies planned. They're a little bit later in the week, I think maybe like on Wednesday of the workshop where we're going to talk about some of this sort of project based learning strategies that I think will be really compatible with what you're doing. Um, so in the earlier days we'll try and it doesn't mean it's going to be on top of this. She's going to like make sure we know that we're paying attention to your, to your needs. Is there anything else that we can help you with in getting ready for stem or do you have any questions? Anything else we can do that would make this a good experience for you?

Interviewee: No, I'm excited. I'm excited. I mean, like I said, I hope I fit in and they don't say, "like why did he even apply?"

Interviewer: We have, you know, everyone is really unique. We had like just a broad variety of people from all sorts of different departments and different courses they're teaching and different amounts of experience. So I think there's a place for you.

#### Interview #9

Interviewer: To start out with, can you tell us about your teaching background?

Interviewee: Uhh . . . so I did all my training in [REDACTED], so uh, all the way to my PhD, so my training is a bit different than most of the faculty member here—members here, um, in the sense that I got all my training in [REDACTED], so, uh . . . where the teaching philosophies may be a bit different you know than here. Mm, concentrating more on the content, and mm . . . maybe a bigger mathematical component, uh, than here. It's more the interaction with the students, so that's something I'm learning as I'm teaching as a faculty, so . . . but, I - you know, I did all my training back in [REDACTED], so it's, you know—I actually did even a special training to become a professor uh in addition to the academic um degrees, like you know the master and the PhD, but also this degree which is called *agrégation*--you can look it up online, but it's --

Interviewer: Can you say it again?

Interviewee: *Agrégation*

Interviewer: *Agrégation*

Interviewee: *Agrégation*. It's a special teaching diploma which is kind of selective; it's a national competition, and there's a -a written part and uh-huh, which take place in Paris, anyway, so we are trained to be, to teach at the university level, and so I was trained in physics for that, but, again, this is a different philosophy than than here. Um, and, uh, yeah, and I guess I became here, I came here at BYU a few years ago now. And I've just be- it was my first time teaching uh in English, because I'd never been a student in the U.S., I'd never took a class in the U.S. in English, so, so I was kind of frightened actually -[small

laugh]- so it took me a few years to kind of, you know, adjust, and get confidence . . . be more confident in myself I guess but I'm still, you know, working on it [small laugh] I will say the unique aspect for me is that I'm [REDACTED], so English is not my native language, so I'm teaching in non-native language, which is, which is -ah, a bit of a -you know-challenge for me in the sense that I sometimes you know am wondering if I'm pronouncing things correctly or if students understand me when I'm talking so—which is something I wish I would not have to worry about, but unfortunately, um, this is something that I have to worry about all the time, in addition to worry about if they understand the content.

Interviewer: The, the special teaching training-or training to be a professor, did that focus mostly on teaching, or other aspects of being a pro-

Interviewee:[Mm's in background] No, teaching – no, being a professor, no just teaching—being a teacher, yeah, so teaching the material. But again, back in [REDACTED], it's really focusing on, on the content, um, like, you know, how to introduce the content so it's maybe clear to the student, but not so much how to interact with the students and how – I think in that sense, here in the U.S. or here at BYU um in particular there's um a big focus on that, on understanding um what is going on in the student's brain and you know how they are understanding things so . . .

Interviewer: Thank you.

Interviewee:Mm-hmm.

Interviewer: So, uh, how do you think students learn best?

Interviewee:I'm not sure [laugh] I'm still uh you know learning about it, but, well, it may vary wi-on the student, you know, so, I mean, some students are just learning best by by reading and you know just you know reading things over and over, sounds like, you know, maybe over all it's one of the best method, but um, I realize that, um, some students may learn best by listening or by by having actual examples or talking about what is being taught, or having to verbalize or explain things themselves, you know. So there is this, you have two kind of, um you know, assimilate the knowledge and then being able to re-explain it, uh so, I think there is a term for that, but um, kind of, so, understanding the knowledge but not only understanding it – from reading it, for example, but also being able to explain it. Uh, so I think that's probably the best way, uh, the best practice for learning.

Interviewer: Are you ready for another question? Um, as an educator, what do you think your role should be?

Interviewee:Well, to help, to help in this um process of learning, um, um, so in detail, not only conveying the material, but also helping the students assimilate the material and I admit that I spend a lot of time—still now—focusing on how I'm going to convey the material because it's it's also an important part, I believe um and I uh, I still spend a large amount

of my time and my effort on that because I am trying to be the best teacher I can but but I -I realize that there is another step beyond that, beyond just conveying the material, is making sure the material is assimilated so um, so at this stage I -I will say my teaching is more traditional, like you know, most of my lectures are, you know, lecturing basically, and I'm interacting with the students through quizzes and through things like that but, I will say that maybe 80% of the time is lecturing and maybe 20% of the time quizzing or asking questions and I, but I realize that quizzing, the quizzing part is actually a crucial part, because that's when the student, you know, can check if they understand concepts and and we get to interact and that's where I I realize myself that maybe they, you know, didn't understand the way I thought they were understanding. You know. But the problem is finding good balance for the time, you know, with all the material we have to cover, so, if there is anything I could change, I would like to learn to change. It's hard to maybe increase this interacting part, but not too much at the expense of, you know, the amount of material we are covering, so, learning to do that while still covering all the material, also which may be challenging, but . . .

Interviewer: Yeah, that's something we've heard people mention. [Laughter.]

Interviewee: I see. I see.

Interviewer: What do –

Interviewee: Sorry, finishing with that, I -I know this notion of, I've heard of this concept of um flipped classroom, and I've never tried it myself because I'm, I'm kind of scared [small laugh] because like you know, I'm not sure if the students are really, you know, going to learn everything I want them to learn and so I -I'm, maybe it's also I want to control everything that's being taught, so I don't know. But, um, but I understand that ultimately what could benefit the student is really having them um interact more and being more engaged in the classroom I guess. Yeah.

Interviewer: So, kind of along those lines, with the student, and what might help them most, what do you feel like the student's ideal role should be, as learners?

Interviewee: Well, uh, I don't know, I guess, um, they are here to learn, so [laugh] um it so, uh, I mean they they they shouldn't, well, one thing I should say, so I I I'm not encouraging passive, passivity, or being passive as a student, and then just coming here like you know a customer basically and then um taking class and then being either satisfied or unsatisfied, which is a bit of the -the mmm . . . you know the . . . mmm . . . like um the negative side of the student evaluations is you know we are being evaluated like a product basically, like how good this teacher is and, you know, if they have difficulties, blaming the professor for everything basically, so I'm I'm really not encouraging that, so, um also it's my culture from from France where people, I mean the students never get to evaluate their teachers, I mean, that doesn't exist or teachers will get a nervous breakdown I think-[laughter]

Interviewer: [Laughter]

Interviewee:-which is, I mean, what I've been doing so much crying over reading these evaluations because it's, it's hard, you know, it's hard. I take them personally, of course, well, I try my best, but, you know, uh, what I wanted to say, so you know, I think the students should feel, you know, if they maybe a role that we should emphasize is is that they should feel responsible for their learning and not think that it's all the responsibility of the professor. So, I still believe in that, that there's a huge responsibility from the students. Uh, they have of course to complete their work, and they have to also engage in the classroom to improve their learning experience.

Interviewer: Do you want to say any more about their responsibility maybe to prepare or come in, or in the classroom?

Interviewee: Yeah, no, so I've been, recently I've been implementing what we call here um warm-up quizzes, um before classes, and I've found them super helpful and nice so um because I'm testing them on conceptual questions, so what uh, related to the reading of the day, but then, in the end, I will have a box where I will ask them if they have any question related to the reading that they would like to be addressed during class time and often um there are many questions I didn't suspect they would have, and I find that it's um very helpful to address those questions in the during class time, and well if I didn't have that box or had asked those question, I will have never guessed, you know, that they would have those questions [small laugh] so, so uh, yeah, the warm-up quizzes are uh very helpful in that and helping the students prepare before class and they need to come to class and we have quizzes in class; they're for credit, and so, um, it's encouraging them to come. And so, you know, in the upper-level classes like Physics 451 452 the students at that stage are more mature, and so they usually they want to learn, they want to be successful, and so they will be engaged, um, I mean, not all of them, but a good portion of them.

Interviewer: I wanted to ask you, and you said that your Physics [REDACTED] you teach kind of in similar ways . . .

Interviewee: Well, yeah. Yeah.

Interviewer: If you were, and you've mentioned some aspects of this, but if you were to describe a typical day in your classroom, and what activities you're doing, and what activities you're students doing, what would that look like?

Interviewee: So, in Physics [REDACTED], I have warm-up quizzes, um, so those are the different steps. So first the reading, with the warm-up quizzes, and then in class, um, we have them participate, so quizzes, in-class quizzes, and then, after that, so we prepare them for –

Interviewer: Is that like a clicker?

Interviewee: Clicker. Using i-clickers.

Interviewer: Okay.

Interviewee: Uh-huh. Yes. Absolutely. Using i-clickers. And then, um, after class, we have, I mean, outside the lecture time, we have help sessions with the teaching assistants. Sometimes I try to go to those sessions, but it's mostly run by my teaching assistants. And they are here to help the students complete the homework, so they encouraged to work in groups. And then, finally, we have tests and midterms where I guess they are on their own and they go to the testing center to take them. But that's usually at the beginning of the semester, that's what I explain to them, this gradual progression, you know, in the learning process, so starting with the reading, the warm-up quizzes, and then the in-class time, the in-class quizzes, and those help sessions and then finally the tests.

Interviewer: Thank you.

Interviewee: Did I answer all the question?

Interviewer: What, um, what do you feel like are some of your strengths as an educator, and what do you feel like are some of your weaknesses, and you mentioned –

Interviewee: Yeah

Interviewer: -the language being a tricky thing.

Interviewee: Yeah, so, strengths, I don't know, maybe, so maybe the . . . ability to um . . . see what they are struggling with when completing a problem and helping them clarify, you know, like derivations and things like that, and everything that is relating to mathematical knowledge and derivation, so I feel very comfortable with that, mm, being able to help students with that. Um . . . but then, my, maybe my weakness is more explaining things without the math, and just by hands. And just physical . . . um, I -I realized that students here in the U.S. have been used to that, maybe from high school, that everything can be explained by hand, and again, um my educational background back in [REDACTED] so is very different because we will just use math – math, and there will be very little physical explanation. Do you see what I mean? So, and that's what I'm learning here. Which, I think that it's a very important component, and actually the most difficult part. It's not the mathematical derivation, um, you know, content, but it's more the physical interpretation, actually, and you need to have a big overview and understanding to be able to do that, and that's what I'm learning to do as well, and it goes together with also mastering the language, so, you know, um, English not being my native language, so I need to be able to convey things clearly uh to explain things so, without the math, just, you know, with English sentences, and and making you know, analogies, and, by hands, basically, yeah, so-

R: And you said “by hand,” do you mean, sort of—

Interviewee: Without, uh, derivations.



R: Do you mean by hand motions? Or, like, uh, by pictures? Or some kind of physical representation?

Interviewee: Uh, I think it's a— isn't it an English expression, by hand? Uh, uh, I thought it was! [Laugh] But—

R: It is an English expression, yeah, but I uh—

Interviewee: I thought it, like for me, at least in physics, I think, yeah, physicists usually say that, uh, like, “by hands” when—not using any mathematical derivation.

R: Okay, okay.

Interviewee: I don't know if this is also used in Chemistry, but, I mean, that's what we usually say, if we are able to explain things just using words, English words, you know, without the math, we call that “by hands.”

R: Okay. Okay.

Interviewer: So it doesn't necessarily need to be—when you say “physical things”—it doesn't necessarily need to be a demo, but just being able to talk about analogies

Interviewee: Yeah, it could be a demo, but also, yeah, just verbally, uh, without using the math. You see what I mean?

Interviewer: I understand. Uh-huh. We don't use—I don't use that phrase. Maybe other people do.

Interviewee: Oh, so, okay. [laugh]

Interviewer: Yeah, I don't know. [laugh]

Interviewer: But I understand what you mean. I understand.

Interviewee: You heard it—or? Okay.

Interviewer: Our next question has to do with a time you might have changed something in your teaching. Can you think of a time you decided change something and maybe why you made a change and maybe what the outcome was?

Interviewee: Well, I guess the main reason for me to change my teaching will be the the feedback from the students, of course, I mean, so so the student evaluations either at the end of the semester, but also through the midcourse evaluation, which I've been using, with the, you know, um, CTL, center for teaching and learning. But, um, yeah of course, we want to satisfy the students and make them happy and and feel that they have learned something,

that they have benefitted from the class, so that's the ultimate goal, um, so that would be the main reason for me, if, I mean, seeing a student who is not satisfied or upset or unhappy or frustrated, trying to, um, address the issues best I can, I guess, so yeah. . .

Interviewer: Is there a time that you can you think of as an example that you did, consciously, make a change in your class?

Interviewee: So, yeah, for example, like last semester, I did, I used the midterm- midcourse evaluation, and so I had some comments on, about how to improve the class, and I did adjust and change my class, for example, it has to do, accordingly, it had to do with the homework load, for example. They found—many students apparently found it was too heavy. And so I decided, for the second portion of the semester, to lighten the homework load, which was appreciated, but uh, and make some of those problems for extra credit, and so the homework was light. And I didn't realize, you know, I was not sure, you know, if it was too much or not enough or if it was the right amount of homework – to me it sounded that it was the right amount of homework, but, if, you know, many students, you know, complain or I guess feel like it's a bit too much, I'm happy to adjust that, so it's you know, more acceptable to them, I mean, given all the classes that they have to take.

Interviewer: Did you feel like, when you made that change, did you feel like it ultimately helped the students learn the material, helped—

Interviewee: So, I don't know for sure, I think that that's a good question, I mean, uh, unfortunately, we live in a world where, in the end, we are evaluated, and it's the satisfaction of the student which matters, you know. And I'm sad about that, because, I am an educator, and I'm not, you know, I don't know, I'm not selling a product. So, uh, I would like them to learn as much as they can and, you know, um. . . sometimes, maybe, um, what I'm trying, because they say, the comment they will say that I'm expecting too much from the students, for example, I mean, like, I want them to learn too much, and so maybe I need to adjust that slightly, so, um, because in the end, I mean, um, not all of them will become like physics professors or will stay in academia, and in the end, you know, it's a trade-off between, you know, the amount of what you learn but also the kind of feeling of satisfaction and having, you know, had a pleasant experience, while learning not like torture, not like it was too painful or . . . yeah, so I admit that when I came here I didn't have this notion of, you know, satisfying the student and make them happy, I thought that, you know, you just have to learn that and, no matter what they're thinking or, if they're happy or unhappy, they just have to learn it, and so, but, I'm kind of adjusting now my philosophy so to kind of try to satisfy them, and but still, still, of course, it's a trade-off, you know, still wanting to making sure that we are covering the right amount of material.

Interviewer: And, um, talking about covering the material, the courses that you are talking about, are they prerequisites for other courses? How do you decide what has to be covered?

Interviewee: Uh, yeah, so, we do have prerequisites, indeed, um, and you mentioned that; for Physics 222, um, so, yeah, so they have to have taken Physics 121, 123, and 220, and

then also, um, a math class which will have covered multivariable calculus, but its true that we don't ask them to, as a prerequisite, to have taken differential equations, and um, and we do use that, so I'm kind of, um, introducing that step-by-step, and doing a lecture on that, so, yeah.

Interviewer: What do they take after [REDACTED]?

Interviewee:Um, [REDACTED], for example, Physics [REDACTED], and then, yeah, [REDACTED].

Interviewer: So do those courses count on them learning specific things in [REDACTED]

Interviewee:Which one, [REDACTED] do you mean? Or . . .

R: Mm-hmm.

Interviewee:Mmm . . . maybe, not completely, no, it's only not until they take 415 they use again the knowledge learned in 222. But 222 is super helpful actually for taking the GRE.

R: Uh huh.

Interviewee:To go to graduate school. Cause most of the knowledge, all the questions, many of the questions on the GRE are focusing on material taught in Physics 222.

R: Interesting.

Interviewee:Physics GRE of course.

R: Uh-huh. Cool.

Interviewer: Thank you. The next question that I have has a couple of words that I'm just wondering what you feel the meaning is. So it's 'what is student-centered learning or active learning?'

Interviewee:So, oh, you mean, both of those words are the same in your vocabulary, or . . .

Interviewer: Yeah, so-

Interviewee:When you say "or," what do you mean . . .

Interviewer: Yeah, either one. What is student-centered learning or active learning?

Interviewee:Ah, okay. Ah, um . . . yeah, so student-centered learning for me so that we need to focus on the student, their learning, the learning outcome, and I realize that sometimes we don't know how much they are learning until we really interact closely with them and we have them involved in answering questions in the classroom, um, yeah, so that's an important part of teaching, I guess, which I'm learning myself and discovering it as I'm

being a professor here on campus. Which I didn't fully realize before. But it's also, it's a process, because you need to have assimilated the knowledge that you are teaching first, which is a process itself, I mean, we are all, you know, learning, learners to some extent, and then being able to convey the material, and then the ultimate step is to make sure that the material is well assimilated by the students. So, um, so it's yeah, so it's a process, and I didn't realize that until I've been here, teaching at BYU. And then, the other one was, you said, active learning, which you say may be similar? Uh, so, active learning for me inspires, um, the notion of interaction, and being actively involved in the classroom, so not being passive, basically. So, um . . . yeah, that's what, I guess, the goal is, to have them participate, basically. And once they get to participate, we can see big improvements in the learning. I can see that even in my, you know, I just came out of the classroom before I came here, and I've been trying to encourage more questions, and them interacting in the classroom, and I can see that it's helping them a lot assimilating that material. Some of them have expressed that how – it was like almost like a ah-ha moment, like you know, they, when they were reading the material in the textbook, they didn't fully understand until we were then discussing it in the classroom. That was, very nice to hear that. That the classroom time was not a waste of time.

R: Yeah. It's rewarding.

Interviewee: Rewarding. Yeah. Cause, I think that's what it means active learning, not just reading the material, but discuss it, I guess.

Interviewer: Mm-hmm. Thank you. Um, this next question is, why—

Interviewee: I'm sorry, but, back to the previous question,-

Interviewer: Yeah!

Interviewee: -um, the reason why it's also a process for me as a teacher to understand them is because myself as a student, I didn't need to ask much as a discussion, and maybe this is the case for most of the faculty members, while, usually we were good in school, I mean, like, good students, and they didn't need too much of the discussion, like, they could just learn from reading. And so, I didn't realize that. That students in general, or many of them would need the discussion afterwards to understand the material that is being read. Because I didn't know! I thought, you just read it and you understand it, and you don't need discussing it. But I -I understand, so I'm learning as a teacher to improve myself as a teacher to encourage the discussion, because I had no idea it was so important I realize now how important that is.

Interviewer: That's really interesting. Huh.

Interviewee: Mm-hmm. Yeah. Yeah.

Interviewer: So what made you want to participate in the STEMFI experience?

Interviewee: Uh, I don't know, you know, I saw the advertisement, and I guess, you know, I'm always open to improve, and, I mean, improvement, and so, yeah, [laugh] so I thought I would participate in this.

Interviewer: Is there anything in specific you're hoping to gain from the experience?

Interviewee: Yeah, no, I mean, I'm actually learning, uh, yeah, at the beginning of this discussion, I wanted to know more about your program or your project here. So I don't have a specific goal or intent; I'm just happy to improve my teaching.

Interviewer: We're excited to have you participate! [Some laughing.] . . . Um, were there, um, any specific aspects of the experience that were most motivating for you to participate? So maybe, um, having a mentor, or gaining skills—you said, 'well, I didn't know I was going to be paid,' [laughing] so maybe, um, that wasn't . . . was there any aspect of the experience that was particularly motivating to you to participate?

Interviewee: Yeah, no so the, kind of the mentoring aspect in the sense that you know, other faculty mentor will help you yeah sounded attractive. Because also—yeah, I want to say that—I've be—I've felt quite lonely as a faculty member here; I've taught all my classes, since I came here, alone; I didn't co-teach any class; and I've seen other faculty members doing that. They would teach two sections of the same class, but then they would sort of co-teach in the sense that they would meet every day, to you know, like discuss what they are going to teach, and the material, and how they would organize the class and everything. I mean, um, they would even attend each other's classes. And so, um, it sounded like this was a positive, constructive experience, and I've never had the opportunity to do that with anyone, so I thought maybe this could help a bit in that direction.

Interviewer: I think you said this earlier, but remind me how long you've been at BYU?

Interviewee: Um, I think nine years now.

Interviewer: Nine years?

Interviewee: Yes.

Interviewer: Awesome. Would, um, you talked a little bit about maybe wanting to use more engaging strategies in your classroom . . . ?

Interviewee: Mm, yeah . . . well, I don't have any ideas yet, beyond, I mean the quizzes, the i-clicker, I'm open—I mean I want to learn, basically, I don't have much knowledge of what can be done.

