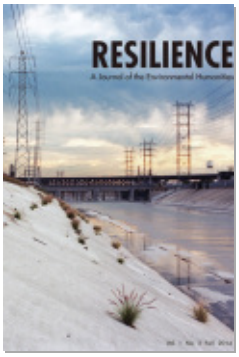
Higher Education, MOOCs, and the Question of Sustainability: An Interview with Jonathan Tomkin



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Higher Education, MOOCs, and the Question of Sustainability

An Interview with Jonathan Tomkin.

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Jonathan Tomkin is the associate director of the School of Earth, Society, and Environment and a research associate professor in the Department of Geology at the University of Illinois Urbana–Champaign, where he also directs the undergraduate program in environmental sustainability. His research aims to uncover the processes of how changing climates, glaciers, and landscapes interact. This study has involved fieldwork all over the world—including the Olympic Mountains, the Swiss Alps, Patagonia, and Antarctica. He is a coeditor and contributing author of the open-access college textbook *Sustainability: A Comprehensive Foundation*, available from the Open Textbook Library. Professor Tomkin also designed and teaches Introduction to Sustainability, a Coursera MOOC (massive open online course), at https://www.coursera.org/course/sustain.

SF: Each of the eight weeks of your MOOC seems to respond to an ecological crisis a person might see in the media. "Is climate change real?" for example. Did you design it that way?

JT: No! It was by accident! I thought about this word sustainability, and people said, "Well, isn't this the same thing as environmentalism, which is the same thing as ecological awareness going back to the seventies, and are we just changing the word every few years." You've got "resilience" here—that's another one.

But actually all of these terms mean different things, and one of the things I figured out is that sustainability is different from environmentalism. And the way that sustainability is different is that, perversely, it's very human centric, and I think that's why it's so popular.

It's really about, "How do we make *our* society sustainable?" It doesn't really think about the natural world except as an afterthought, whereas environmentalism puts the natural world first. So sustainability is a particular focus, and I think this is part of the reason it's so popular. It's about what most people really care about, which is ourselves.

And then the next thought I had was, "All right, if that's the idea, what are the important things you have to know to be conversant with this idea?" And that's why it broke down in these areas. Maybe this is the way the information wants to be organized.

SF: It's funny you say that, because when I look at the weekly breakdown of the MOOC, it looks like an eight-part PBS special.

JT: [*Laughs ruefully*] Yes, yes . . .

SF: But that's a good thing! There's a huge amount of data, but it has to be organized around things people are already thinking about.

JT: That's where MOOCs show the value of academics. We're really curators, and I know that's a commonly used idea. But we really are curators of knowledge, and we have more knowledge than we could ever use. So many of the resources I use for the MOOC—there's the online textbook, which actually gave me the idea for the structure of the class, because I was the editor and I was trying to figure out what I need to have covered—but so many of the resources are online. There are so many free talks, and there are so many papers you can read. There's so much! *But* if someone isn't telling you, "This is the thing that is worth knowing, this is the order you need to learn it so you can understand it," then it's not accessible.

SF: Is there a base-level mathematical or scientific knowledge the students in the MOOC need to have?

JT: No. Not in this class. It's more about a general aptitude. One of the shocking things about MOOCs is that something like half the students

have higher degrees, maybe not the ones entering but the ones that finish. Three-quarters of them have a BA. Half have an MA or something. It's amazing. So these are not your typical undergraduate students. And they're not American; maybe one in three is American. So they're global—they're a global group of people who know how to learn.

So that's the other question we have. What are we doing with MOOCs? Are people who know how to learn going to be further advantaged than people who aren't able to sit through a class? Are they just going to fall further and further behind?

SF: So when you start, when you do climate change, how do you frame that?

JT: Climate change is sort of my area, so I treated that differently than the other areas. I've got a PhD in earth science, and my undergraduate degree was in physics, so I have a very physical-science view of the world. My published work has largely been in how climate change and landscape change and even the tectonics—that's the movement of the earth—all interact as a combined system. And I tend to look at kind of what you could call deep history relative to what we think of as climate change. My research looks over the last few million years typically.

