*Resource scan*

Looking into Virtual Reality: A view of Virtual Reality’s role in online learning.

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# Need or problem

Technology has always played a role in the online learning or eLearning experience, acting as a key tool to help learners better understand and teachers better educate on a skill, process, or idea. Virtual Reality (VR) has become a recent technological innovation that could be used as a tool for education, but due to its relative infancy, there are many questions surrounding VR’s current, future, and even theoretical use in the education and training industries. Is it better or worse than current forms of online learning, and in what respects? What kind of financial investment is required for research and development interests, and what are some of the metrics current researchers are using to measure and argue those investments are valid and effective? This overview provides a starting point to other interested in learning more on Virtual Reality and its place in the eLearning industry.

# Search method

To curate content on VR, the online Auraria Library database was used with certain parameters in place to limit results to feasibility and the effectiveness of VR in a distance education setting. While results on augmented reality and mixed reality are equally interesting, those terms were excluded from search results. The term “virtual reality” was used to search for peer-reviewed journal articles in the education discipline, with subject terms like ‘validity’, ‘distance education/learning’, ‘instructional effectiveness’, ‘technology uses in education’, and ‘technology application’ selected as filters. The results presented below represent only a portion of the many industries using and discussing VR in education and training. Given VR’s infancy in the online education setting, results were limited to publications within the last five years.

# Resources

**Farra S, Miller E, Timm N, Schafer J. Improved training for disasters using 3-D
 virtual reality simulation. *West J Nurs Res*. 2013;35(5):655-671.**

One of the arguments made against Virtual Reality implementation is the new costs associated with this type of training compared to the continued practice of current classroom or online models. A counterargument, then, would be that if less overall training instances were needed over time with VR because there was better retention of information, perhaps VR offers a better return on investment. While the results apply to nursing students enrolled in a disaster course, the students who were exposed to the virtual reality simulation had much better retention of information in follow-up assessments of the material compared to their peers who only received the web-based modules. This encourages the notion that VR-based training, at least when applied to the appropriate situations, has the capability of benefitting learners as well as budgets. The idea VR can be cost effective helps me leverage VR ideas in my business, where every investment is scruitinized.

**Jensen L, Konradsen F. A review of the use of virtual reality head-mounted displays
 in education and training. *Education and Information Technologies*. 2017:1-15.**

This review paper looked at 21 experimental studies that used head-mounted displays (HMDs) as part of their virtual reality learning solution to determine what role and impact virtual reality is playing in training and educational environments. I am curious to know what areas of teaching, if any, are showing promise and where others could be dead ends. The results showed VR holding promise in skills acquisition in a number of areas related to understanding and remembering spatial and visual information, psychomotor skills related to head movement, and affective skills related to controlling emotional responses to stressful and difficult situations. I train a lot on physical products sold in retail, and being able to train on how to repair these products or become more familiar with its features by seeing 3D models is very compelling. Outside of these specialty subjects, however, VR is either as effective or worse than conventional methods thanks in part to things like cybersickness. It will be interesting to see if these results change in 5 more years when virtual reality is double its age, has improved hardware, people are more comfortable and familiar with wearing the technology, and researches have had more time to apply VR HMDs to other industries and learning areas.

**Köhler T, Münster S, Schlenker L. Smart communities in virtual reality. A comparison of design approaches for academic education. *Interaction Design and Architecture(s)*. 2014(22):48-59.**

Kohler and his TU Dresden staff use their experience and research to propose possibilities for adopting VR in teaching and training. A useful argument provided is the ability for VR to act as a “third place” for people to meet and collaborate, one which participants view as unique and different than other currently existing digital worlds. Collaboration and socializing is an important factor to learning, and the three-dimensional space VR offers allows for more realistic online collaborating than before. A simulation in a coffee shop using a three-dimensional representation of yourself is more realistic than a profile picture in a webinar, and this sense of realism allows people to feel more natural and able to communicate their thoughts and ideas to others. While meeting up in a coffee shop in real life then would be even better, that’s not always possible and so I like the fact this research group encourages the experimental use of VR around social learning constructs. I work as part of a remote team and thinking VR could help us collaborate more effectively, or that VR could help our participation and interaction in training webinars, is very encouraging.

