PROFESSOR 1: OK. Just a few announcements before we get into the lecture today. So the structure for today-- our lecture, two hours' work in your groups. We have, unfortunately, Elle, the grad student who's working with the heat wave, who would be using the heat wave game, is sick today.

So she won't be able to come in. But I'm working on rescheduling a time for her to come in. What I'd love to do is if we can get her a web link of the heat wave game that she could then give you feedback on, that might be good for you all.

For the rest of the class, we've got Pablo in today. He talked to the snap team already. Is he going to talk to you again today? Or are you guys all on the right page with him?

STUDENT: It'd be nice to show him the game.

PROFESSOR 1: OK. Oh, you didn't show him the game then? OK, cool, cool. What I'd like him to do is take a look at the forecast-based future game today if he can at 2 o'clock. I'm going to just show him a build, get some feedback from him. And then he'll take a look at the snap game.

And then if he's got time, the two cholera games. He can take a look at those. And again, if you want to give him web links to playable versions of the games, just send them to the Video Game Bosses list. And I'll forward along.

Other announcements-- I'm going to email this to the announcements list later today. This Friday there is a free conference workshop thing going on at a hotel, I think, in Boston. But it's being run by Epic Games, about Unreal. So they're going to do a bunch of different workshops from about 2:00 to 5:00 and end the day with a networking party.

So if you're interested in using the Unreal engine and all the different new things about that engine, they'll be running that. They're also going to be on campus Tuesday at 5:00 PM, so Tuesday, November 18. That can be found at the GameLab website.

And they'll be talking about Blueprint, a way to do scripting in Unreal that's kind of similar to

some things I've seen for Unity, but it's baked into Unreal. And if you used previous versions of Unreal, I think it's related to Akismet, if you used that tool before.

Otherwise, upcoming guests we have at the class that are different from the syllabus-- on Monday we're going to have two writers and talking with Drew, doing a little panel and then a Q&A with y'all talking about different ways of looking at writing for games that I think would be very directly related to at least two of the games that I've seen. Because yours was a very dialogue-driven game, yeah?

And then the Animal Crossing kind of game, I imagine, would be really useful for you all. Probably useful for the other two, as well, but those are the ones that first came to my mind when I was scheduling that one. And then on the 19th, we have Blizzard coming in, right?

PROFESSOR 2: I think that's right.

PROFESSOR 1: Yeah. So Wednesday night, Blizzard's going to come in. And it's teams from *Heroes of the Storm?*

PROFESSOR 2: I think so. But--

PROFESSOR 1: But yeah, we're not quite sure exactly who's going to be there for that. But we talked to them. And we requested either *Heroes of the Storm* or *Hearthstone.* So one of those groups, we'll begin to talk about their production process. And you can ask them things about what it's like to work at Blizzard. That's everything I've got. Yeah, so I'm going to bring it over to-- you're wired? Cool. Great.

PROFESSOR 2: So when I went over to GDC Next just last week, I met Richard. Actually, he's been to all that before. And he gave this talk on game audio. And then I remembered, wait a minute, there's a talk on game audio that's coming up in class. And I was just going to fake it. And then I heard his talk and realized maybe he should be the one talking to you, instead.

So I invited him and Andy Forsberg, who's his partner at Hexany Audio. Let's see. You'll see the name of the company come up in the next slide. And they do professional sound design and audio design and music. That includes things like sound effects, as well as scoring and also advising companies on things like the technology that they're using.

And he's going to talk a little bit about how to do good audio on a budget, as well as just things to think about in your audio design of your own game. So I'm going to hand it over to you. And

thank you very much for speaking today.

RICHARD LUDLOW: Yeah. Well, thanks so much. Happy to be here. Just curious-- so the class, I'm wondering, what level is it? Is it more introductory, advanced? What's the focus?

PROFESSOR 2: Intermediate. So they're making video games. But it's a class that actually has prerequisites. So they needed to take another classes, either in game design or in programming, before they came here.

RICHARD LUDLOW: OK. Cool, cool. So I'm just curious-- show of hands, how many people are planning to go out into the world after you graduate and become game designers, game developers? Anyone? Anyone? OK, cool, cool. Nice. That's cool.

ANDY FORSBERG: Sweet. No, very nice.

RICHARD LUDLOW: Great. So yeah, we're going to talk to you about music and sound in games and then give a little bit of very practical advice about working with composers and working with sound designers. And so that's the situation most of you will probably be in.

So we'll give you a little overview of ourselves in a second. But if you want to go on to the next slide, we're going to talk about three key areas. Yeah, we're just going to tag team this. So the three things we're going to talk about are, number one, Interactivity.

So we're going to talk to you about what makes game audio different than film audio and why you should care about it. And then in Agreements, we're going to talk about contracts and what that looks like for you hiring a composer or a sound designer, which is really most often the case with an indy game. And then lastly, we'll talk about money and budgets and how much hiring one of us audio guys takes.

So a little bit about us-- I'm Richard Ludlow, again. And I'm the audio director of our company. And Andy is the music director.

ANDY FORSBERG: Yeah we both went to school in Boston, actually.

