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Immersive Philosophical Thought Experiments Through Virtual Reality

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ABSTRACT

Virtual reality (VR) is transforming higher education by providing immersive and interactive learning environments that enhance traditional pedagogical methods. While disciplines such as medicine and engineering have been early adopters of VR for skill development and simulation training, its potential in the humanities, particularly Philosophy, is only beginning to be explored. Philosophy courses often challenge students to grapple with abstract concepts and complex ethical dilemmas which can feel disconnected from real-world applications. VR offers a unique opportunity to bridge this gap by allowing students to experience these scenarios in lifelike, immersive settings. This study examines the use of VR in university courses by teaching the classic Trolley Problem taught across Philosophy departments, especially as part of introductory courses to the field. The experiment used an A/B test approach to get feedback on the participants' experience and their attitudes towards VR and traditional classroom approaches to teaching the Trolley Problem thought experiment, represented in this experiment as a video lecture. While the experiment uncovered a range of interesting information, key results indicate evidence the VR experience was perceived as different or more impactful when deciding what decision to make in the thought experiment, strong support for the VR experience as a learning tool, preference for the virtual reality experience over a video presentation of the same material, and a wish for inclusion of VR content in courses regardless of previous experience with VR or videogaming. The paper also discusses additional connections in the data, methodological limitations, and opportunities for future research.

Keywords: Virtual reality, Augmented reality, Education, Pedagogy, Simulation, Philosophy, Trolley problem

INTRODUCTION

Virtual reality (VR) is transforming higher education by providing immersive and interactive learning environments that enhance traditional pedagogical methods. While disciplines such as medicine and engineering have been early adopters of VR for skill development and simulation training (Cipresso et al., 2018), its potential in the humanities, particularly Philosophy, is only beginning to be explored. Philosophy courses often challenge students to grapple with abstract concepts and complex ethical dilemmas which can feel disconnected from real-world applications. VR offers a unique opportunity to bridge this gap by allowing students to experience these scenarios in

lifelike, immersive settings. For example, VR can place learners directly within thought experiments, such as the classic Trolley Problem taught across Philosophy departments, especially as part of introductory courses to the field. It is thought that doing so can foster deeper understanding and emotional engagement. The research presented here examines the increasing role of VR and related technologies in higher education (Asad et al., 2021; Millett, 2002), with a focus on its application in Philosophy courses (Henry, 2013), highlighting its potential to revolutionize the way abstract and theoretical concepts are taught.

Testifying to the widespread interest in both VR and the Trolley Problem, researchers from the areas of Philosophy, neuroscience, psychology, and communication have produced studies, articles, and polemics in this area (Ramirez and Labarge, 2018; Ramirez, 2018; Ramirez, 2022; Francis et al., 2017; Francis et al., 2018). Some of this literature focuses on experiments using a VR version of the Trolley Problem, particularly the Experience Machine VR software developed by Erick Ramirez et al. (2018). Other entries in this area give arguments about whether it is either morally appropriate or methodologically sound to use VR versions of the Trolley Problem, and still others focus on varying the mode of delivery. In short, the last several years has seen an increase in literature exploring the use, impact, delivery, ethics, and shortcomings of using a VR version of the Trolley Problem in psychology, experimental philosophy, and other areas.

METHOD

This research employs a traditional experimental design exposing participants to two experiences to help them learn about the Trolley Problem thought experiment. In one version, the participant watches a video created by a faculty member in Philosophy who gives a lecture style explanation. In the second version, participants wear a VR headset and participate in a 3D environment with a train on tracks that will hit animated characters who are calling for help. The participant can control the track switch allowing them to virtually partake in the thought experiment. The VR version was created by the research team in the Unity 3D videogame engine and employed a Vive Pro 2 VR system.

Following Institutional Review Board approval, participants were recruited by soliciting adult faculty, staff, and students at a midsized public university in the American Midwest. Participants provided basic demographic information including their gender, level and area of education, comfort with technology, and experience using VR or videogames. The experiment used an A/B test approach to get feedback on the participants' experience and their attitudes towards VR and traditional classroom approaches to teaching the Trolley Problem thought experiment. Each participant was randomly placed into group A or B. Group A experienced the VR version of the lesson first, and the video version second. Group B experienced the options in reverse order to minimize immediacy bias (analysis of internal consistency in answers and participant grouping showed no significant effect from being in either group).