The way you would justify this as being related to current debates is you would say, "Well, we need to understand how the system works so that if we make changes to it, we would understand what the effects would be." The most exciting work I've done is showing things like, as the climate changes, it actually influences how mountain belts grow. To me that's a very interesting subject. I've got some very interesting results on that, but you can see how that's sort of a long way away from some of these other things.

SF: Well, in Illinois, yes.

JT: [*Laughs*] So, by the way, my joke on that is that snowflakes cause earthquakes. But not on any time frame that humans have to worry about. So because of that, I have an interest in deep history and the deep history of the earth system when it comes to the climate. So for this module of the course, we start out by looking at what are the main physical drivers of the earth's climate, and it's things like the insolation (that's the energy from the sun), the albedo (how much it reflects), and

internal processes—for example, the natural greenhouse effect. So we talk about that, and of course, people interested in climate change know, whether they're a skeptic or not in the human causes behind change, there's a lot of natural variation, and there is. For example, we've gone through periods in earth's history when the entire planet was probably covered with ice. So that's a really amazing difference from today. And conversely, there used to be crocodilians in South Dakota just a few tens of millions of years ago.

So we can see that obviously the planet has been much warmer and colder than it is today. So there's a lot of natural variation in the climate. So the first goal is to understand those natural changes. And then to put those natural changes in context with what's going on now, and also how the processes, how the greenhouse effect that is man-made and not natural, and how we can understand why this would theoretically lead us to expect the climate to change. And then finally we look at the actual data and say, "Well, what's the evidence this actual theory is correct?" Then you do some projections about what the future would hold. Because this is about sustainability, you can then broaden it out to social questions about what this means for global societies in the twenty-first century. So that's my approach for that subject.

And as you can see, it really comes from a very theoretical place to begin with, but I feel like if you don't understand those natural science processes, and I can't assume that anyone understands any of those, then you haven't lifted your level of debate. For all of the subjects, I want people to be more sophisticated, so when they have a discussion about the sustainability subject, I don't want them to fall into the same tropes or traps or ways of thinking they've just heard secondhand and they haven't analyzed. If they hear a concept, I want them to be able to think, after taking my course, "You know, that's a lot like the tragedy of the commons idea that I heard about," or "Oh, this is an example of someone making a Malthusian argument."

They've got so much knowledge now that they can reject the baggage and they can say, "Well, I know the theoretical reasons why people argued this in the past, what the evidence looks like," and so in a general sense they can apply these theoretical ideas to specific examples.

SF: Would it be fair to say that you are trying to teach them how to assess data as well as how to model ideas?

JT: As I've taught it more, it's moved more to the models end than data. The problem is that in one course the amount of data you can present is so little, and of course in a MOOC what can you expect people to do? There are debates about that, and I feel like that's a key difference between this and my college classes. In my college classes, I'm much more likely to actually say, "Here's a data set, and let's look at this data set." And that usually involves quite a lot of feedback.

Data involves quantifiable thinking, and that's hard for a lot of people. So for this class, I felt that was too much. Though that would be my next class. If I were to teach another MOOC, which I've been thinking about, what I would do is I basically would have the next step of the class be "Let's add just the sort of math that everybody can do." And that's hugely powerful. So we're not talking about calculus. We're just talking about, "Can you add, divide, multiply, subtract?" And that's all you need. And that's actually algebra, by the way. People don't know it, but we all know algebra. You would be amazed at what you could do, and you would go, "Oh, it's so simple!"

SF: I would be amazed, because I think a lot of people in the humanities would like to know more from the sciences about sustainability and how to model the Anthropocene; but there's anxiety about the level of math and science knowledge we would need to have that conversation.

