

The following content is provided under a Creative Commons license. Your support will help MIT OpenCourseWare continue to offer high quality educational resources for free. To make a donation or to view additional materials from hundreds of MIT courses, visit MIT OpenCourseWare at ocw.mit.edu.

ELIZABETH CHOE: All right, so everyone is here for 20.219, correct, Becoming the Next Bill Nye? No one's in the wrong room? All right. OK, well, welcome to the class. I'm Elizabeth, I run the K12 videos program. Maybe we can do a quick intro with the staff over here. So Jamie, you want to--

JAIME GOLDSTEIN: Hi, I'm Jaime Goldstein. I run the communication lab in Biological Engineering, and I oversee it in Nuclear Science and Engineering as well.

CERI RILEY: I'm Ceri. I am the TA for this class. I'm a junior in Comparative Media Studies and Biology.

JOSH GUNN: I'm Josh. I run an animation studio here in Cambridge called Planet Nutshell.

CHRIS BOEBEL: I'm Chris Boebel. I'm Media Development Director at MITx, and I also teach a class here at MIT called DV Lab on documentary, and I'll be guest lecturing for a couple of sessions.

ELIZABETH CHOE: Come on in, take a seat. So just logistics stuff. All the information about this class is on our Tumblr, which I'll email it out to you guys, but it's mit219.tumblr.com. And you'll find the class syllabus, all the links, all the videos that I'll be showing you during class, and basically everything you need to know about just homework assignments and things like that. So we're just going to go ahead and dive right in.

This class is about writing, hosting, and producing video, short-form video, but in the context of this sort of scary, amorphous blob that people talk about a lot, the problems in science, technology, and engineering and math education. And the specific problems that we're going to be trying to be thinking about in the context of making these videos are these three problems, which is that the culture that we have right now, especially with video and science, is that it kind of implies that the door to science and engineering, whether or not you want to be a scientist or whether or not you want to study it, is only open to certain people.

We also have this issue of maintaining a love of lifelong learning. Josh I were just talking about the dark ages, when you quit playing with LEGOs. But kids are very curious creatures, and somehow our educational system squelches that curiosity. And science and engineering are

these topics that I'm sure you guys are very excited about. I'm very excited about it too. But somehow it becomes this sort of boring subject, and especially in high school, people think of chemistry as their least favorite class. It was my least favorite class in high school.

And then you have this civic responsibility as scientists and engineers to make sure that you're promoting STEM literacy among the public. We don't want everyone in our culture to become a scientist or an engineer. That would be terrible, it would be super boring. It wouldn't really be helping our society at all. But at the same time, science and engineering affects your daily life. Whether or not you're an artist or you're an author, you're voting on issues that require a certain knowledge of science and engineering. And as scientists and engineers, we need to be making sure that we're promoting a basic level of literacy among the voting public. So it's a practical thing for us, as scientists and engineers. It's also sharing that excitement and love of learning with other people that maybe they lost in a boring class or something like that.

So the idea of this class is to bring together the best practices in education, and some of these problems that I'm talking about with STEM education, and bringing it together with some of the tools that we have in entertainment. So how can we use video, how can we leverage video to address that big, amorphous blob. So we're going to try to occupy this middle space. But the problem is that the best practices in this middle space have not really been established.

Part of that is because there aren't really experts in edutainment, necessarily. It's not a super academic field. It's also pretty new. The advent of science entertainment on the web, especially now it's exploding, but it's all very new, so it's hard to establish the best practices. And on top of that, the best practices in education and the best practices in entertainment don't always align. A lot of times they conflict with each other. So a lot of this class will be piecing together what's great about these two disciplines, and it'll also be sort of discovering on our own what are the pieces that we want to take and implement ourselves.

At this point, I wanted you guys to think about this question, partially to inform us and help us help you guys over the course of this month. But I wanted to get a sense of why you all signed up for this class. Maybe it was because you needed six extra units to graduate, which is totally fine. And also what you wanted to get out of this class. If you're coming into the class and you want to learn how to record video, we want to know if that's your objective. If you came in because you thought it sounded interesting or anything like that, we want to know, too. So you guys can think about it, maybe share. If you don't want to share right now, that's totally fine. But I will mention this at the end of class, but every day you're going to be writing blog posts

and daily reflections, so hopefully this is something that you can incorporate into your reflection today.

JAIME Elizabeth, why don't you start? Why are you here?

GOLDSTEIN:

ELIZABETH Why am I here? Well, I'm going to talk about why I'm here after this, so I don't want to spoil it.

CHOE: But Jaime, why are you here?

JAIME Oh, OK. Really good question. I run the communication lab in Biological Engineering, and that

GOLDSTEIN: was it. I oversee Nuclear Science as well. And our goal is really to help scientists learn to communicate more effectively. And that's what I do now. I mostly train graduate students to talk to each other about their science, and to undergraduates, about how do you tell people about what you're doing.

And when Elizabeth approached me-- she was an MBE originally, so she knew about our lab. This was a perfect match for me personally, this course, because prior to my life here I taught middle school for many years, among the many other things. I was a magazine editor for a little while. So this to me is a perfect intersection of things that I'm passionate about, because your videos are targeted, that you're going to be making for that middle school population. And that's one that I know very well and that I care about a lot. So I'm looking forward to sharing with you what I know about the work that I do now blended with the work that I used to do. So I'm excited to tap into your creativity.

ELIZABETH Anyone else want to share why they're here? No wrong answers.

CHOE:

PAUL FOLINO: My name's Paul Folino. I came here to, kind of on what you were saying, just try to be able to convey technical concepts in a simple way, so I can explain to someone, whether it's one of my friends or someone like my niece, what I do.

ELIZABETH Awesome. Anyone else? You will have to stay it in your blog, though.

CHOE:

JAIME I want to hear from everyone.

GOLDSTEIN:

JOSH CHEONG: I'll probably go first.

JAIME Sure.

GOLDSTEIN:

ELIZABETH And what's your name? Sorry.

CHOE:

JOSH CHEONG: My name is Joshua.

ELIZABETH Joshua.

CHOE:

JOSH CHEONG: You can call me Josh. I come from Singapore. So we're here on a really short exchange for about a month. We come from Singapore University of Technology and Design. It's a university that was started in collaboration with MIT.

Well, I came to this class because we study OCW a lot, and that's because we are probably the first [? special ?] university and most of our curriculum comes from MIT. And honestly, I feel like close to 25% of my education comes from online. And I'm very comfortable with it, but - my mom is a chemistry teacher, and she tells me that students don't necessarily like stuff like Khan Academy, because it might look too boring for them. And that's kind of my curiosity right now, how do I convey something that people might not find really interesting but very important for them, and make it very interactive.

ELIZABETH It's Yuliya, right?

CHOE:

YULIYA Mm-hm. So I was very interested in education in high school, and I noticed that kids don't like
KLOCHAN: STEM subjects, generally. And so I just wanted to, as a career, pursue promotion of STEM subjects. That's one of the things I'd like to do.

ELIZABETH Yes.

CHOE:

JONATHAN: Hi, I'm Jonathan.

ELIZABETH Did you say John? Josh?

CHOE:

JONATHAN: Jonathan.

ELIZABETH John.

CHOE:

JONATHAN: John is fine, too. So I noticed there were a number of videos on YouTube popping up, a number of educational videos in range from exciting to pretty boring. And I think this is a very powerful medium to reach kids who wouldn't normally be interested in science, or math. And exposure, and how you receive and where you get information, usually tends to tip the scales as far as who's into something and who's not. So I think this is a really cool project. And I like to be on the other side of the camera as well.