After each of the individual experiences, participants responded to a non-comparative instrument with 11 questions, specific to that modality. Each question was a Likert scale that asked them to rate their level of agreement with a given statement about the experience (1=Strongly disagree, 2=Somewhat disagree, 3=Neutral, 4=Somewhat agree, 5=Strongly agree). Questions in these non-comparative instruments were disordered to help check for internal consistency. After completing both experiences, participants responded to an instrument with 32 questions that directly compared the two experiences through the same style of Likert scale statements.

RESULTS

Questions in the instruments were designed to assess three lines of inquiry:

- **Type A:** Whether the VR or video modalities changed how participants made their decisions when considering the Trolley Problem thought experiment.
- **Type B:** Whether the VR or video modalities helped participants better understand the Trolley Problem thought experiment.
- **Type C:** Whether participants had a preferred modality for learning about the Trolley Problem thought experiment.

Data was collected as part of a larger analysis, but the results presented here focus on Type A and Type B. The study participants ($N = 30$) included 18 females and 12 males. 28 of them ranged from 18–28 years of age, while the others were 40 and 42 years old. Half the participants were undergraduate students, another 12 were graduate students, and the rest held either a master's degree or a doctorate. Except where noted, age and education did not indicate a statistically significant impact on responses across the group. Analysis of data from the participants took the form of descriptive statistics, crosstabs, and t-tests. A number of tests were run looking at each combination of related items on the instruments to address the three lines of inquiry. Full data and test results are available, but only relevant items are included here. In addressing the two lines of inquiry, some notable results become readily apparent.

Type A: Whether the VR or Video Modalities Changed How Participants Made Their Decisions When Considering the Trolley Problem Thought Experiment

A consistent theme in the results was the VR experience being perceived as different and more impactful when deciding what decision to make in the Trolley Problem thought experiment. For example, participants strongly agreed with the statement "The VR experience made me want to save the people who might be hurt by the train more than the video experience" ($M = 4.17, SD = 0.99$) and disagreeing with the opposite "The VR experience made me want to save the people who might be hurt by the train less than the video experience" ($M = 2.57$, $SD = 1.50$) with a paired t-test ($p < .001$) indicating the difference was significant (see Table 1). Similar results were

found (see Table 2) when participants were asked about whether they felt more sympathy in the VR experience ($M = 4.23$, $SD = 0.94$) compared to less sympathy ($M = 1.67$, $SD = 0.99$).

Interestingly, when asked if they made the same moral decision in the VR experience as they did in the video version ($M = 3.93$, $SD = 1.46$) the participants generally indicated they did not change their stance on the philosophical issue. This might indicate that rather than the VR experience changing their answer to the philosophical question, it instead impacts the strength of their feelings rather than their direction.

Table 1: Participants wanted to save people more after VR experience.

	The VR experience made me want to save the people who might be hurt by the train more than the video experience	**The VR experience made me want to save the people who might be hurt by the train less than the video experience**
Mean	4.167	2.567
Variance	0.971	2.254
Observations	30	30
Pooled variance	1.613	
Hypothesized mean difference	0	
df	58.000	
t Stat	4.880	
P(T<=t) one-tail	<.001	
t Critical one-tail	1.672	
P(T<=t) two-tail	<.001	
t Critical two-tail	2.002	

Table 2: Participants felt more sympathy after VR experience.

	The VR experience made me more sympathetic towards the people who might be hurt by the train than the video experience	**The VR experience made me less sympathetic towards the people who might be hurt by the train than the video experience**
Mean	4.233	1.667
Variance	0.875	0.989
Observations	30	30
Pooled variance	0.932	
Hypothesized mean difference	0	
df	58.000	
t Stat	10.299	
P(T<=t) one-tail	<.001	
t Critical one-tail	1.672	
P(T<=t) two-tail	<.001	
t Critical two-tail	2.002	

Type B: Whether the VR or Video Modalities Helped Participants Better Understand the Trolley Problem Thought Experiment

Participant responses indicate strong support for the VR experience as a learning tool. When asked if the VR experience of the Trolley Problem thought experiment helped them understand it better than the video ($M = 4.55$, $SD = 0.78$) they indicated agreement, and disagreed with it helping less than the video ($M = 2.48$, $SD = 1.62$) with statistical significance. The standard deviation of responses does indicate likely exceptions, but this is difficult to fully address given the sample size.

