Digitally-Empowered learning:
Virtual Reality and Social Science Education

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Archaeology in the Real World
Major Challenges of Field Sciences

• Unequal access
  • Socioeconomic barriers
  • Time constraints
  • Ableist
• Resource intensive
• Logistically challenging
• Harassment & safety

Fleischner et al. 2017; Smith, 2004; Mauchline et al. 2013; Clancy et al. 2014
Problems with Archaeology Field Work

- Inherently destructive
- Priceless objects, human remains
- Ethical view of discipline
Innovation and Objectives

• Immersive, interactive, room-scale, virtual excavation
  • HTC Vive VR platform
  • Unreal game engine

• Game-based learning

• Anth 399: Virtual Archaeology (Spring 2019)
  • Undergraduate non-majors
Unique Capabilities of Virtual Reality

- Natural physical interactions
- Abstract concepts with concrete experiences
- Adapt to different learning levels
- Repeatability
Benefits of VR for Archaeology

- Experiences not available in real world
- No-risk interactions
- Guaranteed results
- Data processing
- Big picture
Course Design: Logistics

- VR lab in FLB with 4 Vive set-ups
- 24 students (3 labs of 8 students)
- T/Th: lecture/discussion
- W: weekly VR lab
Course Design: Concept

- Field methods AND theory
- Semester-long, progressive story
- Field notebook: curated materials in virtual and real worlds
Archaeology: Not just digging
Course Design: Learning Objectives

- Recognize goals, ethics of archaeology
- Ethically engage with native communities during fieldwork
- Frame a hypothesis & formulate a research plan for excavation
- Make field observations, collect data, make interpretations
- Use found objects and their environment to interpret past events
- Reconstruct and evaluate unfamiliar historical/prehistoric events in context
Learning Objectives & Content Topics

- Frame a hypothesis & formulate a research plan for excavation
  - Select appropriate survey methods & equipment
  - Understand site formation processes
- Identify and establish excavation site; construct excavation grid
- Use basic excavation tools
Design Process for Game-based Learning

• Game structure
  • Enforce rules
  • Present tasks as goal-oriented play
  • Support learner autonomy

• Game involvement
  • Situated in a fantasy world
  • Immersive
  • Role-playing
  • Present challenge & competition

• Game appeal
  • Use multimedia representations
Game Features

• Game structure
  • Enforce rules
  • Present tasks as goal-oriented play
  • Support learner autonomy
• Game involvement
  • Situated in a fantasy world
  • Immersive
  • Role-playing
  • Present challenge & competition
• Game appeal
  • Use multimedia representations

Task 1

Learning objective
• Frame a hypothesis & formulate a research plan for excavation

Task
• Select appropriate survey method(s) & equipment

Game Structure
• Identify features relevant to available remote survey techniques (ground penetrating radar, magnetometry, LiDAR, metal detector, etc.)
Features of Game-based Learning

- Problem-solving experiences
- Interactions with game system and peers
  - Rules and processes
  - Learn by experimentation and theory formation
- Transferable problem-solving strategies
Testing Prototype

• 150 undergraduate student volunteers
• Self-contained VR activity
• Online survey
• Interview
Design Challenges of Game-based Learning

- Goal: Match learning objectives to game features
  - Goal-oriented play
    - Goals as tasks
    - Building blocks or performance benchmarks AND
    - Assess performance
  - Support learner autonomy – how to establish what is “sufficient information”
- Align VR activities with mental/cognitive investment
Benefits for Archaeology Teaching

- Field school requirement
- Accessibility
- Broaden interest
- Positive impact on artifacts
Next Steps

• Scale up
• Broaden audience
  • Additional populations
  • Educational levels
  • Army Corp Veterans Curation Program
• New content
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Course Content: Overcoming the single user experience

- Student pairs in lab
- Tasks requiring cumulative information