PROFESSOR: Grabbing a bunch of index cards and scribbling things down.

AUDIENCE: Yes.

PROFESSOR: Pretty much how I get by. Another group?

AUDIENCE: So our group is [UNINTELLIGIBLE], [UNINTELLIGIBLE], and Jason. We don't have a rep [UNINTELLIGIBLE]. But [UNINTELLIGIBLE]. [LAUGHTER] We're doing like a real time, supernatural horror/cooperative game.

PROFESSOR: OK. Oh, like real time [UNINTELLIGIBLE] theme?

AUDIENCE: Yeah.

PROFESSOR: I'm excited. I'm excited.

PROFESSOR: One, two, three, four. All right, who else?

AUDIENCE: it's me, it's Tanya, Patrick, and Justin who are here.

PROFESSOR: [UNINTELLIGIBLE]. OK. You guys have kind of a [UNINTELLIGIBLE].

AUDIENCE: And how do you describe this game?

AUDIENCE: It's building a family tree game.

AUDIENCE: Geneology path building.

AUDIENCE: Yeah. It's a path building game involving family members.

AUDIENCE: Consider it geneology path building.

AUDIENCE: It's kind of like a Family Feud game. Except, it's a little bit stranger.

PROFESSOR: So I think Jay and Mia.

AUDIENCE: Yeah. [UNINTELLIGIBLE PHRASE]

PROFESSOR: And Calvin and Jason, you've been [UNINTELLIGIBLE] in that.

AUDIENCE: Oh. [UNINTELLIGIBLE] and things.

AUDIENCE: [UNINTELLIGIBLE].

PROFESSOR: So right now we have a-- we don't have a [UNINTELLIGIBLE]. The idea we have is pretty much you want to get a certain sets of cards. And we get sets by drawing cards or trading with other people or-- but it's also you can take cards if you want, but if you get caught, then it's up to the other players whether you get punished or not.

PROFESSOR: OK, if you get caught then-- OK. So [UNINTELLIGIBLE]. That sounds good. So it sounds like we have four teams. [UNINTELLIGIBLE PHRASE]

So today I'm planning on, for the most part, just going through the lecture stuff that I had planned for today and for last Wednesday. And if there's any time left, we could finish up with [UNINTELLIGIBLE]. And that's what I'd like to do. But if there's only like an hour left, then I think I'd probably rather you play one more game. As this is a useful exercise, but playing these games are just as useful and frankly a better design.

All right. Let's see. So I think I'll start with Wednesday's stuff first, which is the last [COLERA] reading for the entire semester. I did, in fact, actually look a little bit into the weird eskimo stuff from Monday, and one thing, I don't actually think he was speaking figuratively. I think he was actually describing something that he had done some anthropoligical research on-- this is a ritual that a very, very [UNINTELLIGIBLE], just a fine group of eskimos do.

It reminds me a lot of the sort of recitations that you get that sometimes has a morbid quality, sometimes they don't. But this reminds you of either historical events, or important things to do. Like the easiest one that I keep in my brain is righty-tighty, lefty-loosey. That teaches you something of how screws work. But then they're a little bit like ring around the rosy, with a pocket full of poseys, ashes, ashes, we all fall down. But it's actually a commemorative little poem about the black death. That's what that song is about.

So you have these little things. That particular example that he was describing was more about this recitation that you sort of remember the procedure in which things are supposed to be done. But they're [UNINTELLIGIBLE], they're sort of [UNINTELLIGIBLE] reenactment about what you do in order to I guess [UNINTELLIGIBLE PHRASE] or something like that to basically perform taxodermy on an animal. One of those ways where a playful experience was pretty much it's been used as a learning tool.

And that kind of gets back to something I was mentioning much earlier in this course. In many ways, learning how to play a game is literally very exotic. You can't figure out how to play the game unless you have figured out all the rules. And if the rules happen to have some sort of correlation to something real world, you might end up learning something about that real world. Whether you transfer to back to actually something real world is kind of actually the topic of what Wednesday's reading about.

[UNINTELLIGIBLE] talks about mimicry and things being kind of taken over by [UNINTELLIGIBLE PHRASE]. Now he uses these grand, sweeping statements which I think sound a lot more modest when they're in the original language, and what to translate [UNINTELLIGIBLE] sound like you're saying, and this huge wave of competitive games took over witch doctors.

But I think what he's referring to, and if we notice the readings for that chapter three and chapter eight. So there's a whole bunch of stuff that's missing, and we kind of wanted to spare you from the bad translation. But the idea is that there is a lot of stuff that basically mimicry, the old process of putting on masks, putting on costumes, and being someone else has great societal power. This had great societal power. And this is more of an anthropological thing.

But the idea being you have these people-- who are effectively leaders of groups-- shamans, witch doctors, fortune tellers, maybe just elders. And they would have costumes, they'd have masks that not only gave them station, what when I wear this robe I am now in charge of this tribe, but also turned them into somebody else.

Now, if you look at ancient accounts of the Egyptian pharoahs, for instance, in order to actually give up their own name and then they take on a new name. And a lot of them actually just become Pharaoh in the same way that a lot of Roman emperors just become Caesar. You can think of Caesear as just being king. So it becomes a title, but you also become a person. A lot of the-- I'm trying to remember-- Persian, I think, emperors become Darius or Cyrus. Kind of

just one word. This is one name that was given to the king. That's who you become. And that kind of combined with aesthetic solemn rituals.

A lot of these are not what you would recognize as games right now. But in many ways they sort of tap into the same sort of pleasures of sort of critical and losing control. Once in a while, you don't have to be sort of all inhibited and obeying laws. You can just cut loose. And in superstitious tribes, superstitition will be the excuse. But you don't actually necessarily need that reason. And I think one thing that [UNINTELLIGIBLE] sort of describes in chapter eight is how-- we kind of get that today too.

He was describing stuff like identification, for instance, when somebody who could be you wins something for no particular good reason, against incredible odds. And is there some sort of mechanism for you to feel I am now happy partly for this person's success, therefore, I'm a winner. Then you get to have that experience of ecstasy. You get to that news.

A couple of videos. Some of them it's tongue and cheek, but hopefully that you-- it will kind of illustrate my point as well.

So was anyone here in Boston in 2004? You were in Boston in 2004? What happened in Boston in 2004?

AUDIENCE: With the Red Sox?

PROFESSOR: Yes. The Red Sox won after, what, 86 years of coming real close and never actually winning a World Series. And I'm going to-- This is a neat little video that I have. I just kind of then just use this as a back drop. I think this is right around Fenwick Hall. I'm not so sure it's [UNINTELLIGIBLE]. Sorry, the wireless in this particular corner of the office can be bad. This is-- actually let me skip a little bit.

So for those of you who don't know the story, actually how many of you don't know what happened in 2004 around here?

AUDIENCE: Well I don't know exactly what [UNINTELLIGIBLE PHRASE].

PROFESSOR: So basically what happened around here was the Red Sox were down 3, 0 against the Yankees. And managed to come back from them. And then they beat the Cardinals and they won the World Series. Now, this is, of course, after 86 years, again. I mentioned really people just not winning at all. But coming really close. Each time they get really, really close and then

they'd magnificently flub it. [UNINTELLIGIBLE PHRASE].

So this earlier video here is what Boston looked like when it was down 3, 0. [UNINTELLIGIBLE PHRASE] The funniest thing that every time the Red Sox actually won it was like an awakening. So they weren't at Fenway. When all of these celebrations that-- can you see once the buffering stops. All the celebration that's going on is occurring miles and miles, probably 100 miles away from where the game's actually happening with the Cardinals.

And of course, everyone was watching it on TV, everyone's identifying with the Red Sox. And right now you are sort of seeing like, as far as I can tell probably the Northeastern students who were around Fenway. But in here, the vehicles driving by and [UNINTELLIGIBLE PHRASE]. Everybody was listening on the radio, you can see the cars driving by.