When asked "If I was taking a philosophy course I would want the professor to include the VR experience as part of the class" results were stronger ($M = 4.45$, $SD = 0.69$) than when asked whether they would want the professor to include the video experience ($M = 3.67$, $SD = 1.03$) indicating the VR was well received. These two questions are not opposing, meaning students could want both to be included. However, the data in this particular case supports stronger support for the VR experience, with the video version ranked somewhere between "Neutral" and "Somewhat Agree." When directly compared, data indicates a strong preference for VR over the video with regard to learning (see Table 3). Participants strongly agreed with the statement "If I was going to explain the trolley problem thought experiment to a friend, I would use the VR experience instead of the video experience" ($M = 4.37$, $SD = 0.81$) compared to weak support for using the video instead ($M = 1.90$, $SD = 1.21$) or the option of using neither ($M = 2.17$, $SD = 1.15$).

Table 3: Participants preferred learning in VR over video.

	If I was going to explain the Trolley Problem thought experiment to a friend, I would use the VR experience instead of the video experience	**If I was going to explain the Trolley Problem thought experiment to a friend, I would use the video experience instead of the VR experience**
Mean	4.367	1.900
Variance	0.654	1.472
Observations	30	30
Pooled variance	1.063	
Hypothesized mean difference	0	
df	58.000	
t Stat	9.265	
P(T<=t) one-tail	<.001	
t Critical one-tail	1.672	
P(T<=t) two-tail	<.001	
t Critical two-tail	2.002	

DISCUSSION

The most important finding is the strong, positive response to the use of VR as a pedagogical tool participants seem to enjoy. Philosophy, as a discipline, is often under threat in higher education due to a focus on job training or students-as-consumers. When enrolment drop, as they have in recent years in many humanities, Philosophy included, it is useful to have learning modalities available that will engage adult learners. Philosophy can be a fun, exhilarating activity, but is often considered dull, abstract, or too difficult. This study finds initial evidence that increasing the use of VR experiences in Philosophy classes appears to engage learners in different and positive ways. It also has the potential to get students to engage with otherwise abstract and seemingly far-fetched thought experiments due to its immersive nature.

There are real limits to the use of thought experiments (Ramirez, 2017). Insofar as they rely on our imagination, the quality of the imagining will vary with the quality of the imagination. Whether in Philosophy or related fields, there is at least some controversy over the degree to which we can learn something important about the real world just by "thinking or imagining really hard" (Fehige, 2023). Beyond these general concerns about thought experiments, a practical concern is whether or not students are imagining cases with sufficient detail, empathy, and care. Designing a VR version of thought experiments may ameliorate these concerns. VR versions of thought experiments can help force students to dismiss irrelevant features, ignore potentially biasing imaginative factors, and simulate the immersion of being physically present for the experience itself (Ramirez, 2017). The results in this research indicate there is high potential for these kinds of advantages when leveraging VR in Philosophy courses.

LIMITATIONS AND FUTURE RESEARCH

In this study, we applied VR to philosophical thought experiments to test the influence of VR on an individual's ethical choices, their preference between VR and video, and their judgment about how well they learned or understood the relevant philosophical content. The experiment could be improved in future iterations in three main areas. First, the scale of the study is small and while there were statistically significant results, it is likely this data is not generalizable to adult learners generally. A larger study with multiple samples would certainly be of use, and the results so far warrant the effort. Second, the scenario in the VR could be improved in order to seem more lifelike and impressive in order to accurately judge the degree to which the VR experience of the Trolley Problem is relevant to influencing an individual's ethical choices. This would also allow the contrast between the VR experiment and the video experiment to be starker. Third, there is reason to think the instruments could be briefer and more precisely worded. There were participants who commented that some of the questions made them feel confused as they seemed to be asking similar questions.

One finding of interest related to educational experience. On a handful of measures, undergraduate and graduate students' responses differed in a way that was statistically significant. They were not contradictory but

rather indicated differences in strength or intensity of belief. The existing data cannot currently explain this, and it may be a ripe for future work. Another finding of interest is related to gender distribution. On a handful of measures, women and men responded differently in a way that was statistically significant and is also worthy of future analysis in a larger study.

These new opportunities may enable researchers of VR in Philosophy education to develop new pedagogy and improve their teaching effect. VR can simulate a real-time scene for individuals to experience, which leads to a more authentic action or psychological reaction to the environment they are in. More research is needed to explore the reason that individuals make ethical decisions in a certain scenario through VR experiment and the decision's relationship with their psychology, emotion, and characteristics.

CONCLUSION

This research has presented several potential uses for VR in the Philosophy classroom, both as a concept and in terms of the specific use case of the Trolly Problem thought experiment. The summarized results indicate key takeaways from that may be useful, helpful, and practical for Philosophy faculty. The development of VR technology is not stopping or slowing. While the discipline of Philosophy is old, the questions and issues remain as relevant today as they were in the time of Plato or Kongzi. This study indicates modern tools would bring great benefit to its instruction among adult learners.

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