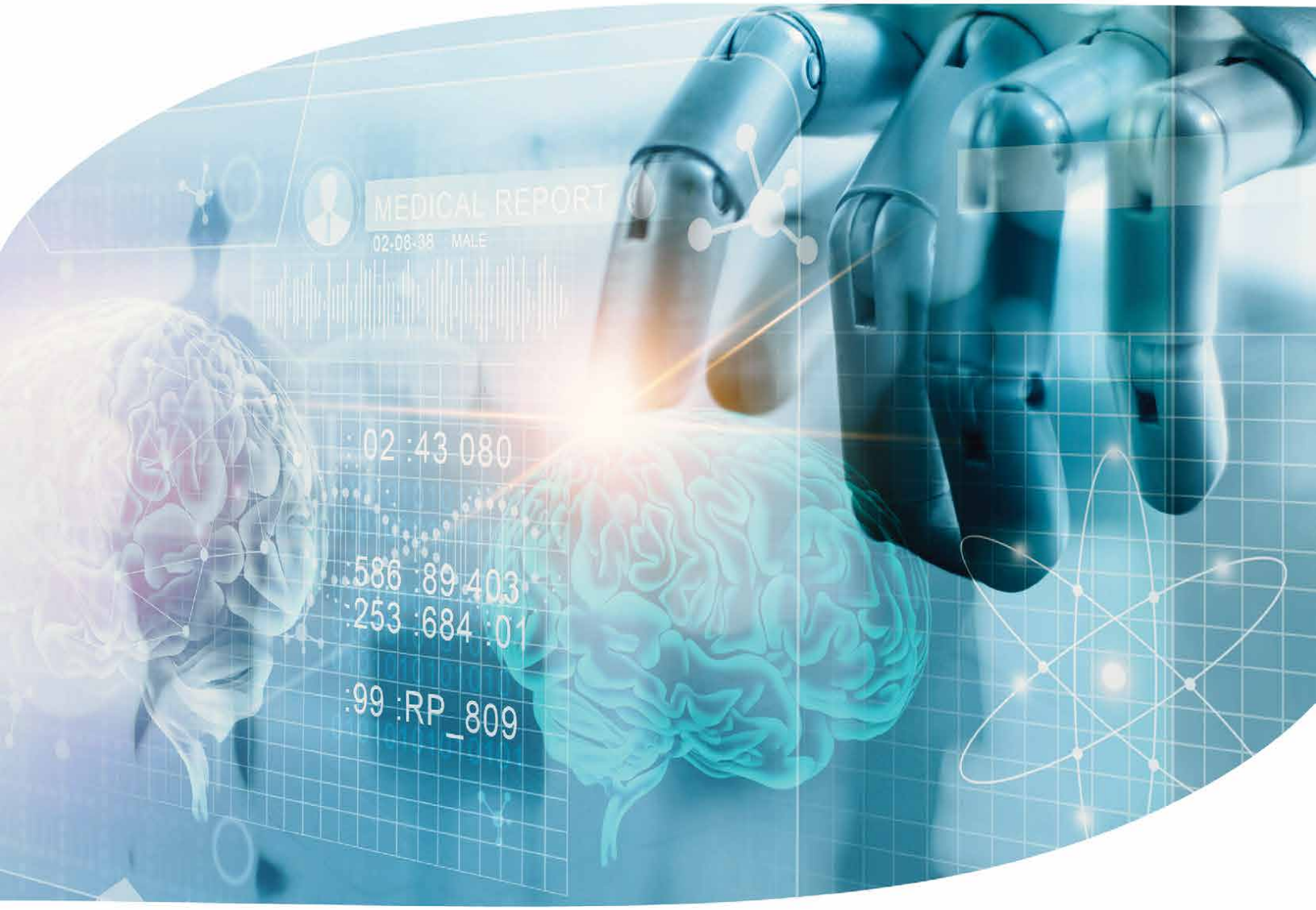


The Environment Is Virtual, The Experience is Real.

A three part practical guide for implementing Virtual Reality in the education space.

Part 1:

Real Suggestions for Implementing Virtual Reality-Based Learning Opportunities

Foreward

At what point did you become inspired by your current career? What or who inspired you? A teacher? A parent? An experience?

