Learning from the patient’s perspective: New worlds in Medical Illustration

Carrie Shaw, MS
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“How do you get a 24 year old medical student to understand what it is like to be someone 60 years older than themselves?”
Select Scientific Advisors

Carrie Shaw, CEO
MS, Biomedical Visualization
5 yrs+ public health educator

Ryan Lebar, Creative
BFA, Film & Theater
Virtual Reality Filmmaker

Olusola Ajilore, MD, PhD
Stanford UIC
Geriatric Mental Health & Neuroscience Expert

Neelum Aggarwal, MD
RUSH
Sr. Population Health Neurologist

Thomas Leahy, Technology
BS, Computer Science
Human-Computer Interaction

Erin Washington, Curriculum
MS, Information Science
10 yrs+ education technologist

William Hazzard, MD
Wake Forest University
Founding Father of Geriatric Medicine
XR: Virtual, Augmented, & Mixed Reality

Paul Milgram’s Reality-Virtuality continuum
Not all VR is the same: Mobile VR

Google cardboard  Samsung Gear VR  Google Daydream
Not all VR is the same: Desktop VR

1. Oculus Rift - Facebook
2. HTC Vive
3. Playstation VR
4. Windows Mixed Reality Headset - Microsoft (Coming soon)
5. Daydream 2 - HTC & Google (Coming Soon)
Strengths of VR: Active Learning
Strengths of VR: Complex assessment
All of a person’s abstract inferences are structured in an image schema – a correlation of an idea to a pattern of movement, orientation, or interaction of the body. (Lakoff & Johnson 1980)
Embodied Cognition & Learning

Embodied learning **marries the tacit schemas** through which tasks are intuitively carried out **with the analytical reasoning** required to learn.

**Interactions:**
- Mind and body
- Thought and action
- Rational schemas and sensorimotor schemas
Embodied Learning

Impacts socioemotional learning with respect to increased...

- motivation to learn content
- understanding of concepts
- ability to self-identify with content & concepts
The 5D framework for XR design

1. **Depth**: Quality & depth of content.
2. **Sustainability**: Feasibility of the XR world to be used over time.
3. **Spread**: Ability for large numbers of people to use the XR world.
4. **Shift**: Learners begin to think of the world as their own, rather than belonging to those who designed it.
5. **Evolution**: Iteratively redesigning the world based on assessment from learners.

Sawyer 2006
FIRST EMBODIED VR EXPERIENCE

The Alfred Lab
- Live-action 7 minute 360° film
- Computer-generated interactive objects
- 3D binaural sound

Who is Alfred?
- A 74 year old African-American patient
- Advanced macular degeneration
- High frequency hearing loss
<table>
<thead>
<tr>
<th>Pre-production</th>
<th>Production</th>
<th>Post-production</th>
<th>Deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project ideation session</td>
<td>2 day 12 hour shoot</td>
<td>High resolution stitching</td>
<td>Embodied Labs application includes:</td>
</tr>
<tr>
<td>Script outline</td>
<td>6k resolution</td>
<td>Draft 1 &amp; 2</td>
<td>Hardware checks</td>
</tr>
<tr>
<td>Script drafts 1 &amp; 2</td>
<td>Monoscopic video</td>
<td>Color grading</td>
<td>Easy user onboarding guide</td>
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<tr>
<td>Final script</td>
<td>Spatial audio sound recording</td>
<td>Spatial sound design</td>
<td>User Metrics</td>
</tr>
<tr>
<td>Location scout</td>
<td>5 person crew</td>
<td>Game engine interaction</td>
<td></td>
</tr>
<tr>
<td>Casting on location</td>
<td>Director Sound mixer</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 camera technicians</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Producer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scene</td>
<td>Learning Goals</td>
<td></td>
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<td>----------------------------</td>
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</table>
| **Scene 1:** Happy Birthday song | • To introduce the learner to being Alfred.  
• To expose the learner to audiovisual perceptive changes. |
| **Scene 2:** Day Dream      | • To understand how to use the leap motion hand controls.  
• To contrast the audiovisual perceptive deficits present in scene 1 but absent in scene 2. |
| **Scene 3:** Wine spill     | • To learn about family interactions that occur outside of the clinic.          |
| **Scene 4:** Waiting room   | • To feel what a clinic environment is like while having Alfred’s audiovisual perceptive deficits. |
| **Scene 5:** Taking the cognitive test | • To learn from the patient’s perspective how a geriatrician introduces a cognitive test.  
• To feel what it is like to have to compensate for a disability. |
| **Scene 6:** Follow up with doctor | • To understand audiovisual perceptive changes may be misdiagnosed as cognitive impairment.  
• To contrast hearing loss from previous scenes with normal hearing once the hearing device has been accepted by the learner. |

**Principles of design & Alfred**

- Scaffolding learning experience
- Learning goals increase in complexity over time
- Learning goals: cognitive, affective, and procedural
WHAT IS AN EMBODIED LAB?