Interviewer: Do you feel like, you mentioned maybe not having a knowledge much of what can be done, I mean, that can be kind of a barrier keeping you using these things – are there any other barriers that you can think keeping you from using these strategies?

Interviewee: Time.

Interviewer: Time?

Interviewee: Because, I mean, when you change something, it requires time always, right? So time and effort.

Interviewer: In preparation, you mean? Or like in the classroom, implementing?

Interviewee: Both, I mean, you change everything, so you have to adjust, and it takes some time in practice to do that. You have to revise things, right, and change things; it takes time, right?

Interviewer: Mm-hmm.

Interviewee: So, that's the other component. Because I will be teaching two classes. And so, yeah, it might be a limitation, um, I mean how much of a change I will be willing to do you know will be determined mostly by the time I have to do that, so – you see what I mean?

R: The workshop is gonna provide time every day, like during the workshop—

Interviewee: Mm

R: —to work on that, so you won't have to do it all during the semester.

Interviewee: And that will be in May, right?

R: Mm-hmm, mm-hmm.

Interviewee: Yeah.

Interviewer: Are there any other factors that you can think of that could make it a challenge for you to implement new strategies in your classroom?

Interviewee: Well, the fear that it will fail. [Laugh.] That it will negatively impact the students and that they will be unhappy, but, yeah, I mean, hopefully not.

Interviewer: Thank you. Um, do you have any other comments, or even questions for us, or comments on how else we can help you?

Interviewee: Uh, no, I guess, well, I mean, so we will be learning? Like there will be some kind of seminar or lecturing part of it?

R: Yeah, so the rough structure is, in the morning you're gonna be learning different strategies, and in the afternoon, you're going to be-

Interviewee: Practicing

R: -working, practicing, yeah, figuring out, how does this fit into my class, where can I put it in, and during some of that time, your mentor will be there, to help you think about those things too.

Interviewee: Thank you.

Interviewer: So hopefully the time that you talked about won't have to happen so much in the semester, but can happen in the workshop.

Interviewee: In the spring.

R: Exactly.

Interviewee: I see what you mean. So everything could be ready for, for the fall, huh?

R: Mm-hmm.

Interviewee: Kay.

Interviewer: [Softly] Um, any other things you want to ask about or, um, mention?

R: Um, I do have one more question. It's about the GRE. You said that ■■■ is sort of a preparation for the GRE.

Interviewee: Physics GRE.

R: Yeah. The Physics GRE. So, do you feel like pressure to cover certain topics?

Interviewee: Mm. Yep. Yep. So, this class, I mean, I've taught it for . . . four years now, five years, and so the first year was so challenging because you have to cover so much—I mean basically covering all modern physics—so the whole 20<sup>th</sup> century physics, uh, starting with Einstein and relativity, and then, uh quantum mechanics and nuclear physics, it's just, I mean, each of those subjects could be a class-

R: Uh-huh [laugh]

Interviewee: And so it's just introducing, and, I mean, I explain to the students at the beginning of each semester how we won't have time to go very deep into each topic, but we're going to do a wide overview, and, but then, yeah, the first semester, the first year, I wasn't able to cover everything. And so, only gradually, after a couple of years teaching it, I was able to finally cover everything. And so, it's tough. It's-it's a challenge.

Interviewer: Are the different subjects things that physics majors would learn in higher classes?  
So if you ended up not covering something, would they get it covered in another class?

Interviewee: Um, I mean, not necessarily, sometimes they would have to go all the way to graduate school, so, you know, before that they have to take that GRE class, and so they rely a lot on what they learned in physics [REDACTED].

Interviewer: Mm-hmm. That makes sense. Thank you.

Interviewee: But, a big portion of it is getting more depth in Physics [REDACTED] which are the quantum classes, which I am also teaching. It turns out I am also teaching those two classes in addition to [REDACTED]. So I am seeing the same students a couple of years apart. So they first took [REDACTED]

Interviewer: Do they remember anything? [Laugh.]

Interviewee: Oh! That's a good point! Because often I make reference to that. And so, I ask them a question, I say, remember, from [REDACTED]? And I am surprised at how fast they forget. How fast they forget. I didn't think they would forget that fast, but most of them forget everything. Even the smartest kid. I mean, if you remind them, some of them will remember, but—

Interviewer: But it comes back so fast!

Interviewee: Yeah, it comes back. But I didn't think! I thought they would remember! And that's also a component I am learning, that you have to teach things over and over—usually two or three times—before it gets assimilated.

Interviewer: Yeah. Thank you so much. Thank you so much. Um, if we have any follow-up questions, we may, uh, send you an email, or um, may come back for another 10 minutes or so real quick if we have some other questions we want to follow up on. We'll let you know.

Interviewee: How will you use . . . um, so it's going to be helpful for you to prepare for the workshop? Or to prepare the workshop I guess?

Interviewer: Mm-hmm. So, we're using it in two ways. So one way is to understand better who is coming. Um, because there's really a wide variety of people

Interviewee: I can imagine.

Interviewer: Um, becau-- we're using the three colleges—

Interviewee: Three colleges!



Interviewer: —engineering, and life sciences . . .

Interviewee: Engineering, physics, and life sciences

Interviewer: Exactly. And so there's really a wide variety of people, and everybody has different experiences, so that's one thing that we're using it for. And the other thing is, um, like I said, we're trying to understand the choices that you're making as an instructor, and um, what the sort of, you know, like, I could do more active learning, but, how would I cover this material? Uh, those choices that you're facing, and trying to understand what people think is challenging about this.

Interviewee: May I ask if there's anyone else from the Physics department participating? Or just—

Interviewer: Uh-huh. Just, I think there's one other person: David Nielson.

Interviewee: Okay, okay.

Interviewer: Yeah.

Interviewee: Great. That's interesting, because he's been teaching the same class now. This class is offered twice a year, so I've been teaching it twice a year for four years, and now, um, since I'm teaching also the other classes, he's teaching it in the winter, and I'm teaching it in the fall, so I don't know which class he selected, but it might be the same one!

Interviewer: I don't know, yeah, he said something about a computer class—

Interviewee: Okay

Interviewer: Like a—isn't that the one he said? Do you remember?

Interviewer: I don't remember.

Interviewee: Maybe another class

Interviewer: Yeah.

Interviewer: Thank you so much.

Interviewee: You're welcome.

### **Interview #10**

Interviewer: So I'll ask you a few questions, this is not to evaluate judge you in any way, this is just to get an understanding and kind of best help you in this program. This first question is, "Tell us about your teaching back ground."

Interviewee: Basically nothing. So I've been here since [REDACTED]. During my PhD I taught one lecture. They had this little thing so I thought, "Maybe I want to just try teaching. I never TA'd a class, I had never had any experience, but at the university they offered this little program where it was basically like teaching a course. You taught one lecture, you wrote the test questions associated with that lecture, and you met with the teacher a few times and kind of walked through it. So I did that once and that was my teaching experience before this. I would say that I've taught, or mentored students on how to do research in the lab, but as far as formal teaching goes I haven't had much experience.

Interviewer: And you came here in [REDACTED]

Interviewee: Yeah, and so they gave me the first fall off, the fall of [REDACTED]. The first time I taught was winter [REDACTED]

Interviewer: How do you think students learn best?

Interviewee: So from what I can tell, they like to be able to explain the concept that we just went through to their neighbor. I actually prefer to have them come up to the board and draw but one of my classes is like 80 students and it's just too hard. I've tried it a few times but it's just too much time. We get stuck without getting all the material, so that's one that I go to a lot. I've tried others. I go to writing workshops and one of the things that was presented was teaching and writing and so I've tried to incorporate a few slides and then say, "write down everything you know about this subject and then explain to your neighbor". But there is no accountability, not everyone writes something down and they just end up talking to their neighbor, and that's ok. I've started a lot of techniques, but that's the one that I go to most often. It doesn't take much time and the students get a lot out of it. I walk around and monitor when the conversations are changing and rein it in. I've gotten a lot of good feedback on that.

Interviewer: What do you feel like your role is as an instructor?

Interviewee: To facilitate. I want to help them to see the material so what I try to do as an instructor is initially get them through the idea. I hand it back to them and say, "now you guys do it". Then we come back and I ask "ok what are your questions?" Because they will find out that they didn't understand it all. So to facilitate learning is the biggest aspect I try to strive for.

Interviewer: What do you think the students role as a learner should be?

Interviewee: I would say probably being involved, being there and being willing to learn. I hit on three big things, one being read before class. I have them read before class and then have a closed book quiz that keeps them accountable for reading before class. In class I have problems to work on. I want to tailor my lecture based on what's hardest for you. They need to be awake and active and ready to go. Part of that is on the instructor too, I think. You have to know when you are losing your audience and figure out ways to bring them back in. That is on us as instructors to try and see the importance of the material.

Interviewer: How would you describe your classroom on a typical day? What are the activities?

Interviewee: So I do a lot of different things. Typically, I start off with a quote from a general authority about [REDACTED]. If there was a quiz that day on the reading that they had done I will ask if there are any questions. I always try to keep that on the back of my mind so when we get to the lecture I can explain better. During the course of the lecture I try to go no more than 10 minutes before having some kind of activity. I have them teach each other or act things out. For example when we talk about cholesterol I will give people assignments to be types of proteins and then we will have

them circulate around the room. I think they enjoy stuff like that but it takes a lot of time. Occasionally I will have people come up and draw on the board. I will have 10 min of activity and then I like to have a student who really knows the material come up and explain so they can all hear it in a different way than I originally presented it. I always going back to explaining it to your neighbor.

Interviewer: I have a follow up question. You mentioned breaking up the lecture, what do you think is the role of faculty centered teaching is?

Interviewee: I think it's just to present the material in a different way than how they presented it in the book. A lot of time the reading is really dense and hard to get your mind around. I use simpler word and try to act it out, you see I use my hands a lot. I try and help them see the material in a different way than what they read it in the text. I think that it is big for the lecture to also have the visual up on the board. I try to keep my slides very visual. I want to minimize text and talk through it or have them ask questions. I also learn my students' names. It takes me a while but when I know someone's name they are so much more likely to ask me a question and start up a dialogue. People are very shy and don't ask questions during class but they may come up after.

Interviewer: What are your strengths and weaknesses as an educator?

Interviewee: I'm very excited about the material. I really like chemistry, I think it's fun, and I think students feel that I feel that. Sometimes they get excited and feel that. But my biggest weakness is that I get distracted, as you've already seen. I get off on tangents and lose track of the lecture. I have lots of flaws but I've noticed that that is the worst one. I will realize, oh shoot I got lost, and now I have to get back to where I was supposed to be. And re-explain what I need to explain

Interviewer: You are just so excited?!

Interviewee: Yes.

Interviewer: Do you feel any particular challenges as an educator?

Interviewee: Well for this 200 class, it's been tricky because I have all different majors. I have seniors with lots of experience in chemistry or biology and then I have students who are just fresh out of [REDACTED] 100 and that's not really even a science class. It's mostly consumer based and so this is a really big step up from that. I have a hard time reaching those students who are struggling a bit. Another problem for me is that we teach another class, [REDACTED] students and it's hard because they only take 2 chemistry classes before they take that class and it's hard to get them to the point where they need to be. When I originally taught they class they wanted me to bring them to the level of passing a grad level [REDACTED] test. And that is not easy. As far as problems go that is the big one that I am trying to get over. Also I'm working with the [REDACTED] department but it's a tricky one.

Interviewer: So the range of students background?

Interviewee: Yes definitely. The other problem I have in the 200 class is attendance. I don't like an attendance policy. I have quite a few people that skip class but I don't like to force them. You are in college you can handle your stuff. I have a class of 80 students and when I know their names I know who is around, I would say I have about 60 or 70 percent attendance. Some of the students are fine, they don't need to go to class and they will be fine. The students who struggle and don't go to class just compound the issue. I don't know how to get them to class without being like their dad. Again, in college you

should be able to handle your life without someone telling you how to do it. So that's a big issue for me.

Interviewer: Tell about a time you decided to change something in your teaching? What prompted the change? What do you change? How did it turn out?

Interviewee: One the biggest was from the first time I taught the class. I used to use more technical language because I thought it was important to learn those definitions but I have very much backed off of that. I feel like the concepts are so hard that I now throw in easier terms so that they don't feel overwhelmed. Another change is that I've cut the number of slides in any given lecture way down. Normally I expect to go through 15-20 slides per lecture. Sometimes less but 15 is the average. I have really tried to slow that class down. I try and make an effort to slow myself down. I tend to speak fast and that is hard for students. The two major things were simplifying the language and then choose to cut down on the number of slides. I got rid of some material, not because it was bad material but because I was spending too much time on it and rushing other things. There was some material focused on primary data. There was the concept and then showing them the data. Well I get so excited that I want them to understand the data so I got rid of that whole section. Now as far as how the changes work, I feel like they like the simplicity. I still get comments every year saying that it's too complex and they don't get it. There will always be students who just have a hard time no matter what I do. As far as cutting primary data I have no feedback. No one has taken both the classes. I feel like it has slowed down my lectures and I like that. It's a class that sets the groundwork for the class. This is the basic class that they will go back to again and again so I want them to get the definitions very well. I focus on them knowing the basic definitions so when they advance in the major they are prepared.

Interviewer: Thank you, switching gears a bit. What are your thoughts on what is student centered or active learning?

Interviewee: Like I said earlier, it's having them drive the questions. We have this set of material that we are going to get through and there are going to be test questions on it. There are occasions when they ask questions and I will usually address it but then say that it's maybe not important for this class. I give them a heads up to focus on other material. I want them to drive the lectures, to be the ones that are searching. I want to understand what they understanding. When I don't know what they don't know there are complications. I used to explain what I thought were hard topics in depth without realizing that they got it super easy and then breeze over topics that I thought were easy but they instead had a lot of difficulty understanding. You need to be on the same page about the parts they aren't understanding.

Interviewer: You mentioned that you felt that the high vocab words are important and then you decided to change that. You also mentioned that at some point there was an expectation that your class would prepare students for graduate level learning. How do you decide what is important for your classes and what you can throw out?

Interviewee: So it's mostly personal preference. I try and stay, especially for the [REDACTED] class, close to the text book, it's pretty good, not amazing but good. I know that most other programs in the country use this text book and so it's got a lot of the definitions that they need to know. I stay close to it. We read and go over the text book and then they are tested on that material. They see it multiple times. As far as what I throw out, a little bit of it is personal bias, I'm always going to focus on the chemistry because I enjoy it, I'm a [REDACTED]

You will get other teachers that are microbiologists or whatever and they will focus on that.

Interviewer: Why are you participating in this STEMFI experience?

Interviewee: Well mostly because of the first question, what experience do you have? I have none and so I want to know more of what's out there. My wife is an art education major and so she has way more experience than me.

Interviewer: Is there anything else you want to gain from the workshops?

Interviewee: Maybe just other activities that I can use. I always go back to the talk to your neighbor one but if there are others then I want to know about them.

Interviewer: What other aspects were intriguing?

Interviewee: I think just the gaining skills part, I'm going up for tenure in two years and my scores have been good but I want to do better and have a better job teaching.

Interviewer: What barriers do you feel keep you from using active learning strategies in your classes?

Interviewee: Time, that's the biggest one.

Interviewer: Would you like to see more?

Interviewee: I would, yeah, I think I would like to use a little bit more. Come and draw on the board I think that does a lot for students but it's just too hard to fit in the time frame and get through all the material.

Interviewer: How confident do you feel in your abilities to use active learning strategies?

Interviewee: I think I'm pretty open, I don't know much about teaching so I will try just about anything. I had a good mentor, [REDACTED], he had already set up the course with active learning parts and he is the guy who is always trying to learn new things so I learned a lot from him. How to not continuously just say, "ok I have this class where I want it" and just teach it for the next 30 years, but always try to say how can I do this better? That's motivating for me. Get my scores up for when I go up for tenure.

Interviewer: Do you think there are any external barriers that inhibit your use of active learning outside of the classroom?

Interviewee: Can you be more specific?

Interviewer: Like preparation... or...

Interviewee: Well yes I guess you have to limit your preparation, you have to get other stuff done. So yeah I guess that's why I haven't been exposed to as many learning activities as I thought. I don't always put the time in. That is probably a limitation, to not have the time to go and observe other people and see how other classes are being taught. Especially in difficult subjects.

Interviewer: Any other comments? Things you want to share? How else can we help you?

Interviewee: It seems pretty thorough what you guys are going to do. I might have questions after but now it seems pretty thorough.

Interviewer: Well great thank you. If you have any other questions feel free to send us an email.

### **Interview #11**

Interviewer: Just to make it clear, we want to understand you and your perspectives and how we can help you. We're not evaluating or judging your answers in anyway.

[REDACTED] Ok.

Interviewer: Um just to start out with, can you tell us about your teaching background?

Interviewee: Well I've been at BYU for 13 years, a little over 13 years. And I've been teaching primarily upper-division undergraduate courses and graduate courses, and uh, let's see what else. When I was first hired, the [REDACTED], they have a seminar, or like a two-day work shop for new faculty that were hired that year. And I went to that during my first year that I was at BYU, so I learned a little bit about some of the more interactive teaching techniques at that time. I haven't used a lot of them over the years, but I am starting to more now.

Interviewer: Awesome.

Interviewee: I don't know, is that um...

Interviewer: That's great, can you tell us why you're starting to do that more now?

Interviewee: Um, yeah so when I first went to the workshop I actually wasn't that impressed. We went there and we basically had every hour a new presenter and after two days of listening to this, you realize that nobody said the same thing. They were all talking about completely different things. One guy comes in and says the secret to having a good interactive [REDACTED] is a room of round tables, the students sit at round tables and work on little projects. Next person comes in and says no it's all you know adjusting time teaching techniques, the next person comes in, no I use clicker questions. You know, there was no overlap almost, so it just seemed like everyone was, it just seemed like if you cared enough to do something and maybe you weren't, and uh I just didn't, after watching it I didn't see a lot of common threads. I'm sure there was some than I skeptically gave it credence, but it just seemed like it was just all over the map. Um, also, it was primarily geared towards uh teaching the very large section courses. The over a hundred to three hundred students. I haven't taught those courses, and so...

Interviewer: like a [REDACTED]

Interviewee: Physics [REDACTED] And where I've taught primarily upper-division courses, they usually quite-- anyway, I didn't see how, you know, a quick two minute clicker question could necessarily help in an advanced class. Um so I would try things every now and then, but like I tried these just in time, I guess you - I'm sure know about those. I tried those for a couple semesters and I just didn't seem to get anything worthwhile, worth the time and effort. You know, you might get two or three questions, good questions, a week, and you'd have to wade through a lot of stuff that wasn't worth it. You know if you require the students to submit a question you typically get someone who just kind of dash off something to fulfill the assignment, they don't care. Anyway, well so going now towards where I am now, um, two years ago I've been teaching recently an upper-division class for [REDACTED] course. Um, and it's very challenging, it's a difficult class, and a couple years ago I found some tutorials that another university had used, and just for fun I thought I'd try them out, and... they were a little bit limited in the sense that, well what I mean is that there weren't enough of them for me. You know, my negative view of it is when you do all of these teaching techniques you don't cover as much material. And that was very well born out in this because the tutorials covered basically the first half of my class and that was it. There was nothing for like the last half of the class. And even then they said, oh if you do this track you don't have the time to do that track, well I do both tracks and more, it's just the nature of the class and what students are expected to know. Anyway, but I used them a

little bit and I was actually quite surprised at how good they were in the sense that you know when I handed the students this little assignment to do in the classroom, for example if we learn about [REDACTED], and one of the things you learn is that planets are on elliptical orbits, you know I would draw, there would be this little graph and the students were supposed to draw the orbit, draw where the sun is, draw the planet, label this is the closest position of the orbit to the sun, this is the furthest. And my junior-level students couldn't do it all. I mean most of them could, but well I wouldn't say most, I'd say you know half the class knew what they were doing, but I was really surprised to say that half the class didn't. And that kind of opened my eyes a little bit more to um... Anyway, the usefulness of the teaching this way, um, and you know but again the problem was they only lasted for like couple of, you know, most, you know the first half of the class. And even then I couldn't do all of them, uh I mean I didn't have the time in my schedule to do all of them, but I'd try to do one or two a week is about what I could do. And anyway it was useful, um and then last semester I taught the same class again and um, I didn't like the class as much as people because they didn't seem to react to anything I would say. I would ask questions and they would just sit there, and they didn't read, prepare, I would ask is this read? Or I would ask a few questions and there would just be blank looks, and I just kind of got frustrated with them. I'm like ok I'm just going to make you do worksheets in class if you're not going to prepare, I'm going to make you do something. So I made a lot of my own little kind of one/two sheet tutorial things where I would try to, if there was something they could graph I would force them to graph it because you know when you have to visualize what's happening and explain it in a qualitative way it forces you to process that information. Um and I thought it worked really well. The people who would sit there on their phones suddenly had to talk to their neighbor. They had to pay attention, they had to interact, they had to think about the material, and the class enjoyed it too. Uh I was a little uncertain how students would take it, you know I would ask them a couple of times, is this helpful? They would all say yes. But I'm not sure they're telling me the truth because I'm in their room asking them the question, and uh but when I got ratings from the class from the beginning of this year, they were all very positive about it so, I was very happy about that. Something I want to continue because I feel like it's something I've found that kind of meets the level of the material in the class a little better than some of the other things I've tried in the past.

