An Education Research Perspective on xR Technologies

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Outline

• What *should* learning look like in the 21st century?
• Design of learning environments for 21st century learning outcomes
• Implementation of technology into learning environments
• What has been done with VR/AR/MR so far? What are the gaps, limits of research so far?
• How do we design the future of VR/AR/MR applications for education?
Learning in the 21st century

• Learning is the process of making sense of ideas
  – Learning is active and social

• New standards: NGSS, CCSS, ISTE, CSTA
  – Emphasis on “knowledge-in-use”
  – Understanding phenomena

• 21st century skills: collaboration, communication, creativity, and critical thinking
Designing Learning Environments

• Building off of decades of learning sciences and education research on how people learn

• Some key principles of learning relevant to design:
  – Constructivism
  – Supporting collaboration
  – Scaffolding
  – Providing timely and relevant feedback
  – Adaptivity
  – Extended projects
  – Community-based learning
  – Personally relevant learning and contexts
Implementation

• Integration of new technologies is always a challenge (and the more complex the tech, the more complex the implementation)

• Classrooms are complex systems
  – Different settings and constraints
  – Teachers and teacher knowledge
  – School, district, state policies
  – Available resources
  – Students interact dynamically
  – Variation is the norm
Research on xR so far...

- Earlier informative work on simulations
  - Added support (e.g., scaffolding, dynamic representations) can be beneficial in simulations for learning

- Most xR research so far has been in the area of VR

- Need to think about the affordances of the technology for learning specifically

VR Design Principles - informed by research

• **Exploring Scale**: Pairing VR with “real life” experiences to support students’ understanding of scale and proportion

• **Immersive Narrative**: Immersing students in VR stories to engender learning, interest, and empathy

• **Experiencing Phenomena**: Using VR to visualize and interact with place-based events and phenomena

• **Linking Systems**: Using VR to illustrate connections among ideas, places, and things
Integrating xR into classrooms

• Can’t just drop in technology - curriculum integration is important
• Detailed lesson plans for teachers that include:
  – Standards addressed
  – Affordances of xR for learning
  – Other hands-on activities
  – Structured prompts for discussion
  – Timing alternatives
• Tech guide for teachers
  – Setup (wifi network, headsets for pairs of students, charging stations, teacher device (tablet))
  – What to do while students are using the xR application
  – Troubleshooting
The future of xR for education

• How does your technology fit into the complex system that is a classroom (or library or museum)?
• What are the affordances of this instance of the technology and what educational and learning needs are being addressed?
• Think not just about the user experience but the learning experience
  – Use research from the learning sciences to inform your design
Thank You!

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• Link to CIRCL Cyberlearning Community Report: http://circlcenter.org/community-report/

• Link to simulation meta-analysis report: http://www.sri.com/work/projects/glasslab-research

• Link to Ed Tech Developer’s Guide: https://tech.ed.gov/developers-guide/