RICHARD LUDLOW: Yeah, just across the river over at Berkeley and did their game audio thing. And now we started the company Hexany Audio. And basically, music, sound, and dialogue, as well as

implementation services are what we do with our clients.

ANDY FORSBERG: And we're based in Los Angeles, obviously.

RICHARD LUDLOW: Yeah, based in LA. And we have experience working on larger AAA console games, lots of mobile indie things, so a really wide range. And we do film and commercial media, as well. But our focus really is on games and interactivity and the technology that drives that. So yeah, without further ado, if you want to jump ahead to The Basics.

ANDY FORSBERG: Yeah, absolutely. So music in games is all about the dynamic experience and player input in the game and how the music and sound effects adapt around that. Obviously, it's much different than linear media, such as film, TV, et cetera. When you watch a film, that same explosion is going to happen in the same point every time. So obviously, with games we have to change that. Because games are different. We have to make it adaptive to what's going on.

So there's four major parts to audio in a game usually. There's the music. There's the sound and the dialogue. But the major part of this, again, is the implementation into the game. If we write amazing music or sound effects or we have the coolest voiceover artists in the world and we get them to do that stuff for our game-- if we implement it incorrectly or the developer doesn't do such a great job because there wasn't a dialogue between us, then all the stuff on the left side, those three things, almost don't even matter. So it's all about how it gets put in the game, as well as how it's crafted.

RICHARD LUDLOW: And we're going to talk about that in the Interactivity section if you're like, what is this implementation witchcraft we speak of?

ANDY FORSBERG: Exactly.

RICHARD LUDLOW: Anyway.

ANDY FORSBERG: Next slide?

RICHARD LUDLOW: Yeah. So The Importance of Audio-- really talking about why you guys should care about audio. Because so often you think, OK, I've got this mobile game. I'm going to shut off the

audio. Who cares about it? But the depth that it adds is really important. And we'd just like to touch on three key areas of why music and sound is so important in games, if you want to--

ANDY FORSBERG: Yeah. The first thing, obviously, the emotional factor. And you can't get around that. With everything else, basically, audio goes straight to the center of your brain that controls that stuff. It just skips everything else and stimulates that. So obviously, when we were kids we turned the music off of a game or turned the music off of a film, and we'd realize that we weren't having those emotional responses that we did when it was on. So obviously, emotion is a huge part of what we do.

RICHARD LUDLOW: Yeah. And that's a chemical response. Like Andy said, it's actually eliciting-- just emphasize again-- a chemical response. Visuals do not trigger these emotional processing centers. It's sound and music. That's stimulating parts of your brain that are different and actually creating the emotion. It's pretty amazing. At least we like to think so. [LAUGHS] Anyway, cool.

So the next one is Function. And this isn't a great term. But audio, it supports the ability for the player to really absorb a lot of the game information. So when I say "function," it has the function of giving you information and also the function of telling you what's going on with regards to your action.

So for example, you're walking down a hallway. And there's a guy up ahead that you hear maybe walking. And you know, OK, there's a guard up ahead. And then maybe your oxygen tank is running low. And you've got a little "beep." And your health is maybe at 50%. Maybe there's an alarm going off in the building. You hear a guy in the next room.

You hear all these different things. And all of that is information that's being processed and sent to you. And you're able to absorb it all instantly without needing to think and see text on the screen that says, oh, OK, I'm at 50% oxygen. There's three enemies nearby. It's getting dark out because I hear the crickets. This is just stuff that your brain subconsciously absorbs. So it's functional in that it provides that information for players in an entirely new dimension that is subconscious to them. So you can convey lots of subconscious information.

ANDY FORSBERG: Exactly.

RICHARD LUDLOW: And then also, it's that feel-good factor for games. So you punch a guy. Oh, well, hold up on that maybe. But yeah, you punch a guy. And it feels good in the game. And that is because of

that trigger, the sound meshing with the psychological.

Anyway, so the sounds we were talking about that are memorable-- I know you just played, what was that, the *Zelda* sound or something?

ANDY FORSBERG: Yeah.

RICHARD LUDLOW: I couldn't quite hear.

ANDY FORSBERG: Yeah, it obviously has to be memorable with game audio, as well. And yeah, you played the *Zelda* one. Think of the countdown for *Mario Kart* where it makes you want to hit A really fast and get everyone, obviously-- but there's countless examples. We might have--

[VIDEO GAME SOUND]

RICHARD LUDLOW: You could just play them all. Just play them all.

ANDY FORSBERG: Let's see.

RICHARD LUDLOW: I'm not sure if you've played them. But I'll just talk about--

[COUNTDOWN SOUNDS]

So these are really iconic sounds. And I think the *Mario* coin sound is next. Let's see.

[COIN SOUND]

So that sound has been in an entire generation of games. And the *Zelda* sound, when you hear that, that's extremely rewarding for the player. It's extremely memorable. Sound is burned into a player's conscience in a way that doesn't necessarily happen with visuals.

You hear that. [SNAPS] And then you hear the achievement sound that we played. And it's like, oh, I've unlocked that. There's this stimulating reward response. And so good sound and bad sound is going to stick with your players. And it can really help set that game apart so that

later on the players are remembering your game in a very unique way. Anyway--

ANDY FORSBERG: Next slide.