Everybody knows immediately. Everyone in Boston immediately knew it [UNINTELLIGIBLE PHRASE]. If they weren't watching the game, they would have heard it anyway. Because they have no affirmative claims. The only way that you would cheer the Red Sox is to say Mackie sucked, which is kind of sad actually.

For those of you who weren't around, it was a really, really awesome night. There was, of course, a little bit of violence. Things got a little bit out-- a bunch of [UNINTELLIGIBLE PHRASE]. But it wasn't like a huge riot or anything. For the most part it was pretty much this. A lot of people with a lot of the hands in the air. No cars being turned over or anything like that. But it was being-- But these are the kind of aesthetic movements that [? Colera ?] talks about in his write-up.

Yup?

AUDIENCE: I have a video on my phone in Barcelona right after they won the semi-finals over the summer. And I had a video of the streets at 11 PM. I could show you [UNINTELLIGIBLE]. I have a video of the streets at 12:30, so half past midnight. And it's the exact same scene. And the exact same people are still in the street with their shirts off, still twirling their shirts around.

PROFESSOR: It was probably more rowdy I would imagine.

AUDIENCE: Oh, it was [UNINTELLIGIBLE] rowdy [UNINTELLIGIBLE]. This is America, they don't know how to be rowdy in [UNINTELLIGIBLE].

PROFESSOR: I think for every three people there was a cop. You don't see that in the video. But there were

a lot of cops out there that night just to make sure that [UNINTELLIGIBLE PHRASE]. But I think Barcelona also would have been partying.

AUDIENCE: Yeah.

PROFESSOR: So the idea-- of course, the idea of a sports team is something which you identify with because associated with the city that you live in. They win. I didn't do anything, but because I because I'm a supporter of sports team, I get to identify myself with them. And [? Colera ?] makes the assertion that this is important because if you look at the forces of human chance, of there, which I think gives the various athletes the opportunities, as well as the physical ability, to actually perform well.

The likelihood of any of the people actually celebrating, actually being able to perform that same feat is extremely low. In fact, the likelihood of even someone who has the ability and the opportunities of actually winning is pretty much random and the odds are against you.

But because you identify so strongly with a group of people who can win, you are allowed to sort of enjoy that victory, even though you weren't the one who actually got that victory. And it gets stronger actually for some games-- well for some kind of games where you actually did have something to do with the victory, for instance, talent shows. Especially the modern talent shows. Maybe you've already seen this.

[BEGIN VIDEO PLAYBACK]

PROFESSOR: So [UNINTELLIGIBLE] the *Outward Bound* are on about next week's show. They're going to-- remember that when you look at things like *Britain's Got Talent*, like *American Idol*, all of these things are popularity contests. You have judges, but the judges don't actually determine very much who's actually going to win. The only people who actually determine who's going to win are popular vote. And that vote is happening through short messages basically, which people are being charged for.

The basic idea is that because you might have had voted for someone, you now identify with that person who might win. Whether that person wins or not is effectively random for other purposes. Now sure, that some of them have talent, but later on-- but when you look at who actually tends to progress in these competitions, I think some of the results are really, really random. Like you have some people who move onto the next stage because they are just strange. And you just want to see them next week because they may be entertaining, not

necessarily because they're talented.

So this is [UNINTELLIGIBLE] example. [UNINTELLIGIBLE PHRASE]

[WATCHING VIDEO]

AUDIENCE: Yes, but their [UNINTELLIGIBLE].

AUDIENCE: Dancing.

AUDIENCE: That's an obvious one. Singing for everyone.

AUDIENCE: [UNINTELLIGIBLE PHRASE]

AUDIENCE: [INTERPOSING VOICES]

AUDIENCE: Getting married.

AUDIENCE: [UNINTELLIGIBLE].

AUDIENCE: Cypress.

AUDIENCE: Yeah, what do they do?

PROFESSOR: I should have looked up what their particular is, but they can all do different things.

So the first one is short message vote in.

AUDIENCE: [UNINTELLIGIBLE PHRASE]

AUDIENCE: Slick-backed hair.

PROFESSOR: I notice the camera moves at this point.

[LAUGHTER]

AUDIENCE: They just like the looks of their [UNINTELLIGIBLE].

AUDIENCE: [UNINTELLIGIBLE]

AUDIENCE: [UNINTELLIGIBLE PHRASE]

AUDIENCE: They're obviously [UNINTELLIGIBLE PHRASE].

[INTERPOSING VOICES]

AUDIENCE: It looked like a dance thing. And if you look at the other celebration's like the Susan Boyle video, where I think it got pretty viral. So I'm assuming a lot of you have seen it. It's one of those things where even if you don't necessarily that you're rooting for a person. It's so easy for you to be convinced that you're actually rooting for this person as soon as you have a reason to. So--

AUDIENCE: It's like oh wow, that guy is from Texas.

PROFESSOR: Hey, [UNINTELLIGIBLE]. It's good for you. You don't really need that much of a reason to identify with somebody. And that's where you get sort of still see some of that power of the vertigo, basically. It's not the vertigo of actually playing the game, the vertigo of watching a game, but it's still part of the entire game experience.

Britain's Got Talent, American Idol, everything like that wouldn't have the power if it didn't have the hundreds and hundreds of screaming fans voting in and having their faces changing on camera, and applauding and screaming their heads off.

And of course, that's the identification part of it. But even when you're talking about sort of just basic [UNINTELLIGIBLE PHRASE].

Here's a shrine festival in Japan. And basically what they're doing is just getting started. Everyone's gotten assembled. All of the folks here who are wearing basically the same colored outfit are basically from the same town. Including that logo. And what you've got is basically like a little house for a deity. They're both carried on the shoulders. And those three up there look really precarious, but I think they're having a good time. That's a completely different talent [UNINTELLIGIBLE].

But you know, this is not unlike what you'd see in a sporting event. It's kind of getting [UNINTELLIGIBLE PHRASE].

AUDIENCE: Isn't the town versus town like competition?

PROFESSOR: It's not really so much a competition. But I think there's a certain amount that you have to represent.

AUDIENCE: That show existed in France, it's called [UNINTELLIGIBLE PHRASE], and they literally get

towns in the countryside and have them compete in various competitions. So like each town, for example, designates the strongest person to have an arm wrestling match.

PROFESSOR: Sort of like champions. You send your champions.

AUDIENCE: You send your champions. Then you have like a horseback thing. And I think like other weird events. And it's pretty popular. 1,000 people/person town versus [UNINTELLIGIBLE PHRASE].

PROFESSOR: I think you get that in the Scottish Highland games as well. Basically it's sending people to throw giant pieces of lumber as far as they can.

But [UNINTELLIGIBLE PHRASE] competition. This is not [UNINTELLIGIBLE]. This is a lot closer to kind of the earlier kind of situation. Because they're not vying to win anything. They are really just trying to all get into it together. So if you think of it as what kind of thing. The aim of the game is don't drop the damn--

[LAUGHTER]

It's quite simple. Get thrown-- in fact, it's actually a fair amount of effort because I think they walk a couple of miles. I'm not quite sure what the traditions are on where it starts and where it ends. But it's like a huge street parade. And the whole idea is let's get everybody involved. The people are packed really close with each other, so it's not like you can actually move one foot without colliding into somebody else unless you're all moving in unison. And can you keep in sync. And all the shouting, all the whistles, and all the chance actually just helped that entire process move along.

It continues today, not just in sports, not just in televised shows, but in street fairs and [UNINTELLIGIBLE PHRASE] that's great. And those folks really look like they're having fun. So that's kind of what we were [UNINTELLIGIBLE PHRASE]. And the version of this, the version of what [? Colera ?] describes as since your ability to succeed is so random, especially if you think of it outside of the game context, but more in the silo context-- your ability to be a great athlete, your ability to be a great politician, your ability to make a lot of money, just to succeed in life is so random.

