Optimized Learning with Virtual Reality

Proposal

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**Purpose**

With the prospect of commercial space travel, we approach a new set of skills that must be taught to the general public if they wish to be a part of it. A fast-growing area of technology is virtual reality, which can be used to fast-track the learning process of many endeavors, including being space ready. For this project, virtual reality will be used to discover if the tactile nature of the technology aids in the learning process of both coordinated and procedural skills. Providing information for many senses when teaching new skills results in greater success in the learning objective. **Since virtual reality technology stimulates the tactile sense unlike video, while still providing visual and auditory information, it will allow people to learn skills faster and with greater ability to perform them.**

It goes without saying that educating people more efficiently is an important goal of the modern world. Teaching skills faster and with better quality will ensure that efforts to teach said skills are met with the highest possible yield. Most contemporary methods of teaching utilize visual ways of communication, be it text or pictorial aids, as well as auditory ways like vocal explanation. The only way the tactile sense is currently exploited is to have a subject physically interact with a learning environment. The problem with this method is that it can be very expensive to construct and is not very flexible. Depending on the skill to be taught, the environment can be very expensive, especially if it requires special equipment. This kind of environment is likely very inflexible as well. Virtual reality technology in its current state has the advantage of simulating these environments at a relatively low cost and with few limitations. In fact, because the environments in VR are virtual, there are things possible in these environments that are not in the ones they simulate, such as flying or heads up displays. These reasons make VR a prime medium for accelerated learning of skills suited for tactile learning.

The goal of this experiment is to quantifiably measure what advantages learning in VR has against learning with video. Video is chosen as a control method as it utilizes both visual and auditory communication. Tactile learning is a rare and important method when it comes to physical skills, but VR makes it flexible and reusable in the modern world.

**Existing Research**

Many existing studies focus on a formal academic environment in the world of virtual reality learning. They look at how bring virtual reality to the classroom can help learn traditional subjects. One study compared flight simulation performance between traditional flight simulation hardware and a virtual reality simulation, which found that virtual reality users did not perform as well as those using the traditional equipment (Oberhauser et al., 2018). This is different, however, because it concerns performance within virtual reality rather than experience in virtual reality translating to the real world.

This study focuses on hands-on skills that are otherwise difficult to teach in a classroom. In this study, the question of “does virtual reality offer greater teaching power for skills” applies only to concrete skills that require physical activity in some part, not abstract skills like communication, empathy, or time management. Little research is done that makes this distinction, and the likely reason is that it seems trivial. Although some may deem the results of this study obvious, it is imperative that research is done to solidify the facts so that it supports future applications of the following ideal: virtual reality could and should be used to condition physical skills due its versatility, economy, and supernatural limitations.

**Method**

Experiment

The experiment will consist of a control group and an experimental group of equal size. The participants will be screened to ensure they do not already have the skills this experiment sets out to teach them. Those who claim inexperience in the skills will undergo an initial skills competency test to mark their baseline ability.

One skill will be rooted in coordination, such as the games cornhole and ladder toss. This will study the relationship between physical coordination practice in virtual reality and in reality. The other skill will be based on remembering and executing a procedure. An example would be the emergency protocol for an air or spacecraft.

The control group will watch a lesson video for each skill, and then they will undergo a competency test to score their ability to perform the skill they learned. These tests will contain metrics to measure both speed and quality of execution, which will vary per skill. The subjects will take the tests multiple times to measure short-term longitudinal metrics as well.

The experiment group’s experience varies from the control group only in that instead of watching videos, they will use a virtual reality headset and set of controllers to interact with virtual learning environments for each skill. These subjects may be given a short tutorial on how to use the hardware in the likely event that they are not familiar with it.

Results Analysis

Once all experiments are gathered, the results and observations will be aggregated and analyzed in the following categories:

Onset Skill Delta – The difference between the subject’s baseline ability to perform the skill and their first test score post-education.

Latent Skill Delta – The difference between the subject’s baseline ability to perform the skill and their last test score post-education.

Skill Aptitude – The growth rate in scores from subject’s initial test post-education and their last.

**Timeline**

Jul 13

Begin development of virtual learning environments

Jul 27

Quality assurance for virtual learning environments

Aug 10

Begin experiments

Aug 24

Report & Analysis

Aug 31

Develop presentation & symposium poster

**Materials**

HTC Vive Cosmos Elite Virtual Reality Kit

16 GB USB Flash Drive (for videos)

Cornhole or Ladder Toss Game Kit

**Deliverables**

2x Virtual Learning Environment

2x Video Skill Lesson

Experimental Results

Research Report and Analysis

Research Presentation

Symposium Poster

**References**

Oberhauser, M., Dreyer, D., Braunstingl, R., & Koglbauer, I. (2018). What’s real about virtual reality flight simulation? Comparing the fidelity of a virtual reality with a conventional flight simulation environment. Aviation Psychology and Applied Human Factors, 8(1), 22–34. <https://doi.org/10.1027/2192-0923/a000134>