

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



Carrie Shaw, MS
July 22, 2017

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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?”

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Carrie Shaw, CEO

MS, Biomedical Visualization
5 yrs+ public health educator



Ryan Lebar, Creative

BFA, Film & Theater
Virtual Reality Filmmaker



Thomas Leahy, Technology

BS, Computer Science
Human-Computer Interaction



Erin Washington, Curriculum

MS, Information Science
10 yrs+ education technologist

Select Scientific Advisors



Olusola Ajilore, MD, PhD



Geriatric Mental Health
& Neuroscience Expert



Neelum Aggarwal, MD



Sr. Population Health
Neurologist



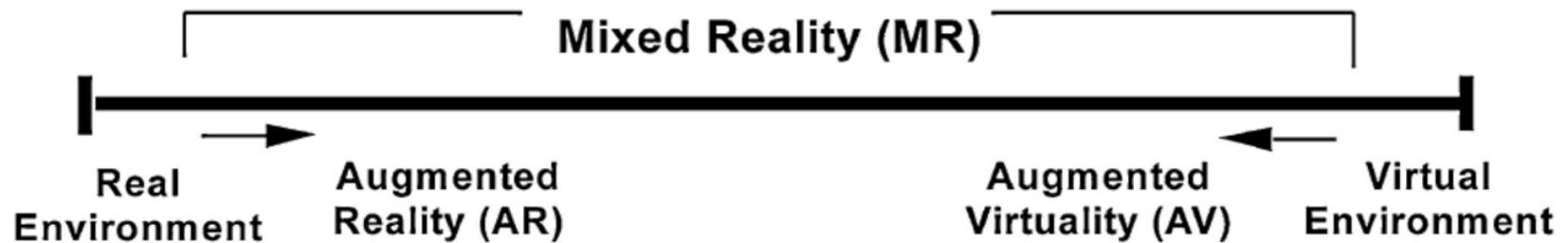
William Hazzard, MD



Founding Father of
Geriatric Medicine

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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



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Strengths of VR: Complex assessment