But people kind of don't necessarily want to acknowledge that it's random because you have rules, because you have sort of rules set in to promote merit to sort of equalize systems. Is this the equilaterian [UNINTELLIGIBLE], which I think actually he meant. I think the original word was egalitarian. While there are a lot of processes trying to stabilize, in the end you can't

really ignore the forces of one's birth. At least that's the way he sees it.

When you get competitions that are effectively just completely random, which means anybody can win, people really do understand and sort of ascribe to that kind of power. They accept. The likelihood of me winning the lottery is about as good as the likelihood that I'm going to succeed in life. A lot of it is based on who was I born to, and which year, and which region are we born in? What's happening in the world as I-- at least that's the way of how he puts it. So he has a really hilarious video, by the way, [UNINTELLIGIBLE].

This is an ad. Let me get--

AUDIENCE: [UNINTELLIGIBLE]

PROFESSOR: I guess so. Sorry about the-- It looks damn pretty.

AUDIENCE: [UNINTELLIGIBLE]

[BEGIN VIDEO PLAYBACK]

-Mos of us when we buy a lottery scratch-off ticket, we're thinking this is my day, right? OK, if that's the case, then a 19-year-old Mills college student is super lucky tonight.

-Louis Jay became an instant millionaire with the scratch of a ticket, and he told Rob Robert all about it today.

-It was on his birthday when Towson University student, Louis Jay, decided to buy a scratch-off lottery ticket.

-I actually won $20 on the scratch-off the prior week.

-Louis Jay went to this giant [UNINTELLIGIBLE] Mills and used the $20 he won on a scratch-off ticket and bought another one. As he began scratching off the numbers, Louis couldn't believe his eyes.

-I'm at the second to the last line and it's not going too well. And I was starting to see six. I was like oh, it matched up. All right, I won $30 or something, why not. I saw a million. I started double-checking, triple-checking everything. Make sure all the numbers matches and everything. I was like oh, my God.

-And when it came time to scratch off the last number, his mother told him--

-He was scratching on every one. And when it was the next to the last one I said, don't scratch it from right to left, do it from left to right.

[LAUGHTER]

-And there it was. Louis had won himself one million dollars.

-This little dollar sign bag right here that I won on, I'm actually got number six for my lucky number right here. And down here it matches the six with the prize for a million dollars.

-He's a hardworking young man, and he has fun and he likes the lottery. He buys a ticket on his 19th birthday, and lo and behold, he wins a million dollars. I don't know if he told you the other part of the story. He bought a ticket on his 18th birthday, his first one, and he won $100. So I don't know what's going on his 20th birthday. Everyone in the family about Louis's good fortune.

-I'm happy for him.

AUDIENCE: Isn't it a story that they're trying to tell [UNINTELLIGIBLE PHRASE].

-And yes, he does have plans for the money.

-I'm putting some money away for my brother and sister to finish schooling. They go to [UNINTELLIGIBLE] school. I'm going to put some money away for myself, help my parents pay off some bills so we could all-- We always said what we'd do if we won the lottery, we'd go to England, visit my father's relatives and stuff. We're going to go there next summer hopefully. Just going to do a lot of things we always said what if we won the lottery, and now we did.

-Rob Robert, Linda. BBAL TV, 11 News.

[END VIDEO PLAYBACK]

PROFESSOR: So this is just a story that they're trying to tell. It's like this is hard-- he's a hard-working young man, as if that had anything to do with his [UNINTELLIGIBLE].

AUDIENCE: He deserved it. [UNINTELLIGIBLE PHRASE].

[LAUGHTER]

PROFESSOR: Behind that is that well, and and if you're a hard-working person as well, and if you bought a lottery ticket, you could win. That's the story that they're trying to tell.

[INTERPOSING VOICES]

AUDIENCE: [UNINTELLIGIBLE] is like perfect time for opportunity. Like with the lotto idea, what if a really, really unlikeable, despicable character wins the lottery, what's the news reports going to be like? She never worked a day in her life.

PROFESSOR: But I think you can still turn that in the way of this is not a person whose odds in life were already in favor. And everyone can sort of identify with that. It's like yeah, things aren't quite working my way, but you could be a lottery winner tomorrow. That's the story that they are telling.

And of course, the idea being what the lottery director was saying, yeah, remember, he didn't just buy one ticket. He bought one ticket the year before, he might buy another ticket. They're trying to encourage you to buy more tickets. That's the story. The story is buy more tickets, which oddly enough is actually the only way to increase your chances of winning the lottery. Buy more tickets. Pity that doesn't work for like past deals and things.

AUDIENCE: [UNINTELLIGIBLE PHRASE]

PROFESSOR: And reapply for more [UNINTELLIGIBLE] classes [UNINTELLIGIBLE PHRASE]. But the basic idea that they're trying to because the forces of life are so random, these kinds of like totally random, high stakes games have incredible power. And not just because of the possibility of winning. But because it resonates very, very strongly with the idea that you could win. And if you identify with somebody else, even better because then you don't even have to win. That person could win. And in fact, increases the range of different winners that you can identify with. Help people sort of get that thrill of winning without necessarily even having competed.

So that's kind of the power that we have in chance. I haven't actually talked about, well so how do we actually use chance in games yet, which is what [UNINTELLIGIBLE PHRASE]. But I think in their book, they describe-- the reason why I like challenges for you to design is that they're very concrete about well if you're stuck and you don't know what to do with a game, have you considered bam, bam, bam, bam, bam, bam. They're very, very systematic about that. You know, have you considered doing options? Have you thought-- That's not chance. That's the second chapter.

The first chapter was have you considered using dice, using cards, using spinners. I don't remember what other randomizing systems they had. Computer or random number generated [UNINTELLIGIBLE]. Are you using it to equalize different skill levels, or are you just trying to make it so that there's sometimes predictability, that sometimes solveability in the system. There are all these different ways that you can use randomness. But don't forget how powerful randomness is. It's one of those things where you normally assume that you don't actually [UNINTELLIGIBLE] in the game. And you don't want him to [UNINTELLIGIBLE].

First of all, as the designer, randomness makes it hard for you to predict what's going to happen, and as a result, it becomes difficult to design. But the power of the this I could be a winner for reasons that are entirely out of my control is actually more powerful than a lot of folks what will naturally assume right off the bat.

So I'm not going to go too much into the various options that Brenda and Ian described as a challenge because you can look those up. But do look those up, especially if I'm having difficulty in your game. If you're having difficulty, oh this game is too predictable, and you can see that there is the optimal strategy. Well then you can think about maybe writing those might be a good [UNINTELLIGIBLE]. Or maybe I want to be able to play this with people who have never played this game before I had met them, and still have a fighting chance. That's another good opportunity to win [UNINTELLIGIBLE].

But know what problem you're trying to solve before you're throwing something away. Because sometimes you can have a lot of fun with games that are effectively just like fun butteries. You know, oh, I draw a card. Munchkin is kind of like this actually. You draw a card. Oh, look at, funny. And you read the text. That was silly. And now they've added a Twitter version of Munchkin where every hour you introduce a new rule. And it's like the player whose name starts with the letter M gets double the hit point for something. But totally random.

And that can be kind of fun, but that's really short-lived fun. That's one of the things where once you look through all of the cards-- the game's pretty much done for you. Even if you haven't even finished playing the game, the game might end for yourself. So try not to go down that track.