JT: I really do think that for most of the sustainability arguments we have, just a level of math which is below what you need to do your taxes is completely sufficient if you're aware that you can do it. That would be my next course. The idea is that you can figure out, "Will biofuel work? Can we switch from oil to biofuel?" And it turns out, actually, to answer that question, you need to do some sums. But the sums aren't very hard. It's just like, "Well this is how much biofuel you get out of a hectare of land." And you find incredible things—for example, that if you covered all of Great Britain in biofuel crops, the entire place, it's still not enough biofuel to power the country. And that's a really useful, simple calculation. Obviously there are complications that you can go on to later. But that's enough to let you know something very powerful in terms of what arguments make sense and what don't.

So in the first course, I'm trying to have people know the essential models that underlie the thinking of sustainability, because we

all have models in our heads and we're just not aware of them. So it's really useful as a self-awareness tool. You know, people talk about population—huge population growth—and this is the thing that's going to dominate everything else. And if you learn a couple of interesting facts—for example, that population growth is slowing down and that according to the UN we might hit peak population midcentury and that development reduces population growth, often to negative amounts—that changes the way you see the world. If you couple that with the fact that there is a very common theory about the impact of population, you can criticize it.

SF: That's an interesting way to give your students models and show them how models are put to a certain political use. But take, for example, food—this is a huge area of interest for people. Issues of food register differently than climate change.

JT: I teach a segment on food, and the module became food and water. And the reason why they were put together, at first, is because I needed eight modules and I needed to do some clumping. But it turned out food and water go together brilliantly and it was a fortuitous thing, because the biggest constraint on food production actually is the amount of water available and the biggest user of water is agriculture. And here, for example, in Illinois, we're not water constrained.

SF: Because we're on the Mahomet Aquifer.

JT: Right, well, we're on the aquifer, but we've also got a lot of natural precipitation, whereas this is not typical of the world. You go to China, and they have about as much available water as we do, but they have four times as many people. And obviously there are also going to be pollution issues as well.

So food also turns out to be so popular because it's something that affects us every day, in a really visceral way. I mean, we turn on a light and that affects us every day, so we're part of the energy economy. But it's not so visceral. And it's bound up in culture, and that segment of the course is *the most controversial* of the entire course.

SF: I'm interested to hear you say it's so controversial.

JT: I bring this on myself a little bit. One of the models I bring in that segment, in the module, is the precautionary principle. This is the idea that unless there is scientific certainty, we shouldn't try something new. And the reason why I bring it into this debate is when we talk about genetically modified organisms, there clearly isn't scientific certainty that this isn't going to cause some great harm as well as whatever benefits we might get from GMOs. So that's the first thing. And I'm critical of that in a sort of an obvious way when I talk about it, because it doesn't always lead to good policy because you also have to consider the benefits foregone. So if you take a very strong stance with the precautionary principle, we'd never do anything new. Obviously that's a sort of extreme position that might be a little bit straw mannish.

And the second thing is that GMOs are incredibly emotional for people.

The thing that really gets people going, at least in this MOOC and this community, is the Monsanto effect. People will talk about, "How can you patent life?" And this is a big issue, and some people worry about this. People worry about the disappearance of small farms that are being replaced by large farms and changes in culture. So you can see, if you talk about food systems, you're really talking about cultural change, which is the most emotional, difficult subject to do.

I do bring up the point that we live in a GMO universe, and what would it mean if we didn't? And when we come to sustainability, this is obviously extremely important, because we want to have a sustainable society that meets what everyone gets to eat. And what would be the consequences of changing our food systems? And one of the conclusions I draw is that it's actually very difficult to step away from industrial agriculture, given the systems we are in now—at least if we want to have the sort of standard of living that we have now. And some people argue, and I point this out, that thanks to industrial agriculture, we're able to set aside more land for other purposes. And this might surprise people, but in countries like the United States there is actually less land under agricultural production today than there was in the past. And the amount of land being used in agriculture is not increasing. It's decreasing. Or at least at the decade-level trend, it's decreasing, and this is a really surprising fact. And one of the reasons this is possible is the land that we do use, thanks to industrial techniques, we use really efficiently.

