

University of Illinois College of Medicine, Peoria



HP Workstations and VR technology transform medical student education

Industry

Healthcare

Objective

Improve medical education efficiency, effectiveness, and return on investment through innovative immersive learning experiences

Approach

Integrate VR-based teaching and learning into medical school curricula and measure the benefits to educators and students

IT matters

- Flexible content creation, teaching, sharing, and learning platform
- Effective tool for student assessments
- Single, integrated solution to cover a wide scope of complex curriculum and topics
- Easy and cost-effective broad range of content—images, video, slides
- Rapid deployment and strong reliability of integrated systems

Business matters

- Improved efficiency of courseware development and teaching of complex topics
- Increased effectiveness of knowledge transfer and greater student retention
- More compelling and interactive student experience for a higher order of learning
- Flexible learning environment for self-paced and follow-up education
- Better prepared, more confident students



“I’ve always had great success with HP and found its product stability and performance to be very strong. In just a few months, VR is making it easier for teachers to deliver complex information, and for students to gain a higher order of knowledge.”

— David Dominguese, Ph.D., Research Assistant Professor of Anatomy and Director of Technology for Anatomy, University of Illinois College of Medicine, Peoria

In late 2017, University of Illinois College of Medicine at Peoria (UICOMP) campus leaders, fascinated by virtual reality’s (VR) potential to impact medical education curricula, designed innovative VR labs for advanced student learning. Using HP workstations, Enduvo software, and state-of-the-art headsets (HTC Vive), professors developed VR-based anatomy lessons and researched faculty and students’ attitudes, perceptions, behaviors, and opinions of these systems. By early 2018, VR was transforming how the College was thinking about the curriculum. Complex coursework was efficiently and effectively delivered, yielding higher orders of knowledge and preparing future practitioners and clinicians to handle difficult procedures with greater confidence.



In 2015, after printing a three-dimensional heart based on MRIs and CT scans, Dr. Matthew Bramlet, a pediatric cardiologist and University of Illinois assistant professor, developed a groundbreaking vision of medical education. While an extremely effective teaching aid, the printed heart was not scalable. Recent advancements in VR, however, addressed this shortcoming and added surprising new benefits.

Fascinated by the application of VR to medical education and convinced of its potential, Dr. Bramlet soon developed software to build 3D learning models and multimedia content. Pushing this vision, the inventive MD then formed Enduvo, a company to simplify content creation, teaching, sharing, and learning within a VR environment, and make VR accessible to everyone—helping teachers and medical practitioners import multimedia materials and record themselves delivering courseware.

“The transformational nature of VR instruction will prepare students to be more successful practitioners and handle difficult procedures with confidence.”

— Sonia Orcutt, M.D., Assistant Professor of Surgery, University of Illinois College of Medicine, Peoria, and Surgical Oncologist, Peoria Surgical Group

In 2017, determined to accelerate VR use at the University of Illinois College of Medicine, Peoria, Dr. Bramlet and David Dominguese, Ph.D., research assistant professor of anatomy and director of technology for anatomy, applied for and were awarded a substantial grant allowing for new support staff and technology labs. This research was made possible by support from the University of Illinois College of Medicine Peoria Dean’s Award for Innovative Medical Student Education and the OSF Healthcare Foundation. Dr. Dominguese and Shu Chien Pan, Ph.D., clinical assistant professor and VR research coordinator, joined the College to spearhead the effort.

Experienced in advanced technology integrations, Dr. Dominguese, along with Trisha Thurman and Nick Dennis in the Communication and Information Services department, skillfully designed dedicated lab space with six powerful ceiling-mounted workstations, each equipped with Enduvo software, HTC Vive Business Edition VR headsets, and display monitors on articulating

arms that mirrored headset visuals. Along with an oversized wall-mounted screen (96 inches), the 1,107 square feet lab configuration facilitated dynamic teaching and learning for a possible dozen students. A second, smaller lab space enabled content creation.

In just a few months, with the help of IT staff and Jolene Harris, M.S., clinical associate of anatomy, Dr. Dominguese developed VR-based clinical anatomy materials for muscle-skeletal anatomy, and engaged a research coordinator to assess using the VR system for students and faculty for teaching and learning. By early 2018, VR was already transforming the College’s medical curriculum and Dr. Dominguese was ready to start measuring its performance and effectiveness.

Efficient and Effective Teaching

Using the Enduvo Platform, Dr. Dominguese quickly developed anatomy class materials merging patient CT scans and MRIs, as well as images, videos, and presentation slides. Combined with powerful HP computing, the integrated solution made complex topics easy to teach and resulted in a more impactful and engaging learning experience for students.

