

## In the Classroom 15

# Using Virtual Reality in the Classroom

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**Stan Skrabut:** First of all, thanks a lot for taking time to listen to this podcast. As I always mention, you could be doing other things, but you're hanging out with me and I really appreciate it. This week we are going to explore virtual reality. Virtual reality is basically where we immerse ourselves into another world. In this episode we're going to look at what virtual reality is, equipment that you will need in order to get the most out of it, uses for virtual reality -- some folks are already using this -- some concerns and challenges, but really how to use VR in the classroom.

Let's get started. First of all, what is virtual reality? Virtual reality is an interactive computer-generated experience taking place within a simulated environment. This allows you to go places that you could not go before. Like right into the center of a biological cell, not something that you can do every day, but with virtual reality, you can. It normally incorporates something that is auditory and also visual. So you're getting this type of feedback, but in some cases, it may be that other senses are involved. It could be haptic where you're feeling vibrations or you're feeling pressure or something on your body because of this environment that you're in.

Normally virtual reality is you wear headsets, but there's different levels, and we'll talk about those different levels of virtual realities shortly, but very often you put a headset on and headphones and you can look around and everywhere you look your viewpoint will change that you're in this virtual world. I've had the experience of being in different type of experiences of using virtual reality. One happened to be at the University of Wyoming, they have this place called the cave, which the cave basically stands for cave automatic virtual environment.

This is where they can display this virtual world where you can see things and manipulate things in this room where it's being projected on all three or four, five sides of you. It's not on your back, but on each, the front and the two sides and the ceiling and the floor, you can see this room and everything is being projected to those spaces. You wear special glasses and these glasses have these little dots on them so the cameras know where you're at and where you're looking and it does that type of measurement and you have these special ones that you hold and this allows you to manipulate these objects and you can spin them around. It's just absolutely fascinating.

One of my friends, Nicholas Shetty, he took me into this virtual world and he would take me into three-dimensional models that they had created and some of them were buildings that you can explore, but there's, also, allows you to jump off and I say jump with quotes, but I'll tell you that you get a sense of dimension and a sense of space that I'm not keen on heights and this was causing me a little bit of angst and so that

was kind of fascinating. This basically is like a holodeck, that you can project these objects and you can spin them around, and they use this to replicate based on the research that they're doing.

They're doing research for oil and gas as an example and being able to show the different landscapes that they're working in and also based on different sensors that they have. They can project what's under the ground and be able to visualize that in three dimensions, which is pretty cool. That was one of the places that I got to see some virtual reality. The other one was a program called Second Life. Second Life is a free 3D virtual world where you can go in and create things, but you can also connect and chat with people and you'll see other people in this environment who are real people but they're being projected as avatars; they're all over the world, you can interact with them and explore different places.

Different universities, countries, and organizations have built out these 3D worlds and some of them are replica. For example, we recently had the fire at Notre-Dame, but inside Second Life they have a replica, a three-dimensional model of Notre-Dame that you could go in and explore. Right now Linden Labs is working on a version of Second Life called Sansar, which allows you to put on the goggles and see this virtual world through the goggles where you really feel that you're immersed into it. My experience has been once removed so I see it through my computer screens, but it is still just a fascinating place and educators have gone in and built educational tools.

When I was working with Cooperative Extension, they had a simulator there for food safety, which was kind of fascinating. You'd go in and it was a dinner, and in this dinner, there was a variety of different food safety problems that you had to diagnose and report back. So that was cool. With a program like Second Life, all you need is really your computer in order to see it. In order to get to the next level where you're fully immersed, that usually requires a headset; a headset that would be connected to the computer in some way and it could be wireless or with wire. With that, you can start adding on layers.

In some cases, you would also have headphones so you would be able to hear what was going around. If you were in a forest, you would be able to hear the trees rustling or you would be able to hear birds chirping and things like that and it would give you more of a feeling that you were in this virtual world. The next layer on top of that is adding some type of motion sensors so you can control things. These motion sensors, they're either by motion where you have cameras picking up where these items that you're holding are or they could have their own gyroscopes and they could also be reporting back like a game console.

One of the gamepads that you would use, something similar, but this would allow the tracking of your head, your hands, your body position and be able to give that type of feedback within the system. If you're going to add this additional equipment on top of what you already have, then you can expect to pay anywhere from \$100 to \$1,000 for the do it at home type system. If you're getting to the advanced level, you can pay anywhere thousands of dollars, tens of thousands of dollars in order to really get what you need.

