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Comparison of Standard 2D and Virtual Reality-Based Teaching of Moral Dilemmas: the Case of the Trolley Problem

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Abstract. This study investigates the comparative effectiveness of 2D and Virtual Reality (VR) methods for teaching moral dilemmas, using the Trolley Problem as a case study. Twenty participants, divided equally into 2D and VR groups, were assessed pre- and post-intervention using the Moral Foundations Questionnaire (MFQ) and Utilitarian Scale (US). Quantitative results revealed a nuanced impact: the 2D method improved fairness and altruism, while the VR method slightly enhanced utilitarian reasoning but risked distraction from abstract moral principles. Qualitative feedback highlighted VR's immersive potential to increase engagement but raised concerns about its suitability for abstract moral reasoning and practical limitations such as equipment cost and discomfort for some users. These findings underline the importance of integrating both approaches to balance immersion and structured learning. The study contributes to the discourse on technological advancements in moral education, emphasizing the need for tailored applications.

Keywords: Moral Education, Virtual Reality, 2D Teaching, Trolley Problem, Ethics.

1 Introduction

The growing accessibility of VR technology presents an opportunity to revolutionize traditional teaching methods by enhancing interactivity and engagement. Immersive experiences provided by VR allow learners to simulate real-world scenarios, offering a deeper understanding of complex concepts like ethics. However, this raises questions about whether the heightened engagement translates into better educational outcomes compared to established methods like 2D presentations. These considerations are particularly relevant in moral education, where abstract reasoning and emotional engagement both play critical roles.

Moral education plays a pivotal role in shaping ethical reasoning and decision-making skills. The Trolley Problem (Fig 1), a classic moral dilemma, offers a platform for analyzing ethical theories such as utilitarianism and deontology [1, 3]. With advancements in technology, the application of VR in educational contexts has gainedraction [4]. This study explores the comparative effectiveness of 2D and VR methods in teaching moral dilemmas.

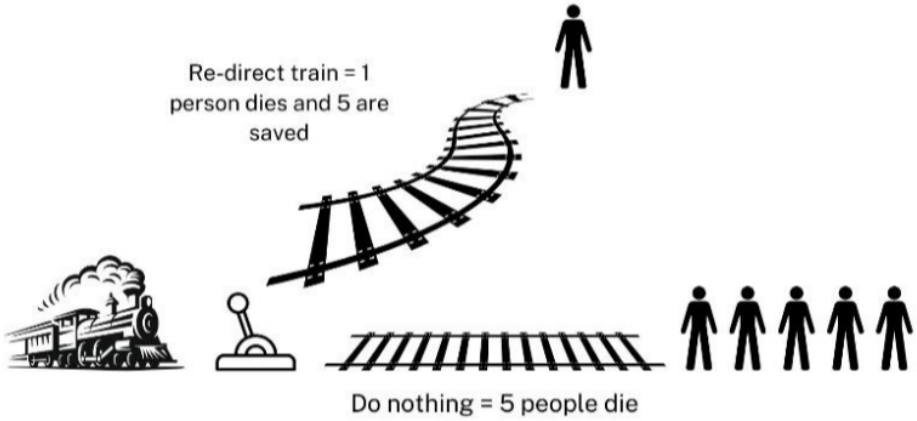

Fig. 1. Illustration of the Trolley Problem.

2 Methods

Twenty participants (mean age 23.65, SD = 1.27) were randomly assigned to two groups: 2D and VR. Participants completed the MFQ and US (Morality Judgement questionnaires) before and after the intervention. The 2D group interacted with a 2D version of the environment of the Trolley Problem, while the VR group experienced a fully immersive scenario. Post-experiment interviews gathered qualitative feedback (Fig 2).

Fig. 2. Experimental set up demonstrating virtual environment. Both 2D and VR versions used the same environment.

