# Virtual Reality as a Tool for Career Development

A Technical Report submitted to the Department of Engineering and Society

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

**Jason Nguyen**

Spring, 2024

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

Advisors

Gerard Fitzgerald, Department of Engineering and Society

Rosanne Vrugtman, Department of Computer Science

# Virtual Reality as a Tool for Career Development

CS4991 Technical Report, 2024

Jason Nguyen
Computer Science
The University of Virginia
School of Engineering and Applied Science
Charlottesville, Virginia USA
jtn4rpr@virginia.edu

**ABSTRACT**

In the contemporary job market, a significant number of professions require a combination of relevant skills, education, and/or experiences which comes at a substantial financial cost. Given this problem, a proposed solution is to use Virtual Reality (VR) as a method for career development by using its simulated three-dimensional environment. I propose to validate pre-existing software and applications embedded in The University of Virginia's VR laboratory to replicate training scenarios. One test group will undergo skills training with VR, while the second group engages in training without VR. Results will ideally show that VR used in career development demonstrates the same effects compared to conventional training methods. Future work will tackle the use of VR in tandem with conventional methods and determine the level and direction of correlation.

## 1. INTRODUCTION

In the contemporary job market, a significant number of professions require a combination of relevant skills, education, and/or experiences in order for success. Cuddy, et. al. (2015) states that individuals who invest time and effort in improving their qualifications tend to perform better in interviews and have a greater chance of obtaining the job. Unfortunately, acquiring these skills and qualifications comes at a substantial financial cost. Various online platforms have played a pivotal role in attempting to decrease this financial outlay. Websites like Khan Academy and LeetCode provide accessible and free educational resources for a wide array of subjects for users to enhance skills.

While these platforms offer valuable educational resources for free, they do not replicate real life coding interviews or personalized teaching. Although technical interviews involve problem-solving skills that these platforms help develop, it also includes communication skills, effective problem solving, and context-specific tasks, taught generally in real life environments (Rand, 2022). Given the limitations of these platforms replicating real-life environments, an emerging solution is VR, a simulated three-dimensional environment that enables users to explore and interact with a virtual surrounding that mimics reality (Sheldon, n.d.). This technical topic focuses on the potential of VR as a more cost-effective and accessible method for professional training and education.

## 2. RELATED WORKS

A number of sources fueled the main project ideas and research basis. Lasserre (2022) addresses many use cases for VR in the military and defense industries. These uses include safe and realistic training simulations for soldiers and engineers. One of the biggest advantages Lasserre addresses

is that it allows new recruits to train under realistic conditions and allows military recruiters to meet recruits wherever they are and keep them engaged. My project takes this usage of VR for training but puts it into other mainstream jobs, such as computer science and education.

However, Han (2022) addresses many current issues users face while interacting with VR. He saw that there are concerns about VR experiences raising ethical dilemmas related to behavior, identity, and social norms. One of the dilemmas discussed is escapism, a need to "leave" the real world, cognitively and emotionally. With the implementation of VR in career development, which incentivizes users in reality by improving real world skills, these social groups believe people with issues of escapism will not leave the VR, leading to potential psychological issues, including a detachment from reality, escalation of addiction and loss of motivation. My project takes these concerns and attempts to prove that VR is safe if used in moderation.

## 3. SYSTEM DESIGN

In order to validate VR as an effective method for training development, demonstrating the effectiveness and safety of this technology for long-term skills advancement is crucial. Therefore, the research focuses on answering the question:
*Can VR be used for frequent and long-term periods of learning?*
Specific inquiries include the duration individuals can comfortably stay in VR, their ability to learn and retain knowledge inside the environment, and their overall perception of VR as a viable training method for professionals. To address these questions, two experiments were conducted by me in my home over a span of two weekends involving a diverse group of eight participants, including current employees and university students.

The first experiment sheds light on the feasibility of utilizing VR for extended periods of time. By simulating realistic conditions, tolerance levels and comfort thresholds can be better understood, which is crucial for several reasons. One: It helps determine whether the duration of time individuals spend in VR, within established safety parameters, is reasonable for professional training purposes. Two: It provides insight into usability and user experience as well as pinpoints areas for improvement in VR systems.

The second experiment delved into the viability of learning within a virtual environment, which is crucial for validating the effectiveness of VR training. By assigning tasks, a participant's ability to engage with educational content while immersed in the VR can be studied. Realistic break schedules and note-taking abilities facilitated through the VR controller, mimicking realistic work environments would provide insights into the potential of VR for educational purposes, underscoring its capacity to simulate real-world scenarios.