ANDREA I guess I'll go next. My name is Andrea. I'm a Sloan Fellow here at MIT. So I'm significantly
DESROSIERS: older than maybe everybody. What I've been doing for the past 10 years of my life has been working in regulatory, so doing medical device submissions to the FDA. So it's a lot of communicating highly technical information to people who aren't exactly laypeople, but they're not going to be as familiar with the topic as, say, I am. So that's what I've been doing. And one of the things that I'd really like to introduce is using video as another tool to convey this information.

NATHAN Hi, I'm Nathan. I think why I'm taking this class is [INAUDIBLE] spread scientific information,
HERNANDEZ: too. At least for me, I think, not necessarily people who adore the science, but just people so they can be scientifically literate now. I don't know.

KENNETH CHEAH:Hi, I'm Kenneth, from SUTD as well. Back when I first graduated from junior college, I actually went to have a teaching internship for a period in Singapore, and that's when I realized that most students in Singapore do not really like blackboard or whiteboard teaching. I realized that a little-- like halfway into my first week of doing the internship, so that's when I revised everything that I had prepared, started creating multimedia tools and animations. It's been like two, three years since then. But the whole idea of using multimedia as well as video tools has still stuck around. I still regularly, when I'm bored and I don't feel like doing my homework, I'll go on YouTube and watch all these random videos, because at least I learn something; not relevant, but something. So this has always been an interest.

ELIZABETH Does anyone have any particular goals out of this month or something that you want to get out
CHOE: of taking this class? That's OK. We'll give you goals, don't worry. All right, well, I won't torture you any further.

JOSH GUNN:

I'll just mention that I'm excited about the class. I run an animation studio, as I said, and we do this work every day. We're engaged in helping biotechs and technology companies and educators explain very complex things, and sometimes not-so-complex things, to very young kids. But I certainly don't have the market cornered on how to do this. And as you said, this isn't really an academic field, and there's no grand unified theory of how to do this most effectively. I think a lot of things are out there right now, but I'm just excited to be engaged in a conversation about techniques and strategies for doing this, because they'll help me in my own work, and help me understand the perspective that you guys have as well. So thanks.

ELIZABETH

CHOE:

Great. As I said in the beginning, I run the K12 videos program, which is a fairly new initiative out of the Office of Digital Learning here. So it's the same group that oversees MITx and OpenCourseWare. I produce a series called Science Out Loud, which is essentially trying to mix education and entertainment, having students like you guys be the face of science and the face of engineering. And to get people not only educated and informed, but also inspired as well.

So I've had an interest in the intersection of all that stuff, I guess, since I took Chris' class. When I was an undergrad I took his DV Lab class. But I think it's a very fascinating area. And like Josh said, it's this market that I don't think anyone really has cornered or really-- no one really has a good grasp on what the best way to practice in it is. So I think it's a really interesting problem, especially for people at MIT to think about, as well.

As some of you guys said, videos have exploded in the last decade or so. These are all science YouTube channels that have over a million subscribers each. And it's not just video exploding in a certain area. You have YouTube entertainment slash educational shows, and then you have things that are very lucrative in our pop culture. Cosmos was raking in like five million viewers a week. Which isn't a whole lot compared to some of the other primetime network shows, but thinking about the fact that a science-based show aired on the FOX Network during a primetime slot and was raking in those views is pretty amazing.

And then you have movies like Interstellar, which are addressing a lot of real science topics, and is also making like \$50 million during opening weekend. And then you have things like edX and OpenCourseWare, and all these open education resources that are video-based, and are also reaching this incredible audience and have a huge group of people investing in it. And these are all very, very different styles of video, but they're all unified by this theme that they're

using video and they're accumulating a huge database of users. So something must be happening with video that's making it compelling for people to use to learn and to entertain.

What can video do? What is it about video that makes it so compelling to use as a tool? Educationally, you have stuff like OpenCourseWare that's really great, because people can pause the video whenever they want, they can rewind and rewatch an explanation. And it's also super scalable, so it means that you don't have to be physically in Cambridge to hear Eric Lander talk about genetics in the 7.012 class. You can be anywhere in the world. You can be in Singapore. You don't have to be restricted to the confines of room 26-100, right? It's a very scalable tool.

And then in terms of movies, I mean the thing about movies is we have this culture where people say that the attention span for video is like less than three minutes, yet you and I-- or at least I spend \$10 to sit for two, three hours in a dark room. And it's because movies are these completely immersive experiences that give us a chance to sort of escape into this other world. And you don't see people paying \$10 to sit in a room to listen to a radio podcast, right? There's something about the integration of the visual with the storytelling and the acting that totally immerses you in this experience, and that's a very, very powerful element that video can do.

I also think it's a window into a world that you don't necessarily have access to. So whether it's the world of 26-100 where Eric Lander is teaching or if it's the world of Middle Earth-- I just went and saw Hobbit III-- you get this chance to look into this world that you don't have access to, and that's what video can do. And then, finally, especially in nonfiction video, there's this idea of the trusted guide, which is a term that PBS Kids use to think about new shows that they pitch. They think about the person who's going to be the host, that it's more than just the person who's going to stand and transfer information to you. It's someone who's relatable, somebody who's a role model, someone who you really trust, that you end up really growing up with people like Bill Nye.

I don't know if you guys have shows or show hosts that you remember growing up as kids. Mine was Jeff Corwin. I'm like obsessed with Jeff Corwin. Does anyone have a figure that they really loved watching growing up? Did anyone watch the old Cosmos with Carl Sagan? Yeah? I feel like that's a big one for people here.

So the trusted guide is a really powerful thing that video can leverage. And I think that's a

really big reason why we're here, at least the reason why I'm here, is because when you look at the landscape of trusted guides right now on especially science and technical TV, and not just TV but Hank Green hosts SciShow on YouTube. And the landscape of trusted guide looks very homogeneous. And I'm not saying that it's a bad thing to be a guy at all, but I do think that we have this opportunity with video to showcase who the scientists and engineers really are. And this landscape is building a group of advocates who are going to be sort of being the ambassadors to the public about what you're learning about and what you're studying. And we have this opportunity to create a landscape that's just as diverse as the group of people it's trying to represent.

And it's an opportunity that I think hasn't necessarily been capitalized upon. Maybe it's because there are political things and it's hard to invest in a figure that looks different than the science hosts that we're used to seeing. But we have a chance here at MIT where the people are so diverse, not just in ethnicity and gender, but in background and personalities and interests. We have this huge landscape here that we can tap into and start contributing to a picture that looks a little bit more like what science and engineering really is.

And the other thing is literacy in digital media, which is the whole idea of understanding your video product as something more than the thing that you just hit play and watch, or understanding making video as something more than just hitting certain buttons to record the present moment, is something that is going to become increasingly relevant. I don't know you guys UROP in labs or anything, but a lot of labs right now have their own cameras. Many of you will probably end up having to give like a TED Talk or some sort of talk to the public where it's going to be more than just conveying information. Like people were saying, you want to learn more about how to engage an audience in a way that is going to inspire and engage them.

So at the end of the day, this class is not about becoming the next Bill Nye. That title is just totally clickbait to get people to sign up for the class. And it's not even really about making videos, like I was saying. The eventual deliverable of this class, the thing that we're going to be working towards every single day of this month, is to eventually create around a three-minute episode that you host, that you're on camera for, where you talk about a science or technology or engineering/math subject or topic that you're interested in.

So that's the deliverable, it's a video. But it's not necessarily about what are the technical steps I need to get there. Those are important, but eventually it's about taking those skills of being a

producer and transferring them into your everyday life. So maybe some of you won't make a video after this month is over, and that's OK, but hopefully the skills that you've picked up along the way to becoming an effective video producer will help you become a great advocate for science and engineering later on.

