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**PROFESSOR:** And before we get into the topic, which is educational teaching with educational technology, I just want to go back to some of the previous assignments, a little bit of logistics, et cetera. So you should have feedback on all the assignments that you can be given feedback on.

The assignment where you gave a presentation to a friend, I can't really give you feedback on. I looked over it. You all made nice observations, good pointed observations, and I hope that you can see how-- and I think I made this comment on the wiki-- that you can see how just your presence, and the choice of words that you make, can have a big effect. And that was the whole point of that assignment. So that's my feedback on that assignment.

The previous one, the last one that I feel like I can give you substantive feedback on is the active learning, how to incorporate active learning. As I mentioned last time, you guys did such a great job of incorporating active learning in the first time you'd submitted that, where it was just creating a course outline, that there wasn't a lot extra to add. But I added comments whenever possible.

One thing that I commented on at least two people's homework, the one about active learning, was the idea-- you mentioned you doing demos. So there's a very interesting piece of work out of Eric Mazur's group at Harvard about the use of demos. And that paper is called "The Crouch and Mazur Paper." And it's a optional reading in, I believe, it's the active learning session. So this is the active learning class, which is class 5, right? Am I right about that? Or it was 6?

**AUDIENCE:** It was 6.

**PROFESSOR:** 6?

**AUDIENCE:** Yes, 6.

**PROFESSOR:** 6.

**AUDIENCE:** [INAUDIBLE]

**PROFESSOR:** Oh, OK. So it's 5. Yeah, so that's a really interesting paper. Because I think sometimes we say, oh, I'm going to do a demo. Apriori, a demo isn't active. I mean, it's active for you. You're

doing the demo. But it's not necessarily active for students. And if we enter into the enterprise of doing a demo thinking we're being-- well, thinking they're being active-- they might not be.

And Croutch and Mazur did an interesting study where they looked at-- they were doing a freshmen mechanics class. And they had amasses on an air track, when you have like a massive  $2M$ , and you slam into it with a mass of  $M$ . What happens to the mass of  $2M$ ? What happens to this mass of  $M$  that was coming in, that kind of stuff.

And so that it would show the students these demos. Oh, look what happens. Here comes a mass of  $M$  at a velocity, da, da, da. And then when they asked students in the same class at the end of the same class period to say what happens when a mass of  $M$  collides with a mass of  $2M$ , a mass of  $M$  going  $x$  miles an hour collides with the mass  $2M$ , what happens, students got it wrong. They had just seen the demo. They had just seen the demo. And they still got it wrong.

And I think that's a really profound finding. Because as experts, we think, of course, they're going to see this. It's going to be emblazoned into their brain. They'll never forget it. But they never learn it, basically. So it's more evidence for active learning for sure.

But what they found out was they forced students to make a prediction, to discuss that prediction with somebody else before they saw the demo. And when they did that, the scores on these sort of post-demo quizzes, if you will, went way up. So it's a small tweak, but it's a profound one. Because you might really just be wasting your time if you show a lot of demos and you don't ask students to make these predictions beforehand.

This goes back to the mathematician George Polya, who wrote in the '50s about asking people to make predictions before you gave them the answer. I'm not sure he had any data for it. But this was his thing.

This is pretty good data suggesting that you really should ask students to make predictions before showing the demo. So a couple people brought that up. And I wanted to make sure everybody heard that. OK? If you can't find this reference, let me know. It might be hiding somewhere else. I'm pretty sure it's in this-- it is? OK.

OK, so that was that. But overall, a great job on that assignment. And then I briefly looked over the assignment it was due today or whenever creating prompts at various levels of Bloom's Taxonomy or a taxonomy of your choosing. Again, I thought you did a great job. I'd like to hear

a little bit of reactions to that assignment. Was it difficult? Was it easy? Do you see how it could be useful? Does it seem like a waste of time?

**AUDIENCE:** I think it was very, very useful. Yeah, it lets you see what the students will go to when you [INAUDIBLE]. Otherwise, because it's like you are solving too. So you kind of feel and see what level to take them to. It's very good.

**PROFESSOR:** Great.

**AUDIENCE:** Otherwise, you don't know. You just [INAUDIBLE]. And then you don't know how [INAUDIBLE]

**PROFESSOR:** Exactly. And I mean, it's happened to me when I first started teaching intro materials. [INAUDIBLE] was like, OK, they'll calculate the stress on this plane, and blah, blah, blah. And you're like, well, why are they doing that? What is that getting them? And it's just this reality check for you, so that you don't go off into the weeds sort of. So, yeah, [INAUDIBLE]?

**AUDIENCE:** I think [INAUDIBLE] most of very good question that [INAUDIBLE] They're [? setting ?] very good questions and [INAUDIBLE] more than just one, [INAUDIBLE] three at the same time. So I think it's really very good. It's a good experience.

**PROFESSOR:** Right. And also to make sure you're aware of that, and then also decide, well, if they don't remember the value of the universal gas constant in these units, but they do the apply part fine, they just use the-- so it's important, we always have to think about that when we grade questions. But I think by parsing it out like that, it makes you more cognizant of those issues that might come up, in terms of how the students respond to the question.

