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GEORGE ZAIDAN: OK. So this is our plan. I'm going to talk a bit about writing. We're going to practice some writing with the examples that you uploaded and then some other examples that are not yours. And then I'll talk a little bit about hosting. And then if we have time-- I don't know if we will-- at the end, we'll do a little bit of hosting practice. But part of the hosting practice will come with the writing practice. It's hard to separate them.

I'm going to talk for like maybe 10 minutes about writing. And then we'll just get right into the practice. I'm going to overload you with a bunch of guidelines or rules or however you want to think about it. Don't worry about remembering them or writing them down. But we'll come back to them all as we do the practice, because that's really how you learn, is by doing.

This is one way to write. It's kind of how I approach writing. You start with an idea. You're like, hey, it'd be great have a video about whatever, x. And then the explosion phase is the, I'm going to think about everything that could possibly relate to this idea. I'm going to write it all down.

I think you saw an example of that with Elizabeth's snot brainstorm. Brainstorm is another word for it. And then from there, you sort of go outward and then you distill it down to the essence, like what is the actual point of the video, who, what, how, why. Where is sometimes important, but not usually.

And then the stuff that we're going to talk about today, this is the writing piece of it. So when you write a script, you want to pay attention to structure. So what do you talk about first? What's in the middle? How do you end it? That kind of thing.

Tone-- are you going for funny? Are you going for dry? Are you going for informal? Are you going for formal?

Jargon-- you want to generally try to avoid jargon, especially if you're shooting for high school, middle school, that range. By the way, it's ironic that I'm using the word jargon. Jargon is a technical language, which jargon is itself a technical word. So that's sort of an ironic thing

there.

Visuals-- you always want to write the script, because video is a weird medium. I mean, you've got the image, and then you've got the soundtrack, and you want to make sure that they are related and don't duplicate each other. So that is a trick that we'll get into. I was reading some of your examples and there are particular sentences where this is going to be really important. So if I don't talk about that on my own, remind me.

Metaphors and jokes-- it's really hard to be funny. So if you think you can, and you want to try, then I would say go for it. But generally, I try to avoid jokes. Metaphors are similar, it's kind of hard to write a good metaphor. Do we all know what a metaphor is, by the way?

PROFESSOR: I showed them the [INAUDIBLE] video yesterday.

GEORGE ZAIDAN: OK, cool. So those are sort of-- the stuff on the left is in every video, you've got to pay attention to. The stuff on the right, the metaphors and the jokes, are sort of advanced.

Anyway, then once you sort of get your first draft together, you explode, you distill that into your essence, then you condense it, and you write your script. And this doesn't happen once. This happens many, many times. Typically, a script will go through between 4 and like 12 revisions before we actually shoot it, up to and including-- we're rewriting five minutes before we shoot. Because you say it out loud, and something just doesn't sound right, and you feel like you have to change it.

So this is generally how my writing process works. Other people do it completely differently. This is sort of an MIT approach. It's very sort of structured and logical, but it doesn't have to be this way. If you don't want to write like this, you absolutely don't have to.

The first writing guideline, this is in addition to the flow chart, is-- and I think you guys talked about this a little bit already-- know your audience and write for them. And I have this note down there, not necessarily to them. So most of the videos that you're going to be working for are aimed at people younger than you than you, and sometimes people a lot younger than you. I mean, maybe even down to like 6th, 7th grade, middle school.

So you want to write to their level of education, but not necessarily talk as if you were talking to a middle schooler. Does anyone know what I mean by that distinction? I'll cold call if people don't speak up.

AUDIENCE: Like, don't baby talk?

GEORGE ZAIDAN: Exactly. Yeah, exactly. Don't baby talk. So give me an example of like-- pick a sentence, any sentence. You can read it off the intellectual property form in front of you if you want. But give me the non-- just the regular version. And give me the baby talk version, just so we have a sense.

AUDIENCE: [INAUDIBLE]

GEORGE ZAIDAN: No, that's exactly right. And you guys notice that it's funny when he does that. There's just something ridiculous about-- you call it baby talk or talking down to your audience or something-- that you immediately don't pay attention to what he's saying. You pay attention to how he's saying it. And you've lost your audience immediately. So that's a really important distinction.

By the way, this holds true if you're just interacting with kids anyway. Most kids are smarter than we give them credit for. And people baby talk kids all the time. But if you just straight talk to them, you'll be surprised at the kind of responses that you get.

Rule number two-- or guideline, sorry, number two-- is write it like you would say it, because you will be saying it. What I mean here is your script is a draft. And it will always be a draft. You will never have a final script, because nobody's going to log on to the internet and read your scripts. What they're going to do is hear you say the words that are on your script.

So even if a sentence is great on paper and you read it in your head and it sounds awesome-- if when you say it out loud it, it sounds weird or it's hard to understand or whatever, then it doesn't matter how great it looked on paper. It's not an effective sentence. This is the most important thing we'll talk about today. We'll come back to that when we do the practice.

This is another version of the previous slide. When you-- and you guys are all know this because you read scientific journal articles and stuff-- when you read that kind of text, it's very dense. It's extremely well structured and logically laid out. It has a lot of jargon. It's very precise. There's very little ambiguity. And it's understated, and it's elegant.

Meaning like-- usually people take the fewest possible words to say something, and that means using long and complex words. And it is beautiful to read. It's great English. But if you try and read it out loud and you do it on video, again, you'll lose your audience instantly. It's

just as bad as baby talk.

When you talk-- people talk in-- people are very repetitive. They say, "uh." They say, "um." They-- uh-- like I just did. They don't really use fancy words. If their audience doesn't understand, they stop and they try another approach. It's a lot more free-form, a lot more inconsistent, a lot fluffier.

And that's what you want to shoot for, because you will be on screen talking to the camera as if that camera is another person. And so that's the write it like you say it. That's what I mean when I say write it like you would say it.

Another-- and I think this is the last guideline-- is you really want to be accurate. Because, obviously, you don't want to say things that are wrong in your videos. But accuracy is not the same thing as detail. So this is the difference between going back to the last slide.

Being very, very, very precise usually requires a lot of detail. If you want to say exactly what you mean, it probably will take you a couple sentences to say it. But if you want to be accurate, that is going to-- and especially if you want to be accurate for a short five minute video-- that's going to mean leaving information out. And that's OK.

The test that I like to subject scripts to is, can an eighth grader understand it? If so, great. And can a PhD In the subject matter of that script read the script. And if their reaction is, wow, this is surprisingly accurate, then you've done a good job. And that's all. That's it for my rules. Hopefully that was less than 10 minutes.

What I want to do now is put these rules in to practice. We're going to start with a quote that is not one of yours. And then we'll move into your scripts. So I'm going to go ahead and-- let me pick one. Let's do the first one. OK. So let's see. Everyone take a second and just read this.

So you'll notice the citation. This is from a paper. It's written English. Can someone just shout out some of the rules that would make this bad for speaking and reading aloud?

In fact, why don't we-- let's actually read this aloud just to see how it sounds. So anthropogenic CO2 emissions are contributing to global climate change and could negatively impact our way of life if serious action is further delayed. OK. So what rules are we breaking, or what guidelines are we breaking?

AUDIENCE:

I think just hearing it out loud, it seems kind of-- life if you were presenting it to someone, it'd

be a long sentence. And it's very statement. It's not conversational. It's not like you're-- you know, it's not written like you would speak.

GEORGE ZAIDAN: Exactly. What else?

AUDIENCE: The word anthropogenic is difficult to hear and remember.

GEORGE ZAIDAN: Exactly. It's also jargon. It means human-made.

AUDIENCE: It's a very passive sentence.

GEORGE ZAIDAN: It is a very passive-- what you mean by that? Explain.

AUDIENCE: Well, if further delayed-- I mean, what you really mean is this could be troublesome. This is bad. Right? Or it could be bad. Right? But their way of stating as further delayed isn't very-- it's not a very active way of saying the same thing.

GEORGE ZAIDAN: So here's another interesting thing. Negatively impact-- those are not difficult words. It's easy to understand what they mean, but let's think about that for a second. So what doesn't negatively impact our way of life mean in colloquial language? What would you say to someone if you were going to say, in 100 years climate change will do what?

AUDIENCE: [INAUDIBLE]

GEORGE ZAIDAN: Yeah. Will it negatively impact our way of life? No, it's going to kill us all. That's sort of the real-life subtext of this sentence. What else?

AUDIENCE: There are a lot of complicated grammar structures-- are contributed, is delayed.

GEORGE ZAIDAN: Mm-hmm. You have to-- I mean, you wait till the end of the sentence before you get the payoff. Right? You don't understand what the point of the sentence is until you get to "negatively impact our way of life if serious action is further delayed."

And really, you don't understand-- I mean, the point is we need to act now. That's what this sentence is saying. If we act later, we're screwed. And you don't get that until, "if serious action is further delayed." So yeah, the payoff really comes at the very, very end.

AUDIENCE: It's a fun exercise to eliminate all of the adjectives and look at the nouns and verbs. Right? Just take a second and see if you can do that. It actually makes it really simple. Emissions are contributing to change and impact-- like picking out all of the things that suddenly simplifies

everything-- [INAUDIBLE]. There's a lot of descriptors in there that are very distracting.

So now that we've done this, let's rephrase it as if we were saying it to someone on camera.

PROFESSOR: Or what if just to someone in general?

GEORGE ZAIDAN: OK, yeah, to someone in general. Say it to me. Anyone.

AUDIENCE: If we don't act now, [INAUDIBLE].

GEORGE ZAIDAN: Right. Another version.

AUDIENCE: Man-made CO2 emissions are hurting us.

GEORGE ZAIDAN: OK. Another. Yeah.

AUDIENCE: Humans create CO2 emissions. We must act now or suffer.

GEORGE ZAIDAN: I like that. We must act now or suffer. That's good. Anyone else? Someone who hasn't said anything yet.

AUDIENCE: If we don't stop emitting CO2, life will look very different soon.

GEORGE ZAIDAN: Good. OK. So the point I'm trying to make by having five or six of you say it each a different way is that there is no one right way to write a script. There are lots of interesting, engaging, dramatic ways to say the same thing. And we are going to get into that now with your examples, which we're going to spend considerably more time on.

PROFESSOR: Before you move on, George.

GEORGE ZAIDAN: Yes?

PROFESSOR: So it's always an interesting challenge balancing avoiding being too jargon-y and ending up baiting your audience. Right? Like, there's no reason why you can't say that words, climate change. Even though those are technical terms. [INAUDIBLE] What was it? Anthro--

GEORGE ZAIDAN: Anthropogenic.

PROFESSOR: Anthropogenic. I mean, we talk about this with [INAUDIBLE] scripts all the time. The way you deliver a word, for instance, can help a lot with conveying. What was the word-- [INAUDIBLE].

GEORGE ZAIDAN: I mean if you want to-- if you're going to use that same word four or five times throughout the script, and it's an important word, and it relates to a demo or something-- if there's some reason for you to use jargon, it's OK to define it. As long as you just define it like you would to another person. Like you say anthropogenic means human-made. And then you go on and use it later on. That's fine.

You don't want to do that like six times in the video and define six different words, because then you overload your audience. But that's true. There is-- if you find yourself having to say human-made, man-made, woman-made. Like if you are stretching to try and find alternatives to word five or six times that you could just define and get it over with, that's fine. I wouldn't limit that probably to like one or two words a video, or one or two words per like three, four minute video.

PROFESSOR: And the other reason why it's really important to actually do the exercise of reading your script out loud, or even just flipping your script over and not looking at it and trying to describe the contents to the person next to you, is that-- a very bad habit of mine, which I am constantly finding I am annoyed toward it a lot-- is that I get very newscaster-y.

So I may end up having a script that sounds good when you say it out loud. But it sounds like you're a reporter talking about the latest news update [INAUDIBLE]. CO2 emission-- can you go back to that quote?

Yeah, like the middle part isn't actually that crazy to say out loud. It's contributing to global climate change and could negatively impact our way of life. Right? Like that doesn't sound too crazy to say out loud.