Whatever motivated you to pursue your current career, there is no question that students today are being encouraged to think more seriously about their future at a much earlier age than I was ever encouraged. K-12 schools and districts are defining expectations not only for college, but also career readiness. They are wrestling with career content as the world of work, and definitions of careers and occupations, evolve at an unprecedented pace. Students are also feeling the pressure in high school, if not middle school, to get clear on their career interests or risk not finding a pathway to their future.

But, how are preteens and teens actually exploring career options? Outside of high school Career and Technical Education (CTE) courses, there are few school systems that offer career development courses that all students must complete. And, where these courses do exist, they are often wanting in real world content and/or deep, authentic learning experiences. This is where advancements in technology can open the world of work up to students. In particular, virtual reality ("VR") technologies hold great promise for both expanding students' understanding of careers and deepening their experience in those most appealing to them.

This paper profiles the role of VR in creating learning experiences that allow students to immerse themselves in jobs and career pathways with which they may not be familiar.

This paper, part one in a three-part series, is structured as a practitioner's guide, rooted in the experience of educators captivated by the potential -- but initially unfamiliar with -- the application of VR.

This paper and the two papers that follow provide a view into how to plan, execute, and improve the application of one of the most exciting new teaching and learning tools available. The articles also offer useful VR implementation suggestions throughout.

If you are an educator, program administrator, high school counselor, or you're simply intrigued by how VR can improve students' career knowledge and inspire them to pursue a career that they love, you will enjoy articles.

Todd Bloom, PhD is a senior vice president at Whiteboard Advisors and an advisory board member to the Coalition for Career Development. He holds an appointment of research associate professor at the University of Virginia Curry School of Education. Todd previously served as chief academic officer of K-12 college and career platform, Naviance.

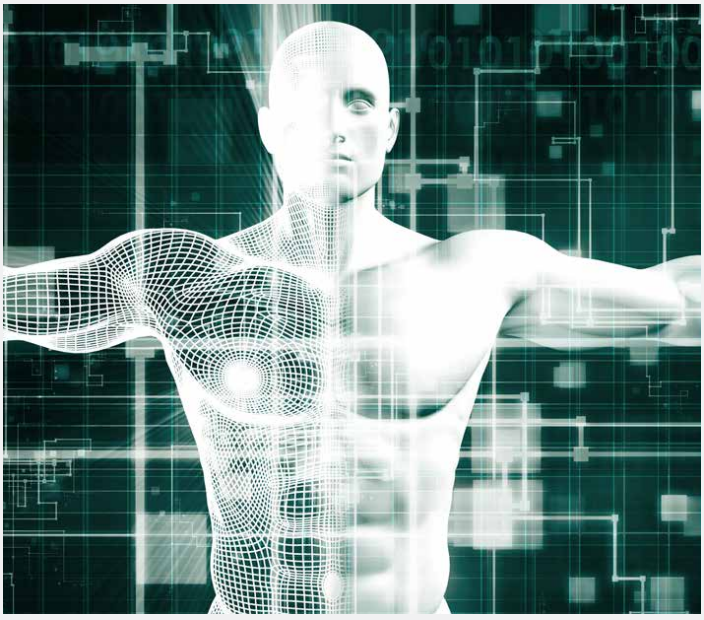
Introduction

This paper is the first of a three-part series that explores our experience implementing virtual reality ("VR") in our experiential, career-focused summer camp programs. Immersive VR fits well with Envision's instructional philosophy: learning by doing breeds passion; a variety of experiences is the spice of life; big, juicy questions drive deep thinking and leaps of learning; portable skills unlock the future; and building and following a roadmap leads to achievement.

We include in each piece our suggestions for teachers, curriculum designers, and school and district leaders who are considering or starting to implement VR in their classrooms. We hope that our "learning by doing" approach to VR will help educators who want to embed VR in their lessons to avoid pitfalls and roll-out the sort engaging learning opportunities that VR can offer students of all ages. Given how new we were to VR and how important it is to us that any new approach or tool we implement is successful, our VR project required careful planning and clear objectives.

Getting to Why VR?

From the start, we included key people from across our organization who would contribute to the success of the project. Our core VR team included Envision's chief academic officer, chief marketing officer, and head of product innovation. With the team in place, we took some time to reflect on why we were investing time and other resources into this endeavor. Some of these reasons included: 1) explore use of novel technology in non-traditional education; 2) elevate Envision programming through incorporation of leading-edge educational tools; and 3) create educational enrichment experiences in the virtual space that are difficult or impossible to replicate in the real-world.