RICHARD LUDLOW: We'll move on to the real stuff now. So Interactivity. That was kind of the preface. So the first section that we talk about is it that implementation and how that works in games. And that interactivity is a huge part of that. So if you want to jump ahead to the next slide--

ANDY FORSBERG: Yeah. So on the music side of things, obviously, if you want music that changes dynamically based on what the player is doing, whether he's walking into a field and staying there for five hours because he left it on to go make a sandwich or because he's walking in to buy something from a shopkeeper.

So how do we do that? There are several different things we can do, whether a player's going into battle, et cetera. We can use one system called layering, which Richard's going to talk about in another slide. We're going to talk about crossfading. And then we're going to give you an example of branching, as well. And then there's also generative.

And these are just a few. There are so many options that we can use to implement music in a cool, interactive way.

RICHARD LUDLOW: Yeah. So let's jump over to one of the examples. And go ahead and throw that up. Don't hit the Play button quite yet. So you can hit the next slide. And it'll pop up the graph. All right. So what you're seeing here is the idea of a layered score.

So in this one, this is a piece of music I wrote for a game where there's three different intensity layers. And you're going to hear a first one that's very low intensity. And then you're going to hear these other layers come in on top as maybe the player starts to go into an area with enemies. And then they go into an area where they're in battle. And you'll hear the music stack in a very dynamic way. Anyway, go ahead and hit play. Let's see.

[MUSIC PLAYING]

So that low intensity. Players done some [INAUDIBLE].

The second layer's going to come in on top.

[MUSIC INTENSIFIES]

You hear all three layers, though, I think. Back to just the first two. And then just the first one. So you can see this as well. You could hear the layers fading out in and between one another. But it was a very dynamic experience. So this is where we'd take the music, and we'd specifically craft it and write it so that these things could stack and be triggered dynamically based on whatever the player is doing.

So let's jump ahead to the next slide. So this is one more example-- and this is the last one we'll show you for music-- that deals with the way that music can move dynamically between states again. So yeah, so we've got the low, medium, high. But this time, we've broken it out into smaller, little chunks.

So the player will do something. And the musical will actually wait until the musical point, like the next bar or beat. And then it will begin a transitional segment into the next level intensities. And this is going to be a much more dynamic and fluid experience than the layering. So go ahead and hit Play.

[AMBIENT MUSIC]

Low intensity, again.

So a player's going to do something. And it's going to come in with the transition.

[MUSIC INTENSIFIES]

Transition.

[MUSIC PLAYING]

Now we're going to go into medium. We're in medium. The player's going to do something. And the music's going to wait to do the transition. Transition.

[MUSIC CHANGES]

Now it's running the high.

[MUSIC PLAYING]

The music's going to wait and then go into the transition. And back to low. Cool. So you saw the music move through-- one, two, three, four-- six different pieces there. But it sounded like the experience was being scored. So again, the idea here is we're trying to-- again, with the film, you watch it. It goes by. You know what's going to happen.

We don't know what's going to happen with the game. So we write music that can change and adapt like that, in a very film-like way to score the player experience. So why do we do this?

ANDY FORSBERG: So obviously, it creates a more immersive and dynamic player experience. Any time we are taking you guys out of that escapist experience, we're not doing our job. It extends track longevity, which we'll explain later with budgets why that's nice, as well. But you get better replay value out of it. And it's the greatest value from each individual minute of music.

RICHARD LUDLOW: Yeah, instead of having to hire someone to write three different pieces of music, if you're on a budget, you can say, we'll do one piece of music. And we'll make it layered. And it'll be one better piece of music.

ANDY FORSBERG: Exactly. Because if a movie is 90 minutes long and they want 60 minutes of music, you write 60 minutes of music. One small mobile game could have 15 minutes of music. Or it could have one minute of music or three minutes. So it all depends.

RICHARD LUDLOW: Yeah. And that goes into-- we'll talk about with budgets how that affects that. But so yeah, jumping onto the next slide, how do we do these interactive systems? We build them with what we call audio middleware. And two of the commercial ones are FMOD, that you see here. And if you want to jump ahead to the next one-- Wwise. And these are just screenshots.

And essentially, these allow us to interface with programmers and set up these musical triggers and these points of musical change based on different parameters, like number of enemies around or game state or health, and let us set up these musical transitions and things like that. So yeah, we can jump onto the next section.

Agreements. So you've learned all about interactivity. And you're like, yes, this is awesome. I'm going to hire a game composer so that they can do this stuff. And then with music, though, it's obviously a creative piece of content. So the agreements look a little different sometimes than other agreements. And so we're going to show you three different kinds.

ANDY FORSBERG: Yeah. So the purposes of these contracts are, obviously, to see who owns it, obviously, first and foremost. What we're going to be delivering to you. What the delivery milestones are in a game just as there's development milestones. How much you guys are paying, which is super important for you and us.

And what's your rights as a developer? Where can you use it? Can you go around and license it to use it in all the things involved with your project or no? And what are our usage rights? Can we use it in our portfolio, on our Facebook page? Can we do that sort of thing? So we're just going to go through a few of the contract types here.

RICHARD LUDLOW: Yeah. And it's really important to spell out all those things. So yeah, let's look at the first one. Work for Hire. This is the most common type of agreement that you run into with composers. And it's essentially where I'm the composer, I've written music, and I am selling you my music or sound.