There was a group last year that did a game where pretty much you just drew silly things to do out of a hat. And, yeah, it was fun until everyone got through the hat, and then once everyone knew pretty much the range of the little silly things, that's it, game was over. There was no

replay. So [UNINTELLIGIBLE PHRASE]. "The [? Side Note ?] About Replayability," that's actually a really excellent essay on I think gamasutra about how replayability isn't actually a well-defined word. Nobody really knows what that word means, but everyone uses it. So if you're interested, check it out. I haven't actually had a chance to form a real opinion on it yet.

So by the way, a lot of the roots of the kinds of randomness things that we use, like dice and cards, have some sort of root in fortune telling, which connects it back to kind of the ritualistic aspects of games again. The idea of you can tell whether you're going to be a success in life by your success in this game. And the game might be draw a card from this deck and hope it's good. Which parallels what a lot of people think like it. If I roll the dice, and if I'm lucky, things are going to work out.

But there's a couple of interesting things about how strategy and skills start to work with things of randomness. For instance, there is one argument that [? Colera ?] makes that the reason why you get things like chance and skill games taking over mimicry and vertigo experiences is because we started developing systems of enumeration. Started being able to count, we started being able to rank things to tell whether something was actually better than other, and some sort of empirical numerical way.

So if you think about it from that sense, then actually when you look at skill and when you look at chance, they're actually kind of on both on the same side. They're sort of dealing with number systems one way or another. If you had a system that has a lot of chance, any number could come up. Any card could come up. Any dice roll having some set of probability. What skill is dealing with what could happen, having a plan, having a strategy.

Maybe that element of chance isn't a random die roll. Maybe a person that you've never met before that you're playing against, and you don't know how good they are, they don't know what the strategies are, they don't know how they play. They're effectively a die roll, and your skill is kind of or the element of skill in the game are all about how do you deal with all the probabilities that have happened.

So one of the things that [? Colera ?] talked about is a lot of the competitive games kind things actually come up from tests-- tests of physical skill, tests of mental skill. Tests the ability to be able to take an administrative position and in society. That sort of thing. But your ability to actually do well on those tests also kind of depends on your luck of having the ability in the first place. It's like did you get the right of education? Did you study the right questions? Do you

happen to have really good genes so that you can jump really high? That sort of thing.

So the idea of whether it is actually just luck, if you would talk about a modern game, you can talk about skill of someone being able to play chess. Or you can talk about the luck of somebody having had the chance to play chess many, many, many times before they're playing this one particular game. Because not everybody in the world has that option. And that's kind of the case that [? Colera ?] is trying to make.

When you're bringing a new person to a game, they haven't had the luck of playing your particular game. I'm going to say the good fortune of playing your particular game, whereas you have had that. So if you wanted to think of it as that, as well they're bad luck, now how do we use rules, either rules of chance or rules of skill to be able to give them a fighting chance, a fighting edge. Probably more rules of chance.

So a there's a couple of different things. One thing that I do want to bring up is you [UNINTELLIGIBLE PHRASE] information [UNINTELLIGIBLE PHRASE]. Sorry. I could probably just draw it. But I just want to make sure I get it right. [UNINTELLIGIBLE PHRASE]

AUDIENCE: Can we also [UNINTELLIGIBLE] shift it over to the big screen?

PROFESSOR: It's really very [UNINTELLIGIBLE PHRASE]. So it's incredibly blurry-- OK, all right. So this is the basic idea. Claude Shannon, back in the '60s, I believe-- I think [UNINTELLIGIBLE PHRASE], basically came up with a model of how communication works. How information gets from a sender to a receiver. How does this have anything to do with games? I will get to that quickly. But let me just talk about models first.

So the sender had some sort of like message, right? And they're going to send it end of this conversation I believe-- yeah. This is transmission. I'm going to shorten it and say X-mission. So a sender has a message. They want to set up-- they want to translate it, and then it needs to be received [UNINTELLIGIBLE] by the receiver.

In between the two, there is some sort of channel. So if you think of this as I got a computer and my message is an email. I'm going to transmit it through the internet. And then it's going to be received by some sort of other mail server and then it's going to the other. This is the important part of this model is that this is where noise gets in the channel.

The reason why this model is useful for thinking about games is you can actually think of the sender as the game. This this game space. And the message could be something, it could be

valuable information about the current state of the game in order for you to make a good decision. In poker, it will be, well everybody's hands. That's the message. That's valuable information. If you knew what everybody had in your hand, and if you knew everything in the deck in the order in which the deck is shuffled, you will be able to make a great decision about whether to raise your bid on the floor.

And so you have rules that sort of encode what that message is going to be, and you have rules that-- you have strategies to help you figure out what to do with that, with the receiver kind of becomes and you think of it as [UNINTELLIGIBLE PHRASE] as a player's position, actually. Or the player's strategy if you would think about it over a long-term strategy. The trick is noise. And noise is actually something that you get to control [UNINTELLIGIBLE PHRASE]. What is hidden? What is obfiscated? What can be deliberately introduced to confuse you about what the game state actually is?

Noise can be random, or noise can be just plain old you don't know. Just deleting information out of the [UNINTELLIGIBLE]. So for instance, you guys know the rules of Texas Bulldog? There is a set of cards in the middle called the river. I could be wrong, so if you really know the rules [UNINTELLIGIBLE]. And these cards are dealt pretty early in the game. They're not dealt right at the beginning, but the--

AUDIENCE: [UNINTELLIGIBLE] at the beginning?

AUDIENCE: Not all at once [UNINTELLIGIBLE].

AUDIENCE: The first three.

AUDIENCE: The flop, yeah. And then [UNINTELLIGIBLE].

PROFESSOR: Oh, the flop and the river, right. Which is the one [UNINTELLIGIBLE PHRASE]?

AUDIENCE: [UNINTELLIGIBLE]

PROFESSOR: The flop is data?

                  [INTERPOSING VOICES]

AUDIENCE: Everyone gets dealt the two cards, and then you turn the flop over, which [INTERPOSING VOICES]. And then the river is the [UNINTELLIGIBLE].

PROFESSOR: The river's the big one.

AUDIENCE: And betting zero, yeah.

AUDIENCE: Well no, technically when you deal you put one card face down then you put the flop [UNINTELLIGIBLE].

AUDIENCE: That part doesn't have anything to do [UNINTELLIGIBLE].

AUDIENCE: Yeah, but I don't know what--

PROFESSOR: Yeah. But the cards would get dealt out. It's pretty much an unknown. It is random. But on and above this, if you just put five cards in whatever side and then just dealt them out. It's a fixed quantity. But you still don't know what the heck it is. Someone else could have picked those cards and still don't know what it is. So they're effectively a random thing. They're noise. They're a bit of information we don't know. And in Texas Hold'em, a bit of information that everybody does know, so that's great. The information is kind of equally shared among everybody except for the one card. They'd be fine.

So-- --when you think about how you can even things out for the players, or how you can make the challenge a little bit higher for decent players, you can think about, well how much information am I currently giving them about what a game state is? And maybe I can, I'll just [UNINTELLIGIBLE] them. Not necessarily lie, just hide. Just deny them information that is necessarily [UNINTELLIGIBLE].

It's also a good way to sort of think of well maybe if you're a little bit behind and you need a little help, then what are you going to do to give them a fighting [UNINTELLIGIBLE] channel. Let them have the next card that's coming up. Because we're talking about card games here. Let them re-roll the next die roll. [UNINTELLIGIBLE PHRASE].

This model, about like thinking what sort of information are you giving your player can also sort of be useful in thinking whether they're giving too much information strictly from a decision-making point of view. It's like I'm throwing all this game state information, but really, all the player needs to know is half of that in order to make a good decision. You might actually want to consider reducing that somehow.

Let me think of an example. I think *Settlers of Catan* that should be a pretty good example of that. You can see the entire board. Everyone can see the entire board at any given time. And

everyone's got cards in their hands. You don't know what other people have in their cards. But for the most part, when you're trying to make a decision about what to do with your cards, you're really just concerned about your cards.