Some of these virtual items like Google Cardboard, you can get Google Cardboard for \$15 and it uses your smartphone and you're able to immerse yourself into this VR system using your smartphone; because your smartphone also has a gyroscope in it similar that it can show basically movement with the program. Then even getting to the next level that there are entire suits that you can wear where there are sensors in the suits or haptic devices in the suits that will apply pressure based on what you're doing. If you rub against a tree or something that you are going to feel it. There's going to be some sense in your suit that something happened. That's really getting into high-level stuff.

There's also these omnidirectional treadmills that you can be in the treadmill and running. It could be like a first-person game that you're involved in and that basically as you're running you have special shoes. This would allow you to move through this program as though you were really walking or running and you would get these sensations through your gloves or the suits that you were in this. That's probably the top level that you really feel that you are immersed into this environment.

If you want to create these worlds, one of the things that you can do is you can get special cameras or special VR cameras or 360-degree cameras that will allow you to take these images that you will then stitch together to show that you're this particular type of world. With a 3D scanner, for example, that you can take 3D objects and scan them. For your class. For example, anthropology, that you can create this, maybe you have skulls or bones or something like that, and that you can have them 3D scanned where then within these virtual viewfinders, basically, you can manipulate this and you can spin it around. There's some programs that allow you to do that.

In this one article that I found, it's written by Tyler Lacoma. Tyler was talking about what is VR, and he talked about these different levels of immersion. You have first of all the basic level, non-immersion. Second Life would be a non-immersion game, that there is 3D or virtual reality elements of the world that you're looking at but because it's displayed within another real world, it's really non-immersive. Even though I'm in Second Life, and I can be totally engrossed, out of my peripheral vision, I can see other things. It doesn't give me that full immersion that you would want.

Then you get into semi-immersion worlds that you would use headsets or maybe you're surrounded in a cockpit simulation, that you could be sitting in the cockpit and have everything around you and be able to see this. You would get this feeling that you're dealing with the real world. You would have real-world objects to manipulate. While I was in Civil Air Patrol, I was able to see some of these type of semi-immersion worlds that were created for aerospace education, which were definitely quite cool, that without actually being in a real cockpit you felt like you were in a cockpit. The only things that didn't affect you is the actual change of gravity as you were taking off or landing and those types of things.

Then you have fully-immersion. This is where you have the headset. You feel that you're in this world. Everywhere you're looking is this new perspective, and that's when you are really immersed into the program. What do you do with this VR? We're really just trying to figure this out. When I say "we," the world, they're really trying to figure this out. One of the uses for virtual reality is actually therapy. It allows you to get

exposure. It could be for phobias, it could be for post-traumatic stress disorder, that you're introduced into these worlds gradually, or you're given therapy around these worlds in order to deal with PTSD, for example.

If you have a phobia for heights, that they can introduce you to different levels of heights, gradually, to let you get comfortable with this concept of heights. If you have fear of spiders, those type of things, that they could put you in these safe worlds and allow you to get used to it as they introduce you to these real world. With medicine, for example, that you can practice virtually an operation or that you can project, perhaps, an X-ray or an MRI scan on top of the human body and be able to see that. That allows you to practice that.

I've seen some worlds in Second Life where basically it was a mock-up of an emergency room. This allowed you to practice even in a virtual environment, some of the procedures that you would normally have to follow. Occupational safety. I gave you the example for Cooperative Extension dealing with food safety, but there's also other safety that you could practice. They have virtual forklifts or virtual cranes that you can go through the procedures in how to use those cranes in this virtual environment and be able to see when you move a lever how this affects the crane before you get actually involved in the real deal.

Education, as I mentioned, you can look at biology, different cells. You can go visit worlds that if you wanted to project into 1700 Massachusetts, that there's probably a world out there that you can project yourself into and see what was going on and listen to different characters talk about that. The military uses virtual worlds more and more, that it allows them to put their soldiers, airmen, and sailors into environments that ends up saving the taxpayer dollars.