### 3.1 Duration and Comfort Experiment

Participants entered the virtual environment and remained until they felt uncomfortable or strained, with a limit of four hours for safety. Short breaks (five minutes) were scheduled every 30 minutes, with a 20-minute break after two hours for restroom usage, hydration, and food. Virtual games and web browsers were available to maintain user interest. After exiting VR, participants provided feedback on their experience and factors influencing their decision to remove the headset. Sample questions participants were asked include:

- What was your main reason for exiting the device? Did you leave due to boredom, discomfort, or other factors?

- As you stayed in the virtual environment, did you feel any mental or physical discomfort?

### 3.2 Learning Viability Experiment

Participants were tasked with two specific assignments: first, to conduct an analysis on the first Netflix episode of "Avatar: The Last Airbender"; and second, to provide a succinct summary of "A Supposedly Fun Thing I'll Never Do Again" by David Wallace (approximately 250 words each). For both tasks, participants were required to engage with the content within the virtual environment. For the video analysis, participants were told to watch the entire video, with one 5-minute break halfway, during which they were encouraged to pause and take notes using the headset's tools. Similarly, for the article summary, participants read through the entire document, with identical break intervals but were free to note-take anytime during the reading.

Following completion of these tasks, participants were asked about their overall experience and opinions about engaging in these educational activities within the virtual environment. Although the time completed and summaries themselves were not subject to analysis, participant responses about their experience were analyzed to draw conclusions regarding the efficacy of learning in a virtual setting. Sample questions participants were asked include:

- How did you find the experience of engaging in educational tasks within the virtual environment compared to traditional methods?
- Do you believe that VR has the potential to be a viable method for career development in today's industries? Why or why not?

## 4. RESULTS

The results of the experiments provided insight on the suitability of VR for frequent and long-term training development. The first experiment concluded that participants could comfortably spend a reasonable time within the virtual environment, long enough to engage in activities such as skills training. The second experiment concluded that the efficacy of learning in a virtual environment was present and that participants saw VR as a good tool to use for career development.

The first experiment resulted in an average of 1.57 hours spent in the virtual environment, with a minimum of one hour and a maximum of two hours. Although there is no set duration someone should spend practicing, studies show that most adults practice a skill for 45-60 minutes a session (Kageyama, 2009), which falls under the average time found in this experiment. From the post-experiment feedback participants provided, almost every individual said that their main reason for exiting the environment was lack of enthusiasm after breaks. This is reasonable, as there were no tasks for participants, and although streaming entertainment and video games were provided to maintain interest, it may not have appealed to everyone.

Additionally, only one participant reported leaving the virtual environment due to physical strain, as seen by the only duration that was not within a break period. However, the symptoms that were reported, such as eye strain and headaches, are identical to symptoms of extended screen time (Kaspersky, n.d.), and the participant remained comfortably in the VR for over an hour. This demonstrates that VR can be used safely for extended periods of time, provided users adhere to outlined safety protocols.

The "Learning Viability Experiment" showed that participants generally found the experience of engaging in educational tasks within the virtual environment enjoyable

and recognized its potential benefits in industry development. When asked how they felt interacting in the VR with each task, every participant said the immersive nature of the virtual environment enabled them to more effectively engage with the content. This feedback was anticipated, as once immersed in the VR, participants were able to tune out outside distractions, focusing solely on the material and notes at hand.

It is noteworthy that all participants demonstrated a general understanding of both the video and the article, as evidenced by their summaries, showing an effective engagement with the content. Every participant also expressed appreciation for the convenience of having their notes readily accessible beside the content, regardless of their physical orientation. Two participants noted their comfort in being able to sit or lie down while completing these tasks because of the headset being attached to participants. In traditional note-taking scenarios, users often have to constantly shift their focus between their written or typed notes and the content they are studying, which can disrupt concentration and flow of learning (Navin, 2020). However, in the virtual environment, this did not occur due to the fact that notes were always present on the screen along with the material at hand.

Despite this, when asked about their opinion about VR as a viable method for career development, every participant expressed optimism but were hesitant to fully embrace it over current traditional methods. Most participants commented on the technology's immersive capabilities and ability to generate unique environments, noting that its features fostered a deeper sense of engagement and allowed for more interactive learning experiences.