**AUDIENCE:** I thought it was actually difficult to make a question that only satisfied one of-- like applied [INAUDIBLE] Because everything I was asking [INAUDIBLE] to try to apply, was also analyzed. Because I tried to-- I guess i could have just made one that did both. But I was sitting and I was like, no, OK, not this one. But really, I almost left it blank and said, I'm stuck. I finally come with something that I think just answered the [INAUDIBLE]. But it was interesting to think about.

**PROFESSOR:** Right, right. And you know, in real life, you don't have to just have one. You can embed them together, but you know, recall and apply, or whatever. And I think for some topics, it might be easier to add to silo-ize it a little bit. Given the data, construct a whatever, so that's more of an apply. But there may be classes of subjects where you can't really do that quite the same way. Other reactions?

**AUDIENCE:** I was also thinking of it in terms of grading. Like if you have a rubric or you have assigning the number of points based on which level you were asking. Like as opposed to say, OK, five points for each question, to say, OK, you get one point for the remembering and then you get 10 points for the creative.

**PROFESSOR:** Right. Right. I would be careful-- I mean, I think that's a fine idea. I would be careful to make sure that students know that, so they don't kill themselves memorizing pi out to 25 digits or something, right? So if you do have these sort of, this is what I think is important, you'll need to specify that. I mean, and a rubric could incorporate that for sure. But you do want to make sure students know what your logic is.

**AUDIENCE:** I think also there are some questions you said that you give the formulas to the equation. Just to make sure that the student [INAUDIBLE]

**PROFESSOR:** Yes, yes. Right. And in most classes, that's totally reasonable. You know the joke I make about it's rare to real life that somebody comes in and says, I need this answer right now! Don't look up anything. I mean, it's kind of a weird pretense. So it's usually reasonable to just put the equations at the bottom, or write it in the problem statement. Anything else on that?

OK, so today we're going to talk about teaching with educational technology. I had written on the website to bring a web-enabled device. If you didn't, I have an extra laptop. And we can share. It's shouldn't be a problem.

As part of this, I hope that you'll be able to identify appropriate educational technologies to advance an intended learning outcome. And I want to get back to that in just a second. And maybe describe best practices and potential pitfalls of particular educational technology, so somewhat modest goals.

I think it's a really interesting thing to think about technology-- and I didn't make this up. I heard this at a conference. So they said, when you walk into Home Depot or one of these big home improvement stores, if you happen to be blessed by having an employee come up to you-- because sometimes it's hard to find an employee in those stores-- what do they ask you?

**AUDIENCE:** Is everything OK? Is there anything I can help you with today?

**PROFESSOR:** Right. OK, is there anything I can help you with? If and you say, yeah. Yeah, you can. And

then they say? Usually, it's, what are you working on? What are you trying to do? They don't say, what tool do you want? I mean, they might. But if they're good, they don't.

And I think that's a word the wise when we think about educational technology. It's not, what looks really cool and fun, and what tool do I want? It's, what am I trying to build? What do I want my students to build? What am I trying to build? What am I trying to accomplish? And then I can step back and say, which of these technologies is going to help me do it?

And it's easy to get wrapped up-- I mean, we're all kind of techie, geeky. I mean that is a compliment. But it's kind of fun. Like, oh, cool, look what this can you. And then we go walking around looking for something to do with it.

And that might be OK, but you have to check your assumption. You have to check your assumptions about why you're doing it. Are you doing it just to be cool? Or are you doing it because it's really going to help student learning, or it's going to help advance the learning outcome?

We can use educational technology as some kind of a scapegoat, but that's true for anything. It's true for that amazing exam question that you thought up in the shower. Like, I know what I'll do. They'll do this, and do that, and blah, blah. Maybe it's cool, but maybe it's not going to get you anywhere. Maybe it's not consistent with your learning outcomes.

So it doesn't have to be technology. But often, technology is kind of pretty shiny. And we tend to gravitate toward it. But it's remembering that we're using it to advance some particular learning outcome, OK?

So you guys did the readings. What are educational technologies? What does it mean? Can we come up with a definition?

**AUDIENCE:** Yeah. I think from what I can understand, educational technology is a tool which, perhaps, the student and also have the teacher. So that means something that can enable inter-communication between the teacher and the student. And then the student and the student.

**PROFESSOR:** OK, so we have a lot of ideas in that statement. So it's a tool. You said, it enables communication.

**AUDIENCE:** Yeah, students connect. And then the teacher [INAUDIBLE].

**PROFESSOR:** And I think you had something else in there. Did you? Or no? Somebody else? [INAUDIBLE]?

**AUDIENCE:** Education technology is like a tool to enhance students' learning-- enhancement of student's learning. And enhancement of instructors' teaching as well.

**AUDIENCE:** The technology part is like a electronic device.

**PROFESSOR:** So it has to have electricity? It has to involve electrons? No, that's everything. Wait, let's let Michelle-- what should we say about that?

**AUDIENCE:** I think that's kind of correct to say it has to be an electronic device, right? Like if it's a clicker or if it's a--

[INTERPOSING VOICES].