As time goes on, you pretty much know what other people have in their hand if you've been paying attention, because people are picking up resources fairly openly. But you don't really care. And that's one nice thing about *Settlers* is that they're hiding this information from you, even though it is information that need to be hidden. Because in order to make a good decision in that game, you do not need to know that information.

So they're introducing noise, they're deliberately hiding information from you so that you can just focus on the two or three decisions that are actually worth making on your turn. And that's one reason why *Settlers* games actually go pretty fast because people aren't paralyzed by too much information.

If your game's getting too long. The game's supposed to be a half an hour and it's taking an hour long, think about the information that you're giving your player. All of it might be relevant to the game state, but not all of it might be relevant to what the players need to know right now in order to make their next move.

And if you find a way to control that, sometimes just a clever color coding. Making your card in such a way that it's really, really obvious that there's a certain part of the card that you need to look at at certain times, and you kind of ignore it outside on a [UNINTELLIGIBLE] call other times, and that might help.

But often what I find is in a lot of games like [UNINTELLIGIBLE] card games, for instance, board games, they would use a lot of icons to describe what the value of something is, or what kind of effect it has. And the reason why they use icons instead of using words is because you don't have translate icons. And they want their games to sell in Germany, in Spain, in England, and US, and Greece, and Italy, and so if you made cards, you couldn't use those same cards in every one of of those countries, so you use icons.

The only problem is that now you have to learn what every one of those icons mean. If it's just a stack of coins, oh 5 coins means 5? OK, all right, I can probably figure that out. That's fine. But this is a picture of a hammer, what does a hammer do? I'll have to check in the reference manual, which happens to be in six different languages. And that's one of the barriers that a lot of folks have to [UNINTELLIGIBLE] in card games and board games. It's not necessarily

that the games are all that complicated. It's just that you have to actually have translation that has to be done because they're not really built for one language.

So I probably have more to say about information, but I'm going to save it till next class. Any questions so far? Everything that I'm sort of directing at you right now are pretty much just different ways to look at the game [UNINTELLIGIBLE]. It's a card game, but try to see it from different ways. Not just how do I get this one game mechanic to work. But what are people going to be getting out of this game. When they're going to be drawing this big card, how are they going to be feeling? Are they going to be getting excited? Apprehensive? Are they going to be counting on the next card to win them the game, or is this just going to be giving them options, and do they know what options they have?

So I'm just going to do a complete transition at this point. So new topic.

One thing I want to talk about, which is not actually covered in any of the readings is the body motion think plate. I think it's probably used as, sort of-- Jason and I use this story quite a bit. We haven't really designed it all that well.

But if you think of the definition of what a good game could be, [UNINTELLIGIBLE] offers, a good game is a series of interesting choices. Our answer is all interesting decisions. So what's an interesting decision? One argument is that an interesting decision is one where you're using mechanics to affect the game state. And you're going to get some information, you're going to use that mechanic and effect the game state.

The game state, the game's going to respond in some way. And how that decision you make corresponds to the result that you get back from the game state as could be interesting. If there's no correspondence at all, if it's completely random or, even worse, completely predictable, than these are not interesting options that you've got. And [UNINTELLIGIBLE] huh.

That result logically made sense, but I didn't expect that it was going to do it, or that turned out better than I expected. Now it becomes really interesting. And if it's just a-- it could be anything. It could be awesome. I could win this game with this next-- oh, look I won. That's not interesting either.

So if that's an interesting decision, [UNINTELLIGIBLE] calls it a meaningful decision, then the converse will be a meaningless decision. So like a game like what I just described. A decision

where making a choice doesn't actually affect your outcome. Because [UNINTELLIGIBLE PHRASE] makes card flip, or you had to do the card flip anyway. You can't choose. Then that's not a meaningful decision. Or you make a decision and have no change in the game state at all. That's not interesting either.

So what you want in your game is something where you've got a system that's nonlinear, that's one that's still deterministic. All of your rules will result in some sort of outcome. But nonlinear enough that you can't really sort of anticipate the entire possibility space when you're making that decision.

If you're thinking of games, that's a huge possibility space, then you, as the designer, your job is to try to make them most frazzled areas of possibility space interesting and fun. So actually do folks know the phrase possibility space. Yeah, and if you think of a game as just a series of terms or series of decisions. Then possibility space is basically every single result that would come out from every single legal decision in your game.

Some of them are going to make sense. Like--

AUDIENCE: [UNINTELLIGIBLE]

PROFESSOR: In process, which now I'm getting back to the [UNINTELLIGIBLE PHRASE]. Someone's got zero and zero, and it's my turn. Putting in actually what makes sense. Putting it anywhere else doesn't make any sense. So I would argue that putting an X anywhere really isn't-- well it is part of the possibility space, because I could put it here, here, here, here or here. You as a game designer, your job is to make sure that the things that people won't naturally do are interesting.

You do not have necessarily any responsibility for somebody who's just trying to play your game in a way that's entirely not what you planned. Say somebody plays one of these card games and says, well I'm just going to play all my card face up. Those specific rules that says that I have to bite my hand, but [UNINTELLIGIBLE PHRASE]. You don't really need to keep it for that. Nice to have a rule that explains, OK, this is what you should hide your cards is crucial to your game.

But for the most part, when somebody plays your game in a way that doesn't logically make sense, you're not really obliged to make sure that they have fun.

On the other hand when people are making rational, if you are making rational decisions--

somebody puts an x here, and then the next move goes on and you design your game, then it's your job to make sure that OK, within the realm of the things that are legally good, and strategically make sense, we're going to try to make that game as interesting as possible. That's your job.

So in order to sort of like help you figure out how to get that, the reading from [UNINTELLIGIBLE] today, introduce a few terms, if you've already taken game theory and economic class or a math course, you probably already know these in far more detail than you necessarily need it for the [UNINTELLIGIBLE] is useful. But utility it's a very useful concept. It's difficult to quantify sometimes, but you're talking about just like regular game design as opposed to the pure mathematic thought experiment.

But a basic idea is if utility is like how winning a move is. Is the likelihood that something is going to actually call you a winner. And in some ways, it's a measure of the games that you're [UNINTELLIGIBLE PHRASE]. So [UNINTELLIGIBLE PHRASE] example has this like ridiculous game where you guess whether somebody has heads or tails. And the person's like literally just choosing whether it's going to be a heads or a tails, and you just guess. The idea being if [UNINTELLIGIBLE PHRASE]. So this is the guesser, this is the flipper. So if the guesser guesses right, the guesser gets a point. And that's a choice of [UNINTELLIGIBLE PHRASE]. If the flipper chooses tails, the guesser chooses tails, the guesser will get one. And if not, then it reverses. So the flipper again gets the penny if the guesser gets it wrong.

So you can sort of tell that, just by looking at this, this is a ridiculous game. It's like at best, your average over multiple games is just going to be zero. On average it's just going to [UNINTELLIGIBLE PHRASE]. And you use this as example to describe how we can come up with a strategy where you're not basically doing the same thing all the time. In this particular case, he's advocating that the best way to win this game is pretty much to break even in this game, and that's to just play it randomly.

Every single time just really caught up in it. As soon as you get consistence, and either you'll get this for your flips, then you are now in a different package. But what you're trying to do in-- but in this particular case, the likelihood of whether it is a heads or a tail, and you're actually doing it randomly, but if you throw a kink and say, well if it most comes up heads, instead of winning one penny, you win one million dollars or something.

There's certainly the probability that the flipper is going to choose heads, drops it, drops like

rubber, right? Not a wise strategy. If a flipper chooses heads 50% of the time, then the guesser is going to be winning several million dollars pretty soon. They'll be losing a couple of pennies once in a while, sure. fine, I'll lose a couple of pennies, I'll just guess heads all the time. And if I know that they are flipping heads 50% of the time, I'm going to be getting [UNINTELLIGIBLE PHRASE].