Interviewer: Thank you.

Interviewee: That's a long answer, but...

Interviewer: You covered a couple of questions, so we're good.

X:Ok.

Interviewer: How do you think students learn best?

Interviewee: I think they learn best by putting things into practice. When I taught before I would view that as, you know, I do give them long homework assignments, I'm known for being more demanding than some of the other people, because I feel like that's where they're really going to learn is doing the homework assignments. Um so previously what I would do typically teaching is I would ask for questions, and then I would summarize the material, and then I would do a couple homework problems, well homework style questions as examples in the class and try and lead them through the logic of how you go from one thing to another. And basically because I was writing my own tutorials and last semester I was doing it very fast, essentially what I did is I would take take those

problems I would typically work in class, and I would just write it out on paper now, but I would give them instead of, you know, you've got a statement of problem this big, but then I would give them like, 10-15 questions that kind of guide them through doing the problem is kind of the goal in that. So I've always felt the homework is where they're really going to learn the material, but maybe this is a way of bringing them more, doing it themselves into the classroom.

Interviewer: As an educator what do you think your role should be?

Interviewee: Um well teaching students one way or the other I guess, mentoring. So in our department we require all of our students to do an independent research project, it's kind of more one on one mentoring. So that's a big part of what I do and also in the classroom teaching.

Interviewer: What do you think the role of faculty-centered lecture is?

Interviewee: The faculty..?

Interviewer: Um just lecturing?

Interviewee: Oh lecturing, um it clearly isn't all that effective as far as, it depends on -- I know, last semester when I was trying to do lots of these in class activities I also found there was some material I just couldn't think of something to do. It was difficult enough and I knew the students wouldn't be able to even really understand what they were reading. And at that point I felt like I had to more lecture and explain what was going on, but I think there has to be some, but kind of kept to a minimum I guess.

Interviewer: What do you feel like the students role as learner should be?

Interviewee: Um, well they have to do a lot of work, it's not easy, and that comes with being prepared before they come to class and being willing to, you know, they're expected to spend 10-15 hours a week on homework if they really wanna understand the material. I still think that's probably where they're going to learn the most is in doing those assignments.

Interviewer: Thank you. The next few questions have to do with your current teaching practices, so to start out, how would you describe a typical day in your classroom?

Interviewee: Um, it depends. Usually I talk about, I kind of go through what they have read for that day and I've identified often three, four, five big important ideas that I want to talk about. And I address those for 10, sometimes 20, minutes. What I try to do then is have an activity for them to do in class. It doesn't happen every week but it happens usually at least once if not twice a week. But other times I've sort of done some sample problems. But other times we've had a little more, especially at the beginnings, some more philosophical type discussions about what this means, we try to have some discussion in the class. With physics students that seems to be kind of hard, but sometimes it works well.

Interviewer: And when you say try to have an activity are you referring to the...?

Interviewee: The tutorials that I've written for them, yeah, or I've found somewhere, yeah.

Interviewer: What, um, what do you feel like as an educator are one of your strengths?

Interviewee: Haha good question, I don't know. I don't think I'm a great lecturer, I'm not the type of person that's going to keep the class spell-bound for 15 minutes. There are some people that can do that but it's not me. I don't know actually. I think I have some ability to explain and help the students understand something. And try to help them develop their skills at solving problems. I don't think I'm great at anything.

Interviewer: What do feel like are some of your greatest challenges as an educator?



Interviewee: That's a good question, I don't know. Um, I'm naturally a shy person, so sometimes being in front of a big group, I feel like I probably don't interact as naturally sometimes when there's a big group. I mean I don't feel like I'm tongue tied, but I, anyway, that's maybe one of challenges.

Interviewer: This next question I feel like you've addressed, but maybe there's another example you might have in mind. But we'd just like to know about some time that you decided to change something in your teaching, and why you wanted to make that change, and whether or not you felt like that was effective.

Interviewee: Um other than what I've already said, I don't remember as well. There have been some things I've done in the past that I didn't think worked as well. Like I said, the just in time quizzes, I've never really.... I've also done like reading quizzes the students have to complete online to motivate them to read a little bit. But I've found that it's really hard to write questions that are good for that. You know, you try not to ask questions that are too hard, that you can get if you read, but I have a feeling that the students see the question and they google the key words and they just find an answer. I don't think I really want to do, I'm not as happy with that, before, this professor put these tutorials online that I first discovered a couple of years ago, he also had some, what he'd call pre-tests, which were just one page, they were more like a simplified version of some of the problems or questions on his tutorial usually, the tutorial builds on it you know. And those I found much more effective. Again, the students have to print out a page, they have to plot something, they have to draw a picture, they have to, you know, maybe explain, you know they're given a problem where the answer isn't obvious. Those I found much more effective than me just trying to, you know, what is, well anyway, some key word from the book or some simple idea. I don't know, I haven't found those working as well for me. I haven't had the time to like, integrate all these things, I mean ideally I would have something like that too, but for the way I want to teach the material I need to cover, but I haven't had time to do that.

Interviewer: Thank you. Hopefully we'll have some time in the workshop.

Interviewee: Yes, that's what I thought would happen, to really have time to really think about that more, having at least given it a stab in the dark, you know, be able to come back and say, ok how can I take this think that I wrote an hour before class, because that's only when it's done. I would sit there, and what would I do. Anyway, and basically expand on it a little bit, have an appropriate accompanying pre-test, and then refine, I mean most of what I wrote was way too long for the time period we had. Anyways, there's a lot that I can do to make it better there.

Interviewer: We just want to ask you some questions about why you are participating in the workshop and what motivated you. And actually to start off with, what is active learning, or student-centered-teaching?

Interviewee: I guess it's having the students grapple with the problems directly in the classroom whether you have them do clicker questions, or something where they have to, if they're given a problem they need to think about it on their own and come up with their own solution and then discuss it with their neighbor or with the class or something.

Interviewer: And then why would you say that you are participating in the workshop and the STEMMFI experience.

Interviewee: Well I got the, I heard about it from our chair and it was roughly at the time when I'd thrown up my hands at the class and said they're not reading. I'd go in and try to ask

questions about the concepts and they'd look at me with blank looks, and I've got four people on their phones and I thought, anyway, it'd be a good chance to figure out how to do this better, what I'm trying to do. I mean I started working on these tutorials about that time and I thought having the workshop might be a good chance to really think more about how to make them more effective and better.

Interviewer: Thank you. There are different incentives, of course, release time, some financial incentive, mentoring, gaining skill at student-centered teaching. What of all the different aspects of the experience, what was most motivating to you?

Interviewee: Well I didn't know about release time because I didn't receive it.

Interviewer: Some people are getting release time and some people aren't. We have no control over it really, so we tried.

Interviewee: Yeah, um, I know there was a financial incentive, I actually don't even really know what it is, it wasn't really a motivator for me. It really was more like I said, it was, I thought to force me to actually think about this more than two hours before class, and it was more just the opportunity to think about how to do this better. How to incorporate it, how to make it more, you know, anyway, I feel like I have, you know, just we'll do this in class, I have, you know, it's kind of like at best a rough draft if even that. It's more like dashing down some ideas that students could do to learn this material. I would like to spend more time to kind of refine, to make it better. And I saw this as an opportunity to do that because I knew I would not do it otherwise.

Interviewer: Well that's excellent, that's great. Can I ask a follow-up question about that? Do you feel like some of the time pressure, like, that prevents you from spending time working at teaching comes from some of your other responsibilities like doing research, or mentoring.

Interviewee: Yeah, research and mentoring they take time and last semester, well actually, last January began a leave, I was on a professional leave. I was working at [REDACTED], and I had lots of projects I didn't quite get done, well I didn't get done when Fall semester started, so I was spending one day a week at the [REDACTED] trying to only do research on that day. And um, so I was trying to do all my other things basically in four days, and I just didn't get it done. I didn't spend a lot anyway, I was trying to work on these other things more.

Interviewer: Thank you. Do you feel like there were other barriers that keep you from using more active learning approaches in your class?

Interviewee: Um, yeah well, so part of it is, I don't know I guess what you mean by barriers. Um I do have another class I'm teaching for the first time this semester, and it's taking a lot of working, it's new prep, and I'm basically following kind of an outline that someone else, the current [chanel?] was the, has taught this class for the past three or four years, she gave me her materials. I'm more or less just following exactly what she had, same assignments, I don't really have any interactive activities for this class because I feel like I'm just trying to understand how it works. So, on one hand I have a class where I'm trying to do this actively, I have another class with some of the same students I had last semester that I'm trying to do some of the same tutorials again. I'm writing them all myself because I don't have anything to copy from. Um, and anyway so it takes time, I haven't found good activities for the other class yet.

Interviewer: How confident are you in your abilities to use active learning strategies?

Interviewee: I don't know, not that confident I guess. On one hand the students seem to have found them useful. Um I don't know.

Interviewer: I wanted to just clarify, it sounded like what you were saying is, just previously, in terms of a barrier, is that the materials you need just aren't available. Like the tutorials, they don't have them for the other classes...

Interviewee: Yeah, so actually I've found another textbook, a different textbook, that someone had kindly pirated and put online. But what they pirated was the instructor manual, because you know, that's what you can't get. And this instructor manual actually has, um for each lesson essentially, well for each chapter, he has 5 or 6 what he calls clicker questions, and then he has 5 or 6, sometimes more, conceptual questions that he discusses in class. And I've found those useful. The books that we're using don't quite line up, you know we're just in the first part of the semester, and this book starts in one place and my book is starting in a different place a little bit. I think that will be more useful as time goes on. Um these are, you don't share these interviews with people in our department right?

Interviewer: No.

Interviewee: Because the other professor that taught this class before, she had clicker questions and I asked, she was kind enough to let me sit in on her class a little bit last semester because I had never taught it, I just wanted to see what it was like, and to be honest, I felt like the clicker questions really took some of the momentum away. You know, you'd be talking about something and then it'd be well I've gotta stop, we've gotta get the computer set up, here's the slide with the question, it just seemed like it was 5 minutes for a question that 80 percent of the people got right. And there never seemed to be follow-up discussion because 80-90 percent of the people already knew the answer. So you know, and again I know it's really hard to find questions that are good enough to provoke real discussion, because they can't be too hard, they can't be too easy, and anyway I had found out later that what she had done, she would give these as warm up questions, she calls them warm up quizzes. I'm using the same quizzes because I'm mostly following what she had done where the students, you know, they answer 3-4 questions before online. I found out later she was using the exact same questions for the clicker questions, and so maybe that's why it just seemed like it was a chance to say you know, yeah I came to class today and, so I don't know, I'm not doing them. But I've looked at using these kinds of cards as you using more of a...

Interviewer: Yeah, it's just faster...

Interviewee: But I haven't done that, yeah, I like the idea of you know, here's the question, what's the answer. I don't like the set up of everyone pull out your clicker, I don't know.

Interviewer: Yeah efficiency is important right? Because you have a lot of stuff to get through.

Interviewee: Yeah exactly.

Interviewer: So in preparation for the workshops and the STEMFI experience is there anything else that we can do to help you or any insights that would help us understand what you're needing now?

Interviewee: I don't know, is there anything that I should read or prepare before it starts or do I just come and...

Interviewer: Well as it gets closer we'll probably have a little bit of reading, you know some articles, but not yet. So for now, the only other thing that will happen this semester is we'll have some students that are going to come observe you teach and they're going to

use an observation protocol called the COPUS that they're basically keeping track of what you're doing and what the students are doing at different times during the lecture--  
Interviewee: Now I did have that I think during last semester.

Interviewer: Oh did you? Ok.

Interviewee: Yes because this class that I talked about I only teach it once a year and I don't remember who I corresponded with but somebody said oh we noticed that you're not teaching this class next semester and so I was observed three times last semester.

Interviewer: Ok great.

## Interview #12

Interviewer: Just to make it clear, we want to understand you and your perspectives and how we can help you. We're not evaluating or judging your answers in anyway.

Interviewee: Ok.

Interviewer: Um just to start out with, can you tell us about your teaching background?

Interviewee: Well I've been at BYU for 13 years, a little over 13 years. And I've been teaching primarily upper-division undergraduate courses and graduate courses, and uh, let's see what else. When I was first hired, the [REDACTED], they have a seminar, or like a two-day work shop for new faculty that were hired that year. And I went to that during my first year that I was at BYU, so I learned a little bit about some of the more interactive teaching techniques at that time. I haven't used a lot of them over the years, but I am starting to more now.

Interviewer: Awesome.

Interviewee: I don't know, is that um...

Interviewer: That's great, can you tell us why you're starting to do that more now?

Interviewee: Um, yeah so when I first went to the workshop I actually wasn't that impressed. We went there and we basically had every hour a new presenter and after two days of listening to this, you realize that nobody said the same thing. They were all talking about completely different things. One guy comes in and says the secret to having a good interactive [REDACTED] is a room of round tables, the students sit at round tables and work on little projects. Next person comes in and says no it's all you know adjusting time teaching techniques, the next person comes in, no I use clicker questions. You know, there was no overlap almost, so it just seemed like everyone was, it just seemed like if you cared enough to do something and maybe you weren't, and uh I just didn't, after watching it I didn't see a lot of common threads. I'm sure there was some than I skeptically gave it credence, but it just seemed like it was just all over the map. Um, also, it was primarily geared towards uh teaching the very large section courses. The over a hundred to three hundred students. I haven't taught those courses, and so...

Interviewer: like a [REDACTED]

Interviewee: Physics [REDACTED] And where I've taught primarily upper-division courses, they usually quite-- anyway, I didn't see how, you know, a quick two minute clicker question could necessarily help in an advanced class. Um so I would try things every now and then, but like I tried these just in time, I guess you - I'm sure know about those. I tried those for a couple semesters and I just didn't

seem to get anything worthwhile, worth the time and effort. You know, you might get two or three questions, good questions, a week, and you'd have to wade through a lot of stuff that wasn't worth it. You know if you require the students to submit a question you typically get someone who just kind of dash off something to fulfill the assignment, they don't care. Anyway, well so going now towards where I am now, um, two years ago I've been teaching recently an upper-division class for [REDACTED] course. Um, and it's very challenging, it's a difficult class, and a couple years ago I found some tutorials that another university had used, and just for fun I thought I'd try them out, and... they were a little bit limited in the sense that, well what I mean is that there weren't enough of them for me. You know, my negative view of it is when you do all of these teaching techniques you don't cover as much material. And that was very well born out in this because the tutorials covered basically the first half of my class and that was it. There was nothing for like the last half of the class. And even then they said, oh if you do this track you don't have the time to do that track, well I do both tracks and more, it's just the nature of the class and what students are expected to know. Anyway, but I used them a little bit and I was actually quite surprised at how good they were in the sense that you know when I handed the students this little assignment to do in the classroom, for example if we learn about [REDACTED], and one of the things you learn is that planets are on elliptical orbits, you know I would draw, there would be this little graph and the students were supposed to draw the orbit, draw where the sun is, draw the planet, label this is the closest position of the orbit to the sun, this is the furthest. And my junior-level students couldn't do it all. I mean most of them could, but well I wouldn't say most, I'd say you know half the class knew what they were doing, but I was really surprised to say that half the class didn't. And that kind of opened my eyes a little bit more to um... Anyway, the usefulness of the teaching this way, um, and you know but again the problem was they only lasted for like couple of, you know, most, you know the first half of the class. And even then I couldn't do all of them, uh I mean I didn't have the time in my schedule to do all of them, but I'd try to do one or two a week is about what I could do. And anyway it was useful, um and then last semester I taught the same class again and um, I didn't like the class as much as people because they didn't seem to react to anything I would say. I would ask questions and they would just sit there, and they didn't read, prepare, I would ask is this read? Or I would ask a few questions and there would just be blank looks, and I just kind of got frustrated with them. I'm like ok I'm just going to make you do worksheets in class if you're not going to prepare, I'm going to make you do something. So I made a lot of my own little kind of one/two sheet tutorial things where I would try to, if there was something they could graph I would force them to graph it because you know when you have to visualize what's happening and explain it in a qualitative way it forces you to process that information. Um and I thought it worked really well. The people who would sit there on their phones suddenly had to talk to their neighbor. They had to pay attention, they had to interact, they had to think about the material, and the class enjoyed it too. Uh I was a little uncertain how students would take it, you know I would ask them a couple of times, is this helpful? They would all say yes. But I'm not sure they're telling me the truth because I'm in their room asking them the question, and uh but when I got ratings from the class from the beginning of this year, they were all very positive about it so, I was very happy about that. Something I want to

continue because I feel like it's something I've found that kind of meets the level of the material in the class a little better than some of the other things I've tried in the past.

Interviewer: Thank you.

Interviewee: That's a long answer, but...

Interviewer: You covered a couple of questions, so we're good.

X:Ok.

Interviewer: How do you think students learn best?

Interviewee: I think they learn best by putting things into practice. When I taught before I would view that as, you know, I do give them long homework assignments, I'm known for being more demanding than some of the other people, because I feel like that's where they're really going to learn is doing the homework assignments. Um so previously what I would do typically teaching is I would ask for questions, and then I would summarize the material, and then I would do a couple homework problems, well homework style questions as examples in the class and try and lead them through the logic of how you go from one thing to another. And basically because I was writing my own tutorials and last semester I was doing it very fast, essentially what I did is I would take take those problems I would typically work in class, and I would just write it out on paper now, but I would give them instead of, you know, you've got a statement of problem this big, but then I would give them like, 10-15 questions that kind of guide them through doing the problem is kind of the goal in that. So I've always felt the homework is where they're really going to learn the material, but maybe this is a way of bringing them more, doing it themselves into the classroom.

Interviewer: As an educator what do you think your role should be?

Interviewee: Um well teaching students one way or the other I guess, mentoring. So in our department we require all of our students to do an independent research project, it's kind of more one on one mentoring. So that's a big part of what I do and also in the classroom teaching.

Interviewer: What do you think the role of faculty-centered lecture is?

Interviewee: The faculty..?

Interviewer: Um just lecturing?

Interviewee: Oh lecturing, um it clearly isn't all that effective as far as, it depends on -- I know, last semester when I was trying to do lots of these in class activities I also found there was some material I just couldn't think of something to do. It was difficult enough and I knew the students wouldn't be able to even really understand what they were reading. And at that point I felt like I had to more lecture and explain what was going on, but I think there has to be some, but kind of kept to a minimum I guess.

Interviewer: What do you feel like the students role as learner should be?

Interviewee: Um, well they have to do a lot of work, it's not easy, and that comes with being prepared before they come to class and being willing to, you know, they're expected to spend 10-15 hours a week on homework if they really wanna understand the material. I still think that's probably where they're going to learn the most is in doing those assignments.

Interviewer: Thank you. The next few questions have to do with your current teaching practices, so to start out, how would you describe a typical day in your classroom?

Interviewee: Um, it depends. Usually I talk about, I kind of go through what they have read for that day and I've identified often three, four, five big important ideas that I want to talk

about. And I address those for 10, sometimes 20, minutes. What I try to do then is have an activity for them to do in class. It doesn't happen every week but it happens usually at least once if not twice a week. But other times I've sort of done some sample problems. But other times we've had a little more, especially at the beginnings, some more philosophical type discussions about what this means, we try to have some discussion in the class. With physics students that seems to be kind of hard, but sometimes it works well.

Interviewer: And when you say try to have an activity are you referring to the...?

Interviewee: The tutorials that I've written for them, yeah, or I've found somewhere, yeah.

Interviewer: What, um, what do you feel like as an educator are one of your strengths?

Interviewee: Haha good question, I don't know. I don't think I'm a great lecturer, I'm not the type of person that's going to keep the class spell-bound for 15 minutes. There are some people that can do that but it's not me. I don't know actually. I think I have some ability to explain and help the students understand something. And try to help them develop their skills at solving problems. I don't think I'm great at anything.

Interviewer: What do feel like are some of your greatest challenges as an educator?

Interviewee: That's a good question, I don't know. Um, I'm naturally a shy person, so sometimes being in front of a big group, I feel like I probably don't interact as naturally sometimes when there's a big group. I mean I don't feel like I'm tongue tied, but I, anyway, that's maybe one of challenges.

Interviewer: This next question I feel like you've addressed, but maybe there's another example you might have in mind. But we'd just like to know about some time that you decided to change something in your teaching, and why you wanted to make that change, and whether or not you felt like that was effective.