Every video that you guys will make in every assignment that you make, and every video that's online right now, has different objectives. Some of you may want to do a video on physics, some of you may want to talk about math. But the thing that should be the overarching objective of everything you make during this month should be to address these three problems in that amorphous STEM blob that I was talking about earlier, that you want to open the door to science and engineering, and really love of learning to everyone. So a lot of that will translate to making sure that your script isn't condescending to your audience, making sure that you're really meeting and knowing your audience where they are, encouraging this lifelong learning. We want curiosity to drive a lot of what your objectives should be. You want your audience to become curious. And then, of course, we want your science to be legit so you're educating the public, you're spreading STEM literacy.

What makes a good video? Now, this is a quote from one of the optional readings that's listed on the syllabus. It's actually really great, we just don't have time in class to cover it. But I love this quote. "Learning how to make really effective video is like learning to speak a second language. You have to learn not just what to say but how what you say will be received by others. We understand video better than any humans that have ever lived. Most of us just don't speak it well."

We consume video all the time, like you were saying you watch YouTube videos. But that doesn't necessarily transfer into us knowing how to make videos. It's the argument of, oh, teaching can't be that hard because I've been a student this whole time, right? It's very hard to extrapolate what it is about the practice of the video that makes it good when all you are used to doing is being a consumer. So what makes a great video?

Let's just take this piece by piece and look at best practices in established video realm. So educational videos. There was this task force that MITx had a couple years ago on what makes an effective educational video, and the four traits that they came up with were, one, that they were short, that they were digestible modules, usually under 10 minutes. Another is that the learner could interact with the speaker of the video, so maybe the speaker would mention a topic and it would be something that the viewer could end up looking up on their

own and interacting with. The other thing was that the host had them engaged, so it wasn't just this passive recording of them rambling on for an hour, the host would actually tell the viewer, OK, now try this problem at home, for instance. And then the host would acknowledge the viewers, so it wasn't just, here's this math problem sent out to this vague audience, it was, you try this at home.

And this is also what a lot of what I call explainer videos do on YouTube. I don't know-- you guys must be familiar with Khan Academy, but there are also things like MIT BLOSSOMS, which is a set of videos that's developed by a group here. There's Bozeman Science, who's this high school teacher out in Montana, and he does tutorial videos on all the AP science subjects. Tyler DeWitt, a former grad student here, he does chemistry tutorial videos. And they're all very, very successful because they take an audience that's already motivated in learning something and they're sort of one-stop shops. So how do I calculate the molar mass of this compound? You can just go to one of Tyler's videos and learn how to do it.

It's very misleading sometimes, though, because people see it and they often mistake it for it being a direct recording of an instruction. And so they say, oh, these explainer videos are much easier to do than big budget productions. And that's not necessarily true. They still spend weeks and weeks writing a script and developing exactly what they're going to say. And they're so effective because it's a very talented host, a very talented teacher who is engaging their audience in a way that helps them achieve mastery of the subject. So it gives them learning confidence. People love Sal Khan because they really feel connected to him beyond sort of this robotic voice that's telling them how to calculate the derivative of something, and that's a very intentional thing I think that he does.

Now, for entertainment, even within the world of YouTuber or within the world of entertaining videos, there are subcategories that have their own best practices. But in general, for entertainment, the thing that is most important, at least I think, is building an emotional connection with your audience. And that's something that is repeated by some of the folks that I'll be quoting in a little bit. And in terms of viral video, the way to best establish that emotional connection is through authenticity. By authenticity I mean when you see a video that goes viral on YouTube, it's not necessarily something that has a super corporate sheen. It's not really polished. A lot of times it just looks like a very janky video that someone took with their iPhone. And that in some ways helps people feel really connected to the material that they're watching.

And you have to be careful with it. But I did want to show a couple clips of two science videos

that have each raked-- I think the first one has over six million and the second one has almost 10 million views. And we'll just watch part of each.

CRAZY RUSSIAN HACKER: All right, here is what we need. Empty soda cans and put a little bit of water. Just a little bit, so it will boil down, you know? And then turn on the stove. While this gets ready we're going to make a nice bowl. So right here we've got our ice water already. And you see how water is boiling and steam coming out. I don't know if you can see it, but this steam is coming out right now. So we're going to get it and drop it. Use the tongs, don't use hands. Get it and drop it upside-down. That kind of fell. Let's start with this one. So are you guys ready? You see? They called this implosion. I want you to tell me why that happens. Why does it implode like that?

So we've got this pan. Here you go, a pan. And just we're going to turn this on. But remember, safety is first. Kids, you're going to need adults' permission. So and there we're going to leave it for a minute. We're going to put a little bit of water. Do you see how water is boiling now because it's too hot? So all the water is gone, boiled out. And let's leave it for another two minutes.

So it's been about two minutes. You see how hot it is? Let's put just a little bit of water, just little drops. You see how all these drops just like spinning around and not boiling out? I want you to comment and tell me why. Let's drop some more.

ELIZABETH CHOE: So the thing is like 10 minutes long so I'm not going to show it. But this video, which I personally cannot stand watching, this thing has gotten over five million views on YouTube. And Crazy Russian Hacker, who's the user who created it, he has millions and millions of subscribers.

I have the co-worker whose son is 12 years old and he loves Crazy Russian Hacker. And I don't know how you guys feel about the video. Were there any certain elements that you noticed about it that either you liked or you understood why people would like it so much? Yes, John.

JONATHAN: He asked the audience to explain what was going on, so that encouraged feedback and more posts by commenting on the video.

ELIZABETH CHOE: Yeah, so there's that element of not only acknowledging your audience but engaging it. And that's something that a lot of YouTube videos do. Maybe it's to get more comments, but it certainly works a lot of the time. Yes.

PAUL FOLINO: That video seemed like it was kind of-- it wasn't necessarily scripted, so it kind of shows that he really knows what he's talking about, he's not robotically following a script. Shows he knows a little bit about what he's doing.

**ELIZABETH
CHOE:** And he's quite a character. I mean, Crazy Russian Hacker has a huge brand, right? Like as soon as he starts talking you know that it's a Crazy Russian Hacker video. And he's kind of outrageous. Which is why it's hard to repeat that. It would be hard-- if I replicated that exact same video, it would probably not go viral. So his whole persona and the way that he has this sort of unpolished look about his videos is actually maybe one of the reasons why it's compelling. Were you going to say something, Yuliya?

**YULIYA
KLOCHAN:** Yeah, I think it's also relatable. He dropped the can the first time, so that tells the viewers that they can also make mistakes.

**ELIZABETH
CHOE:** A lot of online videos have this single-take format. So instead of having two cameras like these guys set up where you're switching back and forth between angles, he kind of just held his iPhone where he was, right, or whatever camera, and followed along. So you actually feel like you're right there with him. You feel like you're in the kitchen with him. There are no cuts back and forth to him talking. It's just one long, continuous take with just a couple mess-ups taken out in between.

JOSH CHEONG: Even though he asked comments, I'm very sure these comments are not all legitimate comments. I'm very sure there will be probably one or two people who purposely are trolls and probably say, oh, this is black magic or something, and then someone will comment, and the virality probably gives him the extra few million views.

**ELIZABETH
CHOE:** Yeah, yeah. Logan Smalley, who's the head of TED-Ed-- you guys have seen TED Talks, right? Have you ever seen TED-Ed videos? They do a spin-off where they have animators and writers partner up. He's the one who directs TED-Ed, and he had this talk where he was saying how a video online has a beginning, middle, and end, but the beginning, middle, and end isn't what's in the video itself. The beginning is the tweet that announces the video, the middle is the video itself, and the end it is all the conversation that takes place afterwards in the comments online and social media. And so with things like Crazy Russian Hacker, the end, the conversation, is almost just as important or just as much a part of the experience as the 10-minute video itself.