So in this particular case, the way how the flipper balances it out is basically to flip tails about one million to one. I think it's more accurately it's like one million to two. So it's like for every one million tail flips, I'm just going to throw in a head flip every once in a while just don't force the guesser to occasionally guess heads. Because if the guesser knows the flipper will be crazy to guess heads all the time, and does tails all the time, then the guesser just guesses tails all the time, and after 50 games the guesser is ahead.

So the idea is every once in a while you throw in a head. And it's roughly the opposite probability of the ability. Approximately. The numbers don't quite work out that easy. But it's I guess in the scale that I'm using right now, one million to one. And when you're talking about balancing a game, if you can't actually break down a decision in your game, say a particular decision that a player has got to fake given a certain hand or having a certain card.

And now they can make one or two or three decisions. And knowing the card distribution well enough saying well, 30% of the time decision A is going to be good. 20% of the times decision B is going to be good. And the other 50%, it's going to be decision C.

Then a balanced game, at least one definition of it, is that the utility of all those decisions, the benefit that you're going to get out of that maybe is raw, winning points. Victory points that you need to be able to get in the game. Maybe some sort of cash. The benefit of actually making that decision should probably be in reverse proportion of those numbers.

So the thing that you will pick 50% of the time, that you [UNINTELLIGIBLE PHRASE]. So say you've got decision A, B, C. And-- actually, I'm not sure if I need [UNINTELLIGIBLE PHRASE]. I'm actually really bad at this. [UNINTELLIGIBLE PHRASE] C is 50% of the time C is good. 30% of the time A is good. [UNINTELLIGIBLE PHRASE] If anyone knows how to do this better than me, [UNINTELLIGIBLE PHRASE].

AUDIENCE: What are you trying to do?

PROFESSOR: So the idea is that A should give you disproportion will be higher than it is. Not

disproportionally, but should give you proportionately higher than it did in decision C. So if C gives you--

AUDIENCE: [UNINTELLIGIBLE PHRASE]

PROFESSOR: Say what?

AUDIENCE: [UNINTELLIGIBLE PHRASE]

PROFESSOR: I'm just picking pure probability right now. Assuming that you're just playing a game with this. They're not playing as we presume [UNINTELLIGIBLE PHRASE].

So say doing decision C gives you five points.

AUDIENCE: You should do it with 30 the numbers would work out better.

PROFESSOR: Say what?

AUDIENCE: If you use 30 the numbers will work out better.

PROFESSOR: OK. 30 coins for 50?

AUDIENCE: Yeah.

[INTERPOSING VOICES]

PROFESSOR: So if you choose B, then what sort of benefit should you be getting? About 13?

AUDIENCE: Yeah.

PROFESSOR: 20.

AUDIENCE: 20.

PROFESSOR: But B only works less of the time. This is [UNINTELLIGIBLE PHRASE].

AUDIENCE: Oh, great.

AUDIENCE: Oh.

[INTERPOSING VOICES]

AUDIENCE: It would be 48, right?

AUDIENCE: Yup.

AUDIENCE: I would say 50?

AUDIENCE: I'm going with 50.

AUDIENCE: I'm going with 50. You want the multiplication in the probability [UNINTELLIGIBLE]. So when you multiply them [UNINTELLIGIBLE].

AUDIENCE: And what would A do?

AUDIENCE: [UNINTELLIGIBLE PHRASE]

PROFESSOR: And this makes it a situation where choosing A, B or C becomes fairly even. You could choose A, and you could get and 20% of the time you've got a pretty good payout.

I'm really terrible at math, so I'm going to see if this is right. But this makes it so that you don't have an immediate dominant strategy just like looking at your cards. It's like well, obviously, I'm just going to do this all the time.

This is very, very, very basic. And I crap at doing this other thing. But once in a while, it's a good idea to actually just write out the numbers. OK, I know that my opponent is always going to have five cards in hand. And out of the five cards they're going to have some combination of cards that's going to be result in the probability of A, B, C affects [UNINTELLIGIBLE PHRASE]. So I have part A, I have part B, I have part C. I could play any one of those, and making that decision, you want to give them rewards that are in inverse proportion to this. That's one way that you can balance a game.

It is very much a first stab. This is how you mathematically take that first stab, and then you actually need to test it out, out of that. You can't actually just assumed that's going to work out. But it can get you pretty close, which is kind of nice. If you're getting a situation where OK, they'll still seeing a dominant strategy, but it's only a small number [UNINTELLIGIBLE PHRASE], then you don't [UNINTELLIGIBLE PHRASE]. Actually those can sometimes be the hardest kinds of games of balance because you keep making really, really small changes, and you know when you get them. But still, [UNINTELLIGIBLE PHRASE].

That's really the only contact that I found utility to be a useful part of this [UNINTELLIGIBLE PHRASE]. It's an interesting concept to be able to talk about strategies, we talk about

decisions making. When it actually comes to now I'm going to sit down and design a game, this is the only time when I'm actually using [UNINTELLIGIBLE]. If you found better uses for utility, please by all means share it because I have not found any.

That's pretty much all. Any questions?

AUDIENCE: The utility. When we played the x game--

PROFESSOR: Which one?

AUDIENCE: The game where you can either click on tokens or roll the dice.

PROFESSOR: [UNINTELLIGIBLE]

AUDIENCE: The one that [UNINTELLIGIBLE PHRASE].

[INTERPOSING VOICES]

PROFESSOR: Oh, yes, yes, yes, yes, yes, yes. Yeah.

AUDIENCE: [UNINTELLIGIBLE] if you viewed the kind of strategy developed and the game we built based on different dice and things, that was kind of the utility model. That we're trying to maximize [UNINTELLIGIBLE]. And if you win you expect your utility [UNINTELLIGIBLE PHRASE]. And then like you can do a bunch of path [UNINTELLIGIBLE] to maximize these things [UNINTELLIGIBLE], which is-- I don't know.

PROFESSOR: Yeah. I mean the thing about it though, of course, if the method you do basically says well the way to maximize our expected value is just to do the same thing all the time, and then that particular game, that's a very standard strategy that tends to work. Then you've got a game that's not interesting. Then you've got a game where those decisions that you're asking someone to make don't actually matter because there's [UNINTELLIGIBLE].

So yeah, that game is a fine example of a game that you could use for work. I'm not going to say the broken game because that was specifically designed for the [UNINTELLIGIBLE] that class act. Here's this game, now I'm going [UNINTELLIGIBLE]. But yeah, that's a good game where the utility's pretty obvious, right? How far are we going to get? Well I could pick this token or I could roll the die, wait a minute, on average you all come out to be about the same. So it doesn't matter anymore. Why this decision is no longer interesting.

AUDIENCE: [UNINTELLIGIBLE PHRASE] because the whole point was that you, the meaningful weave is that you're pulling at the variance table, right? Your expected values are the same. Both of the cases when you're doing just a kind of computation, right?

AUDIENCE: Yeah.

AUDIENCE: Now I can [UNINTELLIGIBLE PHRASE]. Sometimes it's incredibly painful to not get the reward. Sometimes you just want consistency. So imagine in Settlers of Catan where you can go for a strategy where you have a diverse set of numbers that you can possibly rob. And before you can just get up and [UNINTELLIGIBLE PHRASE]. Usually it's better to go for consistency, because you'll get robbed.

AUDIENCE: You can use a large range of numbers.

AUDIENCE: Yeah. The chances you'll get a huge payoff off turn, and then a seven will be rolled before you get [UNINTELLIGIBLE PHRASE]. They would have been better off generating [UNINTELLIGIBLE]. Even if the expectation you generate [UNINTELLIGIBLE].