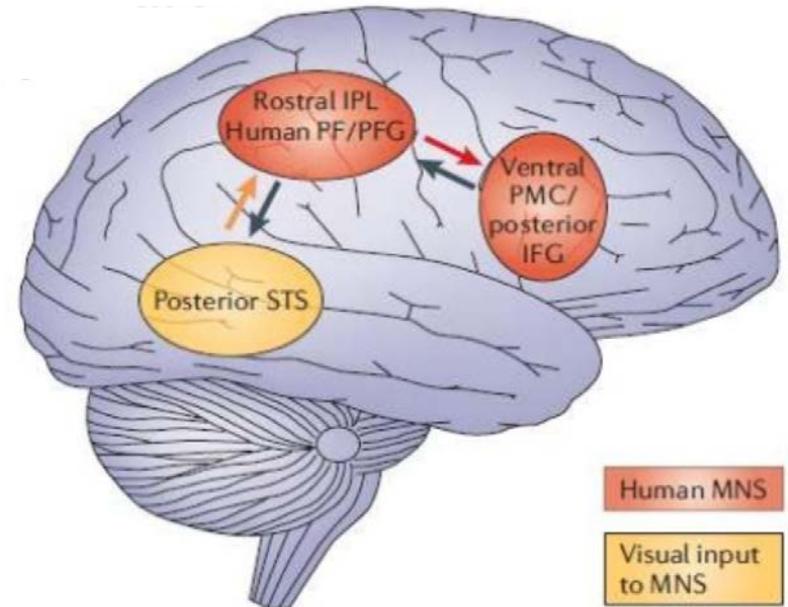


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Embodied Cognition

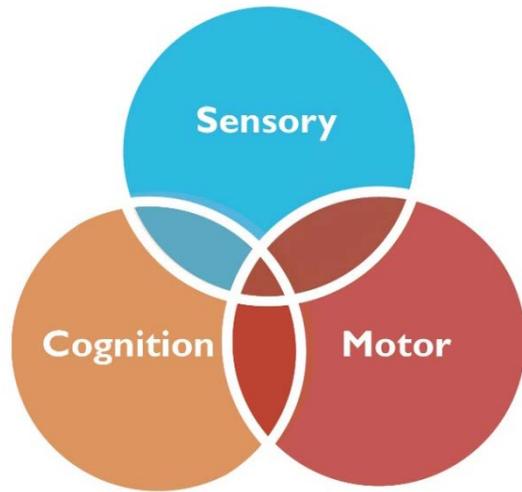
All of a person's abstract inferences are structured in an **image schema** – a correlation of an idea to a pattern of movement, orientation, or interaction of the body.