I wanted to show you one other video. This is from Smarter Every Day, and this has also over five million views.

DESTIN SANDLIN: Hey, it's me, Destin. Welcome back to Smarter Every Day. So you've probably observed that cats almost always land on their feet. Today's question is why. Like most simple questions, there's a very complex answer. For instance, let me reword this question. How does a cat go from feet up to feet down in a falling reference frame without violating the conservation of angular momentum?

Now, I've studied free-falling bodies-- my own, in fact-- in several different environments. And once I get my angular rotation started in one direction, I can't stop it. Today we're going to use a high-speed camera. We're not going to use Ally because this is my daughter's cat, I don't want to hurt it. We're going to use a stunt cat. Let me introduce you to Gigi, the stunt cat.

I'll just flip the video vertical and then motion-track the cat. It's just going to take a lot more effort in post. We're going to try to do it in a way that doesn't make anybody mad. That's pretty hard to do. You got to drop a cat. Ready, Gigi? Checking out the high-speed data there, Gigi?

OK, the first thing a cat does when it's falling is try to figure out which way is up. It does this either with a gyro in the ear or with its eyes. Ready to talk cat physics? All right. So check out this footage I captured with the Phantom Miro while Gigi goes to get a drink of water.

So here's what's interesting about this to me. If you'll notice, at the beginning of the drop the cat is not rotating. Halfway through the drop the cat is rotating, and then at the very end Gigi somehow stops rotating. Newton's first law says that an object at rest will stay at rest unless acted on by an external force. I see no external forces on this cat. So what's happening here? It's not making sense to me.

OK, so in order to really get the right data, we're going to have to drop her 90 degrees out of phase. Ready, girl? This time watch her tail. Three, two, one.

OK, so you think you figured it out? Check this out. You probably noticed that when the cat was falling her tail was rotating in the direction opposite of where her body was rotating. What's interesting about that is that that's not how it works. In fact, even bobtail cats can do this. It's called the cat righting reflex. I'll prove it to you.

I came across some video from the '60s when the Air Force was researching microgravity for future astronauts. Turns out they took some cats up on parabolic flights. He turns to rotate his

tail to flip over, but it doesn't work. He just ends up nutating wildly. Then he does something interesting. He takes his back and he bends it. And when he bends his back and then creates motion, something interesting happens. Ahhh, now we're getting somewhere. So let me show you one more cat flip with the Miro and we'll figure this out.

OK, the arched back ends up being pretty important. What he does is he divides his body up into two separate rotational axes that are tilted from one another. When he's released, he pulls his front paws in and does the ice skater trick. He decreases his moment of inertia in the front so he can spin fast up there. But in the back he pushes his legs away from him, increasing his moment of inertia. So a really large twist in the front equals a really small twist in the back in the opposite direction, and the torques equal out. So as soon as he gets his front paws in under him, all he has to do is extend those legs back out to increase that moment of inertia and stop the front twist, and extend his back legs along that rear axis. That allows him to twist those around really fast. And then all he has to do is pull them back in under his body and then extend all four legs, and brace for impact.

ELIZABETH

CHOE:

All right, so very different from Crazy Russian Hacker but just as popular. I personally really like Smarter Every Day. I think he's one of the best hosts, period. You can disagree with me, that's totally fine. But the thing I like about him is even though he's maybe a little bit more scripted-- he doesn't say um a lot, he doesn't really mess up as much-- I still feel like Destin is talking to me, that it's just this random guy in his backyard.

He happens to be a rocket scientist down at NASA or some similar engineering firm in Alabama, so he obviously knows his stuff very well. But there's something about him that's still very relatable, very natural. He seems like who he is on screen is who he is in real life. Did anyone have any particular aspects about that video that they liked or disliked? Or anything that they noticed?

KENNETH CHEAH: I think he thought about how [INAUDIBLE] tail was what affected the cat's movement, allowed the cat to-- but he mentioned that it wasn't the tail at all, so then that made us more interested in wanting to finish the rest of the video.

ELIZABETH

CHOE:

Mm-hm. He anticipated the misconception [INAUDIBLE] the cat. And that's actually a really big tool that you can use in your videos to hook people in. And Ceri, you take that summer MIT course, right? Where you were specifically addressing misconceptions in biology?

CERI RILEY: Yeah, I actually took a summer class at MIT, and I personally made a video. But our whole objective of the class was to choose a topic in science that people often have misconceptions about. So some people did videos on you catch a cold if you're outside in the cold. And then mine was your deoxygenated blood in diagrams is always shown as blue and so people think our blood is blue sometimes, but it's always different shades of red. Yeah, and so our entire goal was to figure out not only the real science behind the topic, but how to explain it in a way that debunks the myths or the misconceptions that people have about them.

**ELIZABETH
CHOE:** And I don't know what it is about misconceptions, but it does seem to be something that not necessary predicates but can help launch a video into being something more engaging. And maybe it is because it taps into the audience itself and it becomes more relatable, because it's acknowledging, hey, this is what you actually think. And it becomes surprising and maybe more memorable in that way. That you're more likely to remember that a cat doesn't use its tail to sort of out-balance the rotation that it feels when it's flipping but actually scrunches up. I mean, I'm going to remember that way more than I'm going to remember a single one of my 801 lectures on rotational physics. So that's just something to think about.

Now, something I do want to mention, and this is a conversation that Chris and I have a lot, which is that people often confuse correlation for causation, right? They think, oh, well, all these videos did really well so I just need to make a crappy video and do really bad lighting and just be really terrible on camera, and it'll go viral, it'll be great. It'll be relatable and authentic. And that's not necessarily true, right? Low production value is not equal to and does not predict a viral video.

If any of us tried to recreate Crazy Russian Hacker it would probably not go viral for the same reasons that I talked about earlier, which is that there are a lot of elements that go in play into creating something beyond what you see on screen when you're watching it. That it's OK to have good production. Smarter Every Day is actually pretty decent, and when you see his newer videos, his camera work, it's pretty good. And you can tell that he's gotten new equipment and things like that. And it doesn't take away at all from the experience, from the authenticity of the video. That authenticity starts at the core of the host, at the way they're creating it, the reasons why they're creating the video. And it's not created by the conditions of the production itself, necessarily. It's just that the conditions don't hinder the authenticity. But please don't mistake. Bad video production does not help you get to viral video. It just doesn't stop you from getting there.

Now, for YouTube-- and we sort of previewed this a little bit with the two videos that we watched-- there are a couple traits about YouTube videos that I think make them really great for learning and for educating, and for successfully engaging an audience. The first being just sort of the format in which they're written. A lot of viral YouTube videos or videos that are well known, or a lot of SciShow videos, for instance, they follow this format of asking the why, what, and how questions.

So you'll notice that the Smarter Every Day video was not titled gravitational physics, Newton's second law, or rotational dynamics, right? It was why does a cat fall on its feet when it falls down, right? It's contextualizing the question. It's making it relatable. It's sort of tapping into the innate curiosity that people have, even if they hate science. People who watch that video are not physics majors.

And it makes them more sharable. It makes them more memorable. And I think it makes it a little bit more conducive to this idea of retrieval learning, that people aren't going to just end the video right there, right? They're going to maybe share it with their friends or they're going to talk about it with their teacher at school. Which is such a powerful thing to happen with learning.

I think that's what really everyone's objective is as a teacher, or a lot of teachers have this objective, that they don't want the lessons that they're teaching to just stop once people leave the room. They want people to keep thinking about it and thinking about it in the context of their life outside of the classroom. So this format really aids in doing that. And I have a couple of videos I want to show you guys, the first being from AsapSCIENCE.