With the new technology, Dr. Dominguese converted a 60-minute knee and joint presentation into three five-minute learning objective-oriented VR experiences. As anticipated, the new material could be more efficiently delivered in the VR lab and initial data showed more effective knowledge transfer than conventional instruction. “Faculty use of VR is more like one-on-one, real world teaching,” says Dr. Dominguese. “VR coursework is quick and easy to share and has high potential for better comprehension and retention.”

Concurrently, Dr. Bramlet was working on VR coursework with Dr. Sonia Orcutt, an assistant professor of surgery at the medical school and surgical oncologist with the Peoria Surgical Group. Using HP workstations, Dr. Orcutt quickly imported a normal liver CT scan into the integrated HP-HTC-Enduvo solution and segmented the virtual organ into several parts for more dynamic instruction than through prior methods, which will be used for instruction for current medical students.

“Liver anatomy is a very challenging topic, but VR gives students a realistic view of the organ inside the body,” she says. “What previously took years to really understand



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through lectures and clinical observation can now be accomplished faster and with deeper understanding of the topic.”

Dr. Orcutt previously instructed students using two-dimensional surgery simulations but was held back by its limitations. “With VR, students quickly gain perspective on the relationships between parts of the liver, even in a five-minute focused session where they can pause, enlarge, and reorient the organ as often as they’d like.”

Back in the lab, Dr. Dominguese explored the versatility of VR technology by adding new video, images, and built-in assessment within VR. “The user-friendly VR solution is proving to be a single platform on which educators can easily import a wide variety of content types,” he adds. “Creating a VR lecture we hypothesize will be more efficient and effective for our staff and produce a more engaging educational experience.”

Captivating and Flexible Learning

Already, the interactive and captivating nature of VR-based instruction is leading to higher orders of student learning. With the new, innovative mini-lectures, students can manipulate virtual objects in ways previously not possible. While one student virtually explores the knee joint, another can watch. Or two students can interact in one VR session as a teacher separately discusses the content while referencing the wall-mounted monitor.

“The transformational nature of VR instruction will prepare students to be more successful practitioners and handle difficult procedures with confidence,” adds Dr. Orcutt. “The engaging experience can also inspire interest in specific topics and areas of expertise at an earlier point in a student’s education.”

Furthermore, Dr. Dominguese has found VR-based learning to be more flexible than classroom instruction. With VR, students can set their own pace and schedule additional time for follow-up instruction when needed. In fact, self-paced instruction and continuous learning could eventually help doctors shorten patient procedures and improve patient outcomes, or determine whether a procedure is even necessary.

Additionally, Dr. Dominguese sees VR more effectively meeting students’ educational expectations than traditional methods. “Many med students already have gaming and VR experience which makes our teaching and their learning that much more effective.”

From Pilot to Production

The first phase of Dr. Dominguese’s research has already produced convincing data showing VR education is effective and readily accepted by teachers and students. “In just a few months, VR is making it easier for teachers to deliver complex information, and for students to gain a higher order of knowledge,” states Dr. Dominguese. “It’s exciting to see the students captivated by this innovative technology and not being distracted with their cell phones.”

Customer at a glance

Application

VR solutions for more efficient and effective medical school teaching and learning

Hardware

- HP Z4 Workstations
- HTC Vive Business Edition VR headsets
- HP Mixed Reality Headset Professional Edition

Software

- Enduvo Learning Platform

Phase two will include using Enduvo to create additional content development and the possibility of other medical schools joining the research efforts that were developed by UICOMP. Dr. Bramlet created six Enduvo tutorials to show other professors how they can utilize the HP-powered solution to develop their own content. And Dr. Bramlet is extending the use of HP technology to include lighter and higher resolution headsets, such as found in the HP Windows Mixed Reality Headset, Professional Edition.

“I’ve always had great success with HP and found its product stability and performance to be very strong,” adds Dr. Dominguese. Furthermore, with the hardware vendor’s support and increasing affordability of VR solutions, Dr. Bramlet is now piloting HP’s recently released Windows Mixed Reality Professional Edition Headset.

From HP’s Global Healthcare team’s perspective, the University of Illinois’ success with VR in the classroom is a great example of its easy and affordable use for healthcare learning. As a manufacturer of such enabling technologies, it is exciting to see how the flexible nature of VR makes teaching faster and less expensive than traditional methods.

As Dr. Bramlet describes, “our department had few problems convincing healthcare executives to invest in VR-based learning after showing that some facilities spend \$2 million for staff training while we could do it with a much lower budget.”

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— Matthew Bramlet, M.D., CEO and Founder, Enduvo, and Director, Congenital Cardiac MRI, Children’s Hospital of Illinois, University of Illinois College of Medicine, Peoria

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