(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

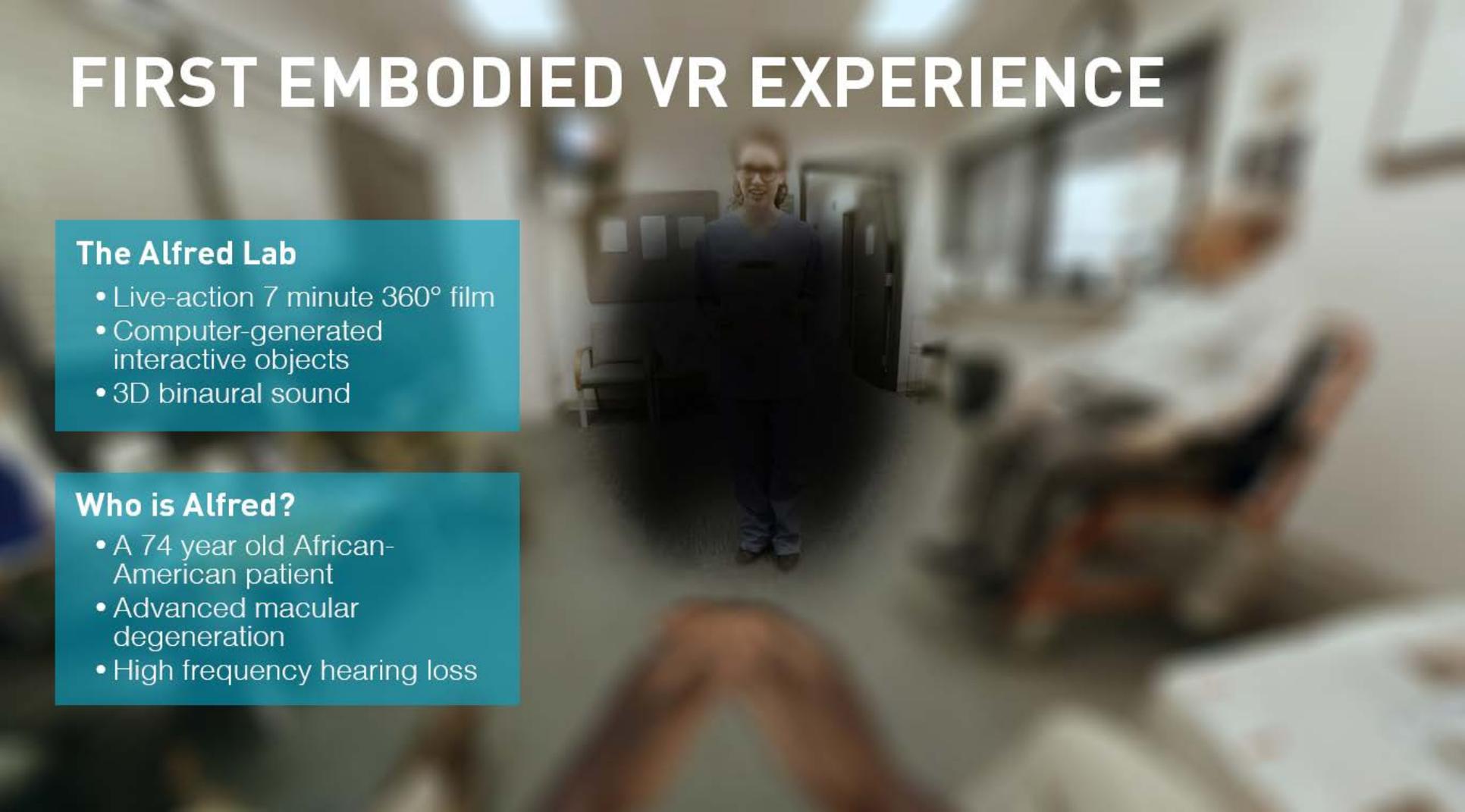
The 5D framework for XR design



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

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Pre-production	Production	Post-production	Deployment
<ul style="list-style-type: none"> Project ideation session Script outline Script drafts 1 & 2 Final script Location scout Casting on location 	<ul style="list-style-type: none"> 2 day 12 hour shoot 6k resolution Monoscopic video Spatial audio sound recording 5 person crew <ul style="list-style-type: none"> Director Sound mixer 2 camera technicians Producer 	<ul style="list-style-type: none"> High resolution stitching Draft 1 & 2 Color grading Spatial sound design Game engine interaction 	<ul style="list-style-type: none"> Embodied Labs application includes: <ul style="list-style-type: none"> Hardware checks Easy user onboarding guide User Metrics

Principles of design & Alfred

- Scaffolded learning experience
- Learning goals increase in complexity over time
- Learning goals: cognitive, affective, and procedural

Scene	Learning Goals	
Scene 1: Happy Birthday song	<ul style="list-style-type: none"> • To introduce the learner to being Alfred. • To expose the learner to audiovisual perceptible changes. 	 
Scene 2: Day Dream	<ul style="list-style-type: none"> • To understand how to use the leap motion hand controls. • To contrast the audiovisual perceptible deficits present in scene 1 but absent in scene 2. 	 
Scene 3: Wine spill	<ul style="list-style-type: none"> • To learn about family interactions that occur outside of the clinic. 	