Interviewee: Um other than what I've already said, I don't remember as well. There have been some things I've done in the past that I didn't think worked as well. Like I said, the just in time quizzes, I've never really.... I've also done like reading quizzes the students have to complete online to motivate them to read a little bit. But I've found that it's really hard to write questions that are good for that. You know, you try not to ask questions that are too hard, that you can get if you read, but I have a feeling that the students see the question and they google the key words and they just find an answer. I don't think I really want to do, I'm not as happy with that, before, this professor put these tutorials online that I first discovered a couple of years ago, he also had some, what he'd call pre-tests, which were just one page, they were more like a simplified version of some of the problems or questions on his tutorial usually, the tutorial builds on it you know. And those I found much more effective. Again, the students have to print out a page, they have to plot something, they have to draw a picture, they have to, you know, maybe explain, you know they're given a problem where the answer isn't obvious. Those I found much more effective than me just trying to, you know, what is, well anyway, some key word from the book or some simple idea. I don't know, I haven't found those working as well for me. I haven't had the time to like, integrate all these things, I mean ideally I would have something like that too, but for the way I want to teach the material I need to cover, but I haven't had time to do that.

Interviewer: Thank you. Hopefully we'll have some time in the workshop.

Interviewee: Yes, that's what I thought would happen, to really have time to really think about that more, having at least given it a stab in the dark, you know, be able to come back and

say, ok how can I take this think that I wrote an hour before class, because that's only when it's done. I would sit there, and what would I do. Anyway, and basically expand on it a little bit, have an appropriate accompanying pre-test, and then refine, I mean most of what I wrote was way too long for the time period we had. Anyways, there's a lot that I can do to make it better there.

Interviewer: We just want to ask you some questions about why you are participating in the workshop and what motivated you. And actually to start off with, what is active learning, or student-centered-teaching?

Interviewee: I guess it's having the students grapple with the problems directly in the classroom whether you have them do clicker questions, or something where they have to, if they're given a problem they need to think about it on their own and come up with their own solution and then discuss it with their neighbor or with the class or something.

Interviewer: And then why would you say that you are participating in the workshop and the STEMMFI experience.

Interviewee: Well I got the, I heard about it from our chair and it was roughly at the time when I'd thrown up my hands at the class and said they're not reading. I'd go in and try to ask questions about the concepts and they'd look at me with blank looks, and I've got four people on their phones and I thought, anyway, it'd be a good chance to figure out how to do this better, what I'm trying to do. I mean I started working on these tutorials about that time and I thought having the workshop might be a good chance to really think more about how to make them more effective and better.

Interviewer: Thank you. There are different incentives, of course, release time, some financial incentive, mentoring, gaining skill at student-centered teaching. What of all the different aspects of the experience, what was most motivating to you?

Interviewee: Well I didn't know about release time because I didn't receive it.

Interviewer: Some people are getting release time and some people aren't. We have no control over it really, so we tried.

Interviewee: Yeah, um, I know there was a financial incentive, I actually don't even really know what it is, it wasn't really a motivator for me. It really was more like I said, it was, I thought to force me to actually think about this more than two hours before class, and it was more just the opportunity to think about how to do this better. How to incorporate it, how to make it more, you know, anyway, I feel like I have, you know, just we'll do this in class, I have, you know, it's kind of like at best a rough draft if even that. It's more like dashing down some ideas that students could do to learn this material. I would like to spend more time to kind of refine, to make it better. And I saw this as an opportunity to do that because I knew I would not do it otherwise.

Interviewer: Well that's excellent, that's great. Can I ask a follow-up question about that? Do you feel like some of the time pressure, like, that prevents you from spending time working at teaching comes from some of your other responsibilities like doing research, or mentoring.

Interviewee: Yeah, research and mentoring they take time and last semester, well actually, last January began a leave, I was on a professional leave. I was working at [REDACTED], and I had lots of projects I didn't quite get done, well I didn't get done when Fall semester started, so I was spending one day a week at the [REDACTED] trying to only do research on that day. And um, so I was trying to do all my other things



basically in four days, and I just didn't get it done. I didn't spend a lot anyway, I was trying to work on these other things more.

Interviewer: Thank you. Do you feel like there were other barriers that keep you from using more active learning approaches in your class?

Interviewee: Um, yeah well, so part of it is, I don't know I guess what you mean by barriers. Um I do have another class I'm teaching for the first time this semester, and it's taking a lot of working, it's new prep, and I'm basically following kind of an outline that someone else, the current [chanel?] was the, has taught this class for the past three or four years, she gave me her materials. I'm more or less just following exactly what she had, same assignments, I don't really have any interactive activities for this class because I feel like I'm just trying to understand how it works. So, on one hand I have a class where I'm trying to do this actively, I have another class with some of the same students I had last semester that I'm trying to do some of the same tutorials again. I'm writing them all myself because I don't have anything to copy from. Um, and anyway so it takes time, I haven't found good activities for the other class yet.

Interviewer: How confident are you in your abilities to use active learning strategies?

Interviewee: I don't know, not that confident I guess. On one hand the students seem to have found them useful. Um I don't know.

Interviewer: I wanted to just clarify, it sounded like what you were saying is, just previously, in terms of a barrier, is that the materials you need just aren't available. Like the tutorials, they don't have them for the other classes...

Interviewee: Yeah, so actually I've found another textbook, a different textbook, that someone had kindly pirated and put online. But what they pirated was the instructor manual, because you know, that's what you can't get. And this instructor manual actually has, um for each lesson essentially, well for each chapter, he has 5 or 6 what he calls clicker questions, and then he has 5 or 6, sometimes more, conceptual questions that he discusses in class. And I've found those useful. The books that we're using don't quite line up, you know we're just in the first part of the semester, and this books starts in one place and my book is starting in a different place a little bit. I think that will be more useful as time goes on. Um these are, you don't share these interviews with people in our department right?

Interviewer: No.

Interviewee: Because the other professor that taught this class before, she had clicker questions and I asked, she was kind enough to let me sit in on her class a little bit last semester because I had never taught it, I just wanted to see what it was like, and to be honest, I felt like the clicker questions really took some of the momentum away. You know, you'd be talking about something and then it'd be well I've gotta stop, we've gotta get the computer set up, here's the slide with the question, it just seemed like it was 5 minutes for a question that 80 percent of the people got right. And there never seemed to be follow-up discussion because 80-90 percent of the people already knew the answer. So you know, and again I know it's really hard to find questions that are good enough to provoke real discussion, because they can't be too hard, they can't be too easy, and anyway I had found out later that what she had done, she would give these as warm up questions, she calls them warm up quizzes. I'm using the same quizzes because I'm mostly following what she had done where the students, you know, they answer 3-4 questions before online. I found out later she was using the exact same questions for the clicker questions, and so

maybe that's why it just seemed like it was a chance to say you know, yeah I came to class today and, so I don't know, I'm not doing them. But I've looked at using these kinds of cards as you using more of a...

Interviewer: Yeah, it's just faster...

Interviewee: But I haven't done that, yeah, I like the idea of you know, here's the question, what's the answer. I don't like the set up of everyone pull out your clicker, I don't know.

Interviewer: Yeah efficiency is important right? Because you have a lot of stuff to get through.

Interviewee: Yeah exactly.

Interviewer: So in preparation for the workshops and the STEMFI experience is there anything else that we can do to help you or any insights that would help us understand what you're needing now?

Interviewee: I don't know, is there anything that I should read or prepare before it starts or do I just come and...

Interviewer: Well as it gets closer we'll probably have a little bit of reading, you know some articles, but not yet. So for now, the only other thing that will happen this semester is we'll have some students that are going to come observe you teach and they're going to use an observation protocol called the COPUS that they're basically keeping track of what you're doing and what the students are doing at different times during the lecture--

Interviewee: Now I did have that I think during last semester.

Interviewer: Oh did you? Ok.

Interviewee: Yes because this class that I talked about I only teach it once a year and I don't remember who I corresponded with but somebody said oh we noticed that you're not teaching this class next semester and so I was observed three times last semester.

Interviewer: Ok great.

### Interview #13

Interviewer: And, um, our interview should take about half an hour maybe just a little longer, and we will be asking about, well we are not here to judge you we are just here to find out what you think about teaching, what you think about learning, what your current practices are, what you hope to get from STEMFI, all those things.

Interviewee: Ok

Interviewer: So we will start with some things just about your teaching background. What is your teaching background?

Interviewee: Yeah so I've been here for 9 years, and I've taught several courses. I teach, um I've taught [REDACTED] which is a junior level course for 5 years. When I first came, I taught that every fall, and then I'd alternate winter semesters between a [REDACTED] class, and a [REDACTED] class, a 500 level class and then in the spring I've taught a [REDACTED] class and it's a graduate course. And then I've taught a couple of other classes that were smaller. Like one time courses, like um [REDACTED] those were sort of taught by other universities and I was the BYU advisor/liaison. And then I taught a

graduate seminar, and um an [REDACTED] seminar which was not really a seminar. It's our [REDACTED] course with a two resumes and presentations so that's the bulk of my teaching. Right now, I'm teaching...oh and then I've taught the [REDACTED] course for the last 4 years in the fall so just finished that up and that's three sections typically, and they are back to back sections. The students learn excel and python and math cad. That's a software on the course and that one is probably the course that I'm probably the most interested from a STEMI point of view, although the other two grad courses that I'm teaching are similar. This semester I'm teaching a graduate [REDACTED] course. The fluids course would have between 75-100 students and then the computational tools class for combined sections are about 90 students. My [REDACTED] class has 6 students and my numerical methods class [REDACTED] that one is typically about 20 students. So big range to go from 90 a semester to 6 a semester.

Interviewer: Um and how many years have you been at BYU again?

Interviewee: 9

Interviewer: 9 years, and before you were at BYU did you teach in any other capacity like as a TA or anything like that?

Interviewee: Just elders quorum

Interviewer: Elders quorum! Great.

Interviewee: Yeah, so you get almost no experience and training to be a professor. The first day at BYU teaching I was in the class room and I had no idea how long a lecture was. It felt like giving a sacrament talk 3 times a week except instead of 15 minutes it was an hour. My first time I had like 10 pages of hand written notes and I didn't realize that a lecture is 4 pages of notes, if you're lucky, if you can get through 4 pages of notes. So yeah that level is a big difference

Interviewer: Ok great, thank you. Um how do you think students learn best?

Interviewee: Um well that's a broad question but the students learn best when they are engaged directly. It's kind of interesting to me to see the difference when I'm teaching a lecture or when I have a student in my office. There is almost no student that can come into your office and leave with it not being crystal clear and somehow in the classroom that's not possible. And I personally think that the difference is the level of engagement. They don't feel like they are the only thing in the room when they are full of other students. They turn off a little bit. That way they are not directly engaged. When I was a student I don't really feel like I ever learned much in lectures, I learned almost everything from reading the book. I went to lectures but I spent a lot of my time being confused or distracted or very quickly would lose my attention and get lost or something. So, I learned to read the book a lot and a lot of students don't read the book

as much as they should, and so to the extent that they are able to pay attention in class, whether they are good at it, or whether the professor is good at it, can make a big impact. So, that's one thing, students learn best when they are engaged, carefully engaged in the class.

Interviewer: Can you clarify? You have another thing so maybe we will go to the other thing, but I wonder if you can expand on this word engaged. Like what does that mean to you?

Interviewee: Like they are actively paying attention and then internalizing it. If they are not following along they are raising their hand and then asking a question as opposed to letting the conversation go and then sort of nodding like you would nod without comprehension you are nodding because the conversation is happening. Um or students that um uh there are cases where they sort of understand, if they feel like they understand but they don't really, and so they are able to sort of get through that and you are not in a private environment so its awkward to necessary physiologically you don't want to be the one who is slowing things up so you can see a big difference with students who are willing to stick their necks out and ask the "dumb question". Does that answer your question?

Interviewer: Yeah, thank you.

Interviewee: When they are in your office they have be engaged because there is no one else there.

Interviewer: Ok um and you said that you had one more thing besides engaged and I interrupted you, I'm sorry.

Interviewee: No, its fine um I mean there are lots of things that help students learning, obviously organization, things like whether they feel like you like them, whether they feel like you take an actual interest in them, those kinds of things make an enormous difference. The morale of the class makes a big difference and I find myself doing things that are solely based on morale, for example students that come in wanting more points on an assignment or a test, almost always leave with some more points, because first of all it almost never matters, like this is going to change their grade like point nothing basically but it makes them really happy and that's even better and there is always some variability and some error in grading, it's not like a perfect grading skill. Especially in engineering, so it's not that big of a deal. That being said, they don't always get points back, but to be heard, morale is a big deal and that's one example of trying to keep morale. Extending a deadline during career fair like for a homework is like gold for students and yet doesn't really hurt you, and so those things I feel like students feel like they are heard, and they are people, and they are wanted. That way, um they're much more willing to suck it up when things are hard when you are asking them to do hard

things because they know that you've got their back and it's not just to be mean or to make it hard so that's another example.

Interviewer: Thank you, um what do you think your responsibility is as a teacher uh in the learning process?

Interviewee: Well I think that the teacher kind of facilitates the learning. Sort of almost a cliché don't like actually, like you can't force them to learn but um you certainly facilitate it to a great degree. So, I get to decide what the course content is, and the pace, and what the assignments are. And I get to organize the material, so I could just hand them a book and say read this, and they could do so, and they would do it and get some level of understanding. And the difference between that and me acting as a professor is I get to interact with them, I get to answer questions, I get to in a large way influence their perceptions of the material. And I also can make it much more efficient to can understand, because I can provide and it can take a lot longer and require multiple textbooks if you are trying to self-learn. And I know because I self-learned topics all the time and that why I have 5 of every topic on my bookshelf, because it's so hard to learn from one thing, so that is organizational area there and in terms of motivating students, that helpful, providing context as I mentioned

Interviewer: Ok and what about the role of faculty centered lecture, so um lecture as opposed to other class interactions?

Interviewee: So that's a little bit tricky um, I have differing views on that and some of the me are at odds with one another. On the one hand lecture is sort of the bedrock of the classroom experience. You go into a class and there is the boss there, the teacher, who is going to talk to you and have some sort of interaction and whether that takes the form of a lecture or not is debatable. At some level you need to have some sort of "this is how this stuff works, I'm going to teach you how this stuff works" but left by itself its not really that helpful. You never, in other words, you never want a classroom setting where the professor just talks the whole time. That never really works well. On the other hand, if you go into a classroom and everything is activity based it's hard to figure out how to make that work in a way that's both time efficient and really gets the students to do what you need them to do. I kind of view those as extremes, the lecture extreme is really easy to figure out for professors, here, I understand the material so im going to stand up and expound right? We do it a lot because its so much easier and because doing other things is really hard to figure out and when we have ideas like, "oh it would great if we could just do this" and it doesn't necessarily work out. Plus there are all kinds of external pressures to not screw up your class and for experiment and risk and whatnot, that can be a little bit challenging to comprehend those other areas. However you can mix those up quite a bit, for example, my class today in my combustion class was very much like a lecture but there are only 6 students in there so I can spend tons of time with them asking questions like, "do you understand this and how do you go about this", its still me standing up front at the board but its not really lecture per say. It

doesn't preclude the students being engaged. There are things that I could have done activity wise for that class today, for example derive the mean expression for a gas as term of mass expression PCS. We kind of worked through that example together but I could have just said, "do this, see how far you can get and then come back". It would have been a better and more memorable example had we done that and we would have also gotten through the material. Well we would have gotten through like 1/10 of the lecture, so like I can't do that. I can't afford to spend that much time on a good activity if it's only a small piece of what we need to do. So trying to find that balance is very tricky in a 50 minute classroom setting. It's so hard when you see the students three days a week. We in engineering, I think, provide them way too much material that's expected to be covered. More than what we could do if we were to truly be productive. In my combustion class where I only have 6 students, I had 7 but I think I lost one today, the drop deadline happened. It's a big blow when you have 6. I had more than half a mind to put all the chairs at a table and just talk about stuff and totally change the method for that class and to some extent. We can kind of do that because it's an elective so I have a lot more flexibility in terms of what the course content is. I don't know maybe that's too long of an answer.

Interviewer: No it's a great answer.

Interviewee: Are you going to get through all your questions at this pace?

Interviewer: I don't know, you know you bring up a really interesting point this idea of efficiency, like using class time efficiently. We've seen that in other interviews that we have done that people are really concerned about how do you do those things that are more engaging? How do you help students internalize info better but also cover the material and get through what you need to do?

Interviewee: We can have daily reading assignments to finish the reading assignments. Most professors make you read the book and then come to class to discuss it, but I do the opposite. I said come to class and then do the reading after the class. On one hand people like to have the reading done before so students are then prepped so they can have a better classroom discussion but I've found that students don't do the reading, and even if they do, it's really superficially. So it kind of screws up my material whereas when they come to class I can really efficiently tell them about what's going on and have a discussion and then when they do the reading they can read it faster and make it their own because when they see things discussed they say, "oh that's what that's about" or, "oh there are some more details" or, "we didn't talk about this maybe I can skip that it not important" so that efficiency is there. I don't know which way I like better. I'm not saying that reading before hand is better but I did that for some of those reasons and it would be great to know what the outcome is. Efficiency is a big deal. Especially when you feel constrained by a big list of things we have to do and some of those are external constraints

Interviewer: You're saying so many interesting things I don't want to move on yet, can you elaborate on the external constraints? You talked about that before if you try something new in class there are some external factors or risks that you face.

Interviewee: Right, my course has a list of competencies that need to be covered and those are typically more detailed than the course descriptions that you will see. You need to make sure that you are hitting all those competencies. You also, and some of those, you know, you could hit them and not really. But, by way of a profession, and in our department, we are professionals and we want to make sure we are getting the right material, like agreeing by consensus at some level for what's important for our students. Some of the constraints are also external because we have an environment, you know, rank and status. If you get bad teaching reviews it can affect whether you can continue to be a teacher. That affects level that I am willing to like try something new. Because, you know, if that reflects badly then that's not great. And those get looked at carefully. Student's comments, you know, they either do or don't like different kinds of things, that's an external constraint in a sense.

Interviewer: Thank you, ok um we want to move on to talking about what you're currently doing in your classroom. You said that [REDACTED] is the class that you are most interested in for stemfi, could you describe atypical day in your [REDACTED] classroom?

Interviewee: Sure, so let me backup just a little bit. The course is organized online. I have my own website and all the material is there. The homework, the lecture notes, it consists of a page with a link to every lecture. There are hand written or typed notes and, typically, I will do a screen video chat during the class or I'll capture my screen and voice myself talking through the notes. Its video of me going through the lecture notes. They have the written notes and the videos of me talking through those lecture notes

Interviewer: And so when you say that its online you say that it's delivered online? like the students are not in the classroom together?

Interviewee: No the course is taught in a classroom

Interviewer: Ok

Interviewee: Twice a week. It's a 2 credit hour class but the course material, like how I distribute my materials, isn't through learning suite. Its through a different site that gives me more flexibility, that way they have access to those kinds of thing. In class we will start with a prayer. Then depending on the day, maybe half the time, I'll give them a mini devotional slash spiritual thought. It depends on what my mood is, because I'm not interested in reading them the scriptures. It has to mean something to me and if I'm not in the mood then I don't give it. Then we will probably also about half the time, maybe a little bit more, do a quiz. The quizzes are usually on learning suite quiz and they take about 5 minutes. The students can take them as many times as they want, they're low stakes,

about 5 PERCENT of total grade. They cover material from previous lectures, usually the last lecture because I'm lazy, but ideally they would be comprehensive because we talk about those techniques a lot in our class. I talk about soft quizzing constantly to the students and so that's sort of a way to keep it on their mind and keep them familiar with it and remind them. It also gives them a gauge, like how well do you know what we talked about?. Those are multiple choice typically or maybe fill in the blank answer. We really get started with the class about 10 minutes after. I get started past the prayer and the devotional things and the quiz and then the remainder would probably be mixture of what would be termed the typical. This class is a computer tools class so the classroom we teach in has a computer for every student and that's why it's in three sections, because of the capacity of the class room. They will typically have my lecture notes open on their page, on their screens and can type along as we work through examples together. They can learn more and it won't be like fully filled in lecture notes, it will be like, "here is this" and then there might be some description and some example work that they can type. Part of the class will be like lecture, "here's this method here what it's about here's why we care", taking questions, giving questions, that kind of thing. Then we will do usually an example where they work the example and they will have typically one or two of those in lecture. They are the kind where I will let them work on it with their neighbors or whatever, encouraging discussion as I'll wander around the classroom. I'll lean over their shoulders and see how many are on facebook and see how many are actually doing it. Some of them are working the homework and sort of quite about that. I try not to make it an issue. I'm not really there, if they aren't being disruptive to the class, to be their boss about it. But for most of them that's not really an issue, but you do notice things like that. Then we will come back together and I'll give them, depending on the time again, between sometimes as short as 2 minutes sometimes as long as 5-10 minutes and then we will usually get back together and like work it out. Sometimes I'll take questions like, "who got this and what did you do", and sometimes I can see that they aren't getting it and we will say, "okay what were things that you struggled with?" or, I'll just go in and do it on the screen. That's not an atypical lecture, Class period, whatever you want to call it.