You're buying it from me. And you're taking all the rights for it as a developer. You become the owners of the music and sound. And so you've got the rights associated with it.

And because you have the rights, the developer then can usually use the audio however they want in the project. Because you own it. You've also got the exclusive right to use the audio, meaning you're the only ones that can use it. I can't go around and turn around and sell it to Bob or Joe over there. You've bought it. It's yours.

And then lastly-- this is the disadvantage for developers-- is that this is a more expensive agreement. Because you are buying out all of our rights. And I'm going to show in detail in a few slides some important clauses to be aware of in these contracts. But yeah, so let's talk about on the other end of the spectrum.

We've got work for hire, where you and me-- the composer selling the developer my rights. And then on the other end of the spectrum, we've got licenses.

ANDY FORSBERG: Right. So we have two sorts of licenses. The first we'll talk about is the non-exclusive. So this means that we are retaining the rights of the music, sound effects, anything we do for your project. We could go around and turn it to another game, et cetera. However, don't be afraid of these. We're writing the same custom music for your game, which is super important to remember. You're getting the same exact product.

It's obviously a lot cheaper. And it's a great way to save yourself some money when working

with people like us. And again, you can still have unrestricted use of the audio in your project and things involved with that usually. But again, we could turn around and use this for whatever we would like to use it for. So yeah, those are the main reasons--

RICHARD LUDLOW: And we use this negotiating with developers all the time. So if they don't want to buy out all of our rights and pay that full price, we'll say, OK, well, we'll retain the right to go sell it to Bob and Joe and still give you the same music.

ANDY FORSBERG: And then we have, obviously, the exclusive license, which is you're going to retain all of the rights. But it's usually for a certain amount of time. And then those rights transfer back to us. And sometimes it's industry-specific. So we might be able to use that audio in a trailer or a film or something. However, pertaining to the game or anything in the game world, we're not going to turn around and license that to someone else.

Usually this lasts about one to five years. We like to call this the happy medium between the work for hire and the non-exclusive license. And it really is a healthy balance of price and control. Because it's right in the middle as far as price is concerned. And everyone's happy. You guys could use it for what you need. But then we also get those rights back. eventually.

RICHARD LUDLOW: Yeah. So work for hire-- I make the music. I'm the composer. I sell it to you. You get all the rights. Non-exclusive-- I'm the composer. I make the music. I retain all the rights. And I can sell it to other people. With exclusive, I'm the composer. I make the music. I retain the rights. But I give you the exclusive right to it. So I can't sell it to anyone else. And then it usually reverts back to us after a brief time, as discussed.

So most common, though, is the work for hire. And you're seeing that contract, and you're like, oh my god. This is awful. I don't want to see this. But anyway, let's jump through that really quick and just a few key points that really go to developers helping protect themselves. And I've got to hit Play over here on my key notes so that I can see all the different slide changes. One second.

OK, cool. So the first thing is services. It's like, what are you paying for music, sound, dialogue? What are you buying? This will be really quick. Jumping onto the next one, so payment for services-- what are you getting paid? You want to spell out exactly how much you're going to charge and how much you're going to pay for the music and sound.

Next point, and this is the independent contractor point. That's important for you as a

developer. Because this essentially says that the composer or sound designer you're hiring is not on salary and does not need benefits. They have to take care of their own taxes. It just protects the developers. So they make everything clear there.

Next, warranties. These are things, again, that protect you, as the developer. So this says, OK, the music we're writing, its original. We're not stealing John Williams' music, as I always say.

ANDY FORSBERG: [HUMMING] score game.

RICHARD LUDLOW: Yes, right. [CHUCKLES] But then if we do steal it-- and we're not going to steal it. And there are some other warranties, as well. But we'll jump onto the indemnification. So then it usually says, if we do steal John Williams' music, you guys are protected. And there's different levels of indemnification. But the indemnification just says it falls on us if we screw things up.

Next, there's usually a little confidential information clause, a little NDA clause about not disclosing things and then some specific legal language about the ownership and assignment of rights specific to work-for-hire, legal mumbo-jumbo. We'll skip the subcontract.

And then there are some rights that are specific to us, as the content creators. So if you remember, we talked about composer-specific rights, things like the ability for us to post our work on our website, something that we like in our contract so that we can advertise music to other people [INAUDIBLE] them to hire us.

Similarly, we often spell out how we're going to be credited. And the credit is a great way, as well, to negotiate with your composer. If you're on a budget, maybe you say, OK, I'll put your name at the opening cinematic instead of just in the back to help compensate for our lack of budget, get you a little more exposure, things like that. So you spell out how you want to be credited.

That's really it for the contract. I don't want to go too detailed there. But some key points to be thinking about if you guys ever hire a composer or a sound designer.

Let's talk about money. This is the question most people have. And whenever I meet a developer, without fail, within like 10 minutes of the conversation, they're like, ah, what do you charge?

ANDY What's generally what you charge for any game?

FORSBERG:

RICHARD LUDLOW: It's funny. And I gave this talk at GDC Next. And you'll see by the end of it why I'm like, that's not a question I can just answer. And then I got like three emails from people who attended the talk after and who were like, can you just give me a range for an indie budget?