Scene 4: Waiting room	<ul style="list-style-type: none"> • To feel what a clinic environment is like while having Alfred's audiovisual perceptible deficits. 	
Scene 5: Taking the cognitive test	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • To understand audiovisual perceptible 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. 	 

Key:  Cognitive  Affective  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



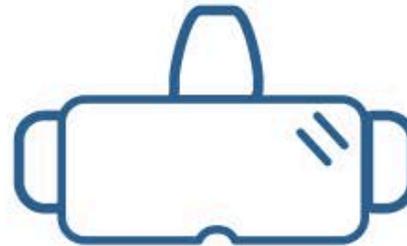
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PRODUCT

Subscription-based software made up of a growing library of patient experience labs.



VIRTUAL REALITY

Embodied experiences
360 films



CURRICULUM

Customized Assessment
Case presentation
Facilitator guide

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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

DEVELOPMENTAL IMPAIRMENTS

- Autism
- Down's
- Cerebral Palsy

DIVERSITY

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

DISEASES

- Cancer
- Stroke
- Multiple Sclerosis
- Diabetes II

CHILDREN

- Type I Diabetes
- Learning Disabilities

MEN/WOMEN'S HEALTH

- High Risk Pregnancy



VR EXPERIENCE



CURRICULUM

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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.

Big Alfred

Alfred 1

Baby Alfred



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Select Customers



“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

U of IL Chicago College of Medicine, Fall 2016



Pilot Study

- 91 study participants
- 2nd year medical students
- Essentials of Clinical Medicine Course
- Geriatrics Workshop