An Embodied Lab has 3 stages:

1. **PREPARE** | Pre-assessment, 360° video documentaries
2. **EMBODY** | Embodied 1st person VR patient experience
3. **REFLECT** | Post-assessment, Debrief & Reflect
Subscription-based software made up of a growing library of patient experience labs.
LABS IN THE PIPELINE

ELDERLY
- Vision Loss | Alfred
- Hearing Loss | Alfred
- Cancer
- Alzheimer’s
- Parkinson’s
- End of Life Decisions

LEARNING DISABILITY
- ADD
- Dyslexia

PSYCH
- Depression
- Anxiety
- Schizophrenia
- Anorexia
- Psychosis

DIVERSITY
- Literacy
- English as a 2nd Language
- Immigrant
- Trans-Health
- Obesity
- Low SES Health

DISEASES
- Cancer
- Stroke
- Multiple Sclerosis
- Diabetes II

CHILDREN
- Type 1 Diabetes
- Learning Disabilities

MEN/WOMEN’S HEALTH
- High Risk Pregnancy

VR EXPERIENCE
CURRICULUM

SUMMER LEADERSHIP SUMMIT 2017
EVOLUTION REVOLUTION
Challenges

1. **Content is fragmented.**
2. Medical VR = many types
3. Platforms today: myriad of content, no one customer type or end user.
4. VR healthcare soft-skills training – content is minimal
5. **Content creation is expensive**
6. Meaningful content is **hard to create.**
7. Quality standards do not exist yet.
8. **Platforms for healthcare have a unique set of needs.**
9. The hardware is changing rapidly.

Platforms cannot succeed without a critical mass of desirable content.
“This app...will change how we treat patients by providing an immersive experience that creates emotional intelligence and ultimately more compassionate care.” [Forbes]

-Dr. Leslie Saxon, Executive Director
USC Center for Body Computing
Pilot Study
- 91 study participants
- 2nd year medical students
- Essentials of Clinical Medicine Course
- Geriatrics Workshop
Body perception augmentation

1. Hands as controller
2. Vision & Hearing Impairments
3. Storytelling: race, age, gender, interactive elements
AGREE/DISAGREE: “Embodying my patient in VR helps me learn concepts important to my career.”

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<tr>
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<th>Pre-Test</th>
<th>Post-Test</th>
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<td>Strongly Disagree</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Somewhat Disagree</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>Somewhat Agree</td>
<td>63%</td>
<td>34%</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>30%</td>
<td>63%</td>
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Percent of students
AGREE/DISAGREE: “I understand the perspective of an elderly patient.”

<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
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<tr>
<td></td>
<td>Somewhat Disagree</td>
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<td></td>
<td>Somewhat Agree</td>
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<tr>
<td></td>
<td>Strongly Agree</td>
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<td>Pre-Test</td>
<td>9%</td>
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<tr>
<td></td>
<td>40%</td>
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<tr>
<td></td>
<td>46%</td>
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<tr>
<td></td>
<td>5%</td>
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<tr>
<td>Post-Test</td>
<td>2%</td>
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<td></td>
<td>14%</td>
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<td></td>
<td>72%</td>
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Interest in pursuing a geriatrics specialty

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<tr>
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<td>32%</td>
<td>23%</td>
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<tr>
<td>Somewhat Disinterested</td>
<td>46%</td>
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<tr>
<td>Somewhat Interested</td>
<td>21%</td>
<td>30%</td>
</tr>
<tr>
<td>Strongly Interested</td>
<td>1%</td>
<td>1%</td>
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</table>

Percent of students
Use of stereotypical words to describe older adults

Common stereotypical words used: old, frail, grandparent, white hair, nursing home, sick, wise, respect, slow
Reactions

• “What’s wrong with this headset?!”
• “Can you turn up the volume?”
• Surprise & frustration at struggle to complete cognitive test
• Sensory vs. cognitive impairment
• Posture changes
Outcomes

• Motivation to pursue a career in aging
• Assess audiovisual status when diagnosing cognitive impairment
• “This was the best 6 minutes I spent in our entire geriatrics unit!”
• Unanimous agreement for more simulations like this one
EMBODIED PATIENT EXPERIENCES
- The Alfred Lab
  Macular degeneration & high frequency hearing loss
- The Betty Lab (Arriving August 2017)
  Alzheimer’s disease

DOCUMENTARY SERIES
- Macular Degeneration (Arriving May 2017)
- Alzheimer’s Disease (Arriving June 2017)

Partner content will be available soon.
“This app...will change how we treat patients by providing an immersive experience that creates emotional intelligence and ultimately more compassionate care.”

- Dr. Leslie Saxon, Executive Director

University of Southern California Center for Body Computing
Thank you!

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References