ASAPSCIENCE: Ahhh, sleep. You can never have enough of it, it seems. In fact, sometimes it literally feels like you aren't getting enough. But what if you stopped sleeping altogether? Strangely, science understands relatively little about why we sleep or how it evolved in the first place. After all, laying unconscious and dormant for hours on end while predators lurk hardly seems advantageous or smart.

But we have discovered a few correlations. For example, adults who sleep between six to eight hours a night tend to live longer. Excessive sleep, however, can lead to medical problems, including cardiovascular disease and diabetes. Similarly, chronic sleep deprivation has been linked to aspects of cardiovascular disease, obesity, depression, and even brain damage.

But what if you stopped sleeping right now? Well, after your first sleepless night, your mesolimbic system becomes stimulated and dopamine runs rampant. And this may actually trigger some extra energy, motivation, positivity, and even sex drive. Sounds appealing, but it's a slippery slope. Your brain slowly begins to shut off the regions responsible for planning and evaluating decisions, leading to more impulsive behavior.

Once exhaustion sets in, you'll find yourself with slower reaction times, and reduced perceptual and cognitive functions. After a day or two of no sleep, the body loses its ability to properly metabolize glucose, and the immune system stops working as well. In some cases, three days of no sleep has led to hallucinations.

Care about how you look? Studies have shown a direct correlation between sleep deprivation and a person's perceived beauty. That is to say, sleep-deprived individuals appeared less healthy and less attractive than when they were well-rested. The longest scientifically documented case of being awake was 264 hours, or 11 days. And while they did develop problems with concentration, perception, and irritability, the surprising truth is that they suffered no serious long-term health effects.

In fact, no individuals under these documented conditions experienced medical, physiological, neurological, or psychiatric problems. But there are limited studies, and this doesn't mean permanent damage couldn't be inflicted with more time. Sleep deprivation experiments on rats, for example, generally lead to death after about two weeks. But scientists aren't totally sure if they're dying from the lack of sleep or from the stress of constantly being woken up.

Perhaps we should look at fatal familial insomnia for an answer, a rare genetic disease of the brain which causes progressively worsening insomnia, or sleeplessness, leading to hallucinations, dementia, and ultimately death. This disease has only affected around 100 people in the world, but their average survival span was around 18 months. Over time, the lack of sleep becomes worse and the body's organs begin to shut down. So while lack of sleep won't necessarily kill you quickly, continual sleep deprivation will have a negative effect on your body. Sleep tight. But not too much. Got a--

ELIZABETH

So were there any elements of that video that you found striking, that you liked, that you disliked? Yes, Yuliya.

CHOE:

YULIYA

I really liked the movement and that he changed his materials.

KLOCHAN:

ELIZABETH Oh, like from drawing to construction paper and things like that. What did you think about the
CHOE: animation? Did you like it or not?

JOSH GUNN: Oh, are you asking me?

ELIZABETH Yeah.

CHOE:

JOSH GUNN: Yeah, I think it's effective. I think one of the things about it that's nice is that the animation allowed him to change to appeal to I think a current need for a constant stream of images that are different. This kind of-- I think we've been conditioned to be sort of bombarded with images, and animation is great for that.

ELIZABETH I mean, I personally am not a huge fan of AsapSCIENCE style, but I also recognize why it's
CHOE: super effective and why other people would like it. Because like you said, it's very engaging, if only for just the visual--

JOSH GUNN: It's also really well written. I actually think that it's better written than it is-- I mean, I think there are any number of ways it could have been performed. But I think it's really well written. It's very concise.

ELIZABETH Right. It's very shareable. It's sort of written in this listicle form that is dominating web media in
CHOE: general. It's like basically taking a BuzzFeed article and putting it into a video. Yet with the visual elements, there is a motivation for you to watch versus just see it on text form, in BuzzFeed, for instance.

JOSH GUNN: I actually thought that the cat video lost some of its engagement for me when he was-- there was this sort of stream of scientific information and all you're doing is just watching this cat in slow motion. And for me, it lost that kind of key component of what makes something engaging, which is the tight cohesion between what you're seeing and what's being said. And also the streamlining of scripting.

ELIZABETH And that's always going to be a push-and-pull that everyone's going to experience, too, with--
CHOE: at some point, are you explaining too much to the viewer? Should you just rely on the visual? Because you don't want to be too jargony and end up alienating an audience, but at the same time you have to cover-- you can't cover everything, right? You can't go in it in detail and

explain everything.

And that's a conflict that we'll hit in later lectures, how you can use animation to help you with that, some of the best practices in that realm. But that is something to think about, and I think that's a struggle that everyone has with video, for sure. I have one more video. Did anyone else want to say anything about what would happen if you didn't sleep? Yes.

JAIME

GOLDSTEIN:

You know, I was watching and I was thinking because so much of it is being shown just sort of from Gary of these pictures and these words, the thing that Crazy Russian Hacker had and the cat guy had that this guy doesn't is that you know they're not making anything up because you can see the cat and you can see the bubbles, whereas there are no references, so how do I know that everything that is being said is based on fact upon fact upon fact. He could be making all of this up, for all I know. And as I was watching it, I was thinking, how do I know he's not-- like where's the truth in here? I don't know.

JOSH GUNN:

Yeah, there is some of that element of like the web has a lot of information but what of it is validated, or where does it come from.

JAIME

GOLDSTEIN:

If there were a little subtext somewhere even just referencing any of the ideas, I'd feel more like, all right, I can believe this guy. But as it is, it's hard, because you just have a whiteboard and a marker, and you think, well, how do I know they've done their research.

ELIZABETH

CHOE:

Right. And I mean, with YouTube channels, a lot of them put in the sources in their descriptions. But I think the thing that maybe I enjoy less about AsapSCIENCE is you could switch the creator out for any other person and have any-- you could have Siri from your phone narrate the video for you and it wouldn't be a completely different experience. I mean, it has its branding because it was really one of the first channels to do that style of hand-drawn animation, so that's its thing.

But it doesn't have the compelling sort of authenticity that Crazy Russian Hacker does, or Smarter Every Day, or SciShow. And I think a lot of it is because you don't see someone on screen, you don't see a person on screen. And maybe that's just my personal taste, but I do think that makes a really big difference. This video is from Vsauce. Has anyone ever seen that channel before? Yeah. So I actually haven't watched all of this video by myself because I was scared to, but this is why I think it's creepy.

MICHAEL

Hey, Vsauce, Michael here. Fear gives us life. Being afraid of the right things kept our

STEVENS: ancestors alive. It makes sense to be afraid of poisonous insects or hungry tigers. But what about fear when there is no clear and obvious danger? For instance, a teddy bear with a full set of human teeth.

ELIZABETH I can't.

CHOE:

MICHAEL A smile.jpg. There's something a little off about these images. Too much mystery and strangeness. But no obvious threat the way there is with a gun or a falling rock. But yet they still incite fear because they are creepy. But why? What gives us the creeps? What causes something to be creepy?

STEVENS:

We are now in my bedroom, the bedroom I grew up in, in Kansas. Like a lot of children my age, I was terrified of scary stories to tell in the dark. But the very first book that ever scared me was the Curse of the Squirrel. To this day I still haven't finished the book, but that's just me.

Psychologist James Geer developed the Fear Survey Schedule-II, which he used to find out what scared us the most. Combined with the results of a more recent Gallup poll, these are the things that scare most of us the most. All of these things are scary, but are they creepy?