Interviewer: Thank you, what do you think are your greatest strengths as an educator?

Interviewee: I'm pretty well organized. My course materials are organized. I understand the material very well. I care about individual students. I care a lot about the individual students and am willing to take a lot of questions. I really go out of my way to make the classroom environment feel respectful. There are, and I don't want anyone telling you that there are, no such things as dumb questions. Don't ever make a student feel like they asked a dumb question. There are times when I just said something as a student asks that very same question and I never ever call them on that. You answer those questions respectfully as if they just barely happened. Frankly, I'm not really there to judge them, my goal is not to make them feel badly. My goal is to try and communicate the material and help them to understand. If that takes them asking a question multiple times then whatever I don't care. I guess those are three things.



Interviewer: What do you think are your greatest challenges as an educator?

Interviewee: I think that a real challenge, and this is true, especially in this particular class, is that we have a pretty wide range of student abilities coming into the course. Some have never seen programming at all and they're clueless. Whatever speed I go is going to be too fast and other students have seen this before and there not necessarily engaged because they have seen this stuff. They are like, "yeah ok I understand what a fore leaf is already without spending all the class talking about it". So that's a challenge in that class. Frankly it's probably a challenge in most classes. When trying to preach to every body at the same time, do you teach to the lower students? do you teach to the upper students? how do you do that when you have 100 students? I guess also trying to communicate a sense of an overall understanding of the course material. Like professors understand the material usually in a very sophisticated way. They don't see the material as someone that's new to it. So how do you communicate that? You always want to give them the sort of understanding that you have and it's really hard to do, you can't give it to them, but you can try to help them to develop it and trying to do that is a major challenge. I mean that's the goal of teaching. You take what you know and give that to the people you are teaching, that's the definition of teaching right? May not be the politically correct one, but i am really trying to take things I know and give them to you so you can go and do great things with them. If you can do that faster than it took me to learn then that's great. So I have behind you, Desiree, is that right? I have like 6 notebooks and those are technical journals, you can pull one if you are interested. I would study something and I would write about what that thing is, what I learned and then some cases there were topics that I probably spent days and weeks trying to understand and then I would condense it on to like two pages. That's like the time it took me to learn a specific topic that could have been handed or taught to a student way, way, faster, way faster. It doesn't mean that just lecture works. How do you communicate things quickly efficiently and effectively. That's the major challenge.

Interviewer: Thank you, um, tell me about a time that you decided to change something about your teaching. What did you change and why was it successful?

Interviewee: Its hard to answer that because the change is always really fairly minor and incremental. Doesn't feel like its that big of change. On the other hand our department spends a lot of time talking about these things in our faculty meetings. We talk about it in our college a lot, we have employee teaching-learning seminars where we discuss techniques and strategies that work. Some things that I've tried to do more of, for example, in [redacted] class, is implementing daily quizzes. That was a direct result of things like that and reading books make it stick. I almost always, when I'm writing an exam, say "whatever I think is good just make it easier", because whatever you think is good is way too hard. My courses, when I teach a class for 5 years every year, get a little easier and every year I spend a little more time discussing topics an every year I take a little bit of stuff out. I've changed that and try and say, "ok how much do they really understand?"

How much are they retaining? How well do they understand the material that we are covering? How much do I want them to really understand the concept versus the detail?" Then I'll change those kind of things. Maybe get rid of blank feed derivations and try to spend more time motivating what's going on and going through the derivation slightly faster than normal, maybe highlighting the big ideas and then providing the notes for details. That's an example. I've put more and more of my course materials online. Students, to some extent, feel entitled to have all of your course materials, it's not an unrealistic thing that they are asking for. They get used to it, and they like it, so they want it again. So at one time I was a little more reluctant to provide notes, but now I just give it to them and be done with it. To a certain extent if you provide the notes it lessens the burden for them to copy what you are doing, allowing them to just focus on what you are doing. If you want to see the details they are already written for you so focus on insights that aren't really in the notes. Or you don't have to type as much out, so that's a little example. I try to put things in the web so they are available after they have taken the class. Learning suite is a little too private and I like the materials to be available to the students and any one else who wants to see things. They can come back when they are not a student anymore and have things like that. I find myself using my notes for reference in the programming section of the course

Interviewer: Thank you, um what uh does student centered learning or active learning mean to you?

Interviewee: Student centered I guess would be the goal. It should be the outcome that the student has as to my desire deliver to what students get. There's some overlap there, but they aren't the exact same thing. They are from different kinds of perspective. So I might cover the same material, but in a student centered environment I might cover it in a way that emphasizes whether the student is getting the material rather than emphasizing me presenting material. Active learning is this idea that the students are engaged in the material they are doing. It's really easy to think of active learning as working some exercise, or some game, or some activity, and I don't view it that narrowly. I think that it could be a regular lecture but if you are actively paying attention and drawing conclusions then that would be active learning. However, certain activities that you do will facilitate that more than others. That is where you get notion that it's not active learning if the students are doing this or not doing that and it's not because of the things, it's because of what they are doing. I know what it's like to sit in a gospel doctrine class for example and not be paying attention at all versus formulating my own questions and thinking about what's happening. There is a difference and they are both effectively lecture style things. It is what the name suggests. Your brain is active on the material that you are trying to learn.

Interviewer: Thank you, um what do you hope to gain from participating in the stem faculty institute?

Interviewee: Well I haven't spent a lot of time thinking about that, I heard about it and was invited to join. I said, "this sounds like a great idea lets do it" and moved on to others things. Right? I respond to emails when you guys want to see me and I'm like sure ,and give you times and then move on to others things. And that's kind of tongue and cheek but beyond that I want to be a better teacher and find ways to make my class better and learn techniques that I can do. Try to do that is. That's we think about sometimes. We should make this class be skills based. Wouldn't it be great if the students could hear, "here's all the things that you guys could learn and I want you guys to decide your own pace and we will call that good ,and if you don't hit all topics well at least you got the topics that you got well". Somehow we would have to attach a grade to that, but that would allow my slow students to not be left behind and my fast students to do that and more for example right? So it would be great if I could learn how to do that in a way that doesn't cause chaos. I have the confidence to try stuff like that. That's an example. Another would be, you know, flipping the classroom. It's a popular thing to do and also chaotic. The chaos is that you might totally miss some students or you might not cover the material you want or you might not feel confident in your teaching or things like that. You might say its not really about flipping the classroom anyway, its about providing the students with active engagement and flipping the classroom is just a way to help facilitate that. The focus should be on the parts that are more about generating and active thinking environment, right? We've seen the college have a really great teaching and learning seminar where there was a teacher who specialized in that topic came and talked to us and that would be useful. How can I improve the materials that I put online? Is it really useful for me to do these videos or not? Is it useful to post my notes? How can I do more examples? The student always want more example. They love love love the examples so how can i give they more example but still have time to communicate in different ways the lecture topics and pass that off on the students? At one time we did kind of flip the classroom, Me and dr hedigren. I taught two sections and he taught one. We had them watch some videos read the notes then come to class and we would recap then spend the rest of the class working examples and stuff. It didn't work very well because the students either wouldn't do the reading or they did the reading and they didn't really get it which meant that ended up having to do way too much recap. Then, once your lecture is off kilter because you were expecting to do something different than what you are coming to class and doing it was messy. The execution was not as tight as it needed to be. I don't know if its related to an engineering class or if my particular engineering class is much more different than what they do in accounting. If its different to say "just do this". It needs to be tailored too much ten how do you really do that in a way thats going to work and get it right the first time without you know having some extra semesters to tweek this thing? Those are some things that I would like to get out of it. I'm only joking when I say haven't really thought about it

Interviewer: Because you have thought a lot about it! There are some aspects of stemfi, also like, um, some financial compensation for participating, having a mentor that you will be meeting with throughout the year, um getting a letter of support from the dean when

you have completed it. Were any of those aspects of the program particularly interesting or motivating to you to make you want to participate?

Interviewee: I didn't know about those. Ok that's fine in fact they could be on this form.

Interviewer: They are probably on the form that you didn't read! That's what happened last time. It says here you get compensated, I think its like 600 dollars, not very much. But one of the other people we met with was like, "oh I get 600 dollars that's amazing!" So anyway um just a couple more questions. These are addressing more specifically what barriers keep you from doing more active learning and we've already talked about some of them. What barriers do you think make it difficult to do active learning?

Interviewee: Um so the first one is just knowing how to do that. Because you are not really necessarily trying to do those things that you hear about. Its not just teaching faculty how to do it, or finding out about those things and trying to implement them. That's one. Student buy in is another. Students have morale issues and whether they buy into this or whether they feel it's waste of time is big. I know exactly how it feels to say "I just came to here to listen and you are going to make me participate, like ugh." Sometimes students push back a little. Like, "k get into groups " and they are like "no" and so there is some of that too. So if they feel that way then buy in is kind of a barrier. TThen some of the other ones I mentioned, efficiency is one. Trying to make sure that you are able to control the environment, but you tend to lose control a lot and you have to be okay with that. You have to understand what that means and that can be a hard thing to do. Professors want to be controlling of the material and so giving up that control and being like, i'ts going to be ok, the students still can have a good education if you don't do everything you'd hoped to in this class." You can tell because just look at another university. Their department is totally different and their curriculum is different and their students still get jobs and they still contribute to society and so don't think so much of your yourself if you are going to tweak something. So those things are kind of hard.

Interviewer: Um how confident do you feel in your ability to use active learning strategies?

Interviewee: Um medium. I do use some of them. Some of the activities that I've mentioned I do consistently. I try to increase the number and length of time in doing those kinds of activities. A lot of times before class ill look at my notes and see, ok, "which of these things are going to be things that I can ask a question?" Then turn it into an activity instead and say, "talk to your neighbor about this and see what happened." Those are pretty low frequency. They aren't hard to do, they aren't super thought out, but they are something and they can help. They can also break up the amount of lecture so the flow is a little bit better and so those with those things I feel fine. The bigger kinds of changes, like totally changing the structure of the class, not so much. Part of that is from experience and part of that is just from not knowing how this is going to work. Ill be comfortable shaking the boat that much, but that also results in you really thinking

about it. You know all the things that we do are like changes. We like to pat ourselves on the back and say, "we are doing this!" You still have a situation where students meet three times a week and there are chalkboards in the front and a professor in the front and that's the order one thing. Every classroom in the university does that. Every single one, with minor exceptions. We don't generalize special classes. What do you want to do to make byu great? Byu has something no one else in the world has, and that's a shared mission, a shared sense of values. You have the opportunity to become something truly great, if you are willing to break that mold a little bit, if you are willing to break things up, to risk, you know, and also if the student body is willing to support you on this, if they're willing to be adults. The students they will give you a lot. They will put up with a lot too. I think that there is more to do than what we really can do and how do the grades fit into that stuff? I mean what gives? I can go on and on about how I feel about the grading systems that are externally imposed and how they affect students and how it affects the way we treat them. What would I do if I didn't have to worry about assigning a student a formal grade? I might be much more willing to teach to the individual and let them learn at the level that they are capable of you know? Um it didn't sound exactly how I meant, but like how do those kind of things limit us? Why do we care? Is it because every other university in the country cares? Is it because of tradition? I think those are really important and hard questions. It's a worthy question that faculty and administrators should ask. Everybody has a phd. You should be able to think about those things like a creative thinker right? And so, uh so im willing to be a radical when it comes to thoughts like that, Doesn't mean im willing to do it. Im not going to jump off this cliff, but keep an open mind because there might be things we can do to turn from being exactly like every other school. We are. Don't kid yourself, we are exactly the same in our teaching as everyone else. At the order of one level. We have three credit hours like everybody else, A classroom like everybody else, and A professor that comes in. There are things we do different, but don't pretend that those little things we do different are big changes. Maybe that's not a bad thing. It may not be bad, maybe this is what the evolution of the classroom has decided. Maybe this method we have in the classroom is best. Maybe that's true, but I don't actually know because I've only ever grown up in that system so I have not really seen anything else. I do know how I learn when i have a new topic, I know what makes me excited. I know what makes me want to fill 6 notebooks of stuff, and its usually, "I have this cool thing I want to learn about and not because, oh you have to do this". I've thought about my numerical methods class. I've thought, well we should not have all these separate topics, we should just do one big project, we are going to design together a computational fluid dynamic simulation, now that's a simulation of fluid. We are going to do this together as a class. We are going to build this cool thing. You know when I get excited about something or even when learning some new things it's because I have something I want to build or make or do. You'd be surprised when you give students a project where there is something new and exciting they will spend way more hours than they are expected to. They get into and they are happy about it. In my fluid mechanics project, I have a project that was 10 percent of the grade and it was super open ended. Like learn something about fluid mechanics and study it. And there were very few limitations, anything you

want. The students loved it and they have a great time and they learned all kinds of great things. Its messy because some of them learn a lot and some of them learn a little bit less, but it totally works so why cant we do stuff like that? Why cant we make people excited and allow them to have different educations? Everyone in our whole department, all 600 students, get exactly the same education. Now they don't in the point of view of what they learn, but they are presented exactly the same material. They are given the exact same chemical engineering education pushed on them by the faculty. They can take elective courses, but there are universities where you take your entire curriculum of electives and others where you get no choice. I could go on and on.

Interviewer: Well you know it's very exciting so thank you for sharing your thought with us. I think you are going to be a great addition to the group. We have 15 faculty from engineering life sciences and cpms and it sounds like you are the pie in the sky dreamer for the group too which is nice.

Interviewee: Sometimes I am willing to have those thoughts. I'm also willing to do the status quo but don't give up on those dreams right? We can do cool things.

Interviewer: Is there anything else we can help you with? I know you haven't thought about it that much but as we are getting ready for the workshop in the spring or any other questions that you have? Any other question we can help you with?

Interviewee: Um not too many. I guess the main thing is making sure that im adequately prepared for the spring in terms of what's needed and um so ive kind of just gone through the emails that ive seen but I also don't really know who's who, who's boss and who are the, who is stemfi?

Interviewer: Yeah, so we have a team of 6. The PI is Jamie jensen from biology, and she may have been the woman you referred to that came to the engineering college because i know she's done some of those lunch and learn things. Jeff wright from technology education, from your college. Myself and Jen Nielsen from the CPMS, in chemistry, we are both in chemistry. Then we have rick west who's from the mckay school, he's uh an expert designer of instruction and then also mike Johnson from the center for teaching and learning.

Interviewee: Ok great,

Interviewer: So we have sort of a variety of people. Jamie Jensen is the Pi and the rest of us are co PI and it's a pretty distributed model in terms of what were are doing um but you will probably, you know, as time goes on, you will probably interact with all of us.

Interviewee: Great well I look forward to that.

Interviewer: Thanks so much thanks for meeting with us.

Interviewee: You're welcome.

#### Interview #14

INTERVIEWEE: Sorry, I had the flu a month ago so my voice is still not 100%.

INTERVIEWER: Oh, that is terrible! The flu has been terrible this year.

INTERVIEWEE: It has been. I am a first-hand witness.

INTERVIEWER: One of my TA's had the flu last week and was out for like a week quarantined at home, not allowed to leave. So. I guess it's better to do that than to get everyone else sick.

INTERVIEWEE: Yeah. The vaccine stinks this year unfortunately. I got the vaccine and I still got the flu.

INTERVIEWER: Aww that's terrible.

OTHER: I got it. I did get it.

INTERVIEWER: Yeah she hadn't gotten her vaccine and like last week I was like, you need the vaccine! Anyway...

INTERVIEWEE: Well hopefully it works for you [REDACTED] It didn't help me that much. I study viruses for a living, and I got the vaccine and I still got the flu. I knew it was going around, I was being super careful, but it didn't really help that much.

INTERVIEWER: Ha. Okay, we will go ahead and get started with the interview. Just to begin, we want to reassure you that we are not here to evaluate your teaching or anything like that. We are just here to get to understand what you think and how we can help you with stemfy. (?)

INTERVIEWEE: Sure.

INTERVIEWER: Okay. So, we will start with some questions that are about your background and your beliefs about teaching. Can you tell us a little bit about your teaching background?

INTERVIEWEE: Sure. So I was an undergraduate student [REDACTED] [REDACTED] I served as a TA [REDACTED] when I was a senior for a laboratory course. But just like a lot of scientists, I haven't had a lot of professional training experience you know. You're an expert on something and and (---) is like "we are going to throw you in." Now from the gospel perspective, I taught at like every level imaginable. I've taught nursery, I've taught primary, I've taught young men's, I've taught seminary, early morning seminary, I've taught gospel principles, I've taught gospel doctrine. And obviously I served a mission so I was

teaching a lot as a missionary. A lot of the expertise that I have comes more from the church's perspective rather than as a professional teacher. I did a post doctoral fellowship at [REDACTED]. I get no teaching involved there, and then you get hired here and it's like "teach away". You know?

INTERVIEWER: And how long have you been at BYU?

INTERVIEWEE: It will be [REDACTED].

INTERVIEWER: Great and can you tell me, you said you teach [REDACTED]? And then what other courses do you teach usually?

INTERVIEWEE: Mhm. So the main bigger courses I teach are [REDACTED]  
[REDACTED] and those are all classes that I teach every year. There are a few smaller classes that I do teach or team teach periodically.

INTERVIEWER: Great. And in terms of stemfy, are you thinking mostly the [REDACTED]? Is that the one you want to focus on?

INTERVIEWEE: Well here's the thing. Right now, [REDACTED]  
[REDACTED] So, it's not a tiny class. But, I mean I plan on incorporating everything into all my different classes. It's just because of the scheduling situation, one night a week up in Salt Lake for two and a half hours would probably be difficult to schedule somebody to observe. So that's why I am doing the virology class right now.

INTERVIEWER: Okay that sounds great. Um. Now thinking back to when you were a student. Do you remember as a science student any particularly powerful learning experiences that you had?

INTERVIEWEE: Yeah. One that I thought was pretty cool was I had a class that was team taught by [REDACTED] whose office is still down the hall. And [REDACTED] when I got hired here. It wasn't the [REDACTED], so it's more than I teach now. And as they team taught the class, they did something that I thought was funny. Everybody came into that class and they were like "DNA. DNA is so cool. I want to learn about DNA. DNA, everyone's talking about DNA all the time." But then (4:15) they like had this funny interplay that they would do where they would joke around with each other. [REDACTED] would say, "Oh, DNA is the most important thing, DNA is where it's at," and [REDACTED], he would play back and say, "Oh, no, it's proteins! They're the most important thing. Proteins, they're the ones that actually like, do everything. DNA, it just sits there, y'know? Its only goal is to help you make proteins!" And we all came into the class thinking, "I wanna learn about DNA!" and then to hear another perspective that was like, "Uhh, DNA is important but it just kinda gets acted upon, it doesn't



really act at all; proteins are really important.” (4:53) It just kind of shifted my perspective. I was like “Oh! Maybe I have this kind of backwards.” And they did it as a joke but in talking to [REDACTED] after I got rehired here, he was like “Oh no. We had a specific purpose on why we are doing that. It was to try and help students realize that although DNA has its purpose, DNA doesn’t really do that much. It’s important you understand what proteins are, what proteins do, and why proteins are important.

INTERVIEWER: Was this around the time of the human genome project. And that’s when everyone was all excited about DNA?

INTERVIEWEE: Yeah. I think that they were working on the human genome project but they hadn’t really gained a whole lot of steam yet. I think when I took that class was like Fall of 1996 or Winter 1997 somewhere around that. And when did they complete the human genome project, was in 2005 I think?

INTERVIEWER: Oh, 2000 – 2002, I am not sure.

INTERVIEWEE: So they were working on it then.

INTERVIEWER: Okay thank you. As an educator, what do you think your role should be in the learning process?

INTERVIEWEE: That’s a great question. I think that’s the biggest conundrum I have, is that historically science classes are all about, “Here we are gonna give you all this stuff! And we are going to try our best to help you understand how these mechanisms work.” Then it’s like, “Now you go learn it. You engrave it into your brain. My job is just to pass it onto you. It’s totally your job to learn it so you can tell it back to me.” And so I know that active learning helps students to learn more but my perspective on this is that it’s hard to kind of break that trend. It seems like that’s what everyone is still doing. What is my role to do active learning? Because I’ve got this set of things that I think are critical for all my students to know these things, and in order for me to have more active learning I feel like I have to shave off. You know? What fraction am I going to have to shave off so I have this chunk of time in class to be able to do active learning? Or maybe I can learn how to do active learning things outside of class, so that I don’t have to shave as much off, or a combination of the two. (7:05) So that’s probably what you hear a lot, scientists at least don’t tend to have much of a perspective of “Oh, my job is to teach you. It’s your job is to actually learn it. If you have questions, I’m happy to help you to learn it. But then it’s up to you to go back into your apartment and actually memorize this figure of how this process takes place.” So again that’s kinda like the battle that’s going on in my mind. How do I incorporate this kind of stuff, because I know that students will learn better, but without sacrificing content. And I have some ideas, but I think that’s one of the main things that I want to get out of this process is, how do I balance those two?