But it sounds like someone is saying that in the context of, I'm here at the MIT Course One lab where researchers are finding a way to prevent global climate change from negatively impacting our life. Right? It doesn't sound like I'm just talking [INAUDIBLE] like a lot of men in admissions are harming [INAUDIBLE] life or something like that. I also-- [INAUDIBLE].

GEORGE ZAIDAN: Yeah. The way you write influences the way you're going to naturally say something. And you could say this sentence both ways. So you could say it, you know, anthropogenic CO2 emissions are contributing to global climate change and could negatively impact our way of life if serious action is further delayed. That sounds like the 7 o'clock news, right?

You could say you could say it like this. Look, anthropogenic CO2 emissions are contributing

to global climate change. And that could really negatively impact our life if we don't do something right now. I mean, it's basically the same line, but it's said two completely different ways.

And it's much harder to say a line like this naturally, but it's possible. So the way you write can impact how you end up saying something. And that's important too. We will-- whoever of you ends up shooting with us in the last week of January, we are going to guaranteed say, no, try that again. It sounds too new newscaster-y.

And this is a style choice, but for Science Out Loud, it's not news. We don't want it to come across like, here at MIT, we're talking to you about whatever. Because MIT already has a news office. They do that well. Our goal is different. And so making that style choice consciously from the beginning is important.

But if you want to write like a newscaster-- I mean, if you're writing for a news show, if the point of the show is news, then that could be perfectly fine. Good?

PROFESSOR: Were you going to show the Ira Glass clip? Later for hosting. Yep. It might actually be fine to show that now while we're talking about it. Let we find it. Yep, here we go.

AUDIENCE: [INAUDIBLE]

GEORGE ZAIDAN: Oh, yeah. There we go.

AUDIENCE: [INAUDIBLE]

GEORGE ZAIDAN: Do you guys know who Ira Glass is-- *This American Life*? He's a radio personality. He's been doing this for many, many years.

AUDIENCE: [INAUDIBLE]

IRA GLASS: I'm going to play you a clip of tape from my eighth year.

[MUSIC PLAYING]

IRA GLASS: [ON RECORDING] It's not such a long way from the local grocery store to the international debate over whether sorghum and meat production are causing corn to decline in Latin America. There's a general air of prosperity here, partly thanks to Mexican imports of US grains, which helps boost our farm economy. Mexico is now one of our biggest grain

customers, buying a half billion to \$1 billion worth every year, including corn to feed its people and sorghum to feed its livestock.

Like what am I talking about? Like, I don't even understand-- like, I wrote this. I don't even understand what it is. OK, also, like every part of this is ill conceived. OK? The writing is horrible. You can't even follow what I'm talking about. And then the performance like-- OK, just a little tip if you're performing for broadcast, you don't underline every third word for emphasis, because it sounds really unnatural. What you want to do is you want to talk the way people normally talk.

[ON RECORDING] This helps cut our own trade deficit and benefits everyone in the US economy. But in Mexico, this policy has lead to fewer tortillas for the poor and unappetizing tortillas for everyone else.

Again, like this is the most moronic kind of like-- it doesn't mean anything. And it's hard. It's actually kind of an interesting story, which I'll say to you in a sentence. Which is, because Mexico produces a lot of stuff that they ship to the United States-- tomatoes and all sorts of really wonderful food that we eat here-- they don't make enough corn for their own people. That's the story.

So for us to get really great tomatoes, or semi-great tomatoes, year round, basically, Mexicans eat worse. That's the story. And it's kind of an interesting idea. Right? Like that's actually sort of like a cool idea executed in the worst possible way.

So he's talking about two things there. The first is how he wrote the story, and the second is how he delivered the story. Right? So in the second part of the clip where he tells you the point of the story in like two sentences and you can actually understand what he's saying, that's a writing issue.

And then the point that he makes about, don't underline every third word, once you hear that-- like, if you listen to the local news or even the national news-- I mean, once you hear that, you can't un-hear that. It's incredible how pervasive that tone is. Because it makes people sound very important and official when they choose certain words to underline and deliver correctly. And, you know, that is something that is fine for the news, because it has a purpose. But it's just-- I mean, I think it's terrible. And Ira Glass does too.

If you listen to-- his show is called *This American Life*. And if you could just listen to the first like

three, four minutes of any show, it's a great example of really good hosting. *Marketplace* is another show that has a similar style and feel to it that's good to listen to. And then everything-- I think eight minutes past the hour or something-- NPR-- or every hour-- NPR goes back to their local news stations. So you can hear the difference between newscaster-y delivery and natural delivery. It's a really good exercise. Like I say, once you hear it, you can't un-hear it.

So let's go back to writing. What we're going to do now is I'm going to have-- I picked, I think, three or four scripts at random. And I'm going to have whoever wrote the script come up here and read it. And then we're going to do a group critique of the script.

This is a humbling experience. We are going to say-- we're going to point out ways that your script has been better. But that's OK. That's how you get better. And it's an experience that we will go through again and again. Well, I won't-- because I won't be here, but you will with Elizabeth again and again throughout the rest of the course, and especially in January.

Because we are going to be very anal about, does this make sense, does this convey the idea we wanted to convey, does it do it effectively? So this is, I think, going to be your first experience of that. So who wrote that? And by the way, I picked random-- all right, come on up-- I picked random sections of the script to talk through. Do you want him to put on a mic? Do you want him to wear a mic? Yes? Does it matter?

AUDIENCE: It doesn't matter. OK.

GEORGE ZAIDAN: All right, come on. What's your name again?

AUDIENCE: David.

GEORGE ZAIDAN: David. Nice to meet you. I'm sorry you're going first. All right. So stand up there. You can read the text here. Deliver it like you would like you would deliver it if you were being recorded, which you are being recorded. And I'm going to sit in your place. And we're all going to have a conversation about it.

AUDIENCE: [INAUDIBLE] I was sitting next to my roommate. So I was actually kind of shy about reading out loud. So actually, I tried to read out loud. But I read it semi-internally. So maybe that's why some of this would sound a bit odd.

GEORGE ZAIDAN: That's OK. No judgment yet. Let's get it out there.

PROFESSOR: Yet? No judgement ever. This is a safe space.

AUDIENCE: OK. So my topic's about why do some people handle cold better than others. So why I was interested is that, why is it that some people are more fearful about the cold, that they'd rather die than be caught outside without all the winter gear, mask and all, while others can wear one layer for morning jog. Actually, I say yesterday morning. And what makes all the difference?

So to understand this, we first need to find out how our body reacts to cold. The first point is that the changes that way it burns energy more efficient. We actually burn more carbohydrates through our metabolic system to generate more heat. Imagine a giant furnace within our bodies. As winter starts to come, we throw more bits of carbohydrates and start energy to burn, and create more heat to warm our bodies. Then we cue pictures of furnace and burning stuff.

GEORGE ZAIDAN: OK, great. OK. You can come back and sit down. Thank you. Excellent. I want to point out something that actually has nothing to do with writing. When you were-- very similar to how there is a newscaster-y tone to deliver things, especially when you're reading off a teleprompter, there is also a reading tone to deliver things, versus reading something out loud versus saying it to someone.

And when you got to the end of your first paragraph-- so you said, without all the winter gear on, mask and all, while others can wear one layer for a morning jog-- I saw that yesterday actually. Did anyone else notice how when he switched from reading to talking, you instantly snapped to attention? Because, I mean, here his focus is there. And then when he switches over to, I saw that yesterday, by the way, he looks at you all. He makes that connection with you, and you respond instantly. Right?

So that's something that is maybe better when we when we talk about hosting, but since you did it right there, I wanted to point it out. OK, so now in one sentence, someone summarize the sort of main point of this part of the script for me. Without re-reading it-- sorry that was a crucial piece of information. Don't read it again.

AUDIENCE: Carbohydrates generate heat.

GEORGE ZAIDAN: OK, how?

AUDIENCE: Carbohydrates are the fuel to generate heat.

GEORGE ZAIDAN: OK, that's a little more specific. Does someone else have a different sentence they were thinking of? Yeah.

AUDIENCE: Our bodies process carbohydrates differently, so we react to differently to the cold.

GEORGE ZAIDAN: OK, cool. What technique is used here to explain how we process carbohydrates?

AUDIENCE: Metaphor?

GEORGE ZAIDAN: Explain. Where?

AUDIENCE: The giant furnace within our bodies.

GEORGE ZAIDAN: Does it work?

AUDIENCE: Yeah. I think it makes you understand something that's technical and scientific in a more relatable way.

GEORGE ZAIDAN: What do you mean by relatable?

AUDIENCE: Well if you have an oil furnace at home and you're used to that thing cranking out in the winter, then you can kind of relate to that.

GEORGE ZAIDAN: Right. So your body is an incredibly complex piece of machinery. It is basically unlike anything else that we're used to in our world. But a furnace, an oil furnace, or even a fireplace, or whatever, something that burns stuff, is something that your audience pretty much you can count on will have seen that. So relating this very complex piece of machinery to something that's much simpler is a great way to clue your audience in immediately on what's going on.

We can talk about metaphors more later and what the tricky parts of metaphors are, but what else here makes this effective? What else makes you want to listen? Makes you interested to know more? What techniques?

AUDIENCE: Asking the question?

GEORGE ZAIDAN: Yeah. So the first paragraph is all questions. That's all it is. it's just sentences of questions. So why is that useful? Why does that help?

AUDIENCE: [INAUDIBLE] they have to know the answer. They [INAUDIBLE] so when the [INAUDIBLE] speaks, they will want to continue.

GEORGE ZAIDAN: Yeah, exactly, and that's a really common technique. You start with the question with-- you start off the video, excuse me, with either one or more questions. What else is effective here? Do you want to say something?

AUDIENCE: I mean the questions themselves work. It's not that pose-- you could have posed much bigger questions like why do I get cold? That's not a really compelling question, but it's a-- the second question, why is it that some people are so fearful in the cold that they would rather be caught dead than go outside? And when you said like I just say this outside, I see it outside all the time too, so the questions themselves immediately jump into relating to the viewer.

GEORGE ZAIDAN: And it's something that is a common-- we didn't talk about-- your idea should be good, right? But having a good idea is an important part of making an interesting and readable script, and this is something that we've all experienced. I mean you walk around MIT, and you see people walking around with shorts in the weather outside. It's like 12 degrees outside or whatever. And you think, my god, they must be insane.

But no, maybe they actually don't feel cold like we do. And that is something that is one of those things that you see a lot, and you don't really process it, but when you really stop to think about it, you're like wow, that is really bizarre. I want to know more. So you're right. It's not just asking questions in and of themselves, but it's what are those questions, and do they point you somewhere interesting? What else is effective here?

AUDIENCE: There's a "we" right there that I feel its absolutely essential.

GEORGE ZAIDAN: Which one?

AUDIENCE: Right in the very middle of the page, there's-- middle, middle, middle.

GEORGE ZAIDAN: To understand this, we first need to find out how our body reacts to the cold.

AUDIENCE: That "we" I think is so essential, because if it were a you or a me it wouldn't work, but the "we" is very appropriately engaging.

GEORGE ZAIDAN: What does it do?

AUDIENCE: I means that you and I together are going to figure this out. I'm not going to tell you, but we're going to explore this together. And that's the perfect tone for this piece.

GEORGE ZAIDAN: You are leading your audience on an adventure of understanding. You're the guide, because you're on camera, but you're bringing them with you-- versus I'm just going to open your head and dump this information in your head, and then you're going to know it. That's not what this. This is an odyssey of exploration that we're going to go on together. Anything else that we want to point out is effective?

OK. What could be improved?

AUDIENCE: I think the pacing makes it easier for the host to read, so just have less commas but more maybe periods, and just split it up into shorter sentences. So you don't have to keep [INAUDIBLE] for a long time.

GEORGE ZAIDAN: Yeah the sentences do get kind of long. The last paragraph is just two sentences and then the middle question in the first paragraph is a very long sentence. So I agree. That's one of the default patterns that you fall into when you're writing something. When you're thinking of something in your head, you tend to think in sort of long, unbroken streams of thought, and that tends to manifest itself on the page. Whereas when you talk, it may not be sentences in the traditional sense of-- OK, I'm going to stop talking now-- there's a period. And now I'm going to start again.

But you do have pauses in your speech that let your audience understand what's going on, and you can count those as sentences. What else?