PROFESSOR: But in the back of your head you always know that you could go to the big payoff round. And usually in a game--

AUDIENCE: What I'm saying is there's a meaningful difference between these things. Even if your expected value/computation shows you that there [UNINTELLIGIBLE PHRASE] strategies [UNINTELLIGIBLE], the variance can really be different.

[INTERPOSING VOICES]

AUDIENCE: The decisions are very different. If you're playing a three player version of Settlers you want to be equally very diverse. Whereas you imagine if there were a version of Settlers where there were 10 players, you would want to like cluster all around a couple different numbers. Because then it's unlikely that if everyone's diverse, everyone's not equal. So you'd rather have a little bit of a [UNINTELLIGIBLE], you'd be like way ahead of everybody. Than having just the [UNINTELLIGIBLE PHRASE].

PROFESSOR: Well basically, again, counting on the huge payout.

AUDIENCE: Yeah. But that comes out to like variance. And where the expected value of the resources you get, this is the same as the expected value of like winning the game where you're really trying

to maximize [UNINTELLIGIBLE PHRASE].

PROFESSOR: There was a really, really, really funny video that I didn't show you guys about how to win at a lottery. And they actually did trot out various facts, basically saying that oh, some percent of the time two numbers-- this is one of those lotteries where you pick six numbers, and the number of numbers that correspond will get you a certain payout. And it's like some percentage of the time you will get two numbers adjacent to each other, like 39 and 40 or something like that. and there's like that's all, you should pick two numbers. That makes no sense at all. Because [UNINTELLIGIBLE PHRASE]. In that particular case, [UNINTELLIGIBLE PHRASE].

I think it was a good point to say, that you get to choose how much variance [UNINTELLIGIBLE PHRASE]. How much risk are you willing [UNINTELLIGIBLE PHRASE]. Because in a game like Settlers, the nice thing about it is if they're going for the big payout is it increases the risk and increases the payout [UNINTELLIGIBLE], or potential payout. So that's what's nice about it. That's a nice balancing act.

AUDIENCE: I don't know if anyone's played-- it's not really a game, it's more of a math problem.

PROFESSOR: I haven't played that one.

AUDIENCE: [UNINTELLIGIBLE PHRASE]

PROFESSOR: It's pretty cool. Can you put that up on the board maybe?

AUDIENCE: Yeah. I can tell you right now. It's first cube has three 5s, the three 2s.

PROFESSOR: Oh, [UNINTELLIGIBLE PHRASE]. Three 5s and three 3s?

AUDIENCE: Three 2s.

AUDIENCE: [UNINTELLIGIBLE PHRASE] One of them is 5, 4 and a 1.

PROFESSOR: 5, 4--

AUDIENCE: They all have expected value of 3 and 1/2. same as the regular value. Last one is one 6 and five 3s.

PROFESSOR: One 6 and five 3s.

AUDIENCE: They all have the expected value of 3 and 1/2. Now, the game is first player chooses a die, and the second player chooses a die. And then [UNINTELLIGIBLE PHRASE].

PROFESSOR: Just [UNINTELLIGIBLE PHRASE].

AUDIENCE: Yeah.

PROFESSOR: And then do you re-roll with the game dice?

AUDIENCE: No. The first player chooses the die, and the second player sees what the first person chose and then the second player chooses a die. So truthfully, the [UNINTELLIGIBLE] take it reverse, and the [UNINTELLIGIBLE] second, even though they [UNINTELLIGIBLE PHRASE].

PROFESSOR: I see.

AUDIENCE: If you're first, you want to [UNINTELLIGIBLE] the board, is that right? But five 2s beats the 4s, but [UNINTELLIGIBLE PHRASE].

AUDIENCE: They can probably just use the 4s for [UNINTELLIGIBLE PHRASE].

AUDIENCE: It's the first player tries [UNINTELLIGIBLE].

AUDIENCE: I don't know exactly, but I'm pretty sure if you're first, [UNINTELLIGIBLE PHRASE].

AUDIENCE: Yeah.

AUDIENCE: Yeah. It's three 6s so dominated by the 4s, but it's like [UNINTELLIGIBLE PHRASE].

AUDIENCE: Yeah. [UNINTELLIGIBLE PHRASE] The second always wins. [UNINTELLIGIBLE PHRASE]

AUDIENCE: They can probabilistically win.

PROFESSOR: So what you're describing is a strategy for the second player. Basically, if the first player can [UNINTELLIGIBLE], you pick something, and on average you will win [UNINTELLIGIBLE PHRASE].

AUDIENCE: It would be more interesting if you did it in two rounds [UNINTELLIGIBLE PHRASE] everyone takes a die sequentially. And then they roll to see who goes first. Because then you're aiming to try to like hit the middle.

PROFESSOR: Will you do that one more time?

AUDIENCE: So you randomly decide who goes first. So the first person chooses a die, and then the next person chooses a die, then next person chooses die. And they roll to determine the order of the actual game. So what you're trying to roll for is to get in second place rather than first because the optimal strategy is the second choice.

AUDIENCE: Oh that's bizzare.

AUDIENCE: Yeah, but the problem is if you take 6 and 3, you also have a pretty high chance of getting the last one.

AUDIENCE: [UNINTELLIGIBLE PHRASE]

AUDIENCE: Well yeah, [UNINTELLIGIBLE PHRASE].

[INTERPOSING VOICES]

PROFESSOR: Evolution is something which happens [UNINTELLIGIBLE] is well. OK, you show that it's clearly a dominant strategy, but how you get to deciding what [UNINTELLIGIBLE] strategy to use gave meaningful information because [UNINTELLIGIBLE].

PROFESSOR: That's possible as well.

PROFESSOR: Once it gets to that point, then you want to think about well maybe there's something you can do to your original game to make it easier for people to get to that second level of the game. And you don't necessarily always have to, because there are going to be people who are just going to have fun at this point, to sort of like playing this game as opposed to figuring out who goes first.

But it'll be interesting if in the process of designing this game, you've got rules to actually let people decide who goes first. And the people who haven't figured out the dominant strategy, this is where the game is at. Just like the first player has an equal [UNINTELLIGIBLE] as the second player. And then later on when people start to realize that there is actually a strategy, they got playing the other game of who goes first.

But if you design your game right, then you can make it all the same game. It's just which set of rules that they're most concerned about and you could [UNINTELLIGIBLE]. It would be nice if your games could do that. Let's see how [UNINTELLIGIBLE] they get.

AUDIENCE: [UNINTELLIGIBLE] move away from game period [UNINTELLIGIBLE]? Are you even going to mention Prisoner's Dillema because I think that's a great tool to try to look at dramatic tension and interesting discussions for players.

AUDIENCE: That does happen often in strategy games.

PROFESSOR: Yeah. Well--

AUDIENCE: Not in a game where you're [INTERPOSING VOICES]

PROFESSOR: There are two arguments about that one.

AUDIENCE: [UNINTELLIGIBLE PHRASE]. I guess we actually have human beings playing.

PROFESSOR: So the Prisoner's Dillema as covered in the reading. I don't know the exact numbers. But basically you've got two people--

AUDIENCE: Well they didn't say exact numbers [UNINTELLIGIBLE PHRASE].

PROFESSOR: I think we have a chart.

AUDIENCE: [UNINTELLIGIBLE] punishment [UNINTELLIGIBLE].

PROFESSOR: In fact, I may be thinking of [UNINTELLIGIBLE].

AUDIENCE: [UNINTELLIGIBLE PHRASE]

PROFESSOR: The one that I know is that-- let's see, I know defect is one of the cases. Anybody remember what the term we use for cooperating?