INTERVIEWER: And can you tell me a little bit more about the content requirements? Is this a prerequisite for other courses? Like where do the content requirements come from?

INTERVIEWEE: Well, my [REDACTED] class doesn't have so much of a prerequisite component. Because it's a [REDACTED] class, you know. My [REDACTED] class does have a number of courses that come after that. Students take genomics after that. They take genetics after that. They take cell biology after that. You know, my students that take my [REDACTED] course, they better know their molecular biology. So, the earlier classes is what I see of having more of, "You better make sure they know all this, otherwise they're gonna get to this class later on and they're gonna say 'What do you mean you don't know what gene expression means? How could you not know what an enzyme is?'" I feel more pressure to make sure that I cover all the bases in the earlier level classes. The later ones I feel like there's more flexibility because they're about to graduate and go on to medical school and whatever [REDACTED] they want them to know about they'll cover those again in Medical school or whatever you know?

INTERVIEWER: In terms of deciding on the content that's in this particular course, does your department talk about that ever? Like how did you decide what content it is that has to be included. (9:05)

INTERVIEWEE: So for the [REDACTED] course, y'know, there are a number of us, probably like 7 or 8 different faculty that teach that class pretty regularly, so the learning outcomes for the whole class were basically set up by a committee in the department, so because the learning outcomes were kinda set up, you don't feel like you can really vary all that much. For my [REDACTED] class, I'm the only one that currently teaches it, so if I wanted to change the learning outcomes for the whole class, I could do that. So, it varies a little bit by the course.

INTERVIEWER: Sure. What role do you think students should have in learning? In class, out of class, what do you think they should be doing?

INTERVIEWEE: My perspective is, and I find ways to encourage my students to do this, I want, y'know, in my perfect world, students would read over the assigned material before class. They would come to class and just say, "These are the things that we're struggling with. Help us to connect all the dots. Help me to understand how this process works because I couldn't figure it out on my own." I've been trying to do this for a while and I haven't successfully gotten to that point. I can show you what I do in my lecture notes to try and encourage this to happen, but clearly this is not the best because it's not working yet. But what I do is, I put this in the beginning, I try to make the classes more of a discussion rather than just, you just sit there and I'm just gonna spit everything at you and you try to catch it as much as you can. I find that this is a question—students are less likely to respond to that, because you're basically baring your soul and saying, "I don't understand everything, some things are hard to me," so that's why I intentionally say, "Hey, what did you think was cool about what you read today?" And then other students are willing to be more vulnerable and say, "I really struggled with this, can we spend more time on this?" Because let's face it, a lot of the things I cover are just, "Hey, you gotta memorize this," and you can memorize it with or without me, but these concepts of like, how this virus replicates its genome that's really difficult to understand, that's what I would like to spend more time on, is concepts, and not so much on just the "Here, I can just read this to

you,” which seems silly to me. But I do want you to know it, y’know? So, I don’t know, that’s part of the approach that I take. Now I’m trying to remember what the question was that you actually asked me...

INTERVIEWER: What the students should do, so like, you said readings before class—

INTERVIEWEE: Oh yeah. And I also do learning objectives for every topic that we (11:56) cover, and so I tell the students, “Okay, if we have prep quiz, the prep quiz and the exams are gonna be based upon these. If you can list these specific things that happen, y’know, when we get damage to the cells in our lungs, when we get influenza, or we get a gastrointestinal tract infection, if you can list those or if you can describe these, then you’ll be successful.” But again, what I’d ideally like is, y’know, what I do is when I come in and after we have the opening discussion, then I show them this and I say, “Is it clear what my expectation is? Is there anything in particular you want to focus on like that?” We do have prep quizzes to encourage students to read over everything that’s assigned, but again, my expectation would be, learn whatever you can and allow me to fill in the gaps on the most difficult things, but I haven’t really been able to get to that point yet, to encourage my students to do that. As we talk about some of these different things, some of these concepts might be hard for a student to understand, so that’s where I feel totally fine “I’ll walk you through this process that’s kind of complicated.” But then, basically, my thought is mostly—okay, I explained it all to you, I gave you every opportunity to ask a question, now you go and commit this to memory or commit a process to memory, too, and then you’re gonna be tested on that.

INTERVIEWER: Thank you. Can you tell us about a time when you felt successful as a teacher?

INTERVIEWEE: I mean, I guess there are individual settings and there are also group settings as well. Sometimes students—you’re just explaining a concept to one student or just a few students and all of a sudden you see the lightbulb go off and they’re like, “OH, now understand that!” That doesn’t seem to happen so much when you have a hundred students in front of you, so that’s something that I’ve felt successful with before. I do tend to embed some iClicker questions just kind of randomly in my lecture notes for some of my classes, and so we’re going along and I’m saying, “Okay, do you guys all understand this?” And everyone’s like, “Oh yeah, we understand it,” and then the next slide pops up and it’s an attention question like, “Okay, here’s a question exactly about what we just talked about.” Sometimes they flop on their faces, sometimes they all get it right, but what I tend to do if they flop is I say, “Okay, we’re gonna go back and talk about this a little bit more.” Then after we talk about it a little bit more, then I’ll usually erase the points for that question if they totally bombed it, then ask it again, then they all get it right and I’m like, “Okay, awesome!” And I’ll usually joke around and say, “Oh, it’s because I’m a great teacher,” and then I’ll say, “No no no, it’s because you guys are great students,” and then we keep going.

INTERVIEWER: Oh, that’s great. As you know, STEM-fi is focused on active learning and what we’re calling learner-centered teaching. So if you were to explain this to a colleague, how would you describe it in your own words?

INTERVIEWEE: I guess I view active learning as having a few different facets to it. Having students teach each other, having them get up and walk around and maybe go talk to somebody else that they don't know that well, or having students teach each other, y'know, I've had students debate things in class before. I'm not currently doing that in any of my classes, but we have done that before. Just anything where students are explaining things to each other, teaching concepts to each other—I always tell them, “Study in groups! You think you understand it and then you go to explain it to somebody else, and then you realize ‘I thought I understood this a hundred percent, now I realize I maybe understand 75%.’” And so I always encourage them to do that, but only one semester I've taught here have I ever said, “You have to study in groups.” I find it a little difficult to monitor how and if they were doing it, so I haven't forced them to do that again, but I love asking questions in class and having students answer from different perspectives and talk about the ramifications. Sometimes the students fall on their face and they kind of throw it back up, like, “What do you guys think about that answer?” Have a peer correct them somewhat rather than having me do it, so I think all these are parts of the active learning process. I feel like I incorporate some, but I feel like there's a lot of other things that I can learn about and that I can incorporate better. But again, that struggle of content and time, and how do you find time to do this?

INTERVIEWER: Great. So we're actually using—it's sort of like semantics, I don't know why, but anyway, we're going to define the words ‘learner-centered instruction’ or ‘learner-centered teaching,’ and that is, basically, rather than focusing on what you, the teacher, are doing, focusing on what the students are learning. It sounds like—active learning is sort of part of this, and it sounds like you have a good understanding of what that means, like they learn it better when they're able to explain it to others and stuff like that. Now, you started telling us a little bit about a typical day in your classroom. Can you tell us the more complete story? So you said you have a prep quiz, and then what happens?

INTERVIEWEE: Yeah, so first, students come in and they don't know if there's gonna be a prep quiz or not, so it encourages them to prepare every day. If there's a prep quiz, it might be a clicker quiz, or it might be a written quiz, whatever it is, we do that and it takes about five minutes. We'll go over the answers to the prep quiz, then we just kind of dive into a new topic. Like I said, I try to foster discussion, I tend to get behind because I like discussing stuff so much, and that definitely scares students from wanting to discuss things. They're like, “We're already like a half a topic behind, so I'm not gonna raise my hand to discuss something.” But at the end of every unit, I have a day programmed in where we're gonna catch up and finish off the material and whatever time we have left over, we're also gonna do an in-class review for this exam besides the TA reviews that they do. So today was one of those days—we were a half an hour behind, so we only got 20 minutes of class review for the exam, but at any rate, I'm getting off topic here. So again, we try and have a discussion, I try and, y'know, sometimes when someone actually does volunteer, this, we'll just go straight to whatever that topic is. We'll just dive right in there and say, okay, here's what your question was; let's talk about this in more detail, and then after we discuss it some, then I'll go back and say, did that answer your entire question? Was there anything we missed? Sometimes they'll say yes, then we'll just kinda go

back and start covering other things, or they may say, “Oh, I was wondering about this as well.” But then typically, after we have that opening discussion, then we talk about, “Okay, do you understand what my expectations are?” If they say yes, I say, “Is there anything in particular you guys want to focus on?” Oftentimes, nobody will volunteer that, so then we just kind of march our way through. This topic has a lot of definitions and so forth—it’s not the most exciting, just one that I picked out of a hat here. But yeah, we go through, and oftentimes I’ll have questions embedded in the topic where I’ll just ask them and say, “What do you guys think about this?” to help them stay engaged. This class, I don’t do the attention questions, but in my 240 class, especially since I teach that up in Salt Lake for two and a half hours in a block, that’s hard. So I have those attention questions embedded so they know that as long as I’m paying attention, then when that attention question comes up, they’re really not that hard, but if you’re playing on your phone or falling asleep, you’re not gonna do that well on it. Like I said, I do embed questions in here, and I hide the answers from them, and I’m like, okay, why do viruses inhibit things in this order? Even though a lot of them have printed out the slides already and they already know what the answers are, I still like to discuss it before I just show it up there, otherwise they’re just gonna read it to you while you talk about it. So I guess those are most of the things I feel like I do.

INTERVIEWER: Great. Thank you! What do you think are some of your strengths as an educator?

INTERVIEWEE: I think I try to engage my students. I learn all their names in all the classes that I have so they can feel comfortable talking to me and approaching me. And then when I do learn their names, then when they raise their hand or something, then I’ll use their name so they know that I know their name. So I feel like students feel more engaged in the learning process because I do like to discuss things. Sometimes students will ask a question and I’ll think, ‘Oh, that’s a great question!’ and I’ll just kind of bounce it back to their peers that way they can be thinking about it and have them answer. I do like to incorporate humor in, y’know, I feel like students, they think the material is funny, so they stay more engaged because, at least, I think some of them are funny. Sometimes they’re probably laughing more at me because I laugh at my own joke and then they’re just laughing that way more. But I think it’s good to help students stay alert and pay attention to everything, so I try to put in humor, so. (21:31)

INTERVIEWER: It’s probably not as bad as the chemists. The chemists are known for their corny jokes. And what do you think are some of your challenges as an educator? We don’t mean weaknesses, but challenges that you face in terms of trying to improve your teaching, what makes that hard?

INTERVIEWEE: I mean, I know I have resources available to do peer teaching reviews, but oftentimes, we don’t really schedule it. It’s one of those things where it’s like, oh yeah, if somebody came up to me and said, “I’m supposed to do a peer teaching review,” and you’re like, okay, yeah, let’s set it up, but it’s usually not high enough of a priority to be like, “Oh yeah, this semester, I’m gonna go ask four different people to come and do a peer teaching review of me.” I mean, you need those when you go up for promotion, but it seems like a lot of times, it’s like, “Oh, I need them? Oh, I better set them up.” We just had a faculty meeting a couple weeks

ago and said, "Okay, I'm in charge of reviewing this person this semester, this person's in charge of reviewing me this semester." So every once in a while it seems like there's a push to tell everyone to do a peer teaching review and then it kind of lags for a while and then it's like oh, yeah, everybody do it again. I know people would be willing to do it if I asked them to and give me their ideas, but it just seems like there's so many other things we have to do as faculty that that rarely rises to the top of the to-do list.

INTERVIEWER: And so "so many things" meaning your research, and citizenship, mentoring...?

INTERVIEWEE: Yeah, those things.

INTERVIEWER: What do you think is the main competitor? Like if you were thinking, "I'm gonna spend some more time on my teaching," what do you think you would have to give up?

INTERVIEWEE: Some facet of the research component. Either writing papers or writing grants or working with my students directly, y'know, I have 15 students that work in my lab. All those things add up to so much time, so you feel like one of those things would likely have to be sacrificed.

INTERVIEWER: Tell me about a time you decided to try something new in your class. Why did you wanna try something new, what did you try, and how did it go?

INTERVIEWEE: Well, I'll tell you about the debating that we did. Some of the debates were more kind of technical things, others were kind of "Which do you think is the worst virus to get infected with?" so it was more kind of fun. But students would really just kind of dive into this and they'd spend a couple minutes, their opening thoughts, y'know, one then the rebuttal, then they would give specific statements to support their ideas, and then they would have like a minute to wrap up. I did it for a couple semesters, I felt like it was a very active thing and students would dive in on certain topics. I did it for I think it was two semesters, but the thing that I was perceiving and that I was reading at the end of the semester in my student evaluations is that other students were like, totally non-engaged while those students were up there. The other students were just goofing around because I didn't put the things they were talking about on exams because, let's face it, some of the things the students were saying were actually wrong, so it's hard to figure out how to do that. For the second semester, I did have students writing down like, "What were some of the cool things that you learned? What score would you give them?" to have them be more involved in the process. I felt like it was a little bit better, but still, I felt like 'Uhh, students aren't learning quite so much.' Whatever your particular topic was, I felt like they learned a lot about that, but how much did they learn from the other students doing their presentations? I felt like they weren't learning as much, so that's when I said, ehh--

INTERVIEWER: And was this in your virology class?

INTERVIEWEE: Yes, yep

INTERVIEWER: That makes sense. When you were making that change, did you talk to any of your colleagues about it? Like, what prompted you to decide to do it?

INTERVIEWEE: I just felt like I wanted to have students have other opportunities to dive deeper on certain topics, y'know, and to have them be teaching each other, have them be interacting more, help them to develop their oral presentation skills better. They had to make a little handout that went along with it, like, okay, why do viruses that have a lipid membrane around them—why are you saying that they're more dangerous than viruses that don't have the lipid membrane? What are your 3 supporting statements for that? And then they would prepare a little handout, so they were working on their presentation skills in more than one way. I still feel like there were good parts of that, but I don't feel like—and maybe it's because I never got any feedback from any of my faculty peers on like, "Hey, how could we make this even better?" And I was getting some negative reviews from the students and then I was like, well, maybe I'll just drop it. I'm still open to the idea of doing that again, but I just need other ideas on how to make it work better.

INTERVIEWER: Yeah, that makes a lot of sense. Okay, we have some questions now that are more about barriers that keep you from using learner-centered teaching. So first, what are some barriers that you think prevent you from doing more of that?

INTERVIEWEE: Well the biggest one I'd say is, do I have enough time to cover the material that I feel like is essential, and then, how do I have enough time to do this? Is it in class, is it out of class? If it's out of class, how do we verify that they're actually doing it, y'know? To be honest, one idea I've thought of is since in a lot of things that I teach, there are some things that are just kind of like, memorize these—I've thought about breaking out the material and saying, "You memorize these outside of class, when you show up, you tell me if you have questions about it." And then that would save me fifteen minutes every day in class, potentially. I mean, the amount varies per topic, but then I can have the fifteen minutes to be able to have more discussion, to have more learner-centered learning, y'know, stuff like that. That's one idea I've had, but I'm curious to see: what do other people do that have successfully incorporated this, how do you make sure you don't drop the amount of things you feel like you need to cover? How do you still do it but not drop content? That's what I'm maybe most interested in getting out of this process.

INTERVIEWER: Mhmm, mhm. And you mentioned also when you did the debates that some student feedback was not positive; is that a concern?

INTERVIEWEE: I mean, that's always kind of a concern. I'm an associate professor, so that means I'm not a full professor yet. So as long as you always have another promotion coming along, you're always—I mean, that's not to say once I become a full professor, I won't care about course ratings anymore, but I feel like you can't be quite as adventurous when you still have another promotion coming along because if you get bad student ratings, you may not get your promotion, or pre-tenure may not get tenure. So I feel like it does seem like a lot of people kind

of play it safe until they get tenure and then they feel like they can try other things, because if you get bad ratings, you feel like you start out with a set of ideas, and you really just have to polish it, polish it, polish it until your ratings go up. Every time you try to slip in something that's really different, your ratings are probably gonna take a little bit of a dive. It's unfortunate that that's the case, and a lot of us say, "Oh, maybe I should wait a few more years until I get this promotion, and then I can try this new idea, because then ratings are not gonna like, kill me anymore." But I don't know, maybe that's a cop-out to say that, but I mean, I think all of us that are not done getting our promotions yet, we're always thinking about these things. I gotta have good ratings, because if I don't get good ratings, then I may not keep my job or not get my promotion or whatever, so.

INTERVIEWER: Yeah, thank you. What do you think would enable to use more learner-centered approaches? If you could make the world any way you wanted it to be, what would you do differently to make so that you could do this?

INTERVIEWEE: I think it would be good for one, me to be able to go to classrooms where other faculty are doing this and I could observe what they're doing, and that of course requires time to be able to do that, have faculty who already know how to do this come to my classroom and observe how I teach and say, "Oh I really liked how you did this, maybe you could take it one step further and try that." And just give me ideas. If it was a perfect world, we'd have an hour instead of 50 minutes and then I'd just have more time! But it's not like that's ever gonna happen, but if we did have more time, I suppose I could make videos and post them on YouTube or something and say, "Hey, do this learning activity outside of class," but I dunno, I haven't really ever thought about doing that much more than just the initial idea. I'm sure there are things I could do to stimulate stuff outside of class, too. It doesn't all have to be done in class, but a lot of us tend to think you would have to do it in class, but I'm sure there are other ways to accomplish it.

INTERVIEWER: Because the role of the instructor is like, delivering the content, yeah.

INTERVIEWEE: Yeah, that's what's all kind of ingrained in our minds, y'know?

INTERVIEWER: Yeah. Wasn't there (30:51)...I just read this quote the other day. I don't know who it was; it was like an ancient Greek. No, that can't be true...I don't know. But it was somebody who was like, "Lecturing is the process whereby information leaves the professor's mouth and enters the student's notes without ever passing through either one's brain." I thought that was a good one. I was like yeah. I guess that's not...that's what we're NOT going for in STEM-fi, just to clarify.

INTERVIEWEE: Well I remember when I was a student, I mean, there was no powerpoint back then! It was just kinda like, they would have overheads, they'd draw on the board or something, and I was just madly scrambling trying to write everything down. I mean, all my lecture notes, I just post them on Learning Suite, so then they can just have everything already there so they can just focus more on learning, listening, rather than just like, taking notes. So that's why I just



post everything in advance; then they can say, “Oh! He said this was really important because of that, or this that and the other,” rather than just trying to write things down. Because sometimes I would write things down and I would have a nice little picture of this, but if somebody had asked me like, what is the point of that? And I’d be like, I have no idea, but I wrote the picture down. I have no idea how it fits into the big picture. So I mean, I think just with technology, I think it’s made it easier for us to be able to focus more on learning rather than just writing it down, you know? But that’s part of my approach, so...

INTERVIEWER: And what are some changes you hope to make in the future?

INTERVIEWEE: Overall, or focusing on like, active learning?

INTERVIEWER: Well, I mean, just in general, we’re interested in the active learning piece, so, but what are your plans? If you were thinking now, what are some changes you’d like to make, what would they be?

INTERVIEWEE: Well, let me think. For my [REDACTED] class, I’d like to incorporate more primary research literature into the class. Y’know, there’s some faculty that do that for 300 level courses and 400 level classes. I have a few kind of short things I weave in during the semester, but they’re not really that much in depth. It’s just like, read one page of an article about how they figured out that fruit bats are the ones that carry ebola, or something like that. So it’s really not that much depth, but I’d like to be able to incorporate more of those things. But again, it’s always a matter of, yeah, I could teach them how to read papers better, but then if I do that, then I would have to sacrifice some of this content that I view as essential, y’know, so how am I gonna do that? For my [REDACTED] class that I teach, I feel like it’s kind of a dog and pony show since a lot of students don’t wanna take the class, and a long time ago, somebody decided to call it [REDACTED], which sounds like the most boring topic in the history of the world, let’s face it. [REDACTED] does not sound cool. It sounds boring, y’know? So what I like to—some things that I have done is, as we start the topic, I say like, what’s the big picture? So they can kinda take a step back and figure out, y’know, why do I have brown hair and somebody else has blonde hair? Why are people taller and shorter, how can we predict if you’re gonna get breast cancer or colon cancer? So I do something like that, kind of at the beginning, to help them understand the relevance. And then at the end of every topic, we talk about like, what is the relevance of this to human health since there’s so many pre-dental, pre-med, pre-PA students. So we talk about crime scene investigations, how could you predict what diseases we’re gonna get, paternity tests, and then we joke about Jerry Springer, all that kind of stuff. Just so they see like, okay, this stuff we’re learning about actually could be important to my health. And if I become a doctor someday, it may be important for me to understand this stuff, because the day is gonna come when we’re just gonna sequence all of our genomes, so we’re already gonna know what sorts of diseases we’re predisposed to. Are the doctors gonna be ready for that, y’know? So, I’ve tried to incorporate this some, y’know, as a way of trying—but it kind of goes back to the dog and pony show where you’re just like, I want them to recognize this will be important in their careers, even if they don’t think it’s going to be, to try and convince them of that. So other ways that I can try and get them more fully engaged—because some

students come in and they're like, oh this is a lot cooler than I thought it would be, and other ones are still just kind of like, ugh, why do I have to take this? So those are kinda some of my goals.