AUDIENCE: Maybe putting the metaphor before the scientific-- picturing the giant furnace [INAUDIBLE].

GEORGE ZAIDAN: So give us a version of how you would imagine that would go.

AUDIENCE: Imagine a giant furnace in the winter, burning coal and charcoal to generate heat. Now imagine the body, the metabolic system as that giant furnace. And then the coal and charcoal as the carbohydrates in your food.

GEORGE ZAIDAN: Yeah, great. That's an excellent point. So the way this script is written, the simple technical answer that has no metaphor comes first, and then you have the metaphor. But the way that-- remind me of your name?

AUDIENCE: Kenneth.

GEORGE ZAIDAN: Kenneth. The way that Kenneth said it is, OK-- we're going to start simple. We're going to start

with something you know, a giant furnace. Got that in your head? Great. Now imagine that your body is that furnace, and instead of coal, you've got sugar, et cetera, et cetera, et cetera. And you the metaphor like that, and that's sort of a principle of start small, start easy, start with something you know, and then build layer by layer on that.

And that is something that is not one of my rules, but easily could be. Everywhere except the very first sentence of the video, it's a great technique to make sure that your audience is caught up with you all the time. And I say everywhere except the first bit, because the exception is that if you want to start with a compelling hook, you might start completely out of order, and then come back to something later in the video just for the purposes of hooking your audience and getting them through the first 10 seconds.

But other than that, that sort of expansion-- I sort of look at it as a funnel. You start really simple, and then work your way out to complicated. What else?

AUDIENCE: I'm not really sure whether you need the middle sentence.

GEORGE ZAIDAN: Which one? This one?

AUDIENCE: Yeah.

GEORGE ZAIDAN: Let's try it. So give us a read-- read the last few lines here, and then why don't you go into Kenneth's version of it. So read the last couple of lines here, and then go into the furnace, and we'll see how it sounds.

AUDIENCE: Well Alice can wear one layer or more layers for the morning job-- what makes all the difference? [INAUDIBLE] What makes all the difference? Imagine a giant furnace within our bodies. Our bodies change and burn energy [INAUDIBLE].

GEORGE ZAIDAN: Great. That's perfect. So I would agree with you-- I think you're absolutely right. I don't think we need the middle sentence, because you're asking a question, and then you go right into this image. And it's clear that you're not immediately answering the question, because imagine a giant furnace is not the answer to what makes the difference, right?

But it's clear that, from your tone, the way you said it-- so you say-- what's the difference?

Well, imagine your body is a giant furnace. So the way that you say something can--

essentially, you're saying this sentence in the tone of your voice. So you don't actually need to say that sentence out loud great. Anything else we can eliminate by the way? What can we

cut?

AUDIENCE: I think you already mentioned it, but the second sentence-- I think you can say that a little less wordy.

GEORGE ZAIDAN: Give it a shot.

AUDIENCE: So why do people hate the cold? That they'd rather die than be caught outside without all their winter clothes on.

GEORGE ZAIDAN: So the way you're doing it is to sort of piecemeal try and chop out certain words, right?

AUDIENCE: Yeah.

GEORGE ZAIDAN: But take a step back, look at the meaning of the sentence, reformulate it, and just say as if you were saying it to me. Actually, do say it to me.

AUDIENCE: So why do we hate the cold? Why do some people have to bundle up and others don't have to wear as much clothes, or something like that.

GEORGE ZAIDAN: Yeah, I think you're on to something. You walk around on a cold winter's day-- why are some people bundled up and some people wearing shorts? What's the deal? That's a much shorter way of saying, essentially, that. There is a theatricality in the way that the first paragraph is written that you lose by changing it to the shorter version, but that comes from the benefit of you're getting into the material faster. But there is a trade-off there.

AUDIENCE: [INAUDIBLE] You can also accomplish all you say and include the extra detail with your images. So if you show an example of someone bundled up with all the layers, and then a jogger with barely anything other than shorts, then you have all the content that was in that sentence, but you're using the rest of the medium that you haven't worked with.

GEORGE ZAIDAN: You reminded me of the thing that I was going to talk about. Thank you. That's exactly what I wanted to talk about. Yeah, so this is really really, really easy to forget when you're writing a script-- is that there's going to be a whole other layer of information that is available to your audience in the final product. So to the extent that you can, I would absolutely encourage use of visuals that are complimentary to the script.

So the way that I-- I don't have the slides for this, but let's say that you wanted to show a synapse. You guys know what a synapse is? The part in your brain where neurotransmitters

go? So you've got this, this, and then-- OK. So this is one nerve. This is another nerve. This is just the space in between the nerves. And these dots are chemicals that this nerve is transmitting to this nerve. These sort of like Poseidon spears are receptors for these chemicals.

Now the way that I said that-- if you were to write down what I just said-- these dots, this nerve, this space, but this area is the space between the nerve, you'd have absolutely no idea what I was talking about without the image. Whereas if you didn't have this image, and you were just writing a script trying to explain what a synapse is, you would have to say, a synapse is the space between two nerves. One nerve releases chemicals that cross that space and get captured by receptors on the other nerve, and that's how data is transmitted from one nerve to another.

So if you were writing a script without the visuals in mind, you can very easily fall into the trap of doing what I just did in writing a script that stands alone. Whereas if you're thinking images, it's going to be mostly like, look at this. Check this out. This spaghetti shaped thing, those dots, that kind of language, and that's totally OK and even encouraged when you're doing a video.

And that's exactly what you said. Another example is to basically talk in general terms and put specific visuals that compliment the script. You were going to say something?

AUDIENCE:

Yeah, just that it's not just that someone can wear less clothes, it's that they're comfortable wearing less clothes. And to me that's an important concept that we can't use in that first paragraph. Because my husband's like this, where he can be wearing half the clothes, and he's happy that way. It's one thing to wear less clothes and be miserable, but it's another thing to be comfortable with that choice, right? I see students on campus without shoes, and I'm like, what's going on?

But the fact that they-- it's one thing to wear less clothes and be shivering, and cold, and miserable, but it's another to have less clothes and actually be OK with that.

GEORGE ZAIDAN:

And following that even further-- I just had a question in my mind. Let's say you took two people. One who can wear shorts in the dead of winter, and one who has to be completely bundled up. If you transport them into the Antarctic or the Arctic where it's-- I don't know. Pick a really cold temperature, subzero. And just let them stand there naked for like 20 days-- who dies first?

Is it the person's comfort, or are they actually better adapted to survive in the cold? Which is a really interesting distinction, because if someone's comfortable in the cold, but they're still going to die at the exact same time, then yeah, comfort is great, but we haven't, as a species, adapted to better overcome the cold. Whereas if it's really your body is substantially different in a way that could help the human race survive the next Ice Age, that's cool. So that's a really interesting point.

AUDIENCE: And that's taking the familiar and making [INAUDIBLE]. It's taking an instance that you see and a question that maybe you very fleetingly have, which is how is that some people don't have to put on a huge winter jacket and can walk outside in the snow fine? Whereas I have to layer up? It's taking that familiar question and slowly building out to this pretty epic concept of-- are certain people within our human race better adapted for total catastrophe?

[LAUGHTER]

AUDIENCE: I'm not saying that you have to go that route, but I think that that's why watch some of these viral videos, because it takes the familiar and makes it unfamiliar.

AUDIENCE: It also-- I mean, not to totally go a different route-- but a question that this could go into is are skinny people versus fat people-- does it have anything to do with your physical being? Or is it your chemical being that makes you be able to handle the situation better, and can you change that? Or is it just how you're built?

AUDIENCE: But if you tighten this first part up, it leaves you the room to explore the really cool questions. We could easily cut all this text down into half it's length. Why do some people handle the cold better than others? How is it that this person who's wearing shorts in winter is fine, whereas this person is wearing five jackets? What's making the difference?

Well, imagine a giant furnace. That furnace is actually us. You're taking out the whole middle chunk. I also think you can highlight the unexpected nature of the furnace metaphor right? You're taking the familiar ones, and you're entering the unfamiliar. Imagine a furnace-- everyone can picture that-- but the crazy thing is that our bodies are furnaces. We kind of did that with the [INAUDIBLE].

And then the whole end-- and winter starts to come and we throw more bits of carbohydrates and stored energy. Carbohydrates and stored energy are similar enough things that you can distill it down into one phrase.

GEORGE ZAIDAN: Sugars.

AUDIENCE: Sugars, yeah. But by tightening all of this intro stuff up into two concepts, it leaves you the rest of the episode to explore the cooler questions.

GEORGE ZAIDAN: And then you can go with-- the metaphor, you can take as far as you want. You can say, OK, well, are some people's furnaces more efficient? Do some burn different types of sugar? Whatever the answer ends up being-- I don't actually know what the answer is. I really want to know, but whatever that is, you can develop the metaphor or not, depending on whether it fits and really explore this question that's fundamental to the nature of our survival, because there will be another Ice Age. It's coming. We just don't know when.

So we took this experience that we've all had, and we turned it into an existential crisis, which is great. So thank you. Next, I was going to do two examples from each script, but I think we should just move on, because we're running short on time. Whose script is this? All right, come on up.

All right, so you know the drill. Give us a read.

AUDIENCE: Once upon a time, in the year 2009 actually, Stephen Hawking held a party with all the usual stuff-- wines, hors d'oeuvres, and yet no one turned up! And you'd have thought he'd be upset, but in fact, he was actually quite happy, because it just proven his own belief that it was impossible to travel back in time. He had, in fact, sent out the invitations for the party to time travelers after the party had-- I already mentioned it. A lack of partygoers actually meant that time travel was probably impossible, or just that people thought that Stephen Hawking was lame and didn't really want to go to his party.

So was time travel really not possible? Yeah.

GEORGE ZAIDAN: Great, come on back. So what is effective in this script? Introduction, really-- It's not a full script. Yeah, you have to raise your hand. Just yell it out.

AUDIENCE: Well he introduces a character who we know, but he's doing this party thing that's just like us.

GEORGE ZAIDAN: So we all love Stephen Hawking. If you don't, leave immediately. So right off the bat, Stephen Hawking is invoked, and that's great. Now we know exactly who we're talking about. We're all on the same page, and we all love Stephen Hawking. At least your audience for this video is most likely going to know and love Stephen Hawking? Not everyone does.

AUDIENCE: And even if they don't, it's still a cool enough premise. This one's doing the opposite-- taking something unfamiliar, and you're going to spend the adventure familiarizing yourself with it. That someone had a party intending to have no one show up, because he was proving time travel. It's like this pop culture fascination. It's very Hollywood science.

It's the reason why so many of the special effects that you have on TV and so much of the science that does end up broadcasting on major networks. They're all about astrophysics stuff, and it's because it's commercializable?

GEORGE ZAIDAN: It's just cool. Who here has watched Cosmos? New or old? New? Both? At one point in one of the episodes, either Carl Sagan, or Neil deGrasse Tyson, or probably both say that we have this inbuilt fascination looking up at the stars and wondering what our place is in the universe, and that is absolutely true. And shows and movies capitalize on that all the time. *Interstellar*, *Gravity*, are two of the most recent ones, but we've always looked up, and wondered, and written stories about it. What else works?

So what's instantly different about this script? This introduction versus the last introduction?

AUDIENCE: Something visual that [INAUDIBLE] something very visual. In my mind, I'm thinking of this sad face, smiley face. It's going to be quite funny.

GEORGE ZAIDAN: Take that even further. It's visual, but it's also-- When Kenneth got up here and started talking to you, what was he doing?

AUDIENCE: He was [INAUDIBLE] face?

GEORGE ZAIDAN: He was what, sorry? Yeah, he was expressive, right?

AUDIENCE: He used his [INAUDIBLE] and [INAUDIBLE].

GEORGE ZAIDAN: But even before that. "Once upon a time," what's that? Once upon a time. It's a story. You're telling a story. And eventually, in this intro-- this is also a story that you're telling, but once upon a time is right off the bat, everybody knows that's story time. And just like we're hard-wired to sort of look up at the stars and wonder where we came from, we're hard-wired to love stories. When you start a sentence with once upon a time, you're listening.

AUDIENCE: But that doesn't necessarily mean you should.