**PROFESSOR:** It must be electronic. That sounds so like 1950s. I think we had-- yeah, Gordon?

**AUDIENCE:** I would just adjust it a little bit and add in front of the two [INAUDIBLE].

**AUDIENCE:** A kind of tool that's created [INAUDIBLE] by time or place.

**PROFESSOR:** So it lends itself to asynchronicity?

**AUDIENCE:** Yes, something like that.

**PROFESSOR:** Most-- Anything else?

**AUDIENCE:** I think it's also enhancer, easier use of materials.

**PROFESSOR:** Facilitates--

**AUDIENCE:** Yeah, materials like. It has to [INAUDIBLE].

**PROFESSOR:** Right, a distribution, aids distribution?

**AUDIENCE:** [INAUDIBLE]

**PROFESSOR:** Did I hear something else?

**AUDIENCE:** [INAUDIBLE]

**PROFESSOR:** Efficient, that's a loaded word. Anybody have anything else? Or does somebody want to make

a comment on this collection of attributes?

**AUDIENCE:** [INAUDIBLE].

**PROFESSOR:** I don't think I have any cynics in this-- well, the cynics haven't said anything.

**AUDIENCE:** I think all the comments are positive things. Like if you're doing it well what should happen. But they aren't necessarily what actually happens. Because most of the time, it's probably not done well. Using technology is not optimal.

**PROFESSOR:** OK, that's one observation. It's sort of, you know, that rhyme, there was a little girl who had a little curl right in the middle her forehead. And when she was good, she was very, very good. And when she was bad, she was horrid. So it's a little bit like this, right?

When it's good, it's very, very good. And when it's bad, maybe it's even worse than if you hadn't bothered. But-- Alex, you had something to say? No?

**AUDIENCE:** Well, on the side of the cynics, I thought that students are often disinterested when they don't see the point, or don't see them using it later. It's not necessarily a definition of it.

**PROFESSOR:** Right, right. No, but that's a very good point. And somebody had quoted this idea of an app, that if an app doesn't load in something like seven seconds, people stop using it. Like if you try to get an app to open on your phone, and you're like, what's going on here? Come on, 1, 2, 3, 4-- OK, forget it.

And that's a similar idea, that if it doesn't look like it's going to help you-- and whatever that means, help, it's self-defined, help. But if it doesn't look like it's going to help you, you're not going to buy into it. Some other thoughts about this list?

Personally, I don't think that to be an educational technology it has meet all these criteria at once. That's an important thing to note, that it might improve productivity. The old school learning management systems that you put up problem sets, and you put up-- the grade book was in one place, and that kind of thing. That might help your productivity. You're not looking around for stuff. But it's not necessarily promoting learning at any level. It's a delivery system, a materials delivery system.

So it kind of does this. And it does this. But it might not really be part of the learning enterprise. It's a store. It's a repository. And that's fine. There's nothing wrong with that. But that's one

type.

If you're saying that it enables communication, well, that might be part of this. But it might be something else. If I say, all right, it's a wiki. And I want you guys to read what everybody else wrote, and to make a comment on at least one other persons' posting, well, I have facilitated communication between you in an asynchronous way. I didn't tell everybody to do it at noon on the 29th of October. But it does facilitate communication.

I think this one is a loaded one, for sure. And it gets to Michelle's comment about if you did it right, it would do that. But if you did it wrong, it's likely to not do that at all. So these are attributes that you could use to describe some educational technologies. I do have a definition from the reading book. But before I put that up, any other thing you want to add? It's interesting to think about it, like does it have to be electronic?

So I have had classes in the past where people argue, OK, well, a blackboard is an educational technology. I mean, you could do that without some sort of human-made product. And without it, I would have to be walking around speaking very slowly and hoping you took notes, or walking around with-- I don't know-- a piece of paper that I wrote on, and sharing it with you or something. So a blackboard does fit a lot of these categories, right?

It's an efficient delivery system. At some level, it enables communication. It's a distribution of learning materials. So we want to think about whether it means it has to be electronic. And you may have guessed by now, there is not a single definition, so that's the other issue.

Comments? Yes, go ahead.

**AUDIENCE:** Just a comment. What about if it's not well-moderated [INAUDIBLE]?

**PROFESSOR:** Yeah, that's the efficient one, that we've all gotten sucked into websites, or sucked into, perhaps, an online discussion, or commenting on something. And it might be interesting. You might learn. But it may not be efficient at all.

Or you might just be on the screed end of things, where people are just either ranting or they're reinforcing misconceptions or whatever. So yeah, you do have to kind of make sure people are using it carefully. But that's true for virtually anything you do. Any other comments?

**AUDIENCE:** And I think, as well, that the fact that these tools are valuable. A student can decide to stay home in the bad weather since he knows this is available. Then he can go [INAUDIBLE]. That could be good and bad. Because the student would continue to learn on his own and become



a good student. And then he could miss out on some critical points as well.