Anyway, but you'll see why that's funny in a minute. Because my response is always to them when they ask, how much do you charge? My response is always, what's your budget? And the reason being because are so many factors, like what the deadline is, musical style, whether or not we're talking about a solo piano piece versus epic orchestral piece.

ANDY FORSBERG: Are we going to get live players to play those orchestral pieces or a piano player to play that song, maybe.

RICHARD LUDLOW: You can throw out the bullet points if you want, just FYI. We're just going through them. Anyway, and what's the release platform? Is this the AAA console? Or is it a Facebook game for the American Cancer Society?

ANDY FORSBERG: Again, are we going to use a work-for-hire or what one of the license deals?

RICHARD LUDLOW: Right. Like we just talked about, buying out the rights or us keeping the rights? Really big effect on the price there. How much are you buying? We're like Costco. [INAUDIBLE].

ANDY FORSBERG: But if you're going to buy 100 sound effects, that's obviously going to be different than if you need five sound effects or 50 sound effects.

RICHARD LUDLOW: Yeah, we give bulk discounts all the time.

ANDY FORSBERG: Exactly. And that goes into, obviously, the depth of the audio experience, as well, which is how crazy we're going to get with interactivity, if we're going to be using middleware.

RICHARD LUDLOW: Like Andy said with the mobile game, you could put one minute, three minutes, 10 minutes, 20 minutes, all in the same game. It's going to be a better game if you've got-- maybe you don't need 20. But if you've got more than one looping track, it's going to be a better game. But the game still exists with a single piece of music.

So saying, how much do you charge, is a very, very difficult question to answer without

	knowing--
ANDY FORSBERG:	Any stipulations.
RICHARD LUDLOW:	--more about your game. Yeah.
ANDY FORSBERG:	One of our clients that we work with, on their page where you go to contact them, it says, when do you need your project done by? And one of the options is, Yesterday.
RICHARD LUDLOW:	Yeah. And deadlines are a huge part of that. Sometimes we get calls where it's like, we need this in two days or in a day. And we'll do it. But it's going to cost more than if you need it in a year. So contacting, guys, early is important. Anyway, let's jump on to payment models.
ANDY FORSBERG:	And you can hit all these bullet points again.
RICHARD LUDLOW:	Yeah, I mean, we were just basically talking about how composers and sound designers charge. Typically with music, it's a per-minute music, so not per minute that we're working.
ANDY FORSBERG:	And then sound effects-- yeah, that we're working-- and then sound effects are usually per-asset.
RICHARD LUDLOW:	Or sometimes a flat fee. That's also common [INAUDIBLE] quote a project and say, OK, I'll do your whole project regardless of how many sound effects for, you know, $20,000. I don't know, whatever.
ANDY FORSBERG:	Sometimes hourly rate. We usually don't do this. This is a really hard one to engage.
RICHARD LUDLOW:	It's a valid thing. People do it. We don't.
ANDY FORSBERG:	We don't.
RICHARD LUDLOW:	But yeah.

[KNOCKING SOUNDS]

There's some weird thing happening below us.

ANDY FORSBERG: Sorry. And then usually, we really like to get back-end profit sharing.

RICHARD LUDLOW: If the budget isn't there.

ANDY FORSBERG: Yeah, that's a big thing with audio to think about. At the end of the day, is it really going to cost you that much to give 0.5% of back-end when you can't give anything up front? Because we always have passion projects. We make money on some of our projects. But we really like to believe in games that are really cool. And sometimes the best to do that is just to share the game.

RICHARD LUDLOW: The indie scene, they often can't afford because they don't have that upfront money. And so we'll talk about a back-end profit sharing percentage. And if you talk to people who have been doing this 30 years, that didn't exist 10, 20, 30 years ago. Audio guys did not get back-end profit sharing usually. Because they were just paid upfront. But that's kind of gone away. I guess that is probably true of all industries.

But so thinking about that is a very valid thing. And it's usually accompanied by some upfront fee. It's usually a reduced amount. But the back-end thing is definitely valid. We want new developers to be less afraid of that and more open to it.

ANDY FORSBERG: Yeah, absolutely.

RICHARD LUDLOW: And then any combination of the above, too. Cool. Anyway, so how does this break down? And you can throw all these up here. Just showing you music, sound, and dialogue. There's a lot of components here. So when we're talking about what we're charging, we charge different prices for themes in the music.

So if I write a musical theme that has its setting, and we charge one price for that. But then we might put an arrangement of that in an underwater level, a desert level, a jungle level. The same theme, but different arrangements for different levels. And we charge less for those arrangements. Those little transitional segments you've heard in that demo I played, those are

transitions. We charge less for those.

And any different price for things like stingers, like a coin pick-up or an end game, like, [HUMMING] sound like that when you die. With sound effects, we break things out into primary sound effects, like if you've got a creature having an attack sound, "ch." And then it's like a die sound, idle sound, those are all primary sounds.

Iterations might be like, attack01, attack02, attack03, die01, die02. And we charge less for iterations. UI and ambiences, different prices there. And then dialogue, there's just a whole slew of components, like casting. Usually you have to hire someone to cast all the actors.