[LAUGHTER]

AUDIENCE: Again, take everything we say with a grain of salt. It's not the tools that you use that make things work, it's the reason why you use the tools.

GEORGE ZAIDAN: So you don't have to say once upon a time here to know that it's a story. Because even if you didn't say, you'd say, in 2009, Stephen Hawking held a party. No one showed up, but he was thrilled. Why? Because he'd just proved time travel. Let me explain to you how that works. Blah, blah, blah, blah. I didn't say once upon a time, but even though I didn't say it, my first two sentences are still this like, click-- I'm going to tell you a story. What else is effective? Actually effective or what you would improve.

AUDIENCE: I think the last sentence kind of throws a loop in. I'm unsure about what the body of it is going to be, because you take this really smart guy like Stephen Hawking. He just proved that you can't travel back in time. So is this going to explain why that's true? Or it's just the next breakthrough where it actually is true. I'm kind of unsure what's going to happen next.

GEORGE ZAIDAN: Anybody else a little bit-- are you saying that as something that works or something that could be improved?

AUDIENCE: To clarify, i guess.

GEORGE ZAIDAN: Was anybody else a little bit hazy on where the script is going, or what's been said already? Yeah? So when I read this, I was a little bit confused. So what's the answer to this question? Tell me in a couple sentences.

AUDIENCE: And what happens after?

GEORGE ZAIDAN: Summarize your script for me in two or three sentences.

AUDIENCE: After that, we talk about what time travel is and how it's maybe possible to time travel, and why, theoretically, it's not possible to do it yet. [INAUDIBLE]. Maybe we just haven't explored enough yet. We don't understand enough of the [INAUDIBLE] time travel.

GEORGE ZAIDAN: So the bottom line, main point of the video is we're not sure if time travel is possible?

AUDIENCE: That currently it points to the fact that we are unable.

GEORGE ZAIDAN: But most science says that it's not going to be possible?

AUDIENCE: Yeah.

GEORGE ZAIDAN: So we think it's not going to be possible ever?

AUDIENCE: But yet we're still asking. We're questioning [INAUDIBLE].

AUDIENCE: I think to fix that, instead of maybe prove by-- I don't know-- you could just take a less qualifying word like the possibility that he has disproven it, or something that gives him some sort of air that there is the possibility that it isn't true. I don't know.

GEORGE ZAIDAN: So let me ask you-- without going back to this intro, tell me again the underlying theory behind the party, and what it proves that no one showed up? Or doesn't prove, or we think, or whatever.

AUDIENCE: Prior to this, Hawking has said [INAUDIBLE], but he believes that it's not possible. So he set up this extra experiment.

GEORGE ZAIDAN: He believes that time travel is not possible?

AUDIENCE: So he set up this extra experiment. He hosted the party. It fails on [INAUDIBLE]. Then he sent out invitations after the party to time travellers. So he even included specific coordinates and specific date and time. So when no one showed up, [INAUDIBLE] so it's not possible.

GEORGE ZAIDAN: I see, OK. Now I get it. So when you read the script the first time-- whose understanding of the script changed based on hearing that explanation. I must say that I actually know this point, but reading this I didn't understand, until I [INAUDIBLE]. And it actually happens to be a Big Bang Theory joke. A Big Bang Theory joke where they sat together, and they said, let's swear to this day that we will come back to this exact same moment if we do invent a time machine. And then they wrote this letter and swore on it, and they wait for one second and no one came. And they were really sad.

GEORGE ZAIDAN: So that's another version of the same? So now I totally get this. Let's think about other creative ways to--

AUDIENCE: I don't.

GEORGE ZAIDAN: You don't.

I still don't get it. I'm sorry, but I still don't get it. I don't understand the concept that he sent

invitations after the party and no one showed up?

GEORGE ZAIDAN: So someone else explain it in a different way than has already been explained.

AUDIENCE: So it's like if I were to swear to myself right now that in the future, if I do invent a time machine, I will come back to the time when I'm writing this right now. So theoretically speaking, that would mean that as I'm writing this, my future self will come right now.

GEORGE ZAIDAN: But actually, now that you say that, that brings up a really interesting point. Your version just proves that you're not going to invent a time machine. But Kenneth's version proves that no one--

AUDIENCE: All the time travelers possible that he sent would not be able to--

GEORGE ZAIDAN: Sorry. So Kenneth's version proves that everyone that Stephen Hawking sends an invite to will not invent a time machine. It doesn't necessarily prove that no one will ever invent a time machine. It's just an interesting point.

AUDIENCE: There was also a time travel [INAUDIBLE] in the '90s on East Campus.

GEORGE ZAIDAN: So this happened?

AUDIENCE: At MIT. So that's just another thing that you should note. Other people have tried to do it, and that's [INAUDIBLE]. But also, it's nicer that MIT students [INAUDIBLE].

[LAUGHTER]

AUDIENCE: That's a good example, but we're still missing what the big-- we're coming up with examples and accessories when we don't have the core point of the video. And I think I really feel like taking the last question, completely scrapping it, and trying to figure out how to best set up the rest of the episode is what's going to help you the most. When you explained all that stuff to me, I

Totally read your intro completely different. And the question that I came up with in my head before you asked your question-- so you read through the whole thing. You said, or maybe Stephen Hawking was too lame-- my initial question as an audience member was, OK, well then how did he prove that? Like how did that party prove it? And if it did prove it, why are we still asking ourselves if time travel is possible? I guess that's how I initially reacted, and that

sets up a very, very different episode than the question that's up there right now.

GEORGE ZAIDAN: I also want to give-- so this kind of discussion is exactly the kind of discussion that happens with every script that we do for Science Out Loud. And I know it seems like we're piling on, but I really want to give you props for taking a chance and doing this sort of creative intro, because we're going with this, I think is really interesting.

So your two questions at the end are-- what were they again? It was?

AUDIENCE: It was how did this actually prove it? And if it's proven, why are we still asking ourselves?

GEORGE ZAIDAN: Yeah. So if we could have an infinite party, where we send out infinity invitations to everybody on the planet in the future, would that prove-- and then no one shows up at this party-- would that prove that time travel is impossible? So let me back up. I'm going from the Big Bang example, which is-- or no, actually your example. Which is you proving to yourself. You say, all right, if I invent a time machine then I swear to myself I'm going to come back to this moment. I don't come back, so I didn't invent a time machine.

Then to Kenneth's version-- Stephen Hawking sends an invitation to let's say 20 people. No one shows up? That means those 20 people didn't come back in time.

AUDIENCE: Actually, it was more like an open invitation to the future. It's [INAUDIBLE]. The fact that he had the party. So in the future, [INAUDIBLE] time travel anyone who would [INAUDIBLE] know of this party.

GEORGE ZAIDAN: But conceivably, you could-- I get what you're saying. I think, as a thought experiment-- you're going to miss somebody in your invite, if you send out a finite number of invitations, no matter how broad your spectrum is. But I mean you could pick something in-between where you send out a million invites, but there are still 7 billion people on the planet. So then the question is, if you send out if you've sent an invitation to not just everybody who's alive right now, but everybody who will ever be born from this moment forward-- everybody, whatever number of billion or hundreds of billion of people that is.

Theoretically, if someone invents a time machine and decides to go to your party, they would come back in time and go to your party. So then if you set that story up with the audience-- and that's a long set up. You've got three separate scenarios-- between one and three, you could do two scenarios. It's a long set up, but the story element of it means that your audience will probably stick with you, especially because it's an unusual story. It's like a weird thing, and

there's confusion at the beginning.

You're saying, like, hold on, I didn't get it. Your audience is going to be in that space for the first 30 seconds of the video. And there's a fine line between I don't get it-- I'm going to turn off this video, and I don't get it-- I'm interested; I want to keep watching. But if you can stay on the line of I'm interested; I'm going to keep watching, the I don't get it can be an OK thing to do. And then after that, you get into Elizabeth's question of what does this thought experiment actually mean? And does it does it prove anything and how do we know, which I think is a fascinating video.

Conceptually, I think it's really hard, the double negative. To either choose to say is time travel possible or not the opposite, which is time travel not-- it's just harder to conceptualize. So when you do go down this road, I would just see if you could take the affirmative approach, which is time travel possible.

AUDIENCE: I would wait to ask that question though, because that's actually not the question that's relevant. The question is how did that prove it? Then the next question is why are we still looking, and then the immediate question that [INAUDIBLE] is time travel possible? That sets the core question, but it doesn't show up at-- it's too big to [INAUDIBLE].

GEORGE ZAIDAN: This is great. This is a fascinating discussion. Good job. Anything else before we move on here?

AUDIENCE: So there was a bit of discussion where there was a detail on how many people Stephen Hawking actually sent out an invitation to, but that kind of detail doesn't really affect the knowledge that you're trying to disseminate. Is it OK if we were to-- because it's not really an official history point, so I'm not sure whether I'll be allowed to deviate from it.

GEORGE ZAIDAN: That's a great point. In writing your scripts, you will generate more material than you'll use. And probably going through-- I had the three scenarios. Probably the middle scenario is just not worth doing, because it takes up a lot of time, there are a lot of subtleties to it-- how many invitations exactly, who gets the invitations, et cetera, et cetera that is not important for the subject matter of the video. So being able to edit yourself or edit others on that stuff is really good. So yeah, absolutely, great point.

AUDIENCE: You can also gloss over it pretty fast. You can be like, OK, so when you're explaining the actual details of the party, you say he sent out an open invitation, no one came, so the

conclusion was that no one invented a time machine. Well I guess you could say maybe someone in Antarctica wasn't aware of the open invitation so that's why they didn't come. So what if we could ensure that every single human being on will ever exist in the future somehow got this invitation? Then will the argument still hold up?

Then you're glossing over each incremental example and addressing the crux of the loophole that's in that scenario.

AUDIENCE: Also, I wanted to mention humor. So saying that Hawking was too lame-- while the other humorous parts are very effective, that one may be kind of edgy, especially for people who don't know who Hawking is. Maybe like, uh-oh, this person is lame, and people who do know him will--

GEORGE ZAIDAN: So that reminds me of your earlier point-- which is that this actually happened at MIT. [INAUDIBLE] time [INAUDIBLE] going. And one of the things that we try and do with the Science Out Loud videos is establish a relevant MIT connection. And so that would be a great way to do that, and then you get around the whole Stephen Hawking thing.

AUDIENCE: I like the humor point, though.

GEORGE ZAIDAN: I do too.

AUDIENCE: The word lame maybe is not as PC.

AUDIENCE: Yeah, I completely forgot.

AUDIENCE: But the whole concept of what other possibility--

GEORGE ZAIDAN: But maybe Stephen Hawking's rival just didn't want to show up to spite him. Maybe he's like, well, I've invented a time machine, but I'm not going to let you know about it, because I'm too cool for you or whatever. There are ways to get that exact same humor thing without using lame. But I like it. I like it too. Anything else? Cool. Whose is this? All right, come on up.

AUDIENCE: So as long as people have lived on this planet, there have been boats. Many of the model boats shown in this museum-- this is at the ship museum at MIT-- are over 100 years old, but evidence suggests that the oldest ones date back to log boats, almost 10,000 years ago. But now, when we look onto the hardware, it is clear that we have advanced since the times of hollowed trees. Today, there are all types of ships, such as container ships, oil tankers, and

cruise ships, among others.

GEORGE ZAIDAN: Great, thanks. OK, what works? Actually, we're not going to-- just comments in general?

Good, bad, whatever. Yes?

AUDIENCE: It feels a lot like a documentary.

GEORGE ZAIDAN: What do you mean by that?

AUDIENCE: The image I get walking through a museum and look around us-- I don't know. That's the feel I get.

GEORGE ZAIDAN: [INAUDIBLE].

AUDIENCE: Uh, what's your question?

AUDIENCE: So what three was-- it kind of gets to that. So I think you're right. There is a lot of words before I get to what I'm presenting.

GEORGE ZAIDAN: Tell us what it is.

AUDIENCE: So it's about subdivision in ships. So if you take something that floats, like a shoebox, and you put a hole in it, it'll sink. But if you divide that shoebox into watertight sections, this one compartment might not cause it to sink. And how we've been asked to-- the time where a ship can be extensively damaged and can still stay afloat and people won't die.

