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Culturally-Anchored Virtual and Augmented Reality Simulations

Engaging Science Learners at Disadvantaged Schools in South Africa in the Use of Culturally-Anchored Virtual Reality Simulations for Inquiry-Based Learning

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Introduction

Problem:

- Lack of culturally relevant science learning tools in African schools
- Low performance in science education in international benchmarks (e.g., TIMSS)

Solution:

- CAVARS: Virtual and Augmented Reality Simulations integrating African cultural knowledge

Theoretical Framework

- **Kolb's Experiential Learning**: Experience, reflection, conceptualization, experimentation
- **Multimodal Learning:** Visual + Auditory + Kinesthetic for deeper engagement

Methodology

- **Design**: Qualitative case study
- **Participants**: Grade 8–9 learners from disadvantaged schools
- **Provinces**: KwaZulu-Natal, Limpopo, Northern Cape
- **Tools**: VR headsets, AR tablets

CAVARS Examples:

- Umqombothi brewing (Chemistry)
- Cultural drumming (Sound)
- Moon phases (Astronomy)

DISCUSSION

- VR/AR technologies improve science learning through emotional and conceptual engagement
- Cultural integration boosts relevance and learner identity
- Hands-on learning matches learner preferences
- Equity in access is a critical concern

Theme	insight	Quote
Emotional Engagement	Excitement and novelty	"Like another world"
Conceptual Understanding	Better grasp of scientific phenomena	"I know types of waves"
Learning Preferences	Kinesthetic and visual learning preferred	"Watching helped more than reading"
Cultural Relevance	Pride in seeing culture in science	"Drumming and beer have science in them"
Tech Access	Demand for broader implementation	"Tell our principal to buy iPads"

Conclusion

- CAVARS offer transformative, culturally anchored learning
- Enhance equity and engagement in under-resourced classrooms
- Call for scalable, sustainable implementation

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