ANDY FORSBERG: Getting Kevin Spacey for the next *Call of Duty* game. Or where--

RICHARD LUDLOW: Kevin Spacey for the next--

ANDY FORSBERG: --we're doing it ourselves.

RICHARD LUDLOW: Who doesn't want to use Kevin Spacey? You're right. And then so they charge a few hundred, a few thousand an hour, depending on the actor. Usually there's someone directing them while they're being recorded. Someone's recording them, editing them, processing. Just throwing this up here so you know all the different components of music-sound that are out there.

So again, asking, what do you charge, what does your game need, is a very-- we need to know what your game needs before we can say.

ANDY FORSBERG: Cool, next slide.

RICHARD LUDLOW: Yeah. So we're getting close to the end here. Then we can do some questions. But just talking about a theoretical project-- say you've got a low budget, $160,000 Kickstarter project. So talking about music-sound, we're typically looking at like 5% to 15% of budget being allocated to audio. 5% to 15%, usually hovering around 10, 15, 20, 25-- very good.

ANDY   100! [LAUGHS]

FORSBERG:

RICHARD LUDLOW: No, but seriously. And so a common problem with this, though, is that your game, to be awesome, needs this much music. But your budget is only going to allow for this much music. So let's say we've got a hypothetical game here where a project might need 18 minutes of music and 300 sound effects.

So say we were going to charge like $750 a minute for themes and $500 a minute for arrangements, which are kind of indie prices. We charge up to-- we have a different scale because of all the different factors involved-- but up to like $1,000 a minute is pretty typical. The big guys on AAA's will be charging $2,500 a minute. But up to $1,000 a minute of music is pretty typical, between $500 and $1,000.

And then maybe sound effects. Maybe you use a combination of all those, total $12,500. Let's say this game, to be awesome, again, needs $23,500 for the audio. And you're like, oh my god, that's a lot of money. And let's say the developer has only allocated $11,000 to audio.

ANDY FORSBERG: Right. So some things we can do to reduce the costs are-- we can reduce the original music themes and increase the arrangements. So we can just do a lot of iterations with things, which is actually a very feasible option, because those composers were trained to do that. We can reduce the number of sound effects iterations, just have more of those primaries.

RICHARD LUDLOW: Only attack01 instead of 02, 03, 04.

ANDY FORSBERG: Exactly. We can do back-end profit sharing, as we mentioned before. So maybe at 3% on that. And then we can use a license agreement instead of saying you're using the work-for-hire.

RICHARD LUDLOW: So just some common things to think about in that negotiating process about, how can we work with the audio guy to reduce the cost to something we're both comfortable with? Yeah, so let's just wrap up really quick. What did we talk about?

Interactivity. It's music. It's sound. It's responding dynamically to player input. The player does something. The music, the sound, it changes, it reacts. It's going to create a deeper player experience. It's going to reduce the cost if you do it right. And we're doing this with FMOD, Wwise, Fabric, different audio middleware.

ANDY And then for budgets, we're trying to look at 5% to 15% of the total budget of your game

FORSBERG: allocated to audio. Remember to consider back-end payments. We really think that's going to be part of the future of how audio works within, especially, the indie market. And just be willing to negotiate and figure things out. Your costs fluctuate. Our costs fluctuate. So it just needs to be a negotiation. We can usually figure something out. Any audio person can.

RICHARD LUDLOW: Yeah. Oh, and then we jumped over Agreements.

ANDY FORSBERG: Oh, sorry. I went right and down.

RICHARD LUDLOW: No, it's cool It's all good. And then, agreements, again, we're talking about work-for-hire. I'm the composer. I'm writing the music. You, as the developer, are buying it. Licenses-- I'm the composer. I write the music. I obtain the rights. And then I give you some type of license to use the music.

But that wraps up, I think, the four points we were going to talk about. If you guys have specific questions, we're happy to answer them. Or Phil, if you have any additional points you want to touch on.

[APPLAUSE]

ANDY FORSBERG: Thanks

RICHARD LUDLOW: Thanks.

PROFESSOR 2: I think for questions, if anyone has any questions, I'll repeat it since I'm a little bit closer to the mic. Although, maybe the mic might pick you up if you're in the back of the room. We'll give it a shot.

RICHARD LUDLOW: It doesn't need to be a question about what we talked about, too. Any audio related things.

ANDY FORSBERG: Favorite color.

PROFESSOR 2: Yeah, as loud as you can.

AUDIENCE: [INAUDIBLE].

PROFESSOR 2: Did you [INAUDIBLE]?

RICHARD LUDLOW: I think so. So was the gist of it basically being folks using music and sound and then getting takedown notices? Is that what she said?

PROFESSOR 2: Yeah, takedown notices on some of those by YouTube or Twitch.

RICHARD LUDLOW: Yeah, absolutely. So the whole takedown notice thing has really come about because people are just using the music or just using the sound without asking for permission for it. Now, in an actual gameplay video, if you're streaming Twitch, that is really a very developer-specific question. And that's not something that we, as the composers and sound designers, really even have control over.