**PROFESSOR:** Right, right. But that implies some sort of like web-housed delivered repository of content, or of video lectures, or whatever. You could have a course that used clickers, let's say, that didn't even have a website, but they used clickers. So that course might be using educational technology, maybe in a very, very good way in the classroom, but they don't even bother with a website. So in that case, the student has to come to class if they want to experience that particular use of technology.

I think you're right, that if you do have a website, or you do have lectures online, or you do have rich content online, then it does sort of, perhaps, make being in the classroom a little bit less necessary. I will say, if you employ active learning methods in class, group discussions, et cetera, that being in the classroom is, certainly, I would argue, is value added for the student. So it's not a replacement experience, but it might be better than nothing, let's say. It might not. Yes, Gordon.

**AUDIENCE:** I found something written very interesting when it said that if you use clickers-- I would love to do that. To take attendance of the students, that it might [INAUDIBLE] the students from using technology. But it's only [INAUDIBLE]. It might actually be good to have technology they can use non-evasively to find out if the student is actually coming to your class.

**AUDIENCE:** What if they gave their clicker to their friend?

**PROFESSOR:** Yeah, it's true.

**AUDIENCE:** One person will come with five friend's clickers, the clicker won't--

**AUDIENCE:** If you have like RFIB technology or something like that that can use to [INAUDIBLE] come to the class to know that, OK, this person is the one using [INAUDIBLE]

[INTERPOSING VOICES]

[INAUDIBLE]

**AUDIENCE:** So in certain courses you have to do that.

**AUDIENCE:** Yeah, you must do that.

**AUDIENCE:** You have to show up?

**AUDIENCE:** Yeah, you should show up. But if you decide it's difficult to take attendance, and if you have this wonderful way of getting the students to [INAUDIBLE].

**AUDIENCE:** [INAUDIBLE]

**PROFESSOR:** Well, I don't know if there's an answer to that. For some students, it's never a problem. For some students, it's awesome. For some students, it's just more information. And it's just another path. And they're learning. And they're learning. And they're learning. And it's supplementing what they're learning in the class. It kind of depends on--

**AUDIENCE:** Taking attendance that Gordon is talking about, so is it [INAUDIBLE]?

**PROFESSOR:** Well, yeah. And actually that's an important point is that I think I showed these slides about clicker use in 511 1. I showed when we did active learning. And the first year they used them, they used them more or less to take attendance. And students figured that out pretty quickly. They did all sorts of things, sharing clickers, clicking and then leaving, or coming in at the end and clicking, but not being there the whole time.

And if you ask students, well, what did you think about the clickers, they're like, fu. This is crappy. This didn't help me. This is terrible. And probably it didn't. There's an attitudinal thing that says at some point, if you think it's not helping, it's not helping.

So the next year, they made it a point to really incorporate it into the class, to ask good questions, rich questions, questions that had interesting and informative distractors. So the wrong answers told the instructors what the problems and misconceptions were. And this was made clear to the students.

And in that way, if you ask students what they thought about the clickers, they were not at all resentful of the use of clickers. And they did not see them as a way of just taking attendance. They didn't think they were sort of baby or whatever. And they were therefore more effective. [? Rachel, ?] you had a comment.

**AUDIENCE:** Yeah, I was just going to say going to 802.

**PROFESSOR:** That's the E and M, Electricity and Magnetism freshman year.

**AUDIENCE:** The class I took it in [INAUDIBLE] So we did all the online [? courseware ?] and then the idea was that you come to class and you just learn for two hours from the teacher using group

discussions, and all these other things. And it was one of the worst classes I've ever [INAUDIBLE].

Because the professor wasn't prepared to do these two hour discussions, like group discussions, and group work, and all these different things that you could tell he wasn't used to doing. And it was just a giant mess. So I think they're really useful tools. But they also require the professor to really put something into it for the students to get something out of it.

**PROFESSOR:**

Right, right. And that's a consideration. For some things, you can adopt them. There's kind of a low bar for adoption and a low bar for solid use, maybe not innovative, maybe not groundbreaking, but a solid pedagogical use. For others, if you're going to use them effectively in the classroom, you're going to have to spend some time engaging with the technology, making sure you understand it, making sure you understand what you can do with it. Otherwise, it's not going to work.

A couple stories, one is the idea of-- well, maybe I'll hold that one. I'll hold that one. I'll bring it up later. Remind me. Any other comments about this?

So this is a definition that I got, I think from one of the [? reasons, ?] so technological processes and resources that are used, created, or managed for learning and/or improving performance. So that's crazy broad. And then in that definition, there's this technological, which gets around the electronic, but brings back the idea of well, a blackboard is probably a technology at some level, or at least it was at some point.

So it's admittedly an incredibly difficult concept to pin down. And maybe at some point, you don't necessarily have to. You have to decide which slice of it you want to deal with. And so the other important thing is that it's-- and it doesn't have to be, but it can be-- an integral part. Or it should be well-integrated within the course, and or it could be a supplemental learning aid. So it could be a way of delivering content outside of class, or the idea of an enrichment of the material. And it could be something like hardware, really just like hardware.