**Lau KW, Lee PY. The use of virtual reality for creating unusual environmental
 stimulation to motivate students to explore creative ideas. *Interactive Learning
 Environments*. 2015;23(1):3-18.**

The author’s goals were to argue that virtual reality offers an opportunity for educators to use a new tool to try out an older technique: develop an unusual classroom environment, this time a virtual one, in an effort to have their students feel they can be creative and explore ideas, which in theory will facilitate more learning individually and socially. This paper encourages more teachers to take up VR as a way to experiment with learning in the classroom, if for no other reason than to try something different, not necessarily because it is more effective. The proposals put forward are creative in their own right, with the authors building upon conventional learning theories with students in a traditional classroom and how they could apply to VR. For example, while it would be one thing to simply create a virtual classroom for students, it would be quite another to invite students from around the state, nation, or world into your virtual classroom – something physical classroom environments cannot do, no matter how well they are decorated. Applying this to the business environment I work in, this makes me curious if virtual reality rooms are being used as a tech support place, where people could congregate and talk through problems, or visit for troubleshooting solutions.

**Lee SH, Sergueeva K, Catangui M, Kandaurova M. Assessing google cardboard
 virtual reality as a content delivery system in business classrooms. *Journal of
 Education for Business*. 2017;92(4):153.**

Google Cardboard is a low-cost kit that allows a user to take most currently in-use Android operated mobile phones and convert it to a HMD for things like 3D videos. This study examined the potential a 360 degree, three-dimensional (3D) video could have on a business classroom learning environment compared to conventional, flat-screen (FS) video. The results did show that compared to those who received the FS video, users with the Google Cardboard VR did report higher scores of enjoyment and interest. However, there was no superior effect for content delivery in terms of understandability or reliability. Both of these results are important to my career, as I am in the process of exploring proper use cases for 360 and 3D video projects. The result that the 3D video was simply more enjoyable is important to me because I create training content for adults that is not mandatory but competes with the trainings other businesses develop for the attention of retail sales associates. Holding other variables constant, offering Google Cardboard or VR-compatible videos in addition to our traditional FS options could lead to more overall consumption of our company’s content compared to our competitors.

**Merchant Z, Goetz ET, Cifuentes L, Keeney-Kennicutt W, Davis TJ. Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. *Comput Educ*. 2014;70:29-40.**

This often-cited meta-analysis paper determines VR is an effective learning solution, at least for the k-12 and higher education industry. It also presents the most common design methods that emerge to be the most effective: games, simulation, and virtual worlds. By compiling results of studies showing VR effectiveness across games, simulations, and virtual worlds the authors are able to present a guideline as to which VR design methods could prove most effective, given the situation at hand. For example, game-based VR solutions are best for simple skillful tasks requiring few steps, and is enhanced when the game is played individually as compared to in a group. When considering certain VR designs, it is useful for me to know that there is evidence to base design decisions upon.

# Takeaway

A key takeaway from this resource scan was seeing that not only is there empirical evidence to support VR being an effective learning tool, but researches and academics have begun publishing findings on its efficacy in specific industries. Based on my search results, one would be led to believe VR is being utilized the most in learning scenarios that require the learner to be “hands on” like for a medical procedure, or apply what they have learned in theory to a real-life simulation like reacting to a natural disaster scenario. While results are encouraging, more research is needed in to how effective VR is or could be in the more traditional K-12 and the corporate learning environments, rather than to novel situations. Overall the difficulty of researching cutting-edge technology with empirical research is the technology innovations move faster than the peer-review process, and some findings – while young – are now also out-of-date.

Personally speaking, this was my first experience using the Auraria Library online database in the ILT program or any university-sponsored academic journal database since my undergraduate concluded in 2010. After navigating the portal as well as watching the tutorial videos on its features, I am so impressed at how much information is available to me, including how there are other databases to be found within the Auraria Library repository like OneFile or ProQuest eBook, so I can search specific types of resources or more specifically within a subject matter. The sheer number of online ready resources, and how easily accessible they are, is remarkable. While I value the physical presence the CU library infrastructure includes, I feel confident I can do thorough research from the comfort of my home as well.