GEORGE ZAIDAN: What you just did right there is a fantastic pitch for a video. Like the way that you explained it to us right now. You get into the subject matter quickly. Use you use something that we're all familiar with, shoebox. You start simple and you expand out. You start with a shoebox, expand out to a ship. And you have the potential for an example that is super relatable, like that Italian cruise-- was it an Italian cruise ship that didn't sink, but it turned sideways-- you could use something like that. I'm sure there's a more appropriate example. But you just add that, and you have the perfect pitch and also a great introduction to a video too.

AUDIENCE: I also really liked what he says in the second part where he says he's a coast guard marine inspector and naval architect, a ship designer, and he [INAUDIBLE] sleep over the subject. So that to me sounds pretty cool. First of all, those are awesome jobs, and also, you are saying that you have an emotional connection. You're an expert in [INAUDIBLE].

GEORGE ZAIDAN: And the other thing is that we don't-- Science Out Loud doesn't put random people on camera.

Whoever we put on camera is going to have some connection to the material, whether it's this is my lab that we're working in, or I am a member of the Coast Guard or whatever it is. And highlighting that in a way that is not newscaster-y. That's hard to do, but highlighting that can really draw the audience into the material.

AUDIENCE: A lot better than poached eggs.

AUDIENCE: [INAUDIBLE]

GEORGE ZAIDAN: So honestly, if I were you, I would cut the intro and go with what you just said. The other nice thing about what you said is that you can do it with a shoe box in front-- it's a demo you can do. So it has a visual that goes along with it really easily.

AUDIENCE: And since you're actually doing that, there's potential for a really big visual reveal, where we have you frame with the shoebox, and then cut you to wide shot, and reveal you in front of an actual ship. So there's a lot of potential to play with the visuals there. Where you don't have to say all the boats here-- we don't even have to go in the museum, we can actually go to wherever you work.

But I agree with George that-- when you were talking about the shoebox stuff, I didn't even realize that that was a question that I had, but then you made me think, just like how David made me think about the whole why do some people feel colder than others. How does a giant ship not sink if there's a little hole in it? Whereas on a toy boat, if there's a hole, then it's just catastrophe.

GEORGE ZAIDAN: Another question I have about ships is that-- you see a giant cruise liner, and a, what percentage of it is underwater? Is it 10% or is it 50%? And b, how the hell does that thing not just tip over?

AUDIENCE: We actually just asked that yesterday. So you're wondering? Yeah there is a lot of draft on it, so the distance below the waterline is substantial, so it's not uncommon to be 40 to 60 feet under the water. But they fin stabilizers which they use when a lot of people are on board. They're just pretty much wings that go on the side of a ship. And with that, they're able to adjust their attitude to provide a more comfortable draft.

GEORGE ZAIDAN: Are they like wings like as big as a airplane wing? Or is it shorter?

AUDIENCE: They're a little bit shorter, and they're kind of stubbier, but they have pretty good--

GEORGE ZAIDAN: So if you took a cruise ship out of the water, it would look like a deformed penguin kind of?

AUDIENCE: I guess you could think like [INAUDIBLE]. Most have-- newer ones all have them.

GEORGE ZAIDAN: This is again that idea explosion phase, where you're talking about compartmentalization, and that's the core of the video. But there may be other things that-- I don't know if this would actually make it into your video or not, but that is something that you wonder when you look at a cruise ship. Like how does that thing possibly stay afloat? Is most of the mass underwater?

AUDIENCE: I can't really say quantitatively. I'm not sure, but I know that that's one of the big parts of it, is having appendages that are able to reduce the roll. So if you have a cylinder, and it's water, and you're trying to pitch it or just have it roll, it's going to go forever, but if you put these two wings on, the inertia of actually rolling it is a lot harder, because it has these arms sticking out.

GEORGE ZAIDAN: I think you've actually got material for two separate videos in there. I think the compartmentalization is one really-- it could be a short video. It doesn't have to be long. And then there's this whole other-- boats, and ship building, and how do these things, how do these giant-- because they've gotten big enough now that you can have 2,000 or 3,000 people on a ship. How do these things stay afloat? It'd be really cool, I think.

AUDIENCE: From an educational context point of view. With the K-12 videos program in its old iteration, where people made their own episodes, there were like 10 episodes on buoyancy. I don't know why people are so obsessed with explaining it, but I think it's because it's a topic that maybe people struggled with in school.

AUDIENCE: No, it's a framework test. So, second graders-- it's the essential question that is asked in the curriculum.

GEORGE ZAIDAN: Buoyancy?

AUDIENCE: Yes, sink or float. What sinks, what floats, and why? And it's a questions that's intended to get them thinking scientifically. And so that big buoyancy question is-- when I was learning to be a teacher, that was the core question, even in schools that had no science curriculum whatsoever. At that age, that's when they begin asking scientific questions, and that experiment is something you need to do, no matter where you are. You have a small bucket. Any kid can do it, regardless of what class. I taught in some inner city schools where there no

resources, but you can still do that experiment.

AUDIENCE: Do they figure out at that age-- do they why a sinkable object like steel would float, or something?

AUDIENCE: Well the idea is that students can construct themselves with themselves by experiment. So the teacher, if it's a great teacher, will put a bucket of water and a whole bunch of objects. And encourage students to eventually come up with some truths themselves about what sinks and what floats through hands-on experimentation. And that's sort the crux of the most early science exploration in our curriculum, which is why there's so much on sink and float, and that's why the kids were all-- they all were interested in that when you talk to them, because it was drilled into them, at least in our educational system, the idea of sinking and floating and a very elementary concept that is the beginning of their scientific roots.

AUDIENCE: But the reason why I bring it up is that there are 100 videos on sinking and floating, and they're all the exact same thing. And every lesson on buoyancy-- you learn it in more detail in high school. It's still on the same thing. And this is presenting it in a way that's very, very different. And I hesitated to bring it up at all, because I don't want you to look at those videos, and I don't want you to look at the standards and accidentally default to that style. I think you should totally keep going the way you're going.

I only wanted to bring it up, because I think that there is definitely an appetite for it in an educational context. I also wanted to bring up that-- it's funny-- I wish we could have the raw footage from all the classes just to [INAUDIBLE], because when you explain the technical components of the wings and stuff-- we could've used that footage. And it's very different from when you read this aloud. And the script also doesn't sound like you at all, when you talk.

And it's a very difficult thing to do. I sympathise with you guys completely. It's really hard to become self-aware of your natural talking style. And so some of it will be just-- maybe you want to record a conversation that you have with someone else. That might not be the best thing for everyone.

GEORGE ZAIDAN: One of the things you could do is instead of recording yourself on camera, record just audio. Because the visual part of it-- like if you're conscious that there's a lens looking at you, it's very hard to be natural.

AUDIENCE: Yeah, and I'm not very good in front of a lens or anything.

GEORGE ZAIDAN: Getting rid of that misconception is a whole other thing. We'll get into it in a second, but it's much easier to just be yourself if you just have a mic, and you're not really-- you sort of forget that the mic is there. You're not looking into a lens or whatever. So having that, it's easier to record yourself and hear what you really sound like if you just use audio, versus video as well.

AUDIENCE: So say you're trying to simplify something, a complicated concept, so you're talking to [INAUDIBLE], and there's a lot of different technical reasons that you have these fin stabilizers. So just being able to say that this is stopping the ship from rolling, it's true, but there's other aspects to it. So this gets into the accuracy portion. Like you could have a naval architect go on K through 12 and be like, yeah, but there's more to it than that. So at what point are you oversimplifying.

GEORGE ZAIDAN: I think there's no harm in alluding to the fact that there are that you are just at the tip of the iceberg of information. So you could say something like-- the way you said it was if you take a cylinder, put it in water, and spin it, it'll spin. You take a cylinder, attach some wings, put it in water-- it's much harder to spin it. That is all 100% accurate and true, but you don't get into any of the technical reasons as to why that's the case. That's one way to do it.

The other way to do it is if you want to start talking about whys. And I don't know what the whys are, so you have to help me, but you can start off your senses with-- look, this is a really simple way of explaining it, but basically, blah, blah, blah, blah, blah, blah, blah. So you just sort of allude to the fact that I'm giving you the super simple version of it. It's much more complicated than this in real life.

And you can even explain what those complications are. So if you had wings with a bunch of holes in them, they wouldn't be as effective as solid wings, because x, y, or z. Or if your ship's wings need to be able to do this and that for whatever reason-- you can allude to stuff without actually explaining it, and that's OK, because you do that in real life. If you're sitting across the table from someone and explaining something to them, the first time you do it, you're not going to be like-- roman numeral I, part a, subsection b-- you're not going to go super in-depth. You're going to be like look, here's the important thing to get right now. Here are some of the details. We can about the details later, but this is the crucial thing.

AUDIENCE: So more of the result and not everything that got to that result?

GEORGE ZAIDAN: I don't know that I would--

AUDIENCE: Or if it's a little too tricky, then mention it, but focus on what the main reason why they're there.

GEORGE ZAIDAN: Yeah. I think just being conscious of the fact that what you're presenting isn't all of the information, it is an accurate portion of the information.

AUDIENCE: And that's actually what we want with Science Out Loud. And keep in mind, it's a very different style than some of the other videos that I was talking about on the first day of class. But we want to pique curiosity. We want people to finish watching the video and ask themselves those questions and try to figure it out on their own and explore the other resources. And that's a very different objective than say a lecture video or a technical video. So just keep that in mind.

Again, whatever best practices we're establishing here aren't necessarily ones that you'll carry over to every single educational video. We encompass such a huge variety, right? But I think that's true of even the most technical video. And again, this goes back to the whole rabbit hole witness test. Once you find yourself clarifying more and more to the point where you found yourself on a topic that is tangential to the main point of your video or the main point of your lesson, then it's time to backtrack a little bit, and that's OK. No video under an hour. No semester-long class is going to answer every single question that's related to the topic of the class.

AUDIENCE: But this gets back to what we were talking about the [INAUDIBLE]. By going deeply and narrowing your focus actually allows you to allude to a lot of much larger topics superficially. And people get it more quickly the more narrow you are in your examples. And think if there were a truth in here, that's the truth to sort of apply-- is that the more specific and narrow you can be without getting [INAUDIBLE] in that extra information, the easier it is to allude to that extra information without it-- like a story flow, you want it always more forward.

And if this information is so little that it doesn't prevent the forward motion of your storyline, then you know you're doing a good job of including that. What you don't want is for this information to take you backwards or sideways.

AUDIENCE: I mean I guess I should rephrase that it's not necessarily a rabbit hole. You don't want to branch out too much. You want accuracy, specificity to a certain degree. You could very well do a video on why do boats float, but that wouldn't really be a good video. It wouldn't be a very compelling video. So you're going to make a video about the wings on a boat. You're going to hit the bigger topic of how things float, but that's not the thing that's driving your video forward.

AUDIENCE: And that's why your topic is perfectly narrow of imagining three differently smooshed shoeboxes. Why does this one versus this one-- and it's a narrow enough topic, and concrete enough that it will allow you to get to some of those bigger sink or float buoyancy design issues. But using this very small way of getting access to that.

GEORGE ZAIDAN: By the way, I wanted to come back to something that is a tad tangential, ironically. You said, maybe it's better then to just tell the results and leave out the process. And I said no, maybe not. The reason that I said no is because sometimes, taking your audience through the experimentation that was done to get to a result is just as interesting or even more interesting as the result itself.

So the Stephen Hawking example-- the time travel experiment and the intricacies of the time travel experiment are just as interesting, to me, anyway, as the result of that experiment, whatever it is. So that's why I would just caution against using that. Sometimes-- how did people first invent compartmentalizing boats? I'm not saying that is an interesting answer. It may not be. But sometimes that process is just as interesting as the fact that there are compartmentalized boats and why they work.

AUDIENCE: One thing that I mentioned-- I don't know if it's worth exploring is the whole reason why [INAUDIBLE] was like I know that floating is obviously a big teaching point, but if you open with why the Titanic sank, which has exactly to do with compartmentalization, is that something that would be a better hook?