There's probably an initial cost to build these worlds, but once the worlds are built, they can be used over and over and over again and save ammunition, for example, which is an expenditure that you pay for. Then also, it's increased realism, that you can actually by getting 3D models of different towns or villages that they need to go through and patrol that you can actually very rapidly build up these models and give a feel for what it's like

Astronauts do virtual training. Before they do something in space, they may go into their massive swimming pool and put on the suit and get into the swimming pool and go through the motions of that. It's not exactly what they will feel in space, but it gives them the sense of weightlessness in a way that they can do this. Minor training, architectural design, driver training, that's another one that practicing being able to haul a 18 wheel tractor-trailer, backing up and those types of things, that there's virtual worlds that you can practice these skills. These are becoming more and more commonplace in order to train people on how to do that.

Bridge inspection is another one, that you can practice the skills of looking at virtual bridges to identify what could possibly be wrong with a bridge in order to build up your skills. One that I thought was fascinating was meat inspecting, that the University of Nebraska created this virtual world where they train people to be meat inspectors and they're able to allow them to manipulate a carcass and see what the different cuts are

and what they're expecting to see and be able to identify what would be a good piece of meat from something that they should challenge.

Another area that I'm finding fascinating are museums, that sometimes it's cost-prohibitive to go to a famous museum. A lot of museums are also having you don the headset and being able to tour their museum and it's a low-cost way of doing this. It's pretty cool that you can actually zoom in and really get to inspect the painting. For one painting that they've created for what's called the Kremer Museum -- I'll put this in the show notes, I'll add that -- that the Kremer Museum, they've taken anywhere from 1,500 to 2,500 individual pictures of a painting and basically getting in where you can see the minute details.

That allows you to really see and understand what's happening when somebody created those paintings. The cool thing, as I mentioned, is no lines, no crowds. You can just explore as you wish. If you have the right gear, you can download that particular program and just go check out a museum. They're using it to bring it to inner-city, poverty areas and having kids look at these different museums to give them a sense of wonder.

With virtual worlds, there's also some challenges. Some concerns and challenges. First of all, some people are not good with these virtual headsets that they ended up having that inner ear problem and their sense of balance is thrown off, they become dizzy. Some have seizures, depending on what the refresh rate is. They may also blackout. They call this motion sickness with these VR devices, they call it cybersickness. That was a new term for me, this idea of cybersickness. I've had it where I've become disoriented. A lot of this happens because there's a little bit of a lag. What you're expected to see that your eyes and your body are out of sync with what is being projected.

The really minute details that the visual input is not catching up, therefore, you may get this virtual sickness or cybersickness. In order to help prevent this is the better your equipment is, the quicker the refresh rate is, that way your body will react to it better. Because the last thing you want to do is trip and fall. You don't want to have a collision and you don't want to get sick from these things. The other thing, that some of this equipment may interfere with medical devices. You have to keep that in mind, and that if you spend a lot of time with this, that you can end up getting eye fatigue. I know how it is sitting in front of a computer for a long time that it's possible getting a little weary because of that.

Here are some ideas for using VR in the classroom. Some of them came from this article 10 reasons to use virtual reality in the classroom by Ashley McCann, plus a few other ideas that are thrown out there. First of all, it allows you to explore places that you could not normally get to. You could go all over the world and other worlds. You don't even have to stay on this world. You can go to worlds that are imaginative, for example. Virtual reality allows you to do this. If you wanted to, you can also go explore another career, that if you are interested in construction work that it may be possible that you find a virtual world that shows what it is to be building and what's all involved with that.

As I mentioned other worlds but also, for example, the ocean, that you can take trips into the ocean that you wouldn't normally be able to take. Being able to go see the Titanic. It's not a trip that you can normally afford and be able to take but with VR, then suddenly, it's possible that you can do this. When we talk about these other worlds, they don't even have to be in this time period. That you can go back into history or go into the future and look at different worlds how they're doing there.

Different industries are also using VR. It's possible to see how these industries are using it. As we mentioned, it could be for occupational safety or for training on special equipment, but it's possible to look at these different industries and get a feel for those industries. One of the goals for virtual reality is you're really working on the experiences and not necessarily on the content; that you are getting into the wise, not necessarily the what's in the house. Those are things that you want to consider. Really trying to create engagement.

Those are some ideas on how you can use virtual reality. I think this is an up and coming field. We're going to just keep seeing more of this, the cost of equipment is coming down. There are more tools coming on board that you can create virtual reality. More industries are interested in it and they just keep exploring and figuring out ways to do this. We should in our lifetime, see a lot more of this going on. That's what I got today for you on virtual reality, so let me tell you a little bit about my book.