The productivity of corn in Champaign County [Illinois] is unbelievable by historic standards. And other people have argued that if ev-

ery country that does agriculture was as efficient as the United States, there wouldn't be a food problem and we would have lots of land that we could return to nature.

SF: Do the students ever say something like, "Well, industrial agriculture and planting monocrops everywhere damages the soil, and thus we have to use more fertilizer?"

JT: So there's other sustainable issues. You talk about energy use, and is the water use sustainable? There are definite things, but I keep getting back to the idea that we're making trade-offs, and actually the name of this journal is a great example of that: *Resilience*. So I sort of think of resilience versus a sort of fragile system or a resilient system. And you might strongly argue that the current industrial system is fragile and not resilient, and that's a reasonable argument to make that would be in opposition to some of the things I've just said. But nevertheless you have to be aware of what you're giving up if you're proposing to move to another system. And then in my view—and again I'm not actually a political scientist, so this is me speaking away from my area of expertise—but we do need to look at costs and benefits. And something that I keep coming back to in the course (and this is something the MOOC makes easier—that's harder on a campus class—because a MOOC is global) is that in the United States we have become used to a certain standard of living that is amazingly atypical.

And one of the points I make is that we don't want to limit energy use. We don't want to limit agricultural production. What we want to do is we want to limit the harmful effects of those things, because without more energy, without more food, without more wealth in general, let's say, then so many people around the world are going to have lives that aren't going to be able to flourish at the same level that we here in America get to enjoy. The amount of opportunity lost is just staggering in the world today. That is a sustainability idea, not an environmentalism idea. Sustainability does sort of think more in terms of society as a whole. Maybe it's a little bit conservative, but it does have room for people in a way that I think pure environmentalism is less likely to put forward. We're more likely to worry about the rain forest. I mean, ideally, we'd like to be able to keep the rain forest and have human development, and I guess what I want to do when people espouse policies for that, and I do have a module on environmental policy, that they know

that there is no magic solution for all this stuff. You can try. What's being done at the moment has advantages as well as disadvantages.

SF: The way that you've been narrating your class is that it's about tradeoffs and incomplete solutions. What are you thinking about sustainable futures now, after having taught these classes?

JT: This is a great point. I came into this actually more pessimistic than I am now. And I'm of an age when I was a kid I had nightmares that nuclear war and then climate change. And even more recently I find when I read fiction that involves maybe near-future fiction. A great example of this maybe is of course *Oryx and Crake* by Margaret Atwood. That really affected me, and I only read that like five years ago—when I was an adult. And I find these sorts of futures very frightening. And what I discovered was—this is my current thinking now—that we are all really living in the aftereffects of massive, massive destruction of the natural world. That is the planet we live on today. Today is the destroyed world.

SF: Bring me back to how you're not pessimistic. That sounds pessimistic!

JT: I'll tell you why. So we stand here in Illinois and look around, and Illinois looks nothing like it did even 150 years ago. And we know about prairie here in Illinois instead of corn, but it wasn't just that. All of the land has been drained here. This used to be sort of swamps and wetlands—that's a less pejorative term. That's all been massively changed, and that's true everywhere around the world. Ecosystems have been completely disrupted in the vast majority of the world. So much has been transformed for agriculture in particular and other land use. So let's take that statement as true, and yet, the world isn't a horrible place. The world is actually quite a nice place for me to live. I enjoy living in the world, and obviously I'm a very privileged person, living in a privileged country. But nevertheless, this is true in many other places as well, so we've already gone through some terrible things. And you might ask yourself, "What's the worst that might happen?" Well, the worst might be global destruction, but in many ways we've already gone through many aspects of the worst. My reduced pessimism comes from the idea that I actually think the twenty-first century, climate change included in fact, won't in any sense be more apocalyptic than the twentieth century was, in terms of what's happened to the natural world.