[INTERPOSING VOICES]

PROFESSOR: Yeah. [UNINTELLIGIBLE PHRASE] So if both people cooperate, they get something like what, five years in prison? So it's like the town. OK, we get two people who are involved in the same [UNINTELLIGIBLE] and they both get caught but then there's not enough evidence to throw both of them away for a real long time. So the basic idea is each of them is separated, and then you give us information on the other guy. Then we will reduce your sentence, and that other guy is going to get hammered with a sentence but we'll give you a get out of jail free card.

But if you don't tell us anything, if you cooperate with your partner, and don't give us the

evidence that we need, we still have enough evidence to put you away for five years. So that's [UNINTELLIGIBLE]. Both of you will go away for five years.

Now, if you do decide to give us the information, then you really get away with just one year in prison. But the the guy you just ratted on goes away for 30 years. [UNINTELLIGIBLE PHRASE] And of course, if both of you decide to rat on each other, oh now we've got [UNINTELLIGIBLE] charges. That's awesome. Both of you go away for a very long time.

[INTERPOSING VOICES]

AUDIENCE: You need to make [UNINTELLIGIBLE] defecting [UNINTELLIGIBLE PHRASE] a person cooperating and another defecting.

PROFESSOR: Oh, right. Right.

[INTERPOSING VOICES]

PROFESSOR: I seen versions where it's not equal. But yeah, it's--

AUDIENCE: Separate game.

PROFESSOR: RXY72?

AUDIENCE: No. Defect should be 66. Defect should be-- [UNINTELLIGIBLE] were you cooperating, but better than getting out.

PROFESSOR: Yeah. Yeah. You're right. [UNINTELLIGIBLE PHRASE] So this [UNINTELLIGIBLE] is probably too high too, too. But--

AUDIENCE: I mean it [UNINTELLIGIBLE PHRASE].

AUDIENCE: All that matters is that it doesn't matter what your opponent does that he will [UNINTELLIGIBLE].

PROFESSOR: Although--

AUDIENCE: [UNINTELLIGIBLE] looking at.

PROFESSOR: --they told me that, which is true for a single instance of this game. The thing that gets really complex is what happens is you had to play this multiple times because you're multiple, repeat

offender bank robber who gets caught all the time.

AUDIENCE: Just give up.

PROFESSOR: And that's where you get into various strategies. The strategy in that particular dilemma is you should always betray your partner because on average, you're going to come out ahead. Is that right?

AUDIENCE: The strategy is you do whatever the partner did to you last time.

PROFESSOR: No. That's a single game [UNINTELLIGIBLE].

AUDIENCE: Oh yeah, single game. [UNINTELLIGIBLE]

AUDIENCE: You always send out [UNINTELLIGIBLE PHRASE].

PROFESSOR: So let me see, if you defect, then what happens is that you could get away with one or six years. Six, you don't know what your opponent is going to do. That's something like three months time. If you cooperate then it's going to be between three and seven. So that's more like expected value of five.

AUDIENCE: You're not trying to win this game, you're trying to [UNINTELLIGIBLE].

AUDIENCE: [UNINTELLIGIBLE PHRASE] is actually right. Say your opponent couldn't cooperate. Then what if you didn't cooperate? If you were to cooperate you get three years. If you defect you get one year. So you should defect. What if they were to defect? Well if you were to cooperate, then you'd get one year. And if you would cooperate then you'd seven years. But if you were to defect, you'd only get six years. So you defect then too. So you should just go ahead with that.

PROFESSOR: That's--

AUDIENCE: [UNINTELLIGIBLE PHRASE]

PROFESSOR: That's basically [UNINTELLIGIBLE] what's the minimum-- [UNINTELLIGIBLE PHRASE] higher numbers to represent that thing happening to you. But the whole principle of [UNINTELLIGIBLE PHRASE] we are trying to maximize your minimum benefits, and the minimum benefit in this particular case, happens in defect. Because the most you can possibly get is six years if you defect.

If you ever cooperate, there's a chance that you're going to get to the years. So [UNINTELLIGIBLE PHRASE].

The only problem is, again, once you get into this repeated over many, many times, then you're in a situation where if you build up a reputation, that all you're going to do is defect, then you can almost assume that your-- you can pretty much assume that whoever you're playing against is also going to defect. At which point you will always [UNINTELLIGIBLE PHRASE]. You will never be able to get here.

There is a concept that helps deal with situations like this that actually make cooperation, again, a viable strategy. I'm hoping I'm getting this right. Well [UNINTELLIGIBLE] in the reading suggested there are saddle points. There are saddle points that basically mean this is where all the strategies pretty much end up because of the reasoning that we just [UNINTELLIGIBLE]. You are maximizing the minimum chaos. The minimum benefit [UNINTELLIGIBLE PHRASE]. And they all [UNINTELLIGIBLE PHRASE]. If everyone did the same analysis, they all end up here.

But John Nash comes along and he suggests that there are other kinds of saddle points that could be found. And these are points where, assuming that everybody sticks with whatever strategies that they've got, if I were to change my strategy I will end up in a horrid situation.

So--

AUDIENCE: [UNINTELLIGIBLE PHRASE]

AUDIENCE: Defective for that. Defective [UNINTELLIGIBLE PHRASE].

PROFESSOR: Yeah. [UNINTELLIGIBLE] remains one of the saddle points Nash [UNINTELLIGIBLE]. But the other thing about it is that what actually becomes an unstable equilibrium. It's one of those things, especially in a multiple game, is like if you're going to assume and you're going to be playing this game over and over and over and over again, switching out of coop has a long-term detrimental effect. Because especially-- if you know that other people have a strategy of basically I'm going to do what you did to me. It's called tit for tat.

If you actually stick with coop, and if everybody else is using the same reasoning as you are, which is another interesting bit of a wrinkle that Nash throws in. Whatever analysis you are capable of solving, everybody else because everybody's a natural player. Therefore, what

actually becomes a unstable, but possible because [UNINTELLIGIBLE] points. Because switching out actually leads to the net loss for [UNINTELLIGIBLE PHRASE]. And that was kind of the little thing that he threw in that kind of made his name and then [UNINTELLIGIBLE PHRASE].

But the basic idea is what is useful from a one table like this becomes really, really interesting when you think about what you're going to do in the long-term. I believe there's a couple of other strategies that involve things like instead of just doing what I did to you last, just sort of like well if you defect and I were to defect the next time, which I think that's a pretty good perspective. But they didn't cooperate and I wouldn't cooperate next time.

There's also strategies like well as soon as you defect, I'm going to nothing but defect. And that actually was an interesting group, because that I think changes the utility numbers in a way where a single defection has a huge negative [UNINTELLIGIBLE] in a way that you might want to [UNINTELLIGIBLE].

But for the most part, I think tit for tat turned out to be the best strategy over the long term. Depending on hos the numbers are weighted, tit for tat basically says whatever you do, I'm going to do to you next. And that actually turns out pretty good because that actually is not [UNINTELLIGIBLE] coop actually works [UNINTELLIGIBLE PHRASE].

Yeah. [UNINTELLIGIBLE PHRASE]

AUDIENCE: This also only works if there's an unknown number of future games. Because if you know you're going to play any finite number of times--

PROFESSOR: True.

AUDIENCE: Yeah.

PROFESSOR: Yeah. There is basically it's just like induction. It goes on forever. But you're going to hope that your game's going to get played infinite number of times. We are planning for it. Not an infinite number of turns.

AUDIENCE: The winner can only resolve after [UNINTELLIGIBLE PHRASE].

PROFESSOR: First one who gives up [UNINTELLIGIBLE].

I really need to get some water.

AUDIENCE: Game break.

PROFESSOR: Yeah. I'm going to give a quick break. But does everyone have your [UNINTELLIGIBLE PHRASE] sheets?

AUDIENCE: Yeah.

PROFESSOR: OK. I will lecture and pick up on that in about 10 minutes.