GEORGE ZAIDAN: I honestly like your shoebox better. I'll tell you why-- because it's more visual. Sorry, it's more visual because it has you in it. There's a demo. There's a thing that someone can look at, and it's directly accessible. With the Titanic, yeah, it's an example that everyone knows, and you could maybe use stock footage of the movie *Titanic* or whatever. But it's one degree of complexity-- it starts at a higher level of complexity than your shoebox example.

AUDIENCE: Well I'm saying you could do--

GEORGE ZAIDAN: First shoebox, then Titanic?

AUDIENCE: No, how the Titanic did their compartmentalization with a shoebox. So they didn't finish their [INAUDIBLE] to the deck, which you could actually easily build with a shoebox, and then just see how it progressively floats.

GEORGE ZAIDAN: So the problem with the Titanic was that their compartments did not extend all the way through

the hull?

AUDIENCE: All the way up the [INAUDIBLE].

GEORGE ZAIDAN: Why? That seems dumb.

AUDIENCE: I have no idea.

AUDIENCE: But then the video becomes about why did the Titanic sink, instead of about how do I prevent boats from sinking as a Coast Guard.

AUDIENCE: I think it's distracting. I think it's distracting, and I think that the simplicity of this shoebox allows you to gain access to the concepts more easily, without getting the story of the Titanic entangled into it.

AUDIENCE: The other thing is, if you are not at MIT studying naval architecture or whatever, and if you weren't actually an engineer, just maybe Vsauce or hand Hank Green, then I'd say, yeah, talk about why the Titanic sunk. But it's a story that's already been told. And it's a story that can be told by anyone. You have this opportunity to tell us a story from a perspective that not many very people can, and that's what I was trying to get out on the first day about being able to take yourself out of the perspective that you're used to having.

I think that is an opportunity to capitalize upon, for sure. So it's not that I think that the Titanic thing is a bad hook, necessarily-- just that the one you have is so much better. And one that not other people can do.

AUDIENCE: Can I also say that you had mentioned about process. In my lab, the work that I see predominately-- I would actually argue that it's extremely hard for scientists to share a process in an interesting way. That scientists, typically-- and I am generalizing, and this is not really fair, but because we spend so much time day-to-day going through a process, you want to share it chronologically, and that's where your default is to go from start to finish, telling people what you did in painstaking detail, and that's boring.

And so that's really, really hard-- if any of you end up doing a process where you're sharing your process, it's really hard to figure out the bigger picture within the process so that an outsider actually finds your process interesting, as opposed to just sharing the I did this, then I did this, then I did this. Explaining why I did what I did each way is what people care about.

GEORGE ZAIDAN: Well the interesting part is the moment of ingenuity that led to an experiment designed the way it was designed. Not the day-to-day--

AUDIENCE: Exactly, and I feel like because people in their labs are like someone needs to listen to me. I did this. It didn't work, and I spent hours and hours working on this and it didn't work. They feel like they want to share that with people, but people don't actually care about that. They care about the why you designed the experiment that way, and why it didn't work, as opposed to the what you actually did, the who cares kind of concept.

AUDIENCE: Actually, I agree with you on the Titanic idea, but you mentioned that you could build these compartments out of shoeboxes, and I think that at least the kids that we talked to yesterday-- they really like the idea of destruction. Something burning, being crushed. So if you could kind of talk about those concepts and in the end, you sink some random ship. That would kind of show, first of all, that it's cool, but also it shows that what you're talking about is important.

AUDIENCE: Don't get me wrong. You can totally bring up the Titanic at the end as the bigger picture application. That's awesome. It's just the hook isn't the place for it, I think personally.

GEORGE ZAIDAN: It's been done before. I agree with you.

GEORGE ZAIDAN: Great. Anything else on this script? Going once, going twice--

AUDIENCE: Before you go onto the next one, I do just want to mention-- sorry.

GEORGE ZAIDAN: I'm just kidding, go ahead.

AUDIENCE: I do want to mention that you guys came up with really fascinating topics. I mean George and I were talking about it this morning. So I mean even though we're critiquing things, the topic at the core, I think there's a lot of potential for it. So just a word of encouragement.

GEORGE ZAIDAN: Yeah, I would totally watch all of these videos.

AUDIENCE: I don't know where we're going quite yet, but we've been going for a while. I suspect people might need a bathroom break.

GEORGE ZAIDAN: Oh yeah, good idea.

AUDIENCE: Yeah, I need a bathroom break.

AUDIENCE: So maybe we should, before we dive into the next one give people a chance to stretch and do

that.

GEORGE ZAIDAN: Yeah, OK, who wrote this?

GUEST SPEAKER: I'm cold.

AUDIENCE: I'm warm.

GEORGE ZAIDAN: I'm pretty warm, yeah.

AUDIENCE: I think it's where you're sitting partly. The first day I was under a vent and it was freezing.

GEORGE ZAIDAN: OK, whenever you're ready.

GUEST SPEAKER: OK. Few things strike more dread than hearing you have to get braces. Whether it's worrying about how much it will hurt, what happens if a wire pops out, how you're going to talk, or how much your friends will make fun of you, it's kind of an awkward experience. So why even get braces in the first place? Cut to pictures of famous stars who have had braces with a voiceover. Should I keep--

GEORGE ZAIDAN: Yep, just the next sentence.

GUEST SPEAKER: Studies have shown that having a beautiful smile with even white teeth conveys health and youth, and makes people like you even a little bit more.

GEORGE ZAIDAN: Cool, thanks. Who were the famous stars that you are thinking of here?

[INTERPOSING VOICES]

AUDIENCE: But this video's about you.

AUDIENCE: Well the way that I structured it is to have as little of me in it as possible, which is why I had so much of the [INAUDIBLE]. There would only be one or two choices.

GEORGE ZAIDAN: Just out of curiosity, why? Why did you structure it that way?

AUDIENCE: I like the animation aspect. I also know I don't look good on camera.

AUDIENCE: No one knows that they don't look at my camera.

AUDIENCE: I feel like this is the fear that every person comes into a Science Out Loud episode with is like,

we want to animate this, because I don't want to explain it on a camera.

GEORGE ZAIDAN: Or I can't say this long of a paragraph without stumbling.

AUDIENCE: Or we'll take their script away, and they'll be like I need to have it. I can't do it. That is so not true. You can't actually prove that you can't do it. And we want your faces to be on camera, and we can talk about this more, but I think that if you do too much of the pictures and the voiceovers and the animations, then we go back to that Siri litmus test. Or if we swap you out for anyone else to do this video, it's not going to make a big difference. And I don't know if you're OK with that, but I certainly feel like you have compelling enough of a perspective.

Didn't you say you used to work for an orthodontics company? Yeah, that is a really unique perspective, both from the industry-- and my mom's a dentist. So I used to work at her office, and I had braces twice. And I know for sure that there's so much fascinating information about that that you would know from that perspective that most people don't.

You can make a video that a lot of people can't. And I would hesitate to let you go on thinking that your video should be that way.

GEORGE ZAIDAN: And that's not to say that like it's just going to be you on camera or any of you. That's not to say the entire video is going to be from here to here, 100% of the time, talking. We know that that doesn't make for compelling video. You want to have the person doing something, interacting with their environment, being in an interesting place, whatever. There are lots of ways to compliment the fact that-- let me back up a second. The human-to-human-- ideally, you want to transmit information. One person sits down and talks to another, that's like the idealized way to engage someone, convey information, talk about an interesting subject, whatever it is.

Obviously, video gives you the power to do that to a wide audience at once, and it's remote, but there is something about seeing someone's face, and expressions, and intonations, and something that really draws you into the material. But that having been said, you don't want to just stay on that person's face for the whole video and not show anything else. But that's our job, as producers and directors, is to figure out where it makes sense to just do a simple head shot of someone talking versus where it makes sense to cut away for an animation.

If you're talking about like teeth moving, that might be a perfect place to do it. Versus where to do a demo or whatever it is to keep visual variety and interest throughout the video. But yes?

AUDIENCE: That was a tangent-- an important one.

AUDIENCE: No, I think it's actually really important.

AUDIENCE: Well, it's also a segue into [INAUDIBLE].

AUDIENCE: Yeah. I have all these graduate fellows who work for me. We do workshops all over campus and our biggest credibility, and why we can give our workshops, and why people care, and listen to them is because we give workshops on how to succeed with the National Science Foundation awards from people who have actually earned them. We're authentic. I did this. I'm going to tell you what I did to be successful. That's what you have that's so powerful. I'm a student. I'm studying this with this really great institute, and I'm going to share with you how I think about something.

That's like the most authentic you can be, is being you. It would be a shame to go to someone who's inauthentic, like someone we don't know like a movie star, when you have this incredible credibility by just being you. That's so powerful.

GEORGE ZAIDAN: OK.

AUDIENCE: Sorry, you guys are so cool.

GEORGE ZAIDAN: No, you're absolutely right. That is correct.

AUDIENCE: But now it's about how to structure the script in which you can feel most comfortable being that.

GEORGE ZAIDAN: Yeah There was something I wanted to say about this, but I forgot. Maybe it'll come back to me. Anyway, comments on the script before we get into the hosting side?

AUDIENCE: I like the first paragraph especially

GEORGE ZAIDAN: What do you like about it?

AUDIENCE: I felt that when she was saying it's as if-- I imagine her saying this to a bunch of girls in front with braces. Telling them a story about her life and saying, oh, I used to have braces, and I didn't like it. So why do you want to get braces? [INAUDIBLE] as to why it's important or why not.

GEORGE ZAIDAN: Yeah, she gives very specific examples about realistic fears that people will have about braces, and that makes it relatable. It's going to hurt. You know you've got these like metal wires in your mouth. What happens if they poke you in the gum? How you going to talk with all this stuff in your face? People are going to make fun of you. Those are actual, real fears that you get when you've had braces. So, pointing them out like that is effective. What else?

AUDIENCE: Just to check, is the content of the question or the video why you get braces or is it [INAUDIBLE]?

AUDIENCE: The actual video itself is about what happens when the braces move your teeth on a cellular level.

AUDIENCE: What happens [INAUDIBLE]?

AUDIENCE: As the force is applied to your tooth, there are two different types of cells, one of which actually dissolves some of the bone in your jaw to make a little bit more room, and another one that actually builds the bone to be able to hold the bone in place.

GEORGE ZAIDAN: Wow. I had no idea. That's cool.

AUDIENCE: And that's like the shoebox thing.

GEORGE ZAIDAN: That's the reaction you want from an audience. What I just did-- I wasn't faking it. That's an authentic reaction. That's the reaction that you want.

AUDIENCE: Yeah, I mean later on in the script I say it's actually dissolving your jaw.

GEORGE ZAIDAN: I had a question-- so the braces are only attached to your teeth, right? So normally when you want to move something-- like I want to move this table-- my foot's on the floor, and I push against my foot to pull the table, whereas with braces, I'm not holding some external object to pull teeth in a certain direction, so how is that by--

AUDIENCE: Headgear.

GEORGE ZAIDAN: Huh?

AUDIENCE: Headgear.

GEORGE ZAIDAN: Headgear, yeah. But most people don't-- I don't know. Correct me if I'm wrong, but I think people-- when you get braces, usually it's just the metal and the wire on your tooth. But there's

no external support there. So how does it move your teeth?

AUDIENCE: So that's a physics question, and we went over this yesterday. Because there are different aspects. There's the sort of what's happening on the cellular level, which is one approach. You can also do it from the material science-- basically what moves your teeth the wire itself and its shape that's constantly applying pressure.

GEORGE ZAIDAN: Is that why you get your wire changed?

AUDIENCE: Yes.

AUDIENCE: I mean imagine being one person who has two boxes on either side of them, and they want to bring them closer together. The external force is the person itself pulling them together.

GEORGE ZAIDAN: Yeah, but the tension in the wire-- that's the--

AUDIENCE: Right.

AUDIENCE: [INAUDIBLE] when I had braces they had my molars-- I don't know if they're using that now to the points or not, but you had the metal--

[INTERPOSING VOICES]

AUDIENCE: They put a whole band around your-- they don't do that anymore.

AUDIENCE: They don't-- back in my day.

[LAUGHTER]

AUDIENCE: They have much better adhesives now, so that was another-- the chemistry of the epoxy that actually-- I mean there's a lot of science that goes into your braces.