Let's get more specific. I love the way Stephen King delineates three types of scary stuff. The first is the gross-out. This is something disgusting, morbid, diseased. The second is horror. Horror, to King, is the unnatural; a giant spider or being grabbed in the dark when you thought you were alone. The third, terror, is different, creepier. He says terror is coming home to find that everything that you own has been replaced with an exact copy. Terror is feeling something behind you, its breath on your neck, knowing that you will be grabbed, but then turning around to find that there was never anything there in the first place.

Not a lot of research has been done on that feeling, the creeps. But many theories and ideas involve vagueness, ambiguity. For instance, masks, and why clowns are creepy. Claude Levi-Strauss wrote that the facial disguise temporarily eliminates from social intercourse the part of the body which reveals personal feelings and attitudes.

Part of the reason even a neutral or happy mask can be creepy may have to do with ambiguity. A mask hides the true emotions and intentions of the person underneath. I don't know if the person wearing that mask is a threat or not. Vagueness is creep when it comes to

the human form. This is the famous uncanny valley.

On a chart of humanness, there's a zone where something can be almost entirely human but off by just a little. Not so wrong that it's clear fake or funny, or so good that it's indistinguishable. Instead, it's just troubling. The creepiness of the uncanny valley is wonderfully demonstrated by John Bergeron's singing androids. Watch these videos when you're alone.

A similar uneasy feeling comes from Shaye Saint John, a character created by Eric Fournier. Funny to some, nightmare fuel to others. Uncanny humanoids, like all creepy things, straddle a line between two regions that we can understand and explain with language.

Francis T. McAndrew and Sara Koehnke describe being creeped out as an adaptive human response to the ambiguity of threats from others. Creepy things are kind of a threat maybe, but they're also kind of not, so our brains don't know what to do. Some parts respond with fear while other parts don't, and they don't know why. So instead of achieving a typical fear response, horror, we simply feel uneasy. Terror. Creeped out.

Between the mountains of safety and danger, there is a valley of creepiness, where the limits of our knowledge and trust and security aren't very clear. Will looking at this cause you to die one week later? Impossible, right? Maybe. That's the terror of ambiguity. We don't do well with ambiguity. When it involves our own intentions, it can make us lie. And when it involves danger--

ELIZABETH Can I stop or you guys want to keep watching?

CHOE:

MICHAEL [INAUDIBLE] recognizable threat, it can make us think and feel some pretty weird--

STEVENS:

ELIZABETH So he goes on and talks more about like the actual psychology behind this. The whole pop-up
CHOE: thing is his trademark move. He does that between all of his transitions. It's like a little kitschy but it works since he was the first to do it. But what did you guys think about this one, especially in comparison to AsapSCIENCE? Very similar format, it's the why-what-how, but executed very differently. Or maybe was there something about this video that you liked better than AsapSCIENCE or that you disliked compared to AsapSCIENCE. Yep.

PAUL FOLINO: I think I got the point maybe couple minutes in, but it seemed like the next three or four

minutes, he was just expounding on that point that I already got.

ELIZABETH Yeah, so it dragged a little bit more.

CHOE:

PAUL FOLINO: Right, it never really answered-- I mean, you didn't finish the video, but it never seemed to answer the question [INAUDIBLE].

ELIZABETH Yeah. I mean, he does sort of eventually, but it does take him a little bit longer to get there.

CHOE: Yes.

YULIYA
KLOCHAN: It still kept my attention because he was very close to the audience and he was an interesting character, so I was interested in knowing what he would say next, [INAUDIBLE].

ELIZABETH
CHOE: Yeah, Michael Stevens definitely is a very memorable persona on screen. And this is something that we'll emphasize throughout the course. We don't want you to feel like you have to exaggerate yourself or sort of because this persona on screen that you're not naturally. It's not about you trying to adapt into a Bill Nye personality or into a Michael Stevens personality. A lot of people find him super annoying, and I don't blame them.

It's really about how to best capture who you are in real life and just maintain that as much as possible in front of a camera, because maybe he is a little bit different in real life, but it doesn't seem super unnatural when you watch, right? You're not like, this guy is acting just like totally over the top. It's just part of his brand, part of his persona to get his message across.

I do think that something that was effective about that video is it took all these concepts that you learn in cognitive psychology, but again, instead of doing a video on here's the definition of uncanny valley or things like that, he tapped into something that resonates-- at least it resonates a lot with me, because I was super creeped out by this video. But it taps into something that we experience every day, that it's a very relatable video, that it's contextual, that I don't feel like I'm watching a lecture, necessarily, on it. I don't feel like I'm even watching a Khan Academy video. That I just want to sit there and learn more. I wanted to learn more for the first two minutes, at least. I don't know if you guys felt that way. Yes, no? Yeah.

JOSH CHEONG: I felt like I got pretty much what-- after he showed me the graph of the thing, I didn't really understand the graph, but he kind of explained it with like, oh, you need to be in between two points to be creepy. Then after that, it's all about trying to figure it myself. He does this

connect-the-dots thing. He doesn't really give you the right answers. He seems to be seeding you.

ELIZABETH

CHOE:

Yeah. The payoff happened, but it takes a long time to get there. And maybe he loses interest along the way. Again, that's something that you're going to have to figure out how to balance, how much tension do you want to build up for the audience. Maybe you'll do it too much, to the point where you lose them. Maybe you do it to just create the buildup to the final reveal of your video.

In addition to being these digestible, listicle type chunks that are shareable and contextual, YouTube videos are also super searchable, right? So you can just go on YouTube and search for literally anything you want, and you'll have suggested videos that pop up at the end, so there's this sort of inherent-- what was the thing I put? There's an inherent vetting process that happens on YouTube, that you have a compendium of knowledge and compendium of resources available to you, and you have things like comments and suggested views and subscriptions to help you decide what to watch. And everything's at your fingertips. You can get whatever you want, whenever you want it.

Then there's this whole trusted guide element that is really-- it's just as present on YouTube as it is on TV. You have people like Vsauce and Michael Stevens. Even with AsapSCIENCE, you don't see the guy, but it has a really strong brand. And it's one of those things where if you replaced a successful YouTube video with another person or another narrator-- a litmus test that I like to think of is if you replace it and it's just not really a noticeable change, then maybe there's something with your video that isn't very engaging. That if you swapped out any of your classmates for it and it still sort of felt like the same video, maybe there's more of your inherent personality that you can highlight more in the video.

And then, with YouTube, there's no invisible college, right? There's no gatekeeper of knowledge. You don't have to pay \$100 to access a lecture course, right? Anybody can access OpenCourseWare. Anybody can go watch a Vsauce video. Anyone can comment, so theoretically, anyone can contribute to that community and landscape, and its products as well. I think we're starting to see more of it. You see more female creators, you see a little bit more diversity in the YouTube environment than you do on TV, certainly. But again, there's a lot of room to grow in that regard.

And then finally, for TV, TV is very different from online video, which is something that I didn't

actually realize myself until fairly recently. I always kind of thought if I want to make a good video online then I should just sort of apply the best practices of making a good video on TV and just shorten it to a five-minute online video. But that's not necessarily the case, because the priority of TV, first of all, is to hold your attention. When you're watching TV, there are going to be commercials, you can flip the channel. I guess you can do that with online stuff as well, but the distractions aren't necessarily as huge. When you go to a commercial, you're going to want to change the channel.

So they really have to hook your attention, and they do that a lot with some of the production styles. On TV you'll tend to see a lot more multi-camera type videos. You'll see a lot of quick cuts, a lot of effects to sort of keep you engaged. I noticed that about the Hobbit, there was like an explosion every other second. And they do that because they have to have this really big hold on you for a much longer period of time. Whereas on online videos, stuff like Smarter Every Day, it's just kind of the same camera set up on a tripod that's shooting you the whole time.