If it's for a game and if it's in a game, if we're working on a Nintendo game and it goes out to them, then that is owned by Nintendo. And if it's not owned by Nintendo, they've got the license for it. So it's all on them with regards to that. So some developers are totally cool letting it slide. Some developers are not. But it's a shifting-- it's all being figured out right now.

ANDY FORSBERG: And usually that happens, obviously, in the bigger game world. The biggest game that would probably happen with in the indie world would be something like *Journey*, or something like that.

RICHARD LUDLOW: And most often, at least now, developers are pretty cool with it. But I know it's all being figured out right now. That's a very shifting landscape.

ANDY FORSBERG: And it has to do with royalties in music and--

RICHARD LUDLOW: That's another thing.

ANDY FORSBERG: Collections have been set up for film and TV for eons now. And there's a system in place for that. But there's really no landscape for games yet.

RICHARD It's a little different with YouTube, and the Twitch, as well. We get paid 0.0001 cents every time

LUDLOW: someone will watch something on YouTube.

ANDY FORSBERG: Yeah, it's insulting.

RICHARD LUDLOW: In five years, hopefully, that will all be figured out. But sorry I don't have a better answer. our fault. It's the developer.

PROFESSOR 2: Just a follow up question on that-- it seems like in order for all these services to actually detect that they're using the music, they need to cross check it against some sort of audio database. So is that something that you, as composers, usually end up submitting? Or is that something that the game companies usually end up doing? Or does it really depend on the license agreement that you have with the company?

ANDY FORSBERG: It's usually the developer.

RICHARD LUDLOW: Yeah. So there's a couple different ways. We have friends who work for PlayStation. And they were just talking about how they posted things on their PlayStation North America account. And they got taken down by PlayStation Japan or something. So their own companies aren't even really able to quite mesh this together yet.

But the databases are sometimes internal to publishers. But also sometimes they're scanning surfaces that these royalties agencies like BMI and ASCAP actually have. And they've got these automatic scannings that are set up.

And that sometimes comes about because we submit our music to these royalty agencies like ASCAP and BMI in order to be able to get paid. But then they use them to find out how many times things are getting played. They don't use them to figure out what should be taken down.

ANDY FORSBERG: Exactly. Yeah, I think, especially on the indie level, the only way we would be able to detect something is if we went and watched a YouTube video, our music was in it, and we're like, oh, crap! That's our music.

RICHARD LUDLOW: We don't have these engines going. The publishers have teams of people doing takedowns on their content.

ANDY Yay, team.

FORSBERG:

RICHARD LUDLOW: Yeah, and I don't know all the details behind that.

ANDY FORSBERG: Sorry?

RICHARD LUDLOW: The ASCAP stands for--

BOTH: American Society of Composers and Publishers?

RICHARD LUDLOW: I want to say Publishers. I think they probably should. I don't know, man. We just get the checks from them.

ANDY FORSBERG: BMI is Broadcast Music, Incorporated.

PROFESSOR 2: So I can take a look at that.

ANDY FORSBERG: They're called PRO's.

RICHARD LUDLOW: Composers, Authors, and Publishers.

PROFESSOR 2: Next one?

RICHARD LUDLOW: Yes.

PROFESSOR 2: Other questions? Yeah, Liz?

AUDIENCE: [INAUDIBLE] art talk of last class, they have done an artist test to see if the particular artists are right for the game. Is there an equivalent for music?

ANDY FORSBERG: Yeah, absolutely.

RICHARD LUDLOW:	Yeah, we do those all the time. And that's a totally legitimate thing if you aren't sure. Asking them to do a 30-second demo. I'd say a 30-second demo is totally legitimate. Yeah, and usually the best way to do that, guys, just so you know, take some gameplay, be it from your game, a different game, concept art for your game, take some visuals as a video, send it to them. Or just concept art, send it to them. And let them work with that.
ANDY FORSBERG:	Because we could even do an interactive demo for it at that point. The big thing, again, is there's the difference between being able to write good music and having a core concept for a game from the beginning and thinking about interactivity when you're composing and doing sound effects. Because it's a whole different animal.
RICHARD LUDLOW:	Yeah. But the demos are totally legitimate. We do them all the time. But sending some visuals along is very important to making sure you get what you want. And then we're able to see what the game is going to look like and then make that decision.
	Otherwise, we might write something that you might not have the vision for because we haven't seen the art. And maybe we could easily do what you wanted, but we just misinterpreted it and went a different direction. But yeah, tests are legitimate, absolutely.
PROFESSOR 2:	Questions?
AUDIENCE:	How much are they paid for the music test?
PROFESSOR 2:	Will you be paid for an audio test?
RICHARD LUDLOW:	What did the art guy say? I'm curious.
AUDIENCE:	They said [INAUDIBLE].
ANDY FORSBERG:	We have not found that to be extremely common with what we do. We'd like it to be more common.
RICHARD LUDLOW:	It used to be a thing.
ANDY FORSBERG:	Yeah, it used to be a huge thing.

RICHARD LUDLOW: For commercials, it was a big thing. You'd get paid for doing a demo.

ANDY FORSBERG: I think it's definitely more common in the game world. In the film and TV world, it's so saturated with composers and sound designers right now that they don't need to. Because so many people want the work. But it is a respectful thing to do, I think if it's a longer demo. If it's a shorter demo, then it's like, we're happy to get the gig.