I'm going to come back to how we chop this up in just a second. Remember that we don't want to do any thing-- this is the idea about walking into Home Depot. We don't want to do anything without thinking first about our intended learning outcomes. What intended learning outcome is the technology going to advance, not, what am I going to do with this technology?

And so in terms of categorization, this is something that I came up with just after grappling with

things. So this is just my thing. And we're going to talk more about different ways to think about it. So this is just one slice of it.

You could think about technologies that you use in the classroom, so that would be clickers, that would be using some sort of projection system, using a smart board, using some sort of simulations that you show students, et cetera, like virtual demos. It could be a way for students to engage with the content and with other students outside of the classroom. So it could be some sort of a wiki, some other collaboration tool, and/or it could be something that delivers the content to the student outside of class.

And there may be an overlap. You may show a simulation in class, and then decide students should have access to it outside of class. So they're not mutually exclusive. And so the engagement with the content can include these collaboration tools, extra materials, content enrichment materials.

And then the third one might be student assignments. So the idea, maybe you're going to say to students, OK, I want you to create a website for a company that you're going to create, and this parameters. And you want to make sure you're explicit about what the company sells, and how you deal with customers, or whatever. The assignment involves the technology. Go out and make an audio recording of people using a particular technology. Or if you're going to design something for use in some community, interview the people in the community, and submit this audio recording.

So it could be that technology could be used in the student assignments. And you could back that all the way up to online problems as they use in MITx. And then for assessment and feedback, the idea that you can either use clicker questions, which would be for the formative feedback. Or you can use it as some sort of an online quiz, or some other way of giving feedback to the students. So that gets to the summative and the formative idea.

And then the idea of just using a learning management system, just to administrate the course. That's one slice. There's another couple other very interesting ways to slice this up. And I have a handout here, because these are woefully tiny, these schematics. So if you just take one and pass it along.

One is called the SECTIONS framework. And the other is called the backward Ed Tech Tool Flowchart. So these are different. These are not mine. And these are different ways of thinking about technology.

So the first one is this Ed Tech chart. And I know you can't read that here. So that's why you have the handout. And I like it, because it kind of starts with the activity that you want students to use. So it starts with this, what do you want students to do? And that's what the purple box are, the student tasks.

And then it kind of creates these sort of guiding questions that sort of reroute you. And then it gives you a suggestion for a tech tool. So I'm going to give you a few minutes just to parse that, just to engage with it a little bit.

**AUDIENCE:** It's very beautiful.

**PROFESSOR:** I like this one. I like this one. I think it's very useful. Any other comments or thoughts about it? Yeah, Gordon?

**AUDIENCE:** I think it's [INAUDIBLE].

**PROFESSOR:** OK, Gordon doesn't get it. Somebody want to-- maybe nobody gets it. But do you want to explain it a little bit? Out loud, David, please.

**AUDIENCE:** Yeah, [INAUDIBLE].

**PROFESSOR:** But can you explain to everybody?

**AUDIENCE:** [INAUDIBLE]

**PROFESSOR:** Oh, sure.

**AUDIENCE:** OK, [INAUDIBLE]

**PROFESSOR:** It's certainly not exclusive. I mean, it doesn't have everything on here. But it kind of gives you, I think, a way of thinking about, OK, I start with what I want students to do, which most of us have a pretty good handle on. And then it helps you just think backwards to the technology. [INAUDIBLE]?

**AUDIENCE:** Yes, I just want to add that it's only about what you want to do, and how can you did it.

**PROFESSOR:** Yes.

**AUDIENCE:** That's what it's all about. And secondly, [INAUDIBLE] but what you want them to do, and how

do you have them doing it, that's what [INAUDIBLE].

**PROFESSOR:** Yeah, Yeah. No, it is great. Other thoughts? And yeah, we'll get to get back to the idea of the taxonomy shortly. Other thoughts? Let's see, there's a second one, which is on the other side of your handout. And so these are just-- I know you can't see this. That's why you have the handout.

These are just ideas. Again, there's no rules really. But depending on what you're trying to do, it just may help you start to think about how to get the right tool for the job. So it's called sections, because each of those boxes with the red outline, S-E-C-T-I-O-N-S. The S is student characteristics. The E is ease of use. C is cost, teaching and learning, interaction to promote active learning, organization, novelty, and speed.

And this chart, I think-- I'm going to let you engage with it for just a minute. But it brings up the idea of the learning curve for the instructor, which you don't want to lose sight of, that you want to factor that into your choices about what technologies to use. So again, I'm going to shut up for a minute or so, so you can look at this.

**AUDIENCE:** [INAUDIBLE].

**PROFESSOR:** Right, right. But what's the difference between this one-- I mean, there's many differences, obviously. But what's kind of a utility difference?

**AUDIENCE:** One's a flow chart that points you to the answer. So it asks the yes or no questions. The other just gives you the-- then you have to select from a-- it doesn't guide you directly.

**PROFESSOR:** Right. Exactly. It kind of helps you think about it. Oh, my gosh, I have no money. So that's certainly going to rule out a whole set of options for you. But it doesn't say, oh, you have no money, think about these. It's not a flowchart. It doesn't point you to an end result. But if you went through this exercise and answered these questions, I think you'd be in a better place, with respect to choosing the particular technology. Gordon?