I would like to think I'm looking at this as it is rather than through an ideological lens. In balance, if you look at the really big issues about what's going on, all the really terrible things are not speeding up, maybe apart from climate change.

So what are the things? Terrible things are like destruction of natural habitats. Destruction of natural habitats is definitely ongoing and is definitely a huge problem in tropical areas, but most of the world now has stopped doing more damage to natural ecosystems. People talk about the sixth extinction. So there were five giant extinctions in earth's history, and these are incredible extinctions on a scale unimaginable to us. One of them was the extinction that wiped out all the dinosaurs, for example. We are not anywhere near to that level. And in fact the number of mammals that have become extinct is—it's very sad, and speaking as an Australian, the thylacine, the Tasmanian tiger, that's a great example of a very recent and sad extinction, and there many other stories like that—but actually most mammals have not become extinct, and most mammals don't look like they will become extinct now. Whales are back from the brink in many places. There are so many things that looked like they were destined to be doomed in the twentieth century that in the twenty-first century, it's not clear that that's the case. In that sense, you could say the trajectory that the twentieth century projects out is not the one that we're seeing in the twenty-first century.

SF: My students are worried about—who wouldn't be worried about—the failure of nuclear power plants. The unanticipated consequences of everything that's in place now, the unanticipated consequences of radioactive decay. Do your students ask you about this?

JT: So food is like the super–most controversial thing. Another controversial thing is energy.

Again, this affects us and in some countries in the MOOC. You have some people who live in Germany, and they're paying . . . I mean they've gone to enormous lengths to improve their renewable use, but that's come at an enormous cost as well. It's really expensive. And so you have people from different parts of the world and their perspectives on that. But for energy, nuclear power is really interesting, because some environmentalists—Stewart Brand's kind of famous for this—think that nuclear power is the answer. And you can see his argu-

ment is very clear. It doesn't produce very much carbon dioxide. It's a known technology that actually does work—we're using it right now to light this room. It just has these problems, of course. You know the recent accident in Fukushima, and that's really derailed it. And again I'd say this is where people have a reaction that's not quote-unquote rational. We're not having a cost-benefit analysis of this. The number of people killed by the tsunami was—I'm not exactly sure of the number, ten thousand–plus kind of number—like a really big number of people. The number of people killed by the power plant failing, the nuclear power plant failing? I'm not aware of what that number is, but it's plausible the number is zero, right now.

SF: I was a kid of the nuclear age or something, because it's very real for me. I was alive when Three Mile Island melted down. And then Chernobyl and Fukushima.

JT: I don't want to say you have to learn to love the bomb or anything. The point is that it's complicated and it's a trade-off.

SF: And the trade-offs can seem mysterious.

JT: They are mysterious, but I think if we take the attitude that they're unknowable, we'll never make progress. I don't mind someone saying, "We are going to stop nuclear power, and this is the reason," and if that reason is rational and not fallacious, if you like. I don't want it to be done in the sense of, "Well, I saw a movie and now I'm scared."

The thing that makes me afraid of nuclear is not isolated in terms of the sustainability argument. We're not going to stop society by having nuclear accidents. We have nuclear accidents at the same rate we've been having them, even more often, that's not going to disrupt society actually, because these accidents are actually limited in scope. It's just the way it is.

But what I don't address in the course, and you say, you know, I address a lot of things but I do still take this environmental position. I talk about sustainability. An idea like resilience might be more useful in a broader way to think about it, because the danger of nuclear remains nuclear war, which is a real danger. Obviously if Russia and the USA or China and the USA go toe-to-toe, that's pretty much game over for the society we have right now. We're going to have to have some differ-

ent society, if any, after that. But that's the Armageddon scenario. What if China and . . . or let's say even India and Pakistan for that matter—if they go to it, you say, "Well, what effect is that going to have?" Well, we live a long way from India and Pakistan. There'll be disruption to trade. That's not so bad, and the cricket team will be less good. Something like that you might say, but actually, no, actually this could be a society-crippling event because of climate change. If you have a limited nuclear exchange, even a limited nuclear exchange between those two countries, you could alter the climate enough that we could have widespread crop failure globally.