INTERVIEWER: And in terms of active learning, are there things you would be interested in learning more about or trying to change?

INTERVIEWEE: Well, let me show you an example of some of the harder things I teach in some of my classes. I want to give you some perspective. I would love to be able to... I would love get students to be able to look over something like this and be able to explain it to each other in class. This is how HIV, which has a genome that's made of RNA, and then it turns its genome into DNA, y'know, one strand of RNA to two strands of DNA, and there's so many chinks in the armor of the virus. This is where all the initial HIV drugs all targeted this process. That's why I want them to understand how this happens. It's complicated; there are like nine different steps on here. It's really hard for them to understand that. This is something where I'd like to have an active learning thing where students can kind of, y'know, maybe have one person in the class at a time come up and talk about each step, have them prepare; they'll know in advance. I'm gonna pick a name out of a hat, or maybe I would assign one in advance, I don't know. But have them just come up and talk about this and say, y'know, how is this happening, why is it doing it this way, how can we target this with antiviral drugs, y'know, something like that. Because right now, I mean, I'm already spending like 10 minutes on this one slide every semester explaining this, and they still don't understand it that well when we're done, as evidenced by their test scores. But so I think if I could kinda get them to teach each other in small groups or have one person come up and explain it, then say what questions do you have after that? I think this is a good example of something that I could do better on active learning. They're still asking questions all throughout, but I think they'll learn more if they try to explain it to a peer rather than just saying, oh do you have questions? Oh, well, 5 questions, no more? Okay well let's keep on going. Because some concepts or processes are much harder to understand than other ones, y'know.

INTERVIEWER: So sort of targeting those really difficult things?

INTERVIEWEE: Yeah! I'd like to be able to spend more time on this and have students feel okay about asking whatever the questions they have about this, because some of these other things like how HIV inserts its genome into the host cell, is not really that hard to understand. You cut it, you grind it up, and you paste it back in, y'know, you can talk about that in just a few seconds. But this is not something that you can talk about in just a few seconds, y'know? It takes a while for them to understand that the genome actually gets bigger. It grows while it's doing this. Why does it grow? How does it grow, y'know? If you line it up, you see it's getting bigger on this side and on that side; how in the world do you do that? Y'know, and as we talk about how it happens, then I want them to recognize why it happens. The genome has to get bigger because the promoter of the virus is actually housed in this. That's why this actually has to get bigger, and that's why it's shorter once you make the RNA copy again, is part of the promoter gets left off because promoter sequences don't normally get made into RNA, so.... I don't know.

INTERVIEWER: That's great, thank you. Can you tell me a little bit about the teaching culture in your department? What sort of expectations are there around teaching?

INTERVIEWEE: Uhh...departmental teaching expectations...get good ratings! You have to say that because it's true when it's all said and done; that's how you get measured. I mean, we do have the peer teaching reviews that we do, y'know, some people do them more often than others, and we do have kind of an open idea to that. When somebody writes you a peer teaching review, they give it to you. It's not just like going into your packet; they give it to you so that you can see what their perceived strengths, or thoughts on your strengths and weaknesses are. I think our department puts a decent amount of emphasis on being good teachers. I don't know what like, course evaluation ratings are from one department to the other, but I think we do pride ourselves on trying to be really good teachers, but I mean, I think we could always use technology better. I really like to use videos, y'know, I just embed youtube videos in the lecture notes, and then we'll just get on and we'll watch it, and we'll talk about it and talk about why the video's not perfect, 'cause they never are. But uh, in terms of concrete measuring things, umm, what was I gonna say about our department and our approach...umm sometimes we get together if we have multiple faculty that are all teaching the same class and we kinda get together and sit down and say, hey, what's your approach? Here's my approach. What textbook are you using? Y'know, the last time we kinda did this, we decided, oh, let's use a uniform textbook, and then more people started teaching the class and they were like, I don't like that textbook, so they did their own, y'know. So there are always some differing opinions on things, but I feel like we've got a pretty good consensus on the early level classes of like, we have to cover these certain things. We have gotten together and said look, y'know, what are the things that have to be covered in this class, and then if you want to, you can cover these other things, y'know, once you've covered the basics. But that's usually just for the earlier level classes; once you get up to like a 400 level class, no one is gonna gripe about it because they're like, oh, they take this class and they're just gonna graduate anyway. But the early level ones, obviously it bothers you some if there's this prerequisite and then they take this class, they come into your class, and they're like, "I have no idea what a nucleotide is!" Y'know, you're just like uhh!

INTERVIEWER: And how would you say, like, what are other people doing in terms of teaching in the department? Do you have a sense of what the sort of normal mode of operation is for—

INTERVIEWEE: For how people just teach in general?

INTERVIEWER: Yeah, how people teach. Are a lot of people using more tradition formats like lectures, are people like, active learning, is that a thing that people are talking about or doing, do you have any sense of that?

INTERVIEWEE: I think most people are more traditional lecturer. I know [REDACTED]—he teaches mostly cell biology and molecular biology, but I've peer reviewed him before when he was teaching, and I liked how he brought in like, he brought in like, props. Like, in terms of talking about like the membrane of the cell, he brought a balloon and he was talking about how like,

you push on this side of the balloon, and what happens to the other side of the balloon? He talked about like, actin and myosin proteins and he brought in like, those twizzlers, the ones that kind of wrap around each other like that, whatever they're called; the stringy ones. And he used those things, and I was like, man, first of all, is he getting departmental money to buy all these props all the time and buy candy and pass it out? Y'know, that was like, my first or second year and I was like, how's he paying for all these things? And then the second thing I thought was, that's really kinda cool to like, have these props and like, pass them out to students, and then they could actually like, unwind y'know like proteins unwinding from each other and stuff like that. We do have some classes that are very active in terms of—I mean, they're usually lab classes, but you get to go out in the field, collect samples, and sometimes, they're kind of a, it's kind of a mixture. It's like half lecture, half lab class where students are doing a lot of active learning and they're actually discovering new organisms. Y'know, we have this class in our department called "Phage Hunters." Phage are these little tiny viruses—I've got my giant microbe thing here—

INTERVIEWER: They infect bacteria!

INTERVIEWEE: Yeah, yeah! They infect bacteria, and so since maybe 2010 or so, we've had this phage hunters class where students go out and then they find bacteriophage that can kill a certain type of bacteria, and usually these bacteria are problematic to humans or to honeybees or to apple trees or whatever. And then they're like, actually taking these viruses they've discovered, and then they throw them out on the apple trees, and then the apple trees get healed of their bacterial infections! Y'know, so we do have some classes that are very very active learning; the students name their own organisms that they've discovered, they sequence their genomes, they publish papers, so I mean, I guess we do have more active learning stuff than I initially thought of. I guess when I'm thinking about this, I'm more thinking of, "Oh, this is for my lecture class," and so I'm thinking about lecture stuff, but we do have lots of lab classes that are very kind of a different approach. In my lab class, the virology lab, the students actually can take their own blood sample and figure out some different viruses—have I been infected with these different viruses before? And then they can actually figure out their own patient history, y'know, during the course of the semester. So they think that's really fun. I'll bet half the students who take the class just do it so they can find out which of these viruses they've been infected with.

INTERVIEWER: I don't wanna know, I feel like! Um, that's great. And what about—let's say you decided to do more active learning type things in your lecture class. How do you think that be perceived by your colleagues, or maybe by your department chair or the college?

INTERVIEWEE: Oh, I think it would be positively viewed. If it was an earlier level class and I didn't cover all the necessary (44:55) things, that could potentially be a problem later on. But I don't know, it's also your perspective of what you think is essential. So I don't really see any negatives along the lines. The student are learning things better and you know if there's standardized tests that they have to take, if they do better on those, it's all good if they

accomplish that. But I think I've already beat that dead horse too many times of like, "How do you figure out how to make time to do all this?" Is that what a lot of other people say?

INTERVIEWER: Yeah. A lot of other people say that.

INTERVIEWEE: I would figure that. I mean I've been doing this long enough to know.

INTERVIEWER: Yeah. I think that we'll talk about it in the workshop. So hopefully we'll have some strategies that can help you with that. What about the expectations of your students? So with regard to your teaching? What expectations did they have in terms of active learning or learning centered instruction?

INTERVIEWEE: Periodically, I'll get the results of a mid-course evaluation or the end of semester evaluation where students would say something, you know they'll... that I can see a tie to active learning. But it's certainly not the kind of thing where you're getting the majority of your classes saying, "Hey! Can we do these types of things?" It's kind of sporadic. You know? Occasionally you'll get a student, maybe one out of a class of thirty that might say something about like, "Hey, can we teach each other? Or can we do this or that?" So it doesn't seem like something they're begging for. But at the same time, they've also been kind of indoctrinated like this is the way science learning works, you know? So I don't know that they're necessarily thinking about it and like, "Oh yeah we'd love to have this." Because they really haven't had too many experience with it either.

INTERVIEWER: yeah that makes sense. Just a couple more questions about learner centered strategies. How confident do you feel about your ability to use learner centered strategies?

INTERVIEWEE: Um. Not very confident at this point, but I hope that by the end of this process I will feel more confident. But I think I've been able to incorporate some facets of this, but I recognize that there's a lot that I can still learn about it.

INTERVIEWER: So it's not so much that you don't feel confident in carrying out the ones that you know, but more that there are probably other things that you don't know about.

INTERVIEWEE: Yeah! I am sure that there are other strategies that I could incorporate that I just haven't ever witnessed. So I'll see this and say, "That's a great idea!" and I see how I could totally use that, you know? I think I am looking for ideas in terms of how to do it, but also ideas on how to balance and how to juggle everything I need to do.

INTERVIEWER: Yeah absolutely. Are there any other factors outside of your control that you think influence your ability to use learner centered strategies? You've talked about coverage, making sure you get through all the material. Anything else that's an external factor?

INTERVIEWEE: Umm well something that always arises is how engaged are the students in this thing that you're trying to incorporate. Obviously having learner centered learning is not going

to work that well unless the students are saying, "Hey! We think this is a great idea!" So I can totally envision a scenario where I learn three or four different things, you know from participating in STEMFY, I try and incorporate one of those things this first semester and I perceive from the students it's kind of like, "ehh". If they're not loving it or totally engaged in it, then am I really going to try and continue, like how many semesters am I going to keep on trying this until I say, "ehh I don't know if this is really working out that well." So I feel like that's something that might be kind of out of my control. I might think it's a great idea, but if the students don't get the vision, if they're not excited about it, then I don't know how much I am going to continue to pursue it.

INTERVIEWER: Yeah that makes sense. So thinking about this STEMFY program, what do you think you're most excited about and what are you most concerned about, heading into STEMFY?

INTERVIEWEE: Umm I would say most excited is just learning about new ways to help students learn things more effectively. Learning new strategies to help them to be able to do that. And then what am I most apprehensive about is probably just the time commitment. I am not teaching spring term, so that wasn't the week we had blocked off, it shouldn't be hard for me to be able to be there for that, but I know there's like a course buy-out part of this, but for some of my classes, like my [REDACTED] class, I am the only one here currently teaching that. So you're like huh, how are we going to do a buy-out of a class? Is someone going to have to do a new prep for me to do that? So I don't know. We will have to see how that goes. Because my normal teaching assignment is like [REDACTED] I am only teaching [REDACTED] up at the Salt Lake center right now. I'm actually doing that for extra pay, to pay for my sons mission to Bolivia. So I don't really want to buy-out of that, because I am teaching on purpose to get more money. Yeah so what classes would get bought out? Pretty much every year we are asked to teach one of these little one or two credit hour classes. So that's probably what would be the difference for me I would guess. But you see how course buy-outs are not always easy to coordinate too. Because it depends on who else can step in to teach that for you too.

INTERVIEWER: Yeah. We have some departments where they haven't really been able to negotiate it to work out. Which is sort of unfortunate, but we will have a lot of time during the workshop where you'll be able to plan these activities and look at your curriculum and where is it going to fit in. So I don't think it's going to be a huge time commitment during the semester. Okay. Last question. Is there anything else we can do to help you? Getting ready for STEMFY? Anything we can do to make it a great experience for you?

INTERVIEWEE: Umm not that I can think of. No.

INTERVIEWER: Okay. So you're ready to go?

INTERVIEWEE: Yeah!

INTERVIEWER: Okay thank you so much!

## Interview #15

INTERVIEWER: As I ask you a few questions, actually it's a little more than a few...I'm just instructed to assure you that we're not judging you or evaluating your teaching. Just getting an idea of where you are. And so to start out with, we'd like to know a little bit about your background as a teacher.

INTERVIEWEE: Training, experience, all of the above?

INTERVIEWER: Yup.

INTERVIEWEE: So, I masters and PhD like a lot of faculty. I did the masters [REDACTED]. I haven't had much by way of actual pedagogy or training. Not surprising. But we had to teach, for my PhD program we were required to teach a class as part of our teaching practicum. But there wasn't really a lot of feedback or structure with it or guidance, they just see if you can teach a college course. So, I did that. I take a [REDACTED] center of teaching and learning a number of times since I've been here. And I've been here for about 7 years (1:04). And I taught a lot of classes part time before I received my PhD, so I have quite a bit of teaching experience. And then over the last 7-10 years, I've taught 4-6 classes a year. And so I have a fair amount of teaching experience, but most my work to become a better teacher has been mostly proactive...me initiating going to the center of teaching and learning, getting feedback from colleagues, etc.

INTERVIEWER: Was your PhD in teaching?

INTERVIEWEE: No, it's [REDACTED]. So it's in my field.

INTERVIEWER: But, you still had a teaching practicum?

INTERVIEWEE: Yeah it was just part of our PhD. One of the requirements was to teach a college course and that was called your teaching practicum. But there wasn't like training before you did it. Or nobody taught you how to put together a syllabus or how to write test question. It was just like, "Okay, go teach this class and then you're done with your teaching practicum."

INTERVIEWER: That's cool that it was built in though because a lot of PhDs are probably going on to teach.

INTERVIEWEE: Right, it makes sense. I will say too, when I was an undergraduate here I did do the [REDACTED] teaching program. So I took a couple of courses related to that and then taught in the school for a week. (2:41)

INTERVIEWER: We would like to know about a powerful, positive STEM experience you had as a learner. So if you can think back as a student...an experience you had that was meaningful and kind of powerful to you in some way. And tell me a little bit about that.

INTERVIEWEE: Related to STEM specifically, like I don't understand what you mean by that. Like, that it's in a STEM topic or....

INTERVIEWER: Probably in class that you took, but I guess it doesn't need to be.

INTERVIEWEE: Not a lot really sticks out. I feel like when I was an undergraduate here, I did Biology, was in a lot of large classes that were really just pushing information. And classes were really easy to disengage and not be very, they weren't very interactive. You were sitting down the whole time, trying to stay awake. So I think the things- well, I can think of one. I had a professor as an undergraduate, the classes, they weren't huge, but they were probably like 70-80. But he still took time to try to learn everybody's name and try to connect with people personally. And even that small tactic which BYU talks about a lot, not necessarily other places, was I think pretty cool that he made a huge effort. Because I thought, "well, it's kind of a big class to try and learn everybody's name. But he did that. I would say that that is the one thing that sticks out to me. It has nothing to do with content, but just how he tried to connect with the class. And when I came to BYU and I'm teaching here, I see that a lot of faculty do that. But that was before I'd ever thought about getting my PhD or being a University professor. So I wasn't really looking for that kind of a thing.

INTERVIEWER: That's an interesting reflection. Looking back and thinking that there wasn't a whole lot of engagement as a student in the classes- but that meant a lot to you when a professor knew..

INTERVIEWEE: Yeah, it's one of the few things that I remember in my undergraduate- which wasn't that long ago. It's getting longer and longer, I guess.

INTERVIEWER: Our next question is: as an educator, what do you feel your role should be?

INTERVIEWEE: Well, I think my role is to build competency in students. To help them to develop skills, which I think both of those have big value. They're not necessarily mutually exclusive, but I think there are a lot of times when people just think about pushing content at students- they need to be able to answer questions on the exam at the end. But I want my students to be more employable. I want them to be more useful, to have good problem solving skills. I try and present them with scenarios and challenges along the way. I have a long ways to go in that regard still. That's what I'm aiming towards (5:53). But I also, I taught at the [REDACTED] and then I came here. And I also see one of my primary objectives as to help students spiritually and to take time when appropriate to talk about things related to life that would benefit them- and try and incorporate that into course material when appropriate or sometimes just take a tangent when I feel that that's important to do too. I'm not a religion teacher, but I do think that having those kinds of conversations can be really important.

INTERVIEWER: And that ties back into the aims of BYU.



INTERVIEWEE: Right, for sure.

INTERVIEWER: Could you maybe tell me a little more--you mentioned, along with building skills that you present students with challenges, with scenarios--maybe a little more about your role could be in helping them facilitate building those skills and yeah, like what you want students to become and what you specifically can do to help them get there?

INTERVIEWEE: Yeah. I tend to do a lot better with my graduate class than with my undergraduate classes, but my grad classes, we work with a real world, external institution, and we analyze data for them, put together reports, we get feedback from them on making sure that it's gonna be useful and helpful...we essentially turn the class into a semester-long internship with that organization, and so it builds their resume, it also deepens their skills from an analytical perspective. It helps them to create a network as they get to know colleagues in other organizations and looking for other opportunities for more internships. I have a hard time replicating that on a larger level to undergraduate students, but I still, I use scenarios with them that are real-world scenarios that are less timely. So I might take a real scenario, but I don't have an organization that's waiting for an answer from 4500 undergraduate students versus from these 10 grad students, does that make sense?

INTERVIEWER: Yeah. Also, what course are you using, are you planning on doing with this, associated with the STEM-fi--

INTERVIEWEE: Yeah, I think I put down--I teach a class called [REDACTED] undergraduate global health class that's kind of a survey of what health is like from a public health perspective in really poor countries.

INTERVIEWER: And that has about how many students?

INTERVIEWEE: Uhh, it really varies. I probably teach 40-50 students in fall/winter, and then I usually do a spring term that has, y'know, usually less. Like 20 or something like that.

INTERVIEWER: I was just curious. Okay, and then also, so we talked about your role as the educator, and then what do you feel like the students' role should be in the learning process?

INTERVIEWEE: Well, I think students need to take responsibility, but I try to give them carrots to take responsibility rather than try to...I mean, I do have a few lever points, y'know, that coerce them, if you will. But again, I don't do attendance, but I do do quizzes that make sure--that they're pretty simple that require that they do the reading. That helps them to come prepared so they can get more out of the discussion. I try to reward those who are engaged in discussion by hopefully responding to them in respectful ways but also digging in deeper on what they say to kind of validate the value of their comments. I hope, and--the nice thing is my class is an elective, so most students take it because they want to, so I have a little bit of a luxury in that regard. They're not just like, thinking to themselves that, "I don't really wanna be here but I have to take this class to graduate," etc. Most of them are taking it because they have some passion

about global health, so it's a little bit easier for me to kinda take that passion and channel it into really good, meaningful discussions. I still get students that check out, y'know, for whatever reason, but I don't feel really obligated to make sure every person is completely engaged. I try to give them lots of opportunities; I try to teach from different learning styles and perspectives and do different, really varied kinds of activities so that an activity might work for one student but not for another, then try another one that'll maybe work for this one so that at some point in each classroom experience, they have things that bring them to the table or give them opportunities to take action.

INTERVIEWER: Would you like to say any more about anything that you feel like students are responsible for doing out of class to prepare for class, or in class?

INTERVIEWEE: Well, so this class in question, I've been really experimenting a lot with a bit of a hybrid model, so I wouldn't call it a flipped classroom, but I have one day where we have in-depth discussions about the topic for the week and then the other day is a lab, but it's a lab in more of a social science perspective, y'know, they're not mixing chemicals or anything. So then, on that day, they're taking the topic for the week and they're applying it to a semester-long project and fitting in, and so as a smaller group, they're working together to write a paper and to address certain points of that particular topic for the week, and so, and in that regard, then on the second day where they're in the lab, on there is a resource for them, and so just each, y'know, different groups engage in different ways. Sometimes they just do their own thing, they meet elsewhere on campus. A lot of them come to class, ask for help, y'know, additional one-on-one or small group discussions and things like that. So I try to also, so I don't have like a traditional lecture every time they come to class kind of (11:57) approach.