And TV is very much about narrative, about telling a story. And I think that that is something that you should do in an online video too, but it's not as much of a necessity. Things like-- I don't know, any viral video that's not necessarily science-related, most of them don't really have a story. It's more just like, here's a naked celebrity. I guess you could create a story out of it, but it's not narrative-driven, necessarily, whereas TV very much is, and movies are as well.

I wanted to show you another video, and this is from Connections, which I never heard of until Chris showed us this show in his class. But it's awesome. It's like one of the first science TV shows in the UK. And this is from Connections 2, and it's a whodunnit episode.

JAMES BURKE: I suppose a detective catches a crook because he follows a trail from one uniquely relevant event or person to another, until he finds a unique piece of evidence that points to the only person in the world who could've done the deed. And strangely enough, the story I'm about to tell you about why modern detectives are able to do that at all follows exactly the same kind of trail, from one unique character to another through history. Here's my first unique character, Steve Davis, one of the best snooker players in the world.

ELIZABETH Ah, don't look at this. So that is a show that aired-- I don't know, was that like the '70s?

CHOE:

CHRIS BOEBEL: It's the late '70s [INAUDIBLE].

ELIZABETH Late '70s? And this is Connections 2, so maybe it's early '80s. I don't know about you, I felt like
CHOE: that was so endless. It took him two whole minutes to even just introduce the first character of what he was talking about, and it felt--

CHRIS BOEBEL: Isn't it amazing how the pacing has changed, and our expectations?

ELIZABETH Right, it felt agonizing, almost. And I'm sure if I watched it on TV and I saw the rest of it, it
CHOE: would be fine. But I mean, compare that to AsapSCIENCE, for instance. The priority of what Connections producers were doing with that video is very different than AsapSCIENCE, and you have a very different effect. I actually really enjoyed Connections, I really liked the show too. So I'm not saying it's a bad thing, necessarily.

But that's sort of what happens when you're applying this best practices in TV or movies and you think you can just move it over to video on the web and just shorten it down. That's not necessarily going to be the best approach, because some of the best practices aren't going to work, necessarily.

So what I would like you guys to do right now, if you can access-- does everyone have a laptop with them or can share a laptop with someone? If you go onto our class site, it's mit219.tumblr.com. You'll see a post that I just put up earlier today, and it has a link to a Google doc that should look like this. Should look like this.

And what I'd like you guys to do for maybe the next like 20-25 minutes-- and feel free to get up and stretch during this time if you want. If you need to use the restroom, feel free to head out.

JAIME Can you write the URL on the board?

GOLDSTEIN:

ELIZABETH Oh, yeah. Can everyone see on this board? There should only be one post, and it'll have a link
CHOE: to the class syllabus that, again, has all the videos that we've watched today and the assignments for all the days. And then it should have a link to this Google doc.

And what I'd like for you guys to do is to watch the videos that I've listed here, and then record the exact time code in which you want to stop watching the video, and just be completely honest. And then afterwards we'll talk about maybe some of the reasons why you thought certain videos were more engaging. Think about why you might still think that a video is good

even if you wanted to turn it off. And we'll convene at the end. But again, feel free-- if you guys need to get up and stretch or go to the bathroom during this time, feel free to do that too. And you guys can talk to each other as well.

All right, let's go ahead and talk. I know you guys are finishing up. Just so you know, every day you'll do blog reflections, and if you want to talk a little bit more about your thoughts on these videos in your blog today, that's totally fine. I know we're not going to get everything. But did anyone have a favorite video? Yes.

ANDREA The Veritasium one.

DESROSIERS:

ELIZABETH Oh, Veritasium, you like that one the best? Yeah, actually, that one's my favorite too.

CHOE:

ANDREA And Asap.

DESROSIERS:

ELIZABETH And Asap. What about those two videos did you like, or maybe can you hit upon one thing that you found particularly--

CHOE:

ANDREA Veritasium, very charismatic host, and kept the pace not going so quickly, but not going too slowly. Then for AsapSCIENCE, it was very crisp and conveyed the point very succinctly and clearly.

DESROSIERS:

ELIZABETH That's interesting because I actually thought that those were the two videos that I personally watched most of myself. And I'm not necessarily the biggest fan of AsapSCIENCE, but I did want to watch the whole thing. The thing about Veritasium is interesting, because he's not using super fancy equipment, per se. His stuff looks a lot better than a lot of what's on YouTube, but he's using just basic DSLR cameras, I think.

CHOE:

But his background, he's a physicist, that's his PhD. But he does physics education as well, so he's very cognizant of the role of video in education, and that's going to be one of your reading assignments tonight, is watching one of his videos. But I do think that he does a very interesting job and a very good job of being very natural on screen, charismatic, like you were saying. There's something about his delivery that is-- he talks the way that you would think he would just talk in real life, which is actually really hard to do on video.

Did anyone else-- let's see what you guys thought about the Veritasium video. It looks like a lot of people actually finished that one. And I didn't mention this before, but maybe you noticed. All these videos are talking about evolution or natural selection in some way or another, but they're doing it very different ways. What about anyone else, let's see. Nathan, you finished SciShow. What was it about SciShow that you liked?

NATHAN I'd say I liked that there's a little bit of humor in his video. I think that's something that tends to
HERNANDEZ: keep my attention better.

ELIZABETH Sorry, that you what?
CHOE:

NATHAN Just when you have a little bit of humor inserted, that keeps my attention better.
HERNANDEZ:

ELIZABETH And Hank Green is a very neurotic host, right? He talks like this and he has quick cuts and
CHOE: he's very hyper all the time, and it works for him because that's just who he is in real life. So again, being Hank Green doesn't make you successful, it's that he's able to just be himself on camera that works. Did anyone have a least favorite video or one-- let's see, a lot of people ended the TED-Ed one, or maybe a couple people ended that one early, and the Khan Academy one early. Any thoughts about those? What is it that made you-- I keep doing that. What is it about those videos that made you turn them off early? Paul, you turned that one off at 17 seconds. That's pretty early.

PAUL FOLINO: What one?

ELIZABETH The Khan Academy one.
CHOE:

PAUL FOLINO: Oh, yeah. I just thought that was a bad way of portraying evolution. I usually use Khan Academy for math or something like that, because he is going through all the hand motions and how to do an equation.

ELIZABETH Right.
CHOE:

PAUL FOLINO: But I think something like evolution that's kind of nebulous to begin with, I'd like to see pictures, not really-- I don't know. That's just my personal opinion.

ELIZABETH

CHOE:

Well, yeah, I personally agree with that as well. I mean, I also feel like Khan Academy works for a very certain type of video, and that tends to be a numbers and graph-driven one. And we'll talk about this more in a little bit, but when you think about why you want to make a video, you have to consider quite a bit about the visuals that you're going to use and how that's going to motivate the story that you're going to tell, or trying to convey the message that you're trying to convey. And I know-- I wish we could talk a little bit more about this, but we are running a little bit short on time and I want to leave enough room for Chris. So if you can respond a little bit more in your blog reflection tonight about some of these videos, that would be awesome.

So we've hit upon some qualities of what makes a good video, a good educational video, a good YouTube video, a good TV video. But the question of what is good, right? Because ultimately we have to figure out what we're going to define as success in this class, because otherwise there's going to be no impetus to improve. It's a really hard question, because what is good is really intangible. It's really inaccessible, at least in the field of video, or whatever we're going to try to do, because what is good is very much a matter of personal taste, right?