**AUDIENCE:** Yeah, also I think that second one is not [INAUDIBLE] if you want to use technology and you have the money, [INAUDIBLE] the things you can think about. Because if you don't think of everything [INAUDIBLE]

**PROFESSOR:** Right. It's some things to just keep in your head when you're making these choices. It's not necessarily a formalism for making a choice. So one other slice of all this technology is kind of

a classic, I would say classic, model, which is called the SAMR model, S-A-M-R.

I know I'm throwing a lot of models at you. But you have to kind of find the slice that works for you. The SAMR model, I think, is very useful to keep in mind when you're deciding why you're gravitating to a particular technology. And it's this idea of, is the technology just a substitution?

So back in the day, when everybody said, oh, courses need web pages. You have to have a course web page. Well, what was the course web page? It was an electronic version of your syllabus, basically. It had the name of the course. It had some picture. And then there was a link. And you could click on it, and the students got the syllabus. They got a text version of the syllabus, a soft copy of the syllabus. But then they printed it out and brought to class. So it was a one-to-one substitution.

Instead of seeing the syllabus in a piece of paper, they see it online. It was complete substitution. It didn't do anything extra, except maybe made it a little easier for students not to lose the syllabus. But it didn't really have any functional difference.

Then the next level-- that's the S. The A is that there's an augmentation. So there's a substitute, but with a little bit of an improvement. So maybe students could hand the homework in online. They're still handing homework in. They're still probably writing their homework out, scanning it, and handing it in. But it's a little easier. It's a little bit easier. Maybe you don't lose their homework, that kind of thing. So that's the augmentation.

The next level will be a modification, so some sort of serious redesign of a task that you couldn't do before that technology. And then the final would be it just redefines the tasks that you do, the tasks that students do, in a way that's completely different. So I'm going to ask you to think about that for your own courses in about two minutes.

There's a little bit of a schematic here that might help. These are sort a little bit baby. But the idea of substitution, so the idea of using a word processor instead of a typewriter, that was a substitutional technology. So then augmentation, you get spell check. Once you're in a computer, you get to have spell check, and formatting, and cutting and pasting. And that's different than what you can do on a typewriter.

And then so modification, well, there was like an email, or you could put graphs and images right into the document. It changed sort of the way we viewed a whole document. And then the idea of having hypertext, or some sort of a web page that students navigated in a nonlinear, or

a non-prescribed way, that would be the redefinition, let's say. So that's some sort of baby examples of that.

And then this next one, which is pretty fun, is there's this woman, Kathy Schrock. And if you Google Kathy Schrock, she comes up. She's got a ton of stuff. And this to get back to Bloom's Taxonomy there, is that she's taking Bloom's Taxonomy, remember, understand, apply, analyze, evaluate, create, and then she said, OK, well, here's some apps that can facilitate those things, facilitate the act of remembering, or facilitate the act of evaluating, or creating.

So it's not mutually exclusive. It's not exhaustive. But it is important to remember that some of these tools are supporting remembering, or they're supporting some other level, understanding. But they're not necessarily at the highest level. Or they're not at the lowest level. It's good to be aware of that.

Before I charge you with your assignment, I did want to demo a few other technologies, just so you can take a look at them. And there was that list in the reading, which I hope you checked out. I invited you to this-- well, I thought I invited you to-- oh, wait a minute. Huh. Hang on. Well, let's just start up a new one.

So I can create this picture here. And I can share this, then, with you. And I can invite the board. And so this is the link. And if you have a device and want to log in there, you can check it out. And then you can write on it.

Oh, somebody wrote on it. Somebody erased my picture. I don't know who that was. Oh.

**AUDIENCE:** Is that a [INAUDIBLE]?

**PROFESSOR:** U-Q-P-L.

**AUDIENCE:** So that's different from the link that was in the wiki.

**PROFESSOR:** I know. I just created a new one, because I didn't want to go look for the wiki link.

**AUDIENCE:** But this is free?

**PROFESSOR:** This is free, yeah. So we're working a little backwards here. I'm showing you the tool. And now I'm asking you what you might want to do with it, which is not necessarily best practice. But I have a use that I-- you can change the color. This pen here changes the color. No, something changes the color. Maybe not. Oh, somebody got blue.



When I taught thermodynamics, we would often do sketches. I'd say, OK, sketch the Gibbs free energy versus temperature, or Gibbs free energy versus pressure. Tell me what the first derivative of  $g$ , with respect to  $t$ , is, things like that. Sketch the slope, sketch the curvature, et cetera. And so this kind of application is you could have students log in, do that kind of a sketch. And then people can evaluate it.

It's anonymous, you can see. I can't tell who said what it, except David, who wrote his name. But I can't see who did what, so that it could work pretty well in a small class. If you had a class of 400 people, I'd be afraid. I'd be very afraid. But in a small class, you can come up with some interesting uses of it.