INTERVIEWER: This is actually going into another question. So I think I'll maybe just skip ahead. The questions says please describe a typical day in your classroom, which I feel like you're kind of getting at. So the way that this class is structured it sounds like different days are different.

INTERVIEWEE: Yeah, so we meet twice a week for an hour and 20 minutes each time. And each week is a topic. So in international health there's a week on HIV, a week on malaria, maternal health, child health, etc. And so on the first day of the week they'll have readings on that topic that they come prepared to discuss. We have an in depth discussion. I do some activities around those discussion ideas. And so it's really exploring that topic together as a class. And then the second day of the week is a lab day. There's no other preparation other than there is a quiz before they take the lab over the content to make sure that they've studied it and thought about it. And then the lab is an opportunity for them to apply what they've learned to their specific scenarios. So each small group picks a country and then they will address HIV within that country that week or malaria within that country that week or something like that.

INTERVIEWER: And they just meet twice a week.

INTERVIEWEE: Yes, just twice a week. So it works out really well.

INTERVIEWER: Cool. And these groups...they have a country and their group is consistent all semester?

INTERVIEWEE: Yeah.

INTERVIEWER: And then when you are discussing readings, on the first day, how is that facilitated? How much are you talking? How much are the students talking?

INTERVIEWEE: So I use a powerpoint, but I ask a lot of questions throughout the powerpoint to talk about different reading topics. (13:46) I try to use a fair amount of media with global health, but some of these students have never been to these countries so I try to use video clips anywhere from 2-6 minute long clips that will take them and transport them at least temporarily into that place to see what it's like to deliver a baby in Chad. Or what it's like for a child in their first week of life in Bangladesh or whatever. And then we talk about it...what did you see in the video? Think about your reading, what are you learning from this? What are the challenges or barriers are they facing? And so, lots of discussion. It's not pushing information as much as it is making sure they understand the reading and then we give them a lot of different experiences around the world to think about what it means.

INTERVIEWER: Is the discussion like, students have to talk together? Is it like raising hands?

INTERVIEWEE: It's mostly raising hands. Sometimes I'll do like "pair share" methodology, but usually it's raising hands and just having more an open discussion format.

INTERVIEWER: That sounds like an exciting class!

INTERVIEWEE: It's fun to teach for sure.

INTERVIEWER: Can you describe a time when you felt successful as a teacher?

INTERVIEWEE: I measure success in different ways I guess. (15:22) I love to hear back from a student who says "This class really impacted me. This class opened my eyes to a part of the world I didn't know about." I also try to do a couple of times a semester just like a simple thought with them? About 10 minutes long. I usually do it around the test time to try to reduce test anxiety and also to joke to hope they'll have positive feelings about me as they take the test. It's almost like, I don't want to say Sunday school lesson, but I usually take a life theme and then talk to them about it. And I share my testimony on something that may or may not be related at all to the class at the time. I pray about what should I share today. So I make sure I intentionally do that at least twice a semester. Once around the midterm and then once at the end. But they I also look for opportunities elsewhere as they might present themselves. But I don't force it anywhere else...does that make sense? I know lots of students give me feedback that (16:22) they've really appreciated those things. Y'know, I've shared things about my family, my wife, my kids, etc. and they've come back and said that those things were really meaningful for them and

stuff that they needed to hear, so that encouraged me. I keep doing it, and uh...but I think, for me, success is like, if I walk away and the class had a great discussion and I thought they were providing really good insights, showing that they got it and that they were engaged, that to me is success, too. So different kinds of things that I look for. I don't worry as much about test scores or what the curve is at the end of the semester. Their final products, I do hope reflect that they've gotten the gist of the class and that kind of stuff, so I guess that's another thing that I do kind of pick up, so.

INTERVIEWER: Their final product--so that's the group?

INTERVIEWEE: Yeah, the group, as well as I guess their exam at the end the show that they've understood the material.

INTERVIEWER: Is the exam...how are the exams?

INTERVIEWEE: So I give a traditional midterm that has both multiple choice and short answer, and then for the final, I give them two options so they can go through one of two doors. This kinda came about maybe six, seven years ago; I had a student say that they really didn't like my exam, and so I said, well what would you do instead? Y'know, I kinda put it back on them, and they said, well I have a professor who does it this way, and so they gave me an idea that I kind of adjusted to meet my own interests, and so for the final now, they can either take a traditional multiple choice test, or they can do, um, or for the group who's--or, students who are interested, I give them 20 essay questions in advance and then they have to come and do, um, they randomly select on of those and give a five-minute oral presentation on their response to that particular question and I grade it, and so the oral response students all have a fairly similar overall mean score to the students who take the other exam. It's usually a little bit higher, but there's some selection bias because those are students who tend to be more confident, more engaged throughout the semester; I can almost always guess who's gonna sign up for it. A lot of students like the multiple choice exam because it spreads out their risk; it's not just one response that is their final grade. So anyway, so it's another way I try to cater to different learning styles, and some students hate a written exam, but the idea of giving an oral where they can kinda try to talk their way through it is, that kind of fun.

INTERVIEWER: Oh, sweet!

INTERVIEWEE: So anyways, so I try to say okay, you get to pick which one, and they say well, can I take one and if I do poorly, can I take the other? And it's like, that's not an option, so they have to make a decision one way or another. But it's enjoyable for me. I like the oral exam. I've thought about requiring everybody to do it, but y'know, I think people value choice and options, so I give them each the option.

INTERVIEWER: And the class is listening? The class is participating, or just you?

INTERVIEWEE: So when they do the oral, those who sign up for the oral, only the person who is responding to that particular question is presenting it, and I give them a time. So they randomly draw two of the twenty essay questions and then they have to pick one of those two to respond to. And then they go back and sit down and then another person goes, and so, and once a question's used, it's pulled out of the pile, so I never take a group bigger than fifteen. Sometimes I'll do two groups (19:35) if I have that many that respond.

INTERVIEWER: That's neat!

INTERVIEWEE: And I got that from a student. So it wasn't anything that I concocted; I mean, he got it from another class, but it was, I kind of adapted it to kinda work for my class.

INTERVIEWER: Yeah, cool! So the next question I have asks what do you feel learner-centered teaching is, or how would you describe learner-centered teaching to a colleague?

INTERVIEWEE: Umm, well I think it gets away... I mean, hopefully this is the direction I'm moving, imperfectly though, is that...I think that for me, that it moves beyond like, focusing on content and more focusing on the learner and how they can be engaged and learn, rather than how can I push a bunch of content to people? So, thinking more from their perspective, how do they learn, take into account that different people learn differently, umm, and trying to reach them on those different levels and to give a variety of different kinds of activities and formats so that, trying to hit different learners where they learn the best. Y'know, some people really like working by themselves, doing more stuff online; some people really like working in groups, and some people really value, y'know, group discussion, and some people would rather watch a video of their professor, you know what I mean? So trying to get at that and thinking about, how can I provide a learning experience that allows the learner to do it at their pace and their way as much as I can, y'know, in a way that will help them to get the most out of it? I don't know if that's a good answer, but...

INTERVIEWER: Thank you. I think that's a great answer. I struggle a little bit with this question because I feel like it's the "guess what's in my head" sort of thing, sort of "what do you think it is?" Um, I feel like that was really well explained, and as we use it, we, really what you said--focusing more on what's happening for the learner rather than what the teacher's doing.

INTERVIEWEE: Yeah. There's this challenge, y'know, any time you have, y'know, take a class of 50. You have 50 completely different individuals, and sometimes there are things that they might share, but there are also lots of things that they do differently and think differently. Like, every semester, I ask, y'know, I know that they fill out the ratings on the system, but I also do like a small, informal focus group with my classes and I ask for feedback and it's always interesting to me that I get opposite feedback all the time. Like, one student will say, "I really liked this," and another student will say, "I didn't like that," and then vice versa. "I really liked it when you did this and I DIDN'T like it when..." So, part of it for me is saying okay, that's not a conflict. It's a difference in their views of how they learn, but for me then, I need to provide varied opportunities so that I can reach both of those students and try to create enough choice

so that I don't just satisfy one particular niche or kind of student. But that's difficult to kinda figure out how to spread that out, so.

INTERVIEWER: What are some of the things that make that difficult?

INTERVIEWEE: Well I think y'know, for me, like, how much time can I put into this? Y'know, I can teach two classes a semester typically, I have administrative obligations, and I have a really ambitious research, y'know, so BYU kinda straddles this fence of trying to be a really good teacher and a really good researcher, and sometimes it's hard to do both really well, so there are all these trade-offs. If I try to put more time into my teaching craft, then that's less time that I'm putting into research, and vice versa, y'know. So, always kinda figuring out this balance. So every semester I try to, rather than overhaul a class, I try to say okay, well what are two or three things I can do that I can implement the next round? And try to make these incrementally better, and sometimes I succeed and sometimes I don't and it's not any better. Y'know, and the students don't know, because I don't teach it to the same group of students, but my goal is like, every semester, is it ought to be improving, and so I ask for that feedback to try to see, y'know, what's their perspective on this learning experience. How can I make it more centered for them in the next semester so that the next wave of students can--y'know, so, I've got all kinds of ideas as well as feedback on stuff that I wanna make sure I keep doing because they really valued it, which, sometimes I didn't know if they were valued until I asked, y'know? So, anyway.

INTERVIEWER: Thank you. That's one of the things we will probably ask a little more about, is some of the challenges and the constraints, so that's interesting to hear your perspective there. What are some of the things that you see as your strengths as an educator?

INTERVIEWEE: Umm...I don't know, I think--I hope I'm open to change. Like, that I'm not really static, but hopefully I'm willing enough to say, okay, this isn't working, and to be not emotional about a particular way I teach or a particular topic or methodology enough to say okay, well if this isn't working for the students, then I gotta redo it; I gotta rethink it. So being open enough to make those changes. So I think I have a willingness to do that, so hopefully that's a strength. Y'know, I think like a lot of other educators here, like, both because I believe in it but also because I feel it. Like, I really do wanna connect with students on a personal level. I want them to have a meaningful experience; I want them to walk out of my class feeling...not just smarter, or more aware of a particular topic, but also valued as a person, and y'know, feeling like they're going in a good direction, so.

INTERVIEWER: Thank you. Are there things that you see as challenges that you face? So not so much weaknesses as an educator, but challenges that you face as an educator.

INTERVIEWEE: I do have weaknesses, too. But I think that, um...I've felt for a long time, and the center for teaching and learning helped me a little with this, but sometimes I just kinda get a little bit overwhelmed...but um, writing test questions, quiz questions are really hard. Stuff that gets beyond memorization...I always find a hard balance of writing a meaningful quiz or test question that also isn't--doesn't really become really cumbersome to grade and evaluate. Trying

to find that balance of stuff that can be meaningful from an assessment point of view, but not overwhelming from the point of view of like, how much time it takes me to work through it. So I think that's one of my biggest challenges that I'm trying to work towards getting better at. Um, other constraints are just, y'know, trying to figure out the right environment. So I experiment a lot, um, y'know between bits and pieces of online stuff, traditional classroom stuff, flipped classroom stuff, and maybe it's just turned into like, a schizophrenic experience, I don't know. But, uhh, I don't know if it's a constraint as much as I don't know that I've really arrived at what I think is the right place, but maybe I never will. Maybe that's part of what keeps it interesting for me, is just constantly changing. And I think just trying to meet--y'know, work with a very varied group of students who, some may come with a lot of background on the topics, so they come in with a maybe more sophisticated or more book-smart, so they may be bored at certain times when another might be struggling to grasp a concept that somebody else might think is really easy. Y'know, trying to create what's still a meaningful classroom experience for everybody.

INTERVIEWER: Yeah, that makes sense. Thank you. You've talked a lot about changing things every semester, and we actually do want to ask about a specific time when you decided to try something new. So a change that you made specifically, what was it, why did you want to make the change, and how did it go? What were maybe some challenges?

INTERVIEWEE: Yeah, so everything I just elaborated on the example I gave you about the final. So it came about because a student said that I wrote terrible test questions "\_\_\_\_" (28:16), y'know, a good assessment, and so, just trying to say okay, well how can I better assess learning and do it in a meaningful way? And I'm, and it gets better; really good success. Now, I don't require it of all the students, so it creates a little bit of a dichotomy. I think the students who do prepare for that one are much better off in the long run, because they're not trying to memorize information as much as they're trying to understand the concepts and then be able to talk freely about them, and so I think those students walk away, like six months later, my guess is they would've retained more of a conceptual understanding of things that the students who are preparing for that multiple choice plitz (? 29:00), so. But it's been--I still really value that agency for them to say okay, which one do I wanna do? That's probably been as big of a change as I've ever made, but I have other--I mean, there are other examples, too. I guess each semester I try to do probably two or three different things, y'know, but so, that was one of the larger ones.

INTERVIEWER: So changing, potentially, the structure, the students' experience of the final, completely change it out, did you--were you concerned at all about like, possible problem--things that could go wrong, or did that not seem like so much of a possibility?

INTERVIEWEE: No, I don't worry as much about failure, I guess, and I also felt a little bit protected in the sense that I was giving them choice. And I tried to be really clear about each option, describe it really clearly, and say, "Which one fits you best? Don't feel bad if you see other people raising your hand for this; what's gonna be best for you learning style and approach?" And so, I've had really good feedback from it. I don't worry as much about failure in the classroom, I guess, but I haven't ever made like a complete wholesale change that's maybe

been more risky. I don't know, but I've switched from--I haven't always had this kind of discussion and then lab format. I was doing it in another class and then I thought, well, it was working really well in this other class. It was much more of a nuts and bolts skills-oriented class, and I thought, well why can't I apply it in this class? And so I did make that change and more recently, it's gone fine, so I don't know. I don't probably have a picture of myself as being such a great teacher that I--that stumbling would be really hurtful. Stumbling for me is part of the process of getting better at it, y'know?

INTERVIEWER: Thank you. Um, next question is about barriers, which you mentioned a little bit earlier, but what barriers would you say keep you from learning, using more learner-centered approaches, and then also, what do you feel like would enable you to use more of those?

INTERVIEWEE: Yeah, I think the biggest barrier for me is time, which is why I really try to focus on incremental changes, but it's also the reason why I signed up for this. I get to force myself--and that's the reason why I volunteered at the center for teaching and learning in the past, is because in trying to make those commitment, then it kinda forces me to schedule time for those things. Otherwise, it's not gonna happen; I'm just gonna teach largely the way I did the previous semester, I'm gonna work on my research, which is really demanding. So I think time is the biggest barrier.

INTERVIEWER: That definitely makes sense.

INTERVIEWEE: Because it's not BYU, y'know, BYU is really...provides tons of resources and support and like I said, the center for teaching and learning, so it's not a matter of those things. But y'know, if I could just say, y'know, hey, if somebody else could just take care of all these other things and I could focus on making this class better, that would be great, but it just doesn't work that way.

INTERVIEWER: Just need more hours in a day.

INTERVIEWEE: Yes, exactly.

INTERVIEWER: What changes would you or do you hope to make in your teaching, if any?

INTERVIEWEE: I think I'd like to get feedback on this newer model that I'm using with a lab day, y'know, and also maybe experimenting with some more--pushing some more material online, um, and to create some learning that they can do on their own. Obviously, they have reading, but maybe getting a little bit beyond reading to other tasks that they could do outside of class that would be applied and meaningful to kinda round out their learning experience.

INTERVIEWER: That's interesting! Do you have any ideas about what that would look like?

INTERVIEWEE: Well, I do some online modules, but they're still largely just kinda like, content, and then they have some quizzes and assessments that are built into them, but I don't



know...One thing I've never done but that other professors have done with like, online dialogue and things like that, and so I've thought about that, but I've never really done the lifting to get it up and off the ground, and I've had feedback from some students at least that are like, "Ah, I'll just go in and post because I have to," but you could say that about reading, too. I read because I have to. So that's not necessarily a reason not to do it, but I haven't really figured out how I would make it work, but I'd like to, y'know, kinda with my philosophy, I'd like to still continue to search and find meaningful, alternative ways for people to learn and to understand and apply the things that they're learning, so very open to the feedback for how to make it even better.

INTERVIEWER: Cool! Thank you. Could you tell me a little bit about the teaching culture in your department and maybe what some of the expectations for teaching are?

INTERVIEWEE: Yeah, that's a good question. I've never really thought of a teaching culture; I think people here are generally good teachers, I think a lot are still fairly traditional, pushing a lot of information, tests that are largely regurgitation...There's some people that are more innovative than others from my perspective, but the main thing that we get as far as faculty discussions is just to make sure GPAs are in a certain range and that you get good student ratings. I mean, that's kinda it; there's not a lot of other discussion about it. We talk more about our research than we do about teaching. Not that we don't value teaching, but it's kinda like, well, the system's kind of in place; these are your expectations, a little more straightforward.

INTERVIEWER: So there's not a lot of sharing of ideas? Like, here's what's going on in my class, here's what's working now

INTERVIEWEE: Not really, but some of that happens a little bit organically. People are teaching the same class but different sections, but my [REDACTED], I'm the only person that teaches it, so it's not...I don't really have an option of doing that. But we do do peer reviews, and so that can be helpful, y'know, you get feedback. Or doing a peer review for somebody else and giving them feedback, I think always causes at least some self assessment. Like, well, do I even do this better than they do? Because you tend to do people more junior than you and then you give them feedback on how to improve their course. So I think there's always some self-reflection in that process that's helpful.

INTERVIEWER: And you said GPA, student ratings...are there any other expectations, per se, associated with teaching?

INTERVIEWEE: Not really, "\_\_\_" (36:02)

INTERVIEWER: How confident are you in your abilities to use learner-centered strategies like we were talking about?

INTERVIEWEE: Yeah, so I mean, I experiment a lot with it. I think some things are working well, but I'm probably too much of a gut implementer, y'know? It's not like I went to some 3-day seminar and learned how to be a better teacher and then I'm applying all of it. It's just more kind

of like, well this makes sense to me to do it differently. This to me means more learner-centered, but y'know, you or somebody else who actually knows how to teach or who has instruction and training might say, "You're a complete idiot; this doesn't work." I'm not saying you would, but y'know, like, most of mine, I can't say...it's more kinda like my common sense playbook and like just trying to be really observant of students, saying okay, this is working, and this isn't, so I need to make a change here rather than having more sophisticated or professional, y'know, "\_\_\_" (37:04) supply to it, so. I mean, that's one of the reasons why I signed up for this, is to get feedback on how to get better.

INTERVIEWER: Well it sounds like you've been going--like, using a lot of resources, so...

INTERVIEWEE: Well, I try, but I think it's haphazard, y'know, which is probably what a lot of faculty do, y'know, as they're figuring it out.

INTERVIEWER: Are there any factors outside of your control that you feel influence your ability to use learner-centered teaching?

INTERVIEWEE: I think the only--the big factor, like I said, is time, and it's hard to say how much time is in my control versus and expectation, y'know. I can certainly rework things and prioritize this at a different place, but then I would, like I said, there are trade-offs. So, no, I feel really supported. I don't feel like there's a lot of other constraining factors. I think BYU gives us some bandwidth to kinda play with this how think makes sense, so. Unless I create a fire, y'know.

INTERVIEWER: Awesome. Thanks. Our last couple things just have to do with the STEMfi experience. So are there things that you're excited about? What things are you hoping to gain from the experience?

INTERVIEWEE: Yeah, everything that I've talked about up to this point; getting feedback from people who know more about good pedagoge, maybe taking things that hopefully are heading in a right direction but making them better. Part of it, like I said, is just knowing that if I commit to doing this, then I'll commit to some focused time on this class, so I'm looking forward to that.

INTERVIEWER: Anything else?

INTERVIEWEE: Not really.

INTERVIEWER: Okay. That's perfect. Are there anything...things that you're worried about in participating?

INTERVIEWEE: No, not really. Yeah. I mean, how much mountain biking I'll do that week? I mean, it is spring term.

INTERVIEWER: That's a good point! Is there anything else we can do to help you have a successful experience?

INTERVIEWEE: Uhh well, I don't know. Like, I don't know how it's gonna go, so y'know, I mean, if the things that I mentioned, my aspirations are met, then I'll be really excited, so.

INTERVIEWER: Great. Well, I can tell you we're planning on just "\_\_\_" (39:27) talking about how the workshop will be structured and the schedule and stuff. There'll be different strategies introduced in the morning, then afternoon will mostly be work time so you'll have time to plan, plan out how you want things to go in your class.

INTERVIEWEE: Oh, okay cool. Is it May? I can't remember the week.

INTERVIEWER: Yes. It's like, May I think around the 18th.