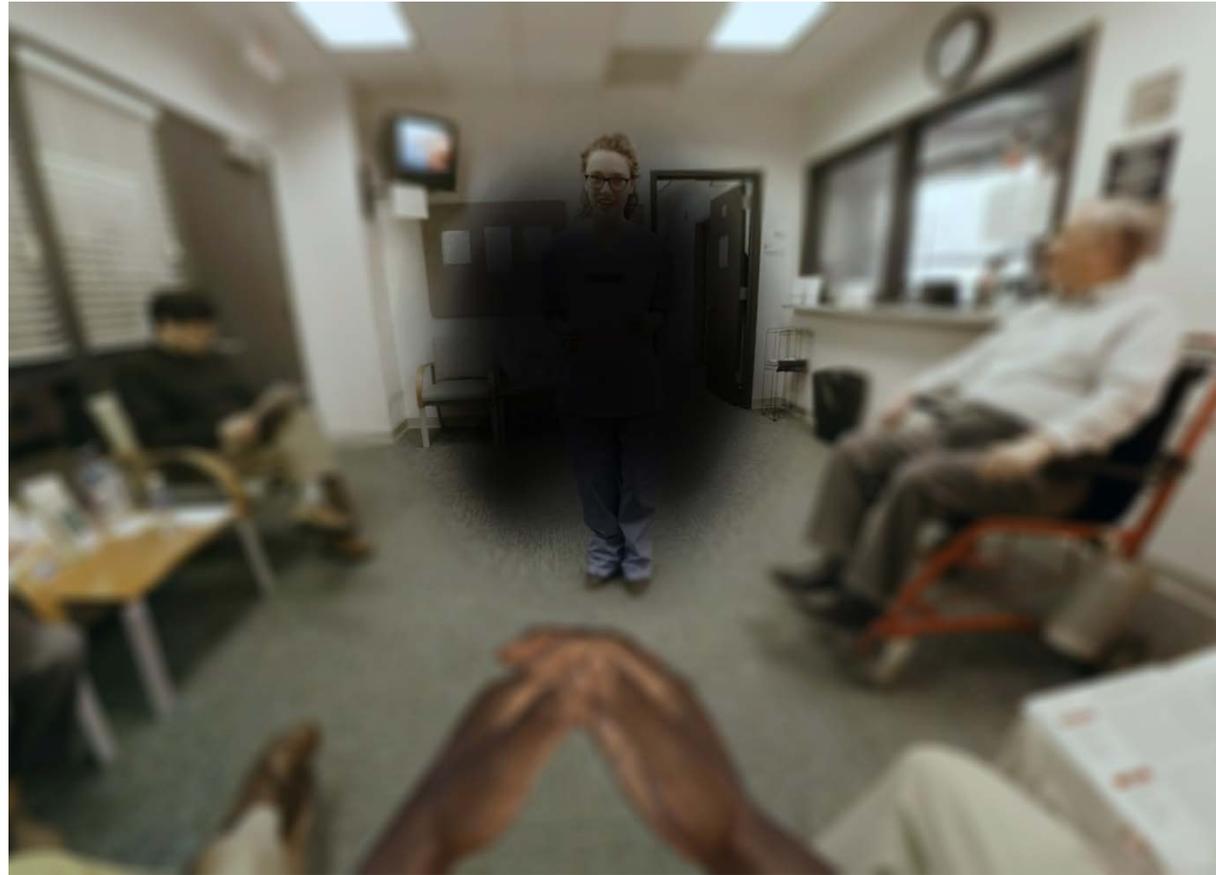
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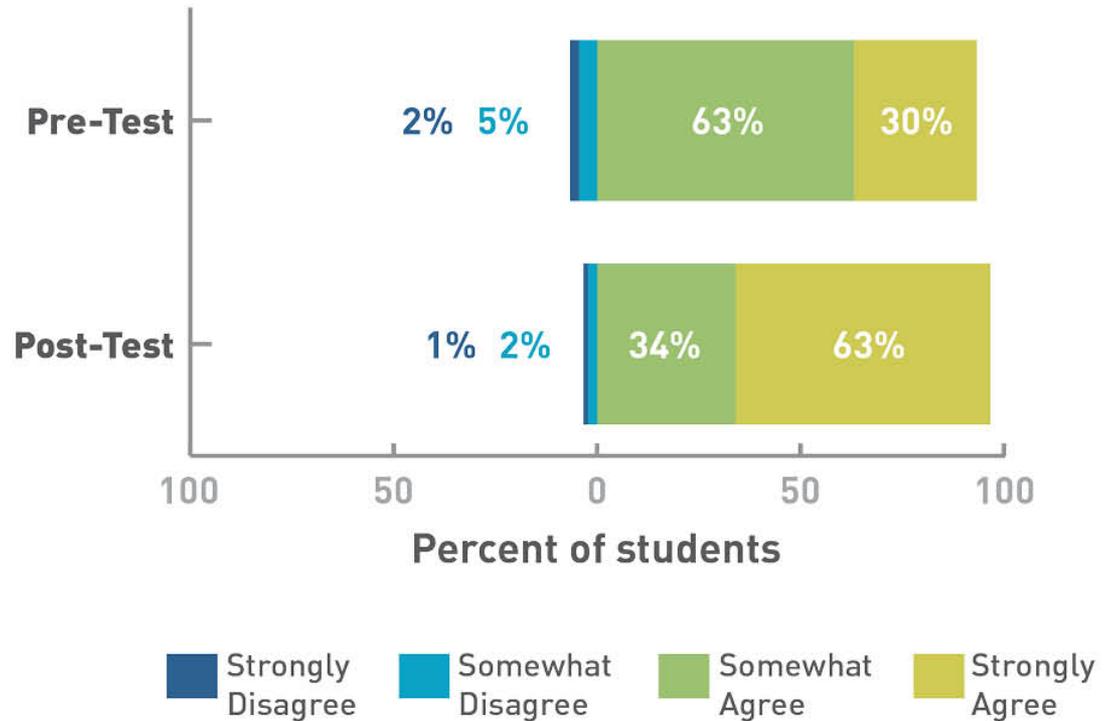
Body perception augmentation