3 Results

Quantitative analysis showed that the 2D group exhibited improved scores in fairness and altruism, as measuredby the MFQ, with pre- and post-test averages of 99.00 and 92.50, respectively (Fig 3). The VR group demonstrated a slight increase in utilitarian reasoning (Instrumental Harm score rising from 3.23 to 3.40) (Fig 4). Qualitative data emphasized that the VR experience heightened emotional engagement but occasionally distracted from abstract reasoning tasks

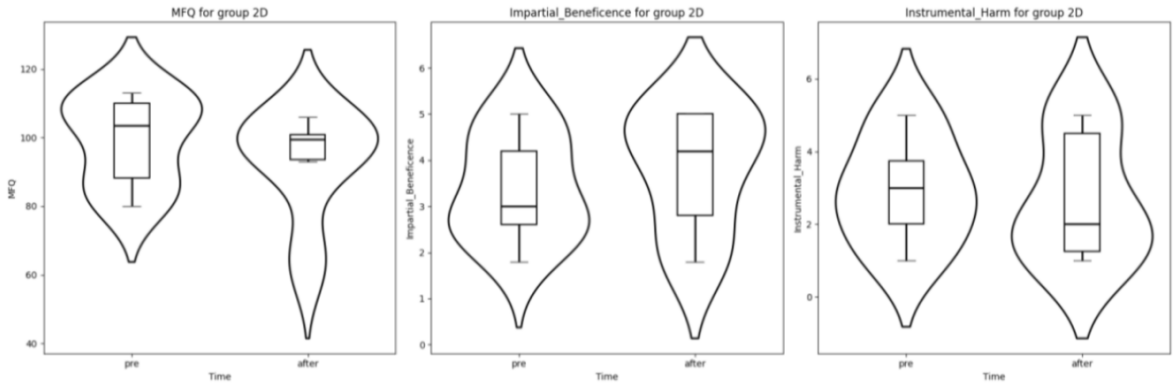

Fig. 3. Visual comparison of group 2D scores before and after intervention on MFQ, Impartial Beneficence, and Instrumental Harm scales.

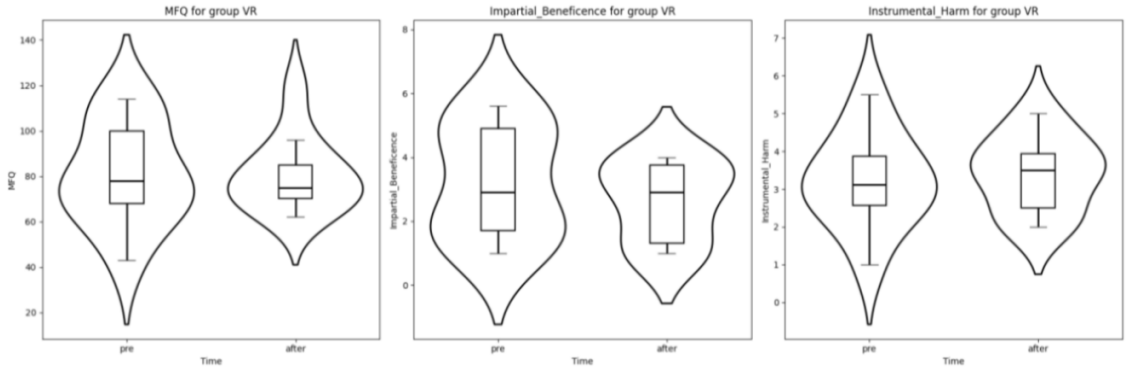

Fig. 4. Visual comparison of group VR scores before and after intervention on MFQ, Impartial Beneficence, and Instrumental Harm scales.

4 Discussion

The findings highlight complementary strengths of both methods. The 2D approach fostered structured learning conducive to abstract moral principles, while VR's immersive environment enhanced engagement and utilitarian reasoning.

Qualitative analysis revealed a more nuanced picture of learners engagement, which was very different for 2D and 3D conditions. Novelty effect should be explored in future research and more qualitative work is needed in this space.

This study contributes to the understanding of technology's role in moral education, advocating for hybrid teaching models that maximize the strengths of both 2D and VR approaches.

References

1. Kahane, G., et al.: Beyond sacrificial harm: A two-dimensional model of utilitarian psychology. Psychological Review 125(2), 131–164 (2018).
2. Mayer, R.E.: Multimedia Learning. 2nd ed. Cambridge University Press (2009).
3. Navarrete, C.D., et al.: Virtual morality: Emotion and action in a simulated three-dimensional 'trolley problem'. Emotion 12(2), 364–370 (2012).
4. Pan, X., Hamilton, A.F.: Why and how to use virtual reality to study human social interaction. British Journal of Psychology 109(3), 395–417 (2018).
5. Savickaite, S., et al.: Virtual Reality (VR) Multi-User Lab for Immersive Teaching. Preprint (2024).