The good thing about it is that you don't have students coming up to the board. It minimizes that motion, the sort of getting everybody unsettled and settled again. It's not a cure. I wouldn't say this redefines anything. In terms of the SAMR model, I'd say it's probably a modification, maybe an augmentation, maybe. I don't know. But it's certainly not and R. So I wanted to just demo that, because it's kind of fun.

The other thing I wanted to do is, I think you guys saw this list? Did you see this list from the readings? This is just some things that I've compiled. It's kind of a mishmash. But there's some interesting things on here that you might want to explore, depending on your learning outcomes. And we've used Backchannel. Today's meet is pretty similar to Backchannel. Backchannel chat is pretty similar Backchannel. So those are some things that are pretty similar.

We just looked at the web app. We've used Plickers. We've talked about Socrative, which is just a cell phone-based clicker. But there's a lot of interesting uses. And you might want to just play around with them. And I'll augment this list. So if you click it again from the wiki, you'll get a augmented list of things, a few things I want to add to it.

So now, given your experience in life, and the readings, et cetera, is that I'd like for you to think about a technology that you haven't used for-- actually, what you want to first is think about a learning outcome. But you want to think about a learning outcome. You want to think about a technology that might advance that learning outcome.

And then just jot down why you chose this technology, where does it fit in the SAMR model, how you would use it in your class, any kind of difficulties. And then there's a Google doc. I'm

pretty sure everybody can access it. We can only hope.

And if you can type your responses into that. So we can give you about five, seven minutes for that activity. And then we're going to do a lightning round based on it. So use whatever. Use the handouts. Use your knowledge, use, et cetera. And then somebody can tell me really quickly if they can get into the Google doc.

Yeah, you guys are good. I was going to say, write your name down. But it doesn't really matter whether your name is up or not. So I want to make sure that you take a look at everybody else's some of the learning outcomes. We're going to do this lightning round where you're going to be talking to other people about the technology they chose, their learning outcome, they chose it, et cetera.

And you're going to be trying to help your partner troubleshoot, or perhaps, implement the technology in a better way, solve some of their problems with the implementation process, or perhaps, think about a different technology altogether given their desired learning outcomes. So let's just take a minute, and either read it on your own device or read it up here, so that you kind of get a sense for what you're going to be talking about. And if you haven't read over it, please do that now.

So there's some really interesting ideas up here, I think, and a broad spectrum of ambition. We had some pretty small-- like one assignment's worth of technology, perhaps. And then we also have kind of a whole course design. So that's another thing we didn't really talk about.

I didn't narrow the scope in any way, or define the scope in any way. So it could be for a whole class. Or it could be for one particular assignment, or one particular class activity. And that's fine. That's OK. So did everybody get a chance to look over the other posts?

**AUDIENCE:** I'll say, I've have had [INAUDIBLE]

**AUDIENCE:** So it gives a follow up of all of these things is that when the AWW where everyone was drawing, I could draw here. But it was never showing up there.

**PROFESSOR:** Interesting.

**AUDIENCE:** Oh, yeah, my thing I drew never showed up.

**AUDIENCE:** Yeah And then the other thing with this now, with the Google doc, I tried to edit it. And it

doesn't let me click on it. It says, do you want to use the app? So then I had to download the app.

And now I say, yes, use the app. And then it says something about the server not being recognized. But then if I go back and say, no, thanks, and I try to use it without the app, then I can't put anything in.

**PROFESSOR:** Interesting. OK, so who had trouble?

**AUDIENCE:** Yeah, I downloaded the app and used it instead.

**PROFESSOR:** All right, did anybody that was using a smartphone not have trouble?

**AUDIENCE:** I didn't have trouble.

**PROFESSOR:** You didn't have trouble?

**AUDIENCE:** No, I downloaded and use it.

**PROFESSOR:** Oh, OK. And were you an Android, or Android?

**AUDIENCE:** [INAUDIBLE]

**PROFESSOR:** Android, iPhone, iPhone. Who else had trouble? It was more than just the two of you with this one?

**AUDIENCE:** With this one.

**PROFESSOR:** With this particular one?

**AUDIENCE:** Yeah, [? Rachel ?] had problems with it.

**PROFESSOR:** So for now, if you wouldn't mind, just-- let's see. We don't have to complete this right now. But maybe if there's a lull, just come on over here. And you can type your app in, just so we have a complete record-- your technology in. But that's interesting.

It's a good thing to keep in mind that access might be an issue. I did try this out on two computers. But I tried it out on two computers. And I didn't try phone.

**AUDIENCE:** [INAUDIBLE] Couldn't do.

**AUDIENCE:** [INAUDIBLE].

**PROFESSOR:** Yeah, after is fine. So if we could get up. And anybody else that wasn't able to input their ideas, if you will do it later, that's fine. So we're going to do the lightning round. And if I could get you gentlemen to come around and fill in the back. Just fill in up to here.

Great, so what we're going to do is I'm going to ask the row in the back, this row, to share their technology, their intended learning outcome, their concern. And then this row will give their advice. And it's two minutes for the whole process. And then we'll switch. OK?

**AUDIENCE:** So what do I do?

**PROFESSOR:** So you just have to tell me more or less what you wrote on the screen. OK, but hold on. I got to set the timer. OK, go.

