Cultivating New Levels of Student Engagement through

Virtual Reality

How one Tennessee high school set out on a six-week mission to test immersive education via virtual reality and answer the question, "Could VR be the next frontier for education?"

Virtual reality (VR) — the use of computer-generated graphics to create lifelike sensory experiences and environments — has historically been used for entertainment. However, companies are now using VR technology — both the hardware headsets and the software that generates the actual "experience" — for other practical applications as consumer-grade versions hit the market.

For example, Walmart recently announced it is using VR to provide management and customer service training for its employees, while companies like Lockheed Martin use VR to train pilots and flight instructors.

But what about VR in education? Could it prove to be an effective way to supplement classroom learning?

Studies show technologies like tablets increase student engagement and make certain tasks easier. Proving that learning improves with such tools, on the other hand, is more difficult. However, there is potential in VR technology — due to its immersive, 3D nature with the combination of visual, auditory and kinesthetic learning models — to better engage students and help them to retain key concepts.

To test this theory, Hunters Lane High School, part of Metropolitan Nashville Public Schools, recently launched a six-week experiment to determine student and teacher perceptions of VR-based learning and evaluate the potential for integrating VR effectively into the classroom.

Students at Hunters Lane High School took part in a six-week experiment to determine student and teacher perceptions of VR-based learning.

VR in Action

Hunters Lane High School Principal Dr. Susan Kessler is a longtime supporter of leveraging technology in education and has tested a variety of technologies at the school. Kessler was particularly interested in assessing how immersive education via VR could potentially change outcomes. Using equipment donated from AMD and HTC Vive™ and applications created by a variety of VR content studios, Kessler volunteered her school to test VR in real-world classrooms. Four classrooms in the high school of approximately 1,700 students agreed to participate.

"The hope was that we would be able to get kids to connect with subject matter better using VR," said Kessler.

The school set up a VR lab where the four classrooms, totaling about 150 students, could use the VR equipment. For the first two weeks, the teachers learned about the VR technology, developed strategies for integrating it into their curriculum and tested the equipment. On the third week, teachers began using VR with their students. Because the school had only one VR headset per classroom, students took turns using it while the other students followed along on a large video screen.

Each of the teachers used Google Earth VR to some extent, but each also tested other apps and games to experience how the technology could be applied in different scenarios.

Information technology teacher Ashley Ross had her students use VR to create computer programs and applications, as well as troubleshoot and fix various technology system issues. Given the reported shortage of tech talent in the U.S. today, Ross said VR could help students learn tech skills quickly, leading to more graduates ready to jump into the tech job market.

"In my classroom, using VR helped the students retain knowledge more effectively," said Ross. "I think this could change the game for kids who are struggling, because you immerse them in this world and they can actually see it and feel it. It makes them more interested and engaged."

Hunters Lane history teacher Ethan Hansen asked each student in his class to choose three places to visit using Google Earth VR. Because Hansen's class was studying the Civil Rights Movement, students also used Google Earth to visit important locations, including Birmingham, Selma and Washington, D.C.

"To put students right in the middle of a historical event they're learning about is a much different experience than just talking to them about it or reading about it in a textbook," said Hansen. "It makes the events much more real and much more tangible."

Hansen said VR engaged students on a new level.

"I have some students who are easily distractible or otherwise wouldn't be very participatory," Hansen said. "To see them get engaged and wanting to participate is something I hadn't seen before. I think it helped them understand and appreciate what we were talking about to a greater extent."

Because Hansen teaches two sections of the same history course, one that used VR and one that didn't, he also had an opportunity to test retention.

"Having access to these tools and having students use VR improved their ability to recall information we discussed," he said. "Because it's a different medium, it engaged them in a completely different way."

Meanwhile, imaginative writing teacher Caitlin Weaver used VR to let her students "experience" historical events such as the sinking of the Titanic and the Apollo 11 space mission before writing about them.

"With the Titanic, the kids did a lot of research on the boats first," said Weaver. "They then used the VR to place themselves in the shoes of different historical figures. They had to pretend to be passengers on the ship, or to be the person that eventually found the wreckage, etc."

Weaver said the VR piqued the interest of students she typically finds difficult to engage. "Some of those students are gamers, so when it came to a VR game with goggles, suddenly they were in. It was a nice tool to use as a carrot of sorts."