1. Hands as controller
2. Vision & Hearing Impairments
3. Storytelling: race, age, gender, interactive elements



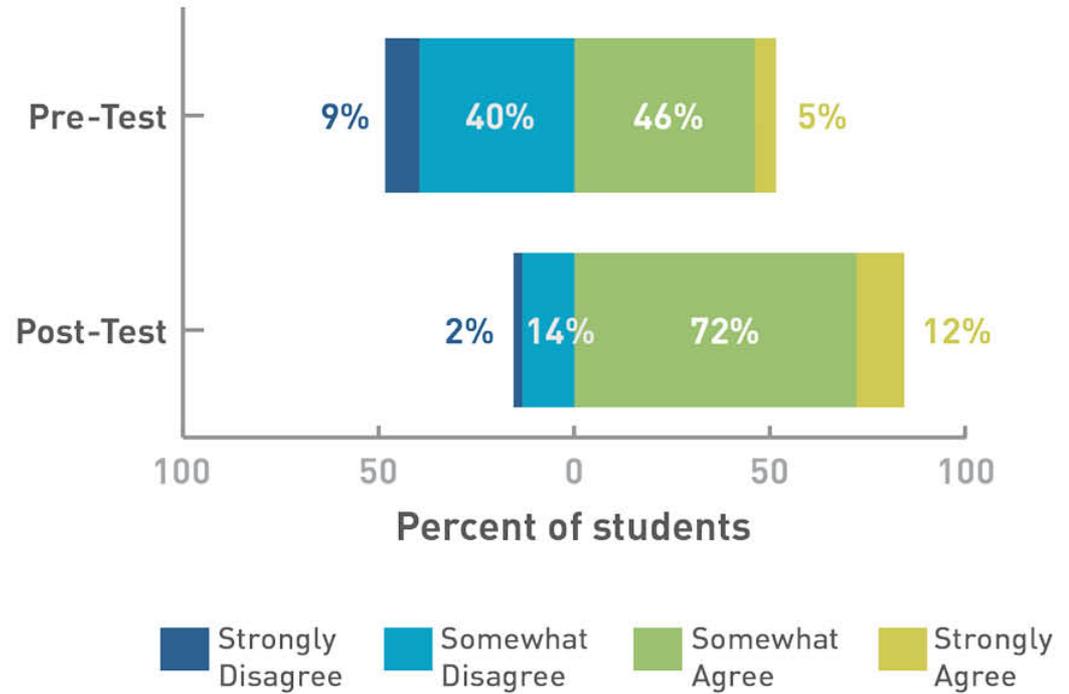


AGREE/DISAGREE: “Embodying my patient in VR helps me learn concepts important to my career.”



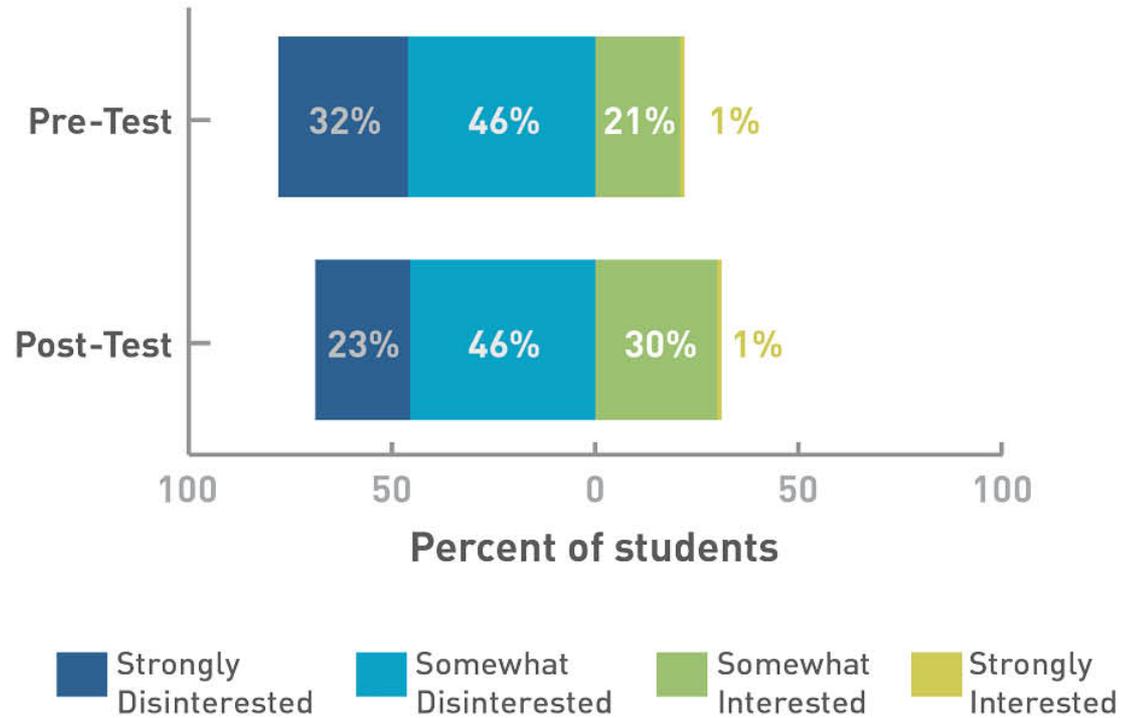


AGREE/DISAGREE: "I understand the perspective of an elderly patient."