AUDIENCE: And when you think about it-- I would have this discussion with my mother all the time, because I had to have braces twice. And I was like, mom. Braces, when you think about it, they're like barbaric. I can't believe we're living in the 21st century, and I pay money for a person to glue metal to my mouth and take wires to yank my teeth together because I have too much gap in-between. That's so barbaric when you think about it, that your jaw is dissolving.

But barbaric in a way that's fascinating to watch on video, and I feel like that's such a more

high-stakes drama-driven hook than you're worrying if braces will hurt or how you'll look.

AUDIENCE: It's interesting too, because the bottom question gets at the anthropological question of what is beauty. But really, I think it's much more. If we're going to get back to the evolutionary question of what makes someone cold versus hot, and will they die soon or not-- if all of us has evolved to the point where 80% of tweens end up getting braces, what's wrong with our society, and why do we have to keep fixing these teeth? Is it actually going to make us die sooner if you don't fix your teeth, or is it just because we look prettier?

GEORGE ZAIDAN: Is it cosmetic?

AUDIENCE: Yeah. I know that I will at some point have to deal with some more significant dental issues that are actually about my functioning. But proportion of this is actually-- I don't know. And I don't know if that's a question you're even going to get into, but why do so many teenagers end up getting braces.

GEORGE ZAIDAN: So that and Elizabeth's point are related. When she was describing the barbarity of you get these metal blocks and a wire in your mouth and all sorts of stuff-- what technique is that? What is that? It's not a metaphor. What is she doing there? Yeah, so she's inducing emotional pain by asking you to put yourself in her shoes and getting this. But specifically when she says, OK, you get braces. You're going to go and have someone-- you're going to pay them to glue metal stuff to every one of your teeth, then take a wire that is not in the shape of your mouth, bend it so that it fits your mouth, and then it forces your teeth to move around. Like what is that that she's doing?

Who here has seen Robin Williams' comedy sketch on golf? Anyone? Oh, you have? It has a lot of bad language in it, but it is hilarious. And I can't do it here for that reason, but you should watch it tonight. He basically says, look, golf-- you take a stick with a really tiny metal thing on the end of it, and you have a small ball. And the goal is, without touching the ball, to beat it with the stick until you get close enough to a tiny hole in the ground that you can take another stick and then gently tap the ball into the hole, not once, but 18 times.

That's the same technique as Elizabeth's using, what is that? Why is that interesting? Why does that make us listen? Yeah?

AUDIENCE: Well it's was humorous, because you get used to the jargon and different terms, but it's the sort of thing if you're trying to describe it to someone who has no clue what you're talking

about. it just sounds so utterly ridiculous.

GEORGE ZAIDAN: Exactly. So the humor, actually, I'd argue is a secondary component. Really, the crux of it is what you said about being used to something. It is taking something that's familiar and describing it from a completely different vantage point, and you can only do that with things that are familiar enough that people are so used to them that they just don't think about it-- braces, oh yeah. Braces, whatever.

But when you shift that perspective, you do inject humor. You can inject drama. You can inject-- mainly humor and drama. Humor and drama. And you force people to sort of step out of their comfort zone and consider something that-- they just look at it in a totally different way, which is an alternative opening. So that's another thing that you could consider.

If I were to tell you-- and the way to do it would be to do it as a reveal. If I were to tell you that you're going to go to someone's place of business, pay them money to fill your mouth with a bunch of metal and plastic and chemicals, would you do it? And then like, no. But people do that every day. It's called getting braces. The way I just did it was not very good, but you get the general idea. Other comments?

AUDIENCE: I also liked-- I was actually with Andrea when she was pitching her idea to sixth graders. And her first question was do you have braces? And this one girl who did-- she was really excited about that. Like yes, this is about me. And then the next question was, well, do you know what they do? And she started pitching all these ideas. This is what I think they do, but then the answer was very different.

GEORGE ZAIDAN: Sorry-- the girl thought they did something completely different than they actually did? What did she think they did? She just kind of said pushing teeth, whatever-- just a really basic answer. But then Andrea was saying there's so much they actually do. And I thought that was a really good way to get into it, because they got really excited, and they started talking about their experience with braces. So here it's kind of-- if you say maybe instead of whether it's worrying, you could say do you worry about how much it will hurt? All these things.

Get the audience thinking maybe offering their own ideas, but also it connects them to-- this is something that I have.

GEORGE ZAIDAN: Yeah. So that approach-- generally, I would call it the preconceived notion approach. So you basically guess or know what your audience thinks about something, and usually that is either

entirely wrong, or parts of it are wrong, or not complete, or whatever. And you say you start the video by saying you probably think that x, but actually y. Or z or whatever.

And so that is another-- it's very different than the fill your mouth with a bunch of metal and wires and stuff, but it can be just as engaging and interesting, depending on what the subject matter is. The only difference-- and this is where you've got to be careful-- is that when you're actually in a room interacting with people, going back and forth with the Socratic method is great, and it is a perfect way to get into the topic, but you can't do that with video. And so you what you don't want to do is make that two dimensional conversation one dimension by sort of just stripping the away the kids' answers and just putting in the questions.

It's kind of like trying to fit a square peg into a round hole, or the other way around in the sense that it's designed for one medium, and you're trying to use it in another. [? SEAM ?] And I know that's not a great way of explaining why it doesn't fully work, and I don't necessarily have a better way of explaining.

AUDIENCE: Isn't that why Dora and why Blues Clues are held the way that they are, where it's like a rhetorical question, but they leave space for the kids to-- my son watches and answers the television.

AUDIENCE: And that's the educational best practices for educational videos that I was talking about on the first day-- that you acknowledge your audience, that you give room for interaction. I will say, going out of your comment, and sort of addressing the kids where they are-- don't forget about George's point of talking for the audience, not to them.

Because the overall point I would say about the wording and the set-up of this opening is that a sixth grade kid would be interested in this, but I'm not sure that their parent would necessarily be relate. And maybe it's just the way the questions are posed, or the types of questions that are asked, but there's a risk of falling into this tone of like after-school special.

I don't know. George, do you have tangible feedback that you can give about that? I can't identify exactly what it is.

GEORGE ZAIDAN: Let's see.

AUDIENCE: Maybe the question of why even get braces-- how that follows this list of examples of how much it'll hurt and depending on the delivery, it can really change how this reads. So why even get braces leads me to think that this is the type of video that they'll show at a dentist's office.

AUDIENCE: I feel maybe what you're getting back to is the-- this is the first example that we've seen where she's directly talking to you, whereas the other ones, it's more of either the voice is different in all the other ones. This is the first one where she's talking directly to the audience, and it's abstract. You were using yourself to say, this is what I do.

This is a boat, and this is back to me, my voice. And you were talking about time travel and Stephen Hawking as this third voice. But this is the first time we've seen sort of an abstract you in there that makes it, I think, a little fuzzy in that way.

GEORGE ZAIDAN: And I'm not necessarily sure that it would help to just switch out the you with a we, because it is a we, but it's also sort of a royal-feeling we rather than a-- we're going to do this. Royal, by the way, I don't want to-- I realize I'm lacing this with jargon, but royal we means basically just I. You say we, but you mean I.

So I don't know. I think this is a really interesting problem. Does anyone have thoughts on how to reward without going the sort of dramatic dentist route? Because I think this is interesting. Yeah?

AUDIENCE: We mentioned the personal aspect of it. If you had braces, and you suffered from this and that kind of [INAUDIBLE]. So we can say how [INAUDIBLE], because I experienced it just as you might be experiencing it right now.

GEORGE ZAIDAN: I kind of think I'd be even better if-- I know you don't have braces now, but I would almost want the host of the video to either actually have braces or I don't know if it's even possible to like put fake braces in your mouth. Like temporary braces that you could just have in there for a day and to just start with something like--

AUDIENCE: They did it on *Ugly Betty* for all their seasons.

GEORGE ZAIDAN: Did they really?

AUDIENCE: Yeah, they did.

GEORGE ZAIDAN: I thought she actually had braces. I don't know. Anyway. But to start with something like see the metal stuff in my teeth? This is called braces. And you have this-- it's a piece of metal. It's glued to my teeth. This wire is bent, and it's forcing my teeth around. So you're kind of doing this sort of dramatic dentist approach, but not as storified. And you are sort of sideways hitting

these points.

Like I've got all the stuff in my mouth-- is it going to hurt? What happens if this wire pops out? Clearly I have a bit of trouble talking or whatever the issues are, but you do it in a way that is-- because you're pointing at something, because it's kind of a demo, it's more conversational, more relatable. I don't know. That's my thought on it. What do you guys think?

AUDIENCE: I was thinking maybe-- you know how infomercials always ask you have you ever had this problem, and then they go into the details. So maybe start off with have you ever had braces

[INTERPOSING VOICES]

AUDIENCE: How much it hurts when [INAUDIBLE]. So it relates back to them.

AUDIENCE: Were the braces your second time having them or your first-- it was your first time.

AUDIENCE: You could show crazy teeth.

AUDIENCE: David Bowie's teeth?

AUDIENCE: Any English person. If think maybe we've all seen the bubba teeth enough times that we know what they are when we see them. But maybe many Europe creators haven't seen them, and you could start talking with this horrible mouth of teeth and then pull them out.

AUDIENCE: I feel like this backing out a lot from what we were talking about. But my big question is why we even have the first section, because to my understanding, the video is about how braces work, but in this first section. It's more about why would you get them, but I kind of get the feeling that the video isn't really about why you get them, it's just how they do that. I don't know.

AUDIENCE: Going off that, I was trying to do figure out what my main concerns with this were, and I didn't have a mental grasp on it until you mentioned [INAUDIBLE]. Because I haven't had braces. I don't plan on getting braces, so I felt really, alienated by the you in this, because I would probably, realistically, turn this video off because I'm not interested in why people get braces, because that's not relevant to my life.

But if you posed the question have you ever thought about exactly what braces do, that's a much more interesting to me and to probably a broader audience. And [INAUDIBLE] your tone with whatever intro you decide to [INAUDIBLE], because that seems to be what your video's going to be about, especially if you phrase it like braces are much more scientific than we think

they are. They're not just magically mashing your teeth into the correct place-- there's actually a lot of things going on in your mouth that people don't think about. And thousands of people have braces every day.

AUDIENCE: And the other thing is I don't actually think that the point of your video should be how braces work, beside that's an instructional video that Invisalign could make and has made, so many times. I've seen them so many times. There's no spark or wonder or curiosity in that whatsoever. And I'm not saying that every video has to be Neil deGrasse Tyson contemplating on the philosophies of our existence or whatever.

But when you think about it, you can be born with bubba teeth, and we have the ability to know how to craft bones in our bodies-- your teeth are the only exposed bone in your entire body. And we have figured out a way to alter that, in such a way that we can still continue to use them. So it's not like you break a bone and try to align a crooked finger or something. We've loop-holed around bubba teeth and the bones that we have been born with, and can actually dissolve the osteoblast or osteoplast or get them to dissolve bone and restructure it. And we can manipulate, essentially--

GEORGE ZAIDAN: I think what you're saying is braces shouldn't work, just by reasonable--

AUDIENCE: Or not even that they shouldn't work, but we shouldn't be able to do the things that we can do with braces. Braces shouldn't exist.

GEORGE ZAIDAN: Well I don't know that they should exist. The fact that you can basically blunt trauma move teeth around and then your body gets them to stay where you put them is really weird. That's something that is-- I don't know about if you were to break an arm and what the difference is between a braces and a cast, for example. That might be another analogy, or simile, or whatever. But it is bizarre.

When you said the thing about one type of cell dissolves the bone, and then the other one re-bonifies it in the right place. To me, that's the weirdest and coolest part of the braces thing. And so incidentally, why does your body even do that? I mean it's not something that your body came up with in response to braces. This is an ability that it has.

AUDIENCE: Yeah, this is in your entire skeleton.

GEORGE ZAIDAN: So what happens in our natural experience where our mouth would need to do that? Get a tooth knocked out or what? Why can we do that? Is it only gums or is it elsewhere in our body

too?