Marketing teacher Cara Harding approached VR from two angles — to test its effects from a learning perspective and to challenge her students to market the technology, imagining a scenario where VR could expand beyond one school. Using Google Earth VR, students selected a location such as Mt. Everest and experienced that location virtually.

"Some didn't know the locations they visited even existed," said Harding. "The wonder of experiencing these new, amazing, beautiful places sucked them in and they wanted to find out more."

For the second phase of her experiment, Harding conducted a pre-assessment to determine what students recalled about two topics they had studied previously: anatomy and the solar system.

Students answered 10 questions on each topic, then used VR to explore those topics virtually. When the students were done, they took the same assessment to see what they remembered post-VR.

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"Everyone's grades went up," said Harding. "It demonstrated how much they could retain after they had the virtual experience. But most importantly, it got them thinking and asking questions they hadn't before."

Managing VR Challenges

Hunters Lane teachers were overwhelmingly supportive of their VR experience, but also pointed out some challenges.

School leaders will need to determine how to best manage VR in a classroom setting before launching larger, more formal implementations. For example, schools would need plenty of bandwidth and a modern IT infrastructure to quickly download large amounts of content. During the test at Hunters Lane, the school's protected network infrastructure prevented teachers from downloading the VR games, requiring teachers to preload content on the computers outside the school's network. Using VR more broadly also means teachers would need enough content to integrate VR into their curriculum in a logical and meaningful way at various points throughout the school year.

Procuring the equipment itself is another potential obstacle. In the Hunters Lane experiment, the school had only one VR headset per classroom, and students took turns using it. Teachers said having more headsets would have allowed more students to simultaneously experience

VR, and controlling their own VR experience would have made the experiences even more engaging. That all comes down to funding. Fortunately, as adoption of VR increases, costs are likely to come down.

Finally, to prevent burnout, Hunters Lane teachers agreed VR would best be used to supplement other forms of teaching and not necessarily used every day or even every week.

"You'd need to make sure it was used in an appropriate manner," said Todd Duncan, Hunters Lane High School librarian, who also tested the VR technology. "It would need to be something students would look forward to, almost like a reward."

Overall, teachers at Hunters Lane High School said the test confirmed for them that VR holds significant potential as an engaging, interactive element of a blended learning environment.

"The students really did retain more," said Harding. "They knew Neptune had rings because they touched them. It promoted long-term knowledge and cognitive ability because they were immersed in an environment rather than reading about a topic or watching a video. In my observation, using VR strategically could be very effective."

Potential and Possibilities

The experiment at Hunters Lane High School attracted significant attention from educators and administrators interested in the potential of VR technology for future educational endeavors.

Among others, Congressman Jim Cooper and representatives from the Tennessee Department of Education recently visited Hunters Lane to see the VR test in action.

Kessler said she hopes VR technology will eventually become available to her school beyond the experimental period and that she can expand the VR experience to more grade levels in the future.

"Our preliminary information indicates students have better retention of the information because instead of learning it one dimensionally they are able to experience the content on multiple levels," said Kessler. "The more experience-based content you have, the more likely kids are going to experience it and feel connected to it."

Hardware and technical support provided by AMD♂ and △ VIVE

With special thanks to the content studios that provided access to their VR applications:

- 3D Organon Anatomy, Medis Media Pty Ltd
- Apollo 11, VR Immersive Education
- theBlu, Wevr
- GE Neuro, Kite & Lightning
- Google Earth, Google, Inc.
- The Lab, Valve Corporation
- Lifeliqe VR Museum, Lifeliqe Inc.
- Mars Odyssey, Steel Wool Studios
- Remembering Pearl Harbor, Time, Inc. and LIFE VR
- Star Chart VR, Escapist Games Limited
- Tilt Brush, Google Inc.
- Titanic VR, VR Immersive Education
- The VR Museum of Fine Art, Polar Software

Hunters Lane teachers also saw the potential for additional benefits.

"As quickly as technology is advancing, the more we can get our students using this technology, the better suited they will be for their jobs in the future," said Hansen. "They will be a more technologically advanced and tech-knowledgeable group."

Perhaps most importantly, the VR experiment made students at Hunters Lane High School curious, and that can go a long way in helping develop student agency.

"Virtual reality is going to change everything for them" predicted Duncan. "It's going to get them excited and engaged. Students are going to want to come to classes where VR is utilized as part of the lesson and teachers can use it in just about every subject. What you can do with VR is truly limitless."

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