As the technology currently stands, participants expressed skepticism about its applicability in other fields, noting limitations and practical challenges during their experience. One of the common limitations was the note-taking tool. Despite it being so accessible, the headset used had no easy writing utensil, such as a keyboard or electronic pen, making note-taking much longer and more difficult.

Another common complaint was the quality of the environment, noting that the material present was blurry and the surrounding environment looked almost "block-like." These results demonstrate that despite the technology's limitations, learning is still fairly effective. Instead, one of the biggest reasons VR has not seen widespread adoption in industries is attributed to its underdeveloped state.

## 5. CONCLUSION

While there is current evidence that VR can be and is being used in industries, its lack of standardized development, innovation, and safety standards have prevented it from expanding to other fields. In order to achieve an effective integration of VR in career development, major stakeholders must be convinced that VR can indeed be a viable and safe method.

My research suggests that while VR is perfectly safe to use frequently with adequate rest time, the technology needs hardware improvement in order to see mainstream usage in industries. With the current technology, VR is already bringing a unique training environment to users that is not found in traditional training environments. It is currently producing a realistic and safe environment for users to learn new skills with minimal risks.

If developers chose to fix current issues with it, there is no reason for major stakeholders in various fields not to invest. The hope is that this and future research will result in greater innovation in VR as a whole to facilitate mass integration of this technology into career development.

## 6. FUTURE WORK

One of the biggest limitations to this research was the technology available. Despite having a fairly up-to-date model of a VR headset, the software had no free educational or learning apps for participants. Therefore, the content of the second experiment had to be adjusted and external materials were imported into the virtual environment to simulate learning scenarios. Although the second experiment did simulate a learning environment, it was not unique to a virtual environment as the tasks presented could have easily been done outside of the environment. Therefore, it would be unjust to claim that VR is an effective learning tool from this experiment. In a more ideal research it would have been better to purchase one of the technology's educational applications and use that to simulate a learning environment for participants in order to better judge the effectiveness of VR for skills training.

If I were to perform this experiment again or continue this research, I would want to increase the sample size of participants. Five participants is not an adequate sample size to draw definitive conclusions about the validity of VR in career development. Next time, I would plan to obtain more VR headsets and conduct these experiments on multiple participants at once, in order to generate a greater sample size.

## REFERENCES


[1] Cuddy, A. J. C., Wilmuth, C. A., Yap, A. J., & Carney, D. R. (2015). Preparatory power posing affects nonverbal presence and job interview performance. The Journal of applied psychology, 100(4), 1286–1295. https://pubmed.ncbi.nlm.nih.gov/25664473/

[2] Han, D. I. D., Bergs, Y., & Moorhouse, N. (2022). Virtual reality consumer experience escapes: preparing for the metaverse. Virtual Reality, 26(4), 1443-1458. https://blog.techviz.net/4-use-cases-for-virtual-reality-in-the-military-and-defense-industry

[3] Kageyama, N. (2015, July 21). How Many Hours a Day Do You Need to Practice? Medium. https://medium.com/@noa_kageyama/how-many-hours-a-day-do-i-need-to-practice-8888a286a1f5

[4] Kaspersky. (n.d.). How does technology affect your physical health? Kaspersky. https://usa.kaspersky.com/resource-center/preemptive-safety/impacts-of-technology-on-health

[5] Khan Academy. (n.d.). Khan Academy. https://www.khanacademy.org/

[6] Lasserre, S. (2022, November 2). Use Cases for Virtual Reality in the Military and Defense Industry. TechViz Blog. https://blog.techviz.net/4-use-cases-for-virtual-reality-in-the-military-and-defense-industry

[7] Navin, C. (2020, November 19). Pros and Cons of Typed, Digitally Handwritten, and Paper Notes | GUTS Tip. GUTS. https://guts.wisc.edu/2020/11/19/pros-and-cons-of-typed-digitally-handwritten-and-paper-notes/

[8] Rand, B. (2022). How To Prepare for Your Coding Interview in 10 Steps. Indeed. https://www.indeed.com/career-advice/interviewing/how-to-prepare-for-coding-interview

[9] Sheldon, Robert. Definition of virtual reality. TechTarget. https://www.techtarget.com/whatis/definition/virtual-reality

[10] "The World's Leading Online Programming Learning Platform." LeetCode, leetcode.com/.