[INTERPOSING VOICES]

**PROFESSOR:** Is going to share their ideas with the other side.

[INTERPOSING VOICES]

**PROFESSOR:** It's moment you've been waiting for. So we're going to do this two more times, this time and one more time, OK? All right.

[INTERPOSING VOICES]

**PROFESSOR:** Yeah?

**AUDIENCE:** For the course which I want to teach using educational technology, so it was a big challenge, because the head of department wanted to say no. But then it continued because many of the professor already preferred it.

**PROFESSOR:** Wow, so does [INAUDIBLE].

[INTERPOSING VOICES]

**AUDIENCE:** Anybody can do anything. And you can reconfigure it.

**PROFESSOR:** Alex, if you come around. And then, [INAUDIBLE], if you come around, please. Everybody

slide down.

**AUDIENCE:** We already went that way.

**PROFESSOR:** Oh, you went that way.

**AUDIENCE:** We already saw those people.

**PROFESSOR:** So, [INAUDIBLE], if you come on over.

[INTERPOSING VOICES]

**PROFESSOR:** So I know in my conversations, I heard some really interesting ideas, some fascinating uses, and some incredible obstacles. I'll just point out David's obstacle is on the spreadsheet. But he wants to use his piece of software. And it costs \$12,000 a year.

So it sounds fabulous. It sounds really fabulous. And your department actually bought it for you?

**AUDIENCE:** Yeah. Have it for all faculty [INAUDIBLE]

**PROFESSOR:** Yeah, so that's great. But that's a huge hurdle. So that's an example of trade-offs that you might not always be able to make. So that was my interesting-- but I did hear some other wonderful ones too.

So I hope that you take a look at it. You'll note that I always give you time after this lightning round. Because it's a very noisy kind of little crazy exercise. And I always like to give you a few minutes of silence afterwards to sort of process it a little bit. Because it can be a bit of an overload. So that's sort of the part of the design or the planning for this exercise.

Anything anybody want to share about something they learned, or some issue or problem that was solved, or still unsolved? All right, I see some people are still typing. I'm going to go on. Feel free to keep adding to this. And again, please take a look at it. Because we only got so many pairings. And you can see virtually everything from the Google doc, assuming everybody gets in.

So what I wanted to do is flash back a little bit to what we talked about the second class that we met. We talked about all these different learning theories, about behaviorism, cognitivism, constructivism. I think we've done some other exercise with these three learning theories

before.

But it's a good chance for you to reflect back, to do a little backward transfer, and to reinforce some of the concepts from the beginning of the semester, and to also think about how technologies might be-- so we talked about how technologies might fit at different levels of Bloom's, or supports different levels of Bloom's, but also, different technologies-- different anything you do in the classroom. But use of different technologies can actually be more behaviorist, cognitivist, or constructivist in nature.

So I think it's useful for you to think about that just as a way of just getting a bit of a marker. About again, it's this idea about, what are we trying to do with this tool? And so I'm going to divide you up. And we have nine people left, so three groups of three, which works absolutely perfectly. Yes, three groups of three.

And we're going to have the behaviorist group, the cognitivist group, and the constructivist group. What I want you to do is think about a particular technology that sort of would be consistent with this-- ooh, OK, one group will have four-- a particular technology that's consistent with that particular learning theory. And so this will take about maybe four minutes. And think about, perhaps, even think about a learning outcome that that tool advances, but at that level, so the behaviorist level, let's say.

And then what I'm going to do is the activity is called a jigsaw. And so first, you're going to be in these homogeneous groups. So one group talks about constructivism. One group talks about behaviorism. And one group talks about cognitivism. And then I'm going to mix you up. So each group then has one cognitivist, one constructivist, and one behaviorist in it. So this is an active learning technique. And I wanted to model it for you. So let's just create some groups.

[INTERPOSING VOICES]

**PROFESSOR:**

All right, folks. I don't know how far you got here. But now each one of you is going to be expert in your particular field. So I'm going to take-- and this is the constructivists. So here's three constructivists. I'd like one cognitivist and one behaviorist to find a constructivist, and to make a new group.

All right, so now each one of you is the content expert for your particular theory. And just sort

of explain what you came up with to your peers. So you'll just go around the table and talk about it.

[INTERPOSING VOICES]

**AUDIENCE:** They're still learning. But they're having an active roll in participating in when they're going to learn about, rather than just being passively taught that.

**AUDIENCE:** And that's?

**AUDIENCE:** Constructivist

**AUDIENCE:** OK, so what technology [INAUDIBLE]

**AUDIENCE:** Well, I think that a cool way to do it is to have computers set up throughout the room to have internet access.

**PROFESSOR:** So the class is officially over. I mean, it's five of. I don't know if people have to go other places or not. So we can take this up beginning of class next time if there's things you want to finish up. I'd like to hear some of what you came up with for sure.

So can we just plan to do that, and just tie up the exercise? Not the best of the best pedagogical strategy, to make you wait a week, but it is what it is, so. OK, thanks very much. And I look forward to seeing your posts on the assignment.