SF: So it could produce nuclear winter?

JT: It could—even a small nuclear exchange could do that. So there are issues like that that I do not address in this course, and this course is not a list of what's going to do us in as a society, but that's sort of what I came in thinking about. When you mention these topics now that I'm talking about, I guess when I'm talking about sustainability, I'm saying, "What's unsustainable, and what are the future consequences of that?" And I guess what I found out is, barring some issues like that some nontechnology disaster or a self-sustaining black hole coming out of the CERN or some crazy thing . . . there's a million ways.

What I said is, "What are the things that society does that we sort of control in that sort of broad social sense, or not even that we control like these large social trends do?" And that's why I broke it down and said, "Okay, we need energy to run our society; we need food; we need to be able to handle whatever our population is; we need water," all that sort of thing. And so you go through all those different lists, and it turns out, if you live in the United States or in a pretty equivalent country with decent governance, yeah, we can do it. And we don't have to change that much is the really shocking thing.

SF: That is the really shocking thing, and I'm so interested. I hope that you could tell our readers two things. The first is that you seem to teach a lot of different kinds of classes: regular online courses, large lecture courses, and a MOOC. But people—me included—are very suspicious of MOOCs. They think they're going to put us out of a job. They think they're going to make the university system itself unsustainable. Tell me why you did a MOOC.

JT: I did a MOOC because it was exciting. I'll just give a quick précis about how I got involved. It actually came out of the book again, the source book. And somebody who heard about it is this guy called Ray Schroeder from the University of Illinois–Springfield, and he had actually been involved in an early MOOC right before the Courseras and Silicon Valleys of the world got really interested. And it had a couple thousand people, and he described it to me, and it was really interesting. You know, I didn't know about constructivism, this idea that you can teach by having people work together and actually the knowledge comes from the participants rather than from the sage on the stage, as we say. I thought, great. I want to do something like this because I've found that it's just an intellectually interesting exercise, and you're right—I do teach many different ways, because I'm really interested in how to teach and how different things work in different contexts. So I said, I'll do it, and I started work on it over the summer. Because I'm a nine-month appointment, I get to spend the summer on what I want to do, so I'm going to do this. And that's how it started. And I had people signing up for it, and I was really excited because I had like a hundred people or something.

I thought I could get a thousand people for this sustainability MOOC, cause, you know, I started advertising and then Coursera happened, and the university signed on to that. And I went into what I joke as is Silicon Valley time instead of university time. And Silicon Valley time is about a hundred times faster than university time. In the first day we went live on the Coursera site, I went from one hundred, in the first eight hours, it went to eight hundred students, like it was just a completely different thing. And so far there's been over seventy thousand students involved in this course over the times I've taught it.

SF: How many times have you taught it?

JT: Three. It's been stable around twenty thousand the last two times. It's ridiculous, right?

SF: What's to stop Coursera from just running it like a movie over and over? Why would you have to teach it again? Why don't they give you your paycheck and say, "Nice to meet you"?

JT: Okay, I'll just jump in on the paycheck.

SF: No, you don't have to tell about the paycheck.

JT: No, I'm really happy to do it. I haven't been paid anything at any point for this, just so you know.

SF: That's insane.

JT: Well, it is and it isn't. It's totally worth it to me. Again, you get the summers. This is the whole point of being an academic, right? You get the summers to do something you find intellectually interesting. And it's totally been worth it. It's been incredibly interesting.

SF: This the only thing you taught?