Like I personally don't really like the AsapSCIENCE videos, but I recognize them as being successful in what they're doing. They're engaging people, they're spreading STEM literacy, they're getting people to be curious. I'm not sure how much they're opening the door to science, but I mean they're doing good things even if I don't personally enjoy them. And a lot of people love Hank Green from SciShow and a lot of people think he's super annoying. So again, it's really hard to define what is good.

We often try to approximate what is good by other measures, so a lot of times we'll look at virality, how many views it has, how many subscribers they have. But again, virality is something that you can sort of assess in retrospect but it's not necessarily the most predictive measure, because so much of it rests on confounding variables like what are the current events that are happening at the time that the video comes out, what's the personality like.

Have you guys ever seen the OK Go music videos? So they're this popular alternative band, and their big breakout video was them doing this huge choreographed dance on four treadmills. And ever since then they've sort of tried to do this similar thing of a single take shot. I didn't actually show any of the videos, but I can send you guys the links later.

They do these single cam, continuous shots of just like outrageous dances, and I don't even know how to describe them. But the first one was the one where they struck gold. And they

repeated the same thing, it was the same people, but their later ones, which are successful, aren't nearly as successful as that treadmill one. So there are qualities about viral video that are universal, things like authenticity. A naked celebrity is always going to go viral. But it's very hard to build a predictive model based off of a regression that you're looking at in the past.

And then you have things like learning objectives that you can use to qualify something as good. You can say, oh, this video hit upon all to the standards that seventh graders in the US need to know about biology so it's a good video, and maybe that's why Bozeman Science-- maybe that's why he makes good videos. But it only tells so much of the picture.

So what is going to be our definition of good? And this is a question that I still am struggling with and I am totally open to us discussing as the class progresses. But I do think that there are going to be certain qualities that we should strive for, regardless of if your taste is in really rapid delivery or if it's in very sort of philosophical, grandiose type videos.

This is a quote from a reading that you guys are going to annotate on tonight for your homework, from Hank Green, who's the host of SciShow. But he says, "People who are new to the medium are starting to think that online video is not 'Just a little bit better than everything else on YouTube' but 'Just a little bit worse than everything that's on TV.'" And, "That perspective is a super dangerous road to go down on." That's sort of hitting upon what I was saying earlier about you can't take necessarily the best practices in the realms that we're trying to combine and transfer them over and expect great results, right? You can't try to make a video like you would TV show, necessarily.

So what is good? If good isn't the combined practices of TV, education, YouTube, what is good going to be? So this is a viral video manifesto that's, again, optional reading. It's actually pretty good. It's from the guys who made the Diet Coke and Mentos video? Have you ever seen it, where they combine Mentos and Diet Coke and there's this huge, choreographed explosion?

They talk about four points. Be true, be authentic. Don't waste our time. On an online video, you can't afford to do what Connections did and take two whole minutes to set up the premise, because that's sometimes the entirety of a video. Be unforgettable, show us something that we've never seen before. And that honestly might be the hardest thing for us here, at least it was the hardest thing for a lot of the students that we worked with on the first two seasons of Science Out Loud, that it's very hard to take yourself out of the perspective of being an MIT

student, or being a student involved in science and engineering.

And remember that some of the things that you take for granted and are part of your everyday life are actually really awesome and really cool, and things that most people don't see every day. You may work at the nuclear reactor here and think that it's just another everyday thing, but that's a window that you can create for people who would have never, ever had access to it. And then ultimately, it's about humanity, about the emotional connection. A lot of that comes from the authenticity, that if we can swap you out with just the computer voice and there's not that much of a difference, then really rethink how you're structuring and writing and producing your video.

So there are going to be four course values that'll guide all of the assignments and all the things that we do. And the rubric is listed in the syllabus that's on the website. We don't really assign point values to did you do correct lighting, did you do this, did you set up your camera the right way, because we don't want you guys to get bogged down in the minutia of it.

Instead, there are going to be these four overarching values that'll dictate what is good, I guess, as we move along in the class. The first one is Spark. There's this quote, and I think it's by Fellini, but something along the lines of it's not what's inside the camera that matters, so much as what's in front of and behind it. So are you promoting curiosity? Is there a perceived love of learning in your product?

Right, is there a perceived love of learning in your product? Is your passion and joy evident in your delivery? This can be seen in your script, in your final video. This doesn't mean that you need to go over the top. It doesn't mean that you have to pretend to be someone that you're naturally not or you don't feel comfortable being. But I'm sure all of us in this room have something that they're excited about, so can we perceive that excitement in your product?

Clarity. So "Kill all of your darlings" is one of my favorite sayings and something that dictates a lot of the work that I do. But this will be learning how to navigate the material you have and getting rid of stuff, maybe getting rid of explanations that don't need to be there. Editing is going to be a lot about this, and the last lecture is a lot about this quote. But it's also about can you convey your message in the most clear manner? Is your script tightly written? Is your delivery engaging? Have you realized your vision as effectively as possible?

Then we have thoughtfulness, which is that every decision matters. Whether it's deciding what background you're going to stand in front of to deliver one of your scenes, or deciding what

facts to include in your final script, every single decision matters. And it's thoughtfulness about what you decide to put in front of the camera, but also how you decide to talk to your audience. And again, it's outlined more in the rubric.

And then go big or go home. This is a hard one for people, understandably. This is probably the hardest one for me. But learning how to step outside your comfort zone and getting creative. We do you want to reward creative risks, so don't feel like you can't try something new. Again, hopefully it's an educated risk.

But these are all qualities that we're going to assess, not only through your final products but through your daily reflections, through a lot of the iterative processes that will be happening on the way to your final products. And this is where we're going to integrate things like are things clearly lit, but in the context of was this a clear message. Does that makes sense to everyone?

So if you want to make a video, where do you start? The first thing is deciding if you should make a video. And I think this list of questions is one that everyone should ask themselves before they make a video. Why am I making a video in the first place, versus a BuzzFeed article or versus a radio piece? Who is going to watch this video? This will make a very big difference in how you decide to write your script, how you decide to deliver. For the most part, our assignments will be assuming sort of a middle school type science background.

What visuals will I show? Again, this makes a really big difference. As Paul was saying, the Khan Academy video didn't really have the visuals that motivated the lesson that he was wanting to learn, so thinking about what visuals you're going to show are super important.

What is the fact or piece of information that the audience is really going to remember the most or surprise them? In the Smarter Every Day video about the cat flipping, it's just that whole concept of a cat can seemingly defy the laws of gravity, but it's really just a modification of their torque or something that actually makes them able to flip the way to do. And the biggest one is what is the point of this video? Now, the guys who wrote the viral video manifesto, they used to be circus performers, so in their book they talk about how there's a slideshow circus pitch, which is when you have the ringleader around the side and he's like step right up, step right up, come see the world's smallest person next to the world's giant man or something like that, right? There should be some sort of circus sideshow pitch to your video idea.

So one of the episodes we made was on farts, which maybe our motivation was just that we wanted to make a video about farts. But on the other hand, there's this amazing biochemical

process that's associated with all of that, and it really reflects just this incredible diversity of microbiomes that exist in your body. And so it's not just step right up, step right up, come watch a video about farts. It's like step right up, step right up-- what's the thing I wrote? Witness your body's countless armies of lowly bacteria squeeze every drop of energy from your gut and create horrendous sounds and smells.

So there should be some sort of circus sideshow pitch to your video, and Chris is going to help us realize that in the actual way of how do I actually make that video, how do I actually create that vision. So that's what we're going to do for the last part of class. But be thinking about maybe what your circus sideshow pitch is going to be. And eventually tonight everyone is going to need to create a very short, maybe two-minute video, one to two-minute video, a science, technology, engineering, math topic that you're basically going to pitch through this video. It's going to be sort of a trailer for your final project. All right, Chris, I will let you take over.