RICHARD LUDLOW: We're going to keep the rights to that, anyway. So you could say a couple hundred bucks maybe. But it's not a required thing. If we want the gig, we're happy to do a 30-second demo to try and get it often. It's nice to throw a couple hundred bucks. But at that point, it's a couple hundred bucks. It's not like-- it's pennies in the grand scheme of things if the project is larger. So yeah, anyway, hopefully that solves it.

PROFESSOR 2: Yes.

RICHARD LUDLOW: Any more?

AUDIENCE: Do you find that part of your job is convincing people that audio is important?

ANDY FORSBERG: Oh yeah.

RICHARD LUDLOW: That's a big part of it. We use the three things-- emotion, function-- no.

ANDY FORSBERG: Yeah, I think the biggest argument in that is probably a mobile scene. Like in class, someone was probably playing a mobile game during our talk today and-- (LAUGHING) just kidding. But it's a big thing, is like well, do they just mute that? And then it's like, yeah, you could say that. But some people do listen to it. When they do listen to it, they listen on headphones.

And we were at a talk at a conference this year called GameSoundCon with a composer named Guy Whitmore, who did the music for *Peggle* and *Peggle 2.* And he was talking about, there's not a more intimate experience for audio than in headphones or in that arena. But I think in general, it is undeniably important.

RICHARD You can put out a game. A mobile game can do OK with bad audio. We're not going to lie.

LUDLOW:	That's a thing, like *Flappy Bird*. Believe me, I love *Flappy Bird*. I have triple-digits score on *Flappy Bird.*
	But if you want to set your game apart, people look at that polished experience. If we're talking about indie games, they look at something like *Journey* or mobile games, something like *Peggel 2*, they look at that, and they're like, wow, this entire experience is super polished.
ANDY FORSBERG:	It's a great game.
RICHARD LUDLOW:	And it's broken down into the three parts, really. It's the functional, it's the mechanic of the game, it's the visual, and it's the audio. And those are all a third of the game. And if you take out one of those, you can sell the game. If you don't have great art, that's fine. There's a lot of great games that don't have great art. If you don't have great mechanics, OK, maybe it's pretty and sounds nice. That'll still sell.
ANDY FORSBERG:	If that was a pie and you had people over for a party, would you hand them only 2/3 of the pie? They'd be like--
RICHARD LUDLOW:	Crazy.
ANDY FORSBERG:	--this dude is selfish. [LAUGHING]
RICHARD LUDLOW:	He says that because I eat like a pie-- I have a thing where I eat a pie a week.
ANDY FORSBERG:	That's a whole other--
RICHARD LUDLOW:	But no, seriously, so your game can function without one of these things being great. But it's not going to be as great of an experience.
	[INAUDIBLE].
PROFESSOR 2:	No? Then I want to thank you again very much for speaking to our students.

RICHARD LUDLOW: Thank you for having us.

[APPLAUSE]

Yeah, and feel free to put up our email addresses. Mine is rludlow his is aforsberg if you want to-- Oh, OK.

ANDY FORSBERG: --@hexany-- oh, yeah, perfect. OK, cool.

RICHARD LUDLOW: And yeah, feel free to shoot us an email. If you have any questions, we're happy to support audio with the new generation of developers. There's a lot of great people over at Berkeley, too. If you're looking for composers and sound designers to collaborate with, other students, there's a lot of great people over there. There's the Video Game Music Club.

ANDY FORSBERG: Don't be afraid to cross the bridge.

RICHARD LUDLOW: Yes. The Video Game Music Club, if you shoot them an email, you'll get like 10 responses from people who are like, yes, let me help you work on this game. You're not getting paid. I'm not getting paid. They might be OK with that.

ANDY FORSBERG: Yeah. You guys have the facilities for what you do. And Berkeley has the facilities for what they do.

RICHARD LUDLOW: Anyway, but then you can call us when you've got paid gigs. [TSKS]

ANDY FORSBERG: (WHISPERING) Just saying.

RICHARD LUDLOW: All right. Anyway, well, thanks so much. I really appreciate you guys caring about audio, really, honestly. We really appreciate people caring about music and sound a little bit. So thanks so much.

ANDY FORSBERG: And good luck with the rest of your semester.

RICHARD LUDLOW: Absolutely. Thanks. See you guys around.

ANDY FORSBERG: Cheers, guys.

RICHARD LUDLOW: Adios.

[APPLAUSE]

PROFESSOR 1: All right. So yeah, on that note, if you are taking CMS617 next semester, the advanced game studio, CMS610, the media arts industries law class, both of those are making a good polished experience for the end of the semester, with the idea of either showing it to publishers or submitting it to a festival.

So audio is really, really important in those two classes. And going to Berkeley for that kind of support is highly recommended. Also recommend them this class if you've got the time, as well. And let us know if you'd like more information about connecting with Berkeley folks.

PROFESSOR 2: Yeah, we actually know the instructors and even some alums. But the alums know the people who are still in college.

PROFESSOR 1: Yep, just email Video Game Bosses if you'd like that contact info. Otherwise, you've got five minutes to take a break, meet back up with your teams. And Pablo will be in at 2 o'clock to play three games.