JT: No, I'm teaching on top of it. But as I say, it's not as much as you think. I do something every week. I spend a few hours every week, but only a few hours. I don't try to control or go through the discussions and help people out very much. I don't do that. I did run an experiment once where I had student TAs help me do that to see how it worked. I didn't think it made it any better, so I didn't do it this time. I had community TAs—I've tried that, and that's a little better. So I'm just running experiments with this class. It's part of my inquiry.

SF: So would it be fair to say that you think that the MOOC structure is good for some kinds of things.

JT: Well, let's get down to that. If you're the sort of person that can take an online class without somebody telling you, "You better come to class," or "You better make sure you get the assignment in." If you can do it without someone doing that, you can learn as well this way as pretty much any other traditional course way. If you're that sort of student, this is perfectly good. To the extent that our students are like that, we could be completely replaced by MOOCs for the sorts of classes where you don't need obviously hands-on things. No one is going to learn carpentry very well in my view. You actually need to be using your hands. I think things that are more quantitative, actually the technology's very good that we're dealing with right now. And it's only getting better. That's something else to be aware of.

Okay, let's look at this in a broader sense. We're living in an age where

machines are getting smarter and smarter. Moore's law is exponential, and software development has not been able to keep up with that. But nevertheless, what machines can do in a cognitive sense is increasing, not decreasing, every minute. Humans are roughly constant. I'm not going to claim I'm smarter than the professor who was in my office fifty years ago or one hundred years ago. I doubt that. I think that they were very able people. It follows that if we can use technology in education, what we can use technology for is increasing every year, in terms of efficiency, if nothing else. My sphere as a human instructor is decreasing over time. So if I want to be the best instructor I can be, I need to cede ground to the machines continually. I need to hand things off to the machines and say, "The machines will teach you this, because they will do a better job than I will."

SF: What can you do, though? This is the thing. You're saying, "If I want to be the best instructor," so what's left to you?

JT: The question then—so MOOC is like an early-technology example of this. MOOCs do a lot of things really great. I think that they're very good for introductory stuff especially. Like if you need to get a corpus of knowledge or if you need to understand the essential models of a field, the central ways of thinking, they're very good at that.

I think mathematics is a good example of a place, because in some ways all the mathematics we teach is a corpus of knowledge and a way of thinking. You don't have to be critical about the theory of limits. You just have to know how the theory of limits works and understand in a deep way; and in many ways, you can learn that by doing math. If you do lots of math, you become better at calculus. That's how basically you become better at it. That's my experience. I believe that there is some research to back that sort of statement up. In any case, that's what I'm saying. What can't we do in a MOOC? Well, this is my observation. We have peer grading. So students could actually write in these quite lengthy portfolios or final projects, and the peer grading they got was reasonable. Probably about as good as I would do if I would grade lots and lots and lots of papers. You know the grades weren't that different. So they can grade. You can grade using this social network model. What they couldn't do in my opinion—this is anecdotal, this is not based on research—but in my class, the feedback was awful.

They could tell you "This is three out of five," but they couldn't tell you, "This is what it needs to be, to be four out of five or five out of five," if you're going to use a grading sense. They couldn't tell you what was wrong and how to fix it. They couldn't do this in our classes. They couldn't say, "The thing that I've realized looking at all your work is that you always lead with 'I think' or there's some other thing." As somebody who grades papers, you know that there's a thousand variations on that. There's always people whose first paragraph is their throat-clearing paragraph, and you say, "Look, if you just remove the first paragraph, everything you write will be stronger." Or whatever it is . . ."You're under-referencing," or whatever the problem is. That's right now where we can devote more attention. Another area where I think we can devote attention—and we're still in the infancy of understanding this—is sort of in a cheerleader support role. What does it do? One of the things that we've learned from these online courses actually is that if you just write, in a blog post discussion or a general forum, "Hey, that's a really interesting point—good job," that's far superior to writing nothing at all in terms of having people engaged for these courses.