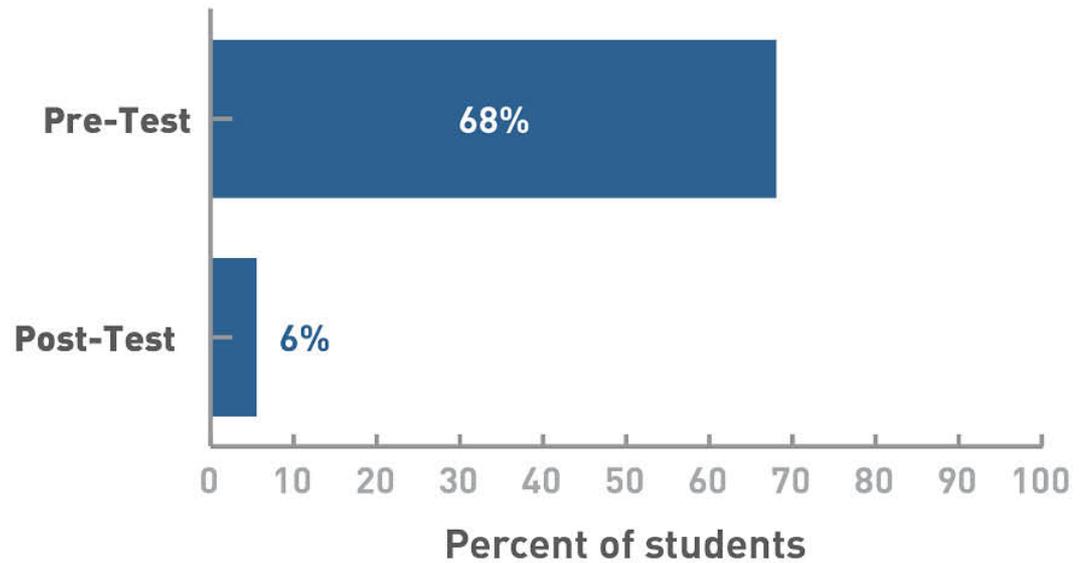


Interest in pursuing a geriatrics specialty





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.

Forbes

“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

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Thank you!

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References

Ahn, S.J. "Embodied Experiences in Immersive Virtual Environments: Effects on Pro-Environmental Attitude and Behavior," PhD, Stanford University, 2011.

Abrahamson, D., & Lindgren, R. (2014). Embodiment and embodied design. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (2nd Edition). Cambridge, MA: Cambridge University Press.

Bransford, J. D., Brown, A. L., & Cocking, R. (eds., 2000). *How People Learn: Brain, Mind, Experience, and School* (pp. 3 - 27). Washington, DC: National Research Council.

Dede, C. (2009). Immersive interfaces for engagement and learning. *Science* 323(5910), 66-69.

Gallagher, S. (2005). *How the body shapes the mind*. Oxford University Press, New York (2005).

Lindgren, R., Johnson, M., (2013). *Emboldened by Embodiment: Six Precepts for Research on Embodied Learning and Mixed Reality*. *Educational Researcher*, 42(8): 445–452. doi: 10.3102/0013189X13511661

Lindgren, R., Tscholl, M., and Moshell, J.M. (2013). *MEteor: Developing Physics Concepts Through Body-Based Interaction With A Mixed Reality Simulation*. doi:10.1119/perc.2013.pr.042

References (cont'd)

- Lindgren, R., Tscholl, M., Wang, S., Johnson, E. (2015). Enhancing learning and engagement through embodied interaction within a mixed reality simulation. Manuscript in preparation.
- Lueg, C. P. (2015). The Missing Link: Information Behavior Research and Its Estranged Relationship With Embodiment. *Journal of The Association for Information Science & Technology*, 66(12), 2704-2707.
doi:10.1002/asi.23441
- Robson, D. (2011). Your clever body. *New Scientist*, 212(2834), 34-38.
- Shumaker, R. (Eds.). (2013). Proceedings from VAMR '13: *5th International Conference Held as a Part of HCI International 2013*, Las Vegas, Nevada: Springer.
- Sawyer, R. K. (Ed.). (2006). Cambridge handbook of the learning sciences. New York: Cambridge University Press
- Yee, N., & Bailenson, J. N. (2006). Walk a mile in digital shoes: The impact of embodied perspective-taking on the reduction of negative stereotyping in immersive virtual environments. Proceedings of PRESENCE 2006: The 9th Annual International Workshop on Presence. August 24-26, Cleveland, Ohio, USA.