Planning for Success

With a clear rationale for why we were moving forward with this VR project, we then identified key objectives for implementing VR into student learning experiences -- what did we want to accomplish and how would we know that the effort was successful? These objectives were the following: 1) utilize VR to enhance student understanding of specific career clusters; 2) design a virtual experience to wholly engage the target learner population; and 3) provide a novel element unique to the non-traditional education space in order to enhance the marketability of the program.

Given the limited time we had to implement VR into our National Youth Leadership Forum (NYLF): Advanced Medicine & Healthcare program taking place at Johns Hopkins University, we decided that we would adopt a rapid-prototyping approach to development. Key to this approach was not simply speed of work or effort, but rather an adherence to the iterative development process of "design, build, implement, and improve," with data collected along the way to fuel the process. (Data that informed this process will be discussed in part two of this three-part series.)

The Bleeding Edge...

The gaming industry is both the pioneer of and the largest industry application of VR technology. The VR gaming industry earned an estimated $286.7 million last year (2017), according to SuperData Research, and that number may grow to $2.3 billion by 2020. The gaming industry continues to push the envelope with regard to how realistic, deep, and generally immersive VR can become. The gaming industry is truly beyond the cutting edge of innovation in VR. However, VR is being used in many industries, often as a means of educating, not simply entertaining, people.

Content Expertise that Ensures Rich Experience

When researching VR in education, few options exist for turn-key development. One critical aspect of executing meaningful learning experiences is ensuring the right collaborators are involved - whether that involves consulting with proper subject-matter experts, employing expert facilitators, or identifying technical staff who can build/support the lesson[1],[2].

Our experience: When seeking out a partner in the healthcare simulation space to assist with design/development of a virtual operating room, the Envision team met with a handful of groups representing a spectrum of products in the augmented and virtual reality space. Experiences fell on one end of the spectrum or the other – either viewing passive 360° video of a previously executed surgical procedure or manipulation of a staged hologram of human anatomy. Nothing readily available on the open market combined the two concepts. Nor was anything designed that added sensory stimulus to demonstrate to the learner the feelings evoked by being immersed in a dynamic virtual learning environment. To prove our vision of using immersive VR as a training tool in workforce readiness, Envision sought the expertise of Arch Virtual to design and build a virtual operating room. As realism in the experience was one of the goals, the collective team brought on a subject-matter expert with extensive experience in designing healthcare simulations, Dr. Eric B. Bauman, to consult on the technical build. Based on the desired outcomes, a basic procedure involving a laceration in the patient's abdomen, was recommended with this short, believable narrative:

> *"The patient fell on a glass-top coffee table, shattering the glass under their fall and there is a laceration on the abdomen needing suturing."*

The design team was able to construct a scene walk-through that was achievable and still engaging to the target learner population. The outcome was a scene that engaged student learners and left room to improve as technology and expertise evolve.

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[1] *https://www.td.org/newsletters/atd-links/the-subject-matter-experts-role-in-training-and-instructional-design*
[2] *https://www.iste.org/explore/articleDetail?articleid=608*

Don't Forget:

- ✓ Engage experts for assistance throughout VR design and build
- ✓ Consider learning experts, not just technical consultants
- ✓ Experts can be costly upfront, but typically decrease potential build errors, which can be even more costly in direct dollars and time

We also highlighted an important element of any VR initiative, involving content experts, which we then described in our own specific project. To add to this piece we've included, below, resources that might be helpful to your process of implementing VR in your or school or district.

In the next piece of this three-part series, we will explore how the practical concerns of space and equipment make a difference for a VR-based student learning experience.

In this first of three part series, we've shared some of what we found to be essential planning practices, such as:

- Clarify why VR?
- Assemble the right team
- Define objectives
- Enable data to fuel your process

About the Authors

Dr. Jan Sikorsky is a vice president of Product Planning & Development at Envision. Dr. Sikorsky has been with Envision and LeadAmerica, now part of Envision, for more than thirteen years, holding a number of positions including vice president of education and director of academics responsible for science and skills development programs. Under his leadership, Envision's product offerings have hosted more than 100,000 students, providing in-depth looks into future academic and career success. In addition to his work at Envision, Dr. Sikorsky has held a number of adjunct faculty appointments including at Florida International University, where he's currently facilitates a fully online graduate level course in Forensic Biology. Dr. Sikorsky actively promotes quality teaching practices in science across the K-20 education continuum; having served on the National Science Teachers Association Committee on College Science Teaching – a committee charged with improving teaching practices of NSTA's more than five thousand college educators. Dr. Sikorsky holds his Ph.D. in Biomedical Sciences and M.S. in Forensic Science from Marshall University, as well a B.S. in Medical Technology from Michigan State University.