AUDIENCE: It's in your entire body, because you very rarely have two hard substances butting up against each other. They have usually some covering that's mediating that relationship. And then if something happens to permanently mean that these two pieces of hard substance now have to be in this orientation as opposed to this one. How do you get it to stay that way.

AUDIENCE: So this is more about how the body heals itself than it is about braces.

GEORGE ZAIDAN: Yeah. The word isn't even heal. It's more like how your body deals with something it can't change anymore. Because healing implies that it puts it back the way it was, which is not what it's doing. It's like we are brute-changing our bodies, and it's adapting to what we're doing. Did you raise your hand?

AUDIENCE: Actually, I think that some experiment [INAUDIBLE] basically to make yourself taller, what they do is they break the bones in your legs.

AUDIENCE: Of your [INAUDIBLE]?

GEORGE ZAIDAN: To make yourself taller.

AUDIENCE: So maybe for one year, they keep breaking the bone in your leg. Then they stretch it slightly, like a few millimeters.

AUDIENCE: How many inches can they [INAUDIBLE] out of you that way?

AUDIENCE: I think it's like an inch or an inch and a half.

AUDIENCE: Is it really worth one inch?

AUDIENCE: It's really painful.

AUDIENCE: So they keep breaking it, and then you have to [INAUDIBLE] the distance apart [INAUDIBLE]

AUDIENCE: Sorry. The point of the video though. This is going back to Jamie's point of you hone in on something very specific like braces, but the point of the video is not really just this is what happens when you get braces-- it points to this bigger thing that we're actually manipulating natural processes that happen in our bodies that are important. Like your bones have to break down and remodel all the time. That is actually an essential process of dissolving old bone and

osteoblasts forming new bone.

If that doesn't happen, your body can't exist. That's actually an essential process, and with braces, you're manipulating that. You're tricking your body in a way to adapt to these blunt forces that you otherwise wouldn't be able to do.

GEORGE ZAIDAN: We had no idea when we invented braces that that's what was happening. This was discovered afterwards? Or did we know?

AUDIENCE: And I think taking those-- what you were saying earlier about how can we do this and what you were just saying. We're manipulating a natural thing. I think part of what you can do is like-- I was talking to you about how your teeth slip. You teeth want to go back to its natural state. They don't want to be straight. They want to be whatever you're born with. And how that-- I don't know if it's possible. You might be able to take that angle-- we're made as how we're made and we're to manipulate this, but in the end, we just want to go back to the [INAUDIBLE].

And how this is process of using braces as kind of-- at first it can seem like it's barbaric, but it's trying to manipulate this process. I don't know.

AUDIENCE: This is such an interesting challenge, because we were talking about this yesterday-- how Andrea is struggling with the opposite issue that almost all the rest of your scripts are struggling with which is she has the very concrete thing, but she's not sure about the big question is. That this is the example for that big question. And we're struggling right now to help her figure out was is that question that allows her to use what she knows about braces as a cool way of illustrating some very cool concept.

And I feel like most of you are actually struggling with the opposite-- you have some cool concept, and you're trying to figure out what's the specific story I'm going to tell to illustrate that. And so we've actually got like a reverse engineering problem here, which is we don't know what the question is that she wants to ask that allows her to tell this cool story about braces in a way that that example is a perfect example for this larger concept.

And the problem right now is that there are a bunch of different questions we could ask.

AUDIENCE: But it's a good exercise to throw-out all these bigger questions, because that gets you out of the after-school special. That gets you out of why do we get braces? You put up with this trauma so that you have a healthy, shiny smile, and then thumbs up and end credits. You don't want to have a video that's like that.

GEORGE ZAIDAN: To play devil's advocate.

AUDIENCE: You don't want to have a video!

GEORGE ZAIDAN: I agree. No, no, I agree. I agree with you. I agree with you. But you can play off that expectation in fun and interesting ways, like I would be perfectly happy to start a video as a parody of an infomercial.

AUDIENCE: Like a parody is different.

GEORGE ZAIDAN: Parody of an infomercial, yes. Yes, yes, yes. I mean to do the infomercial and then reveal it's a parody.

AUDIENCE: But you wouldn't actually go out with the intention of the infomercial as your tone. No, but we'd shoot it and deliver it as an honest-to-God infomercial for the first 20 seconds or whatever, until you establish that you're joking.

AUDIENCE: No more than 20 seconds or else you'll bore the crap out of your audience.

GEORGE ZAIDAN: Yeah. And you actually have to go a bit over the top of what the normal tone would be to sort of signal that you're-- yeah. Yeah?

AUDIENCE: So when I first heard Andrea say that your jaw dissolves. That kind of brings up a lot of images. There are so many movies where there's a focus on teeth destroying mankind. So there's *Jaws*, there's *Piranhas*, there's just random people with teeth walking around, and that's kind of their main feature.

GEORGE ZAIDAN: Zombie movies.

AUDIENCE: Yeah, and we watched a video about what makes things creepy, and one of the images was just a teddy bear with teeth, and that was horrifying. So I think the idea-- so it's just making the familiar thing unfamiliar. So you can even get away from the idea of getting braces. This is something we do, but rather start with this monstrous thing that we dissolve our jaw. And that's a really cool image. And maybe you put it on a teddy bear. You don't even have to associate it with human kind.

And then at the end, you come back to the familiar. This is what we do, let the viewer think back and say, oh, wow. This is me doing really well cool things inside me body.

GEORGE ZAIDAN: I think figuring out other examples where essentially bone is dissolved and basically listing all of those out-- seeing what the differences are, what the commonalities are. And then from there, I think you will have a better sense of what the overall story or big question of the video is, whether it's infomercial parody, horror at the dentist, bub teeth, teddy bear with a creepy smile. Whatever it ends up being, I think you're absolutely right. The challenge is you have one concrete example. One really interesting, good, concrete example. And the question is how to get to it in a way that is authentic and engaging.

AUDIENCE: The body morphing concept is very interesting.

GEORGE ZAIDAN: Oh, that's the other one. Breaking your legs to get taller.

AUDIENCE: And because it's a everyday example of something that's actually really bizarre of us physically altering our own image for one reason or another. And people have experimented with-- in certain countries, big feet are not attractive. And trying to swaddle their feet in order to protect women's feet from getting too big. And thinking of what are the ways we have either for beauty or for function found ways to manipulate our physical appearance at a structural or cellular level. Not just on a going to the plastic surgeon and getting them to fix my nose [INAUDIBLE].

GEORGE ZAIDAN: In a weird way, some of the body modifications that we associate with extremism are the easiest. You get a piercing, you're just driving a nail through your ear, so what, big deal. Braces, which everybody thinks are like-- everyone gets braces-- are actually this incredibly complicated biochemical process that's happening that's a team effort between the hunk of metal in your teeth and your body to reshape the only exposed bones that you have on you.

AUDIENCE: And it's more than just brute force pulling them together, but you're actually affecting the biochemical interactions that are happening within your body.

AUDIENCE: Maybe start off with that, like say the common misconception of how braces work.

AUDIENCE: But until you know where you're going, that doesn't help. So I wonder if, since it kind of feels like we're circling, that maybe what we need to do is either have Andrea or all of us come up with a whole couple of our questions that the braces could be the answer to.

GEORGE ZAIDAN: I think also coming up with a list of other examples that are similar and simple.

AUDIENCE: And then maybe tomorrow we circle back and see if we can better explore this, because I

don't know that right now we're going to get there.

AUDIENCE: I mean we have a lot of options that you can toy with. The point of the conversation is that the point of the video shouldn't be this is how braces work. It's a tool that you use to reach the bigger point. And the bigger point has not been established yet, but there are lots of possibilities that hopefully we've been throwing out. And this thread of body modification is a different thread than the old making the familiar unfamiliar, and I'm not sure that you can address all of them in a single video.

GEORGE ZAIDAN: No, you can't.

AUDIENCE: But they're all possible options They're all equally viable options. I would say that on a practical level, how that relates to the script that you've written here-- I mean the studies have shown that having a beautiful smile-- that's a sentence that's explaining why we get braces, but that's not necessarily a point that I think you should eliminate from the video, it's just a point that can come much, much later.

GEORGE ZAIDAN: I'd actually argue that that's its own video, because the whole-- this is kind of this like philosophical point that raises so many interesting questions like well how important is a smile to the rest of your face. Is symmetry important? Does it really actually make people like you more if your teeth are whiter-- so that, for me--

AUDIENCE: It's almost like a psychology video.

GEORGE ZAIDAN: It's a whole separate video.

[INTERPOSING VOICES]

AUDIENCE: *Time* has done a whole bunch of different-- I think *Time Magazine* has done a whole series on beauty and the physical nature of beauty and all that. I think tons of popular magazine have really tried to explore this topic. I always get nervous when we say studies too, because the critical scientist in all of us is like who? How legit are they? And are they at Harvard, or are they at Podunk somewhere and the only person in the universe who thinks this. So that's just something that I always think about.

AUDIENCE: But just saying that that sentence-- you can neither get rid of it entirely in the open-- I would get rid of it entirely in the opening.

AUDIENCE: I think that if it were me at this point, I would want to actually-- this is what I tell a lot of people who come in my lab for a variety of a different communication tasks-- is to actually minimize this and not not look at it, and see if you can come up with an idea that this fits under, and then come back to this idea and see if you can somehow repurpose it. But the idea of trying to repurpose this without that bigger concept is not really going to allow your mind to get there.

GEORGE ZAIDAN: Yeah, actually. And that leads me to another point, which is everyone who's gone today and almost certainly the people who have not been subjected to this horrifying treatment-- you will all need to completely rewrite your next draft from scratch. So when we say redraft a script, we're not saying like change a few words here or there. We're saying start with a blank word document and start from scratch, because otherwise you're going to end up with all the same issues that we talked about.

AUDIENCE: But if you end up loving a phrase that you used, you can do what you call lifting a line, which is to just copy and paste that line once you've got your new structure in place. And that keeps you from sticking to something that doesn't really work, and trying to step it into something that works a little better. It keeps your mind open that way.

GEORGE ZAIDAN: If there's a line that really sticks with you, oftentimes you will just, of your own will, rewrite it. You don't even need to copy and paste it.

AUDIENCE: We won't get a chance to hit everyone's scripts today, by George can stay until five, and I can stick around as well. It's about 3:30, so we should probably do a hosting.

AUDIENCE: I have to apologize, because I have to leave every day at 3:30, and so I am sorry. This is my moment to leave. But if any of you need to reach me or want to connect with me, email. I will totally get back to you tonight. But I am sorry that this always the moment of the day where I have to leave. So awesome work.

AUDIENCE: This is also a totally normal process. George, your script was terrible. No, we went back and forth actually three or four times where she kept being like this is all fascinating information, but what is the point of your script? And as the writer, you are the worst person to like objectively assess what the point of your script is. So having other people talk about it is helpful.

AUDIENCE: And it's a lot easier to edit someone else's work that exists than to come up with it on your own. So it's totally normal.

GEORGE ZAIDAN: I think we did eight revisions of my script, and I'm a professional writer.

AUDIENCE: What about defining the point before you get started. Particularly if you're doing a series, you probably want some common theme, and then each episode has a particular point. Or I don't know.

GEORGE ZAIDAN: Oftentimes you have a point in your mind when you start writing, but then as the script comes out, maybe there's a better point. Maybe discussions like these you discover that you know what? Actually, this point that I was thinking of when I wrote the script isn't what I want to talk about. This other point really is. And that usually happens, no matter how diligent you are about picking the best point that you can before you start writing.

And again, it's a slightly different process for like purely technical instructional video-- like Lynda videos. Because I remember you had emailed me about that. I don't know if you guys have checked it out yet, but we're not going to technical how to use Final Cut Pro, how to use iMovie-- but you can go on Lynda.com and all MIT students have access to it. And they're just purely technical videos. I listed all the helpful ones in the syllabus.

But the objective of that is basically open your brain, dump the information in, and close the brain. And I mean that in a very positive way. They are very, very good videos, but that's a totally different objective than maybe doing a whole series on time travel, because there's so much you can talk about that right. The objective of a series on time travel to pique curiosity among people can also include informing them and transferring knowledge to them, but it's going to be a very different scripting process.

I hesitate to say a very different scripting process, but the priorities that you're going to have are going to be a little bit different than a Lynda series for example.