



Exploring Learners' Behavioral Patterns in Simulation-based Teaching Training in Virtual Reality

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Introduction

- The current literature has reported the benefits of VR-based learning
- Yet, research that examines learners' in-situ contexts of learning experience in VR is still lacking
- What elements of VR-based learning lead to meaningful learning behaviors?

Theoretical Framework

- Teaching Training in VR
 - VR can situate teachers being trained in contexts resembling authentic teaching settings and thus enhance learning of how to teach (Cheong, 2010; Ke, Lee, & Xu, 2016)
- Meaningful Learning
 - Learning is knowledge construction where learners make sense of their experience (Mayer, 2002)
 - Meaningful learning occurs when learners are engaged in the cognitive processes needed for successful problem solving (Mayer, 2002)
 - Problem representation: building mental representation
 - Problem solution: selecting and implementing a solution (observable)
 - Teaching practice are behaviors reflecting meaningful learning

Theoretical Framework

- Examining Learners' Behavioral Patterns
 - Studying contextual factors that impact learners' behaviors is beneficial when researchers aim to cultivate adaptive behavior or amend problem behavior
 - Apply educational measurement techniques to understand learning behaviors
 - Sequential data mining
 - Sequence, subsequence, item
 - Sequential analysis

Research Questions

- (1) What salient patterns emerge when learners participate in teaching training activities in VR?
- (2) What components of the VR-based teaching training environment demonstrate high likelihood to stimulate teaching practice behaviors?

Method

- Research design: mixed-method
- Participants
 - 21 graduate teaching assistants (GTAs): 7 females and 14 males
 - Recruited from a STEM department at a research university
- Simulation-based Teaching Training in VR
 - Training project designed for GTAs in STEM
 - Four-hour training
 - One orientation scenario: training arena
 - Three teaching scenarios: operating office hours, teaching problem solving, and leading a lab



Figure 1. Screenshot of an office hour scenario: An NPC student asked a question; a dialogue box also presents.



Figure 2. Screenshot of a problem-solving scenario that simulating a recitation session

Method

- Data collection
 - Screen recordings: 21 (avg. length 2.9 hr.)
- Coding
 - Systematic coding scheme
 - Software: BORIS
 - Three coders
 - Reliability: ICC=.88
- Data preparation
 - Analysis will be based on teaching scenarios
 - Sequential pattern mining: extracted behaviors in sequences
 - Behaviors of the who training is defined as one sequence
 - Behaviors of a teaching scenario is defined as one subsequence
 - Sequential analysis:
 - Exported transition matrix based on frequencies of transitions after behaviors

Code	Abbreviation	Description
Debriefing	DB	Debriefing and reflecting on training activities
Exploration	EX	Exploring the virtual environments
Facilitator instruction	FI	Instruction delivered by the facilitator
Handling tech issues	HT	Trying to solve technology issues by oneself
Interacting with facilitator	IF	Interacting with facilitator, including social interaction, responding and commenting
Scaffolding	SC	Facilitator delivered scaffolding
Posters	IG-P	presenting text-based or graphical information on training activities or pedagogy as static posters
Observatory learning	OL	Learning through observing others
Obtaining notecards	ON	Obtaining a notecard, including activity instructions, teaching tips, cards describing a role for role-playing
Off task	OT	Performing behaviors that are irrelevant to training activities
Peer discussion	PD	Discussing with peers
Peer support	PS	Providing or receiving support from peers, including technical support and training activity related support
Prompted roleplay		
Agent prompted	PR-A	Role-playing behaviors prompted by the facilitator or peer
Object prompted	PR-O	Role-playing behaviors prompted by an object, including environmental objects and knowledge objects
Prompting peers	PP	Prompting peers to participate in training activities
Teaching practice		
Lecturing	TP-L	Giving a lecture, presenting
Attending to students	TP-A	Being attentive to students
Instructional tools	TP-T	Using VR-enabled instructional tools, including concept map, simulators, interactive whiteboard
Interacting with student	TP-I	Interacting with NPC students during teaching, including directly answering questions, prompting, delegating, and facilitating
Written instruction	WI	Learning from written instruction, including written instruction on pop-up dialogue boxes, notecards, and posters
Video instruction	VI	Waiting instructional videos that are preloaded to media boards



Coding Scheme