Jon Brouchoud is founder and CEO at Arch Virtual, a VR and AR development company that develops enterprise and education applications. Jon's strategic vision focuses on the praxis of virtual technology, and how it can be leveraged to offer measurable value solving real world problems. Under his leadership, Arch Virtual has completed numerous high profile projects for Fortune 500 companies that have consistently raised the bar and offered innovative concepts that harness the power and potential for VR and AR technologies. Jon holds a Master's Degree in Architecture from the University of Wisconsin, Milwaukee School of Architecture and Urban Planning.

About Envision

Envision is a nation-wide youth development organization devoted to improving student academic success and career readiness through experiential programming. Envision hosts college-accredited, academic- and career-focused programs for youth. Each Envision program employs a variety of instructional approaches – ranging from distinguished faculty-led lectures, to engaging small group activities, to real-world simulations, and subject-specific field excursions. Programs cater to 21st century skills development which are critical across all current and future careers. With a rich history dating back more than thirty years, Envision takes care in program design, development, and delivery in order to execute its mission – to ensure each student leaves having made progress on their career and life aspirations.

Resources

Envision/Arch Virtual offer a powerful team of operators that can assist with both lesson plan design and construction of authentic virtual reality. Both groups draw on experts across a number of career disciplines and can assist government, education, or private organizations interested in onboarding VR for educational or workplace training purposes. Address inquiries to: (curriculum/lesson plan design) to Dr. Jan Sikorsky, Product Innovation at Envision (jsikorsky@envisionexperience.com) or (coding/development/technical specifications) to Jon Brouchoud (jon@archvirtual.com).

Google Expeditions:
https://support.google.com/edu/expeditions/answer/6335093?hl=en

Discovery VR:
http://www.discoveryeducation.co.uk/discoveryvr

http://virtualrealityforeducation.com/about-us/

http://www.schrockguide.net/augmented-reality.html

http://www.classvr.com/school-curriculum-content-subjects/virtual-reality-resources/

Research

Games Research Lab at Teachers College, Columbia University:
http://www.tc.columbia.edu/games-research-lab/)

Michigan State University's Center for Avatar Research and Immersive Social Media Applications (CARISMA) Lab:
https://comartsci.msu.edu/research-and-creative-work/new-center-puts-msu-vanguard-virtual-reality-systems)

References

Virtual Reality in Schools: The Ultimate Educational Technology. Reid, Robert D.; Sykes, Wylmarie, T.H.E. Journal, v26 n7 p.61-63 Feb 1999

Super Data Research. Available: https://www.superdataresearch.com

Figures/Tables

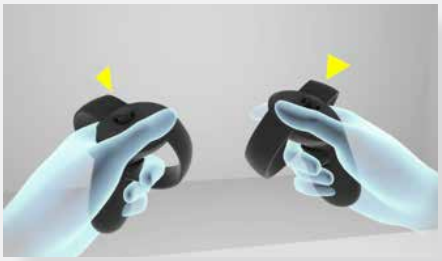

Figure 1. Oculus Touch controller tutorial in white room

Figure 2. Students preview each step of the procedure before the patient is brought in

Figure 3. 3D scan performed on medical actor to achieve realistic virtual patient with laceration on abdomen

Figure 4. Instruments prepared for the procedure

Figure 5. Ghosting is used to direct where an object is placed

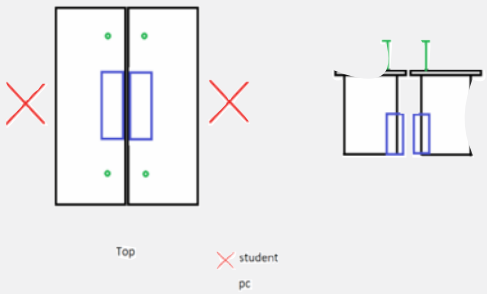

Figure 6. Basic diagram of platform positioning