What the MOOCs are trying to do is trying to make up for the deficiencies in the technology and replacing that with human brains in the forms of community. Some of those things they can do. Some of those things are going to have natural limits. I personally have some reservations about this model where we expect people to do the work for us. I don't like the idea that I don't need to give someone feedback because the community will do that for them and we don't need to pay anyone and that's the new model for education. I mean, talk about unsustainable. In my view, that has definite drawbacks. To me there are moral issues about it, but I also don't see that as a reasonable way to work.

SF: What prevents humanists and people in the sciences from having a discussion about sustainability in a sustained way?

JT: Together?

SF: Yeah, together! [Laughter]

JT: Okay, I work on this problem a lot, because I direct an interdisciplinary degree. We try very hard to bridge. The first one is there's different ways of thinking. Your natural scientists and your social scientist

and your engineer and your humanities person will all think in different ways. They've been taught to think in different ways. In fact, that's really what academic education is all about—how to think like a physicist, how to think like a sociologist, and so on.

So that makes communication harder, and it's also true that every one of these fields has a legitimate deep knowledge that requires a knowledge of jargon. And the jargon is unfortunate but necessary, actually, because if you don't have the shorthand, you'd have to go through these very long discussions.

So what do we do? So the first thing is that I think I haven't solved the problem. I'm not exactly sure. I have found some ways in which you can bring ideas together, but it really is this case of saying, "Well, here are some different perspectives for thinking about this problem." Now in the course, I do try to bring in different areas, ways of thinking, for different sorts of problems; and maybe that's the best way forward. You say this problem requires this style of thinking to solve one problem and this sort for another. And if I'm going to talk about humanities in particular, I think the humanities actually ask the most fundamental questions of all about sustainability. The engineers, natural scientists are asking technical questions. The social scientists are looking at how that interfaces with what people do. But the humanities people are asking questions of why do we care about sustainability anyway? What is sustainability? Why should we give any credence to anything beyond ourselves, be it other people, be it panda bears, be it worms in the garden. If I talk about the value of something intrinsic to itself, I'm talking about a concept coming from the humanities, because there's no equation that says an earthworm has value.

Maybe the real way to talk about this is to say for a particular problem, "You have to identify the heart of the problem that your discipline is expert in."

SF: Well, this would be wonderful if universities would think like this in the sense that, "We have a problem; we need a working group." That way you can actually divide. We don't have working groups. I should take your MOOC!

JT: So in the MOOC thing, one of the weeks—the last week—is this longview week. And I talk about ethics. Okay, so let's go back and make fun of ourselves again. We take our cloth bags to the farmers market, and

we get our apples and our broccoli and so on, and we're pretty pleased with ourselves. What are we doing? Why are we doing that? That's not a question any field outside of the humanities can answer. An economist can say, "Well, this is the economic trade-off." Actually what they would say is, "This is a utility preference." It's your and my preference to go the farmers market. What they're really doing is saying, "We don't know. That's not the thing we care about. That's our assumption. Our assumption is that this is the utility of that person."

Where humanities can make the enormous contribution, of course, is understanding that aspect. So what's going on inside the person? Why are they thinking that? Of course there's many other things you can talk about. And in terms of sustainability, which is a humancentric field, why is there no preference? That sort of question. That's enormously interesting and unsolved. And my students wrestle with that all the time. Maybe if I were a better instructor and I knew the answer—maybe there is an answer, and I just haven't figured out yet. Students will say, "We live in this consumer society, and we have all these impacts." My question is, if I pretended to be an economist, I would just say, "Well, this is just people's preference. Let's not question that."

As a natural scientist, "Well, this is the effect of doing that, but I have no opinion, or I shouldn't have an opinion, as a natural scientist. I can have an opinion as a person." And then as a humanities person—be it philosophy, history, English, whatever it is—that's where you interrogate those ideas. And not to say that you need to come up with a solution. I use the word "solution" a lot because that's the way I am, but I know that not everybody thinks in terms of finding solutions to things. That's, I think, where the humanities is integral to the whole understanding of the subject.

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