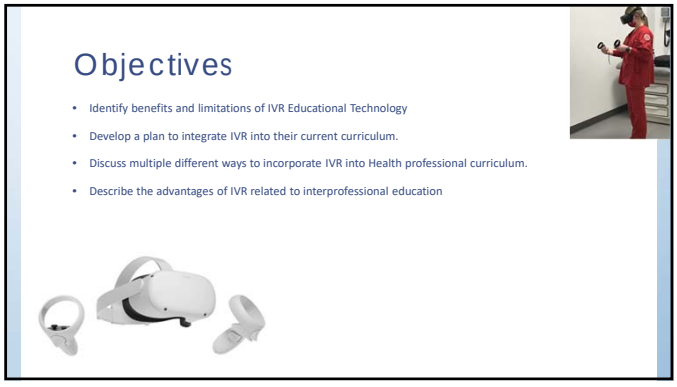

Immersive Virtual Reality:
The new reality in healthcare education
Sue Schuelke PhD RN NPD-BC CNE CCRN-K
Tess McKinney AAS

1


Immersive Virtual Reality:
The new reality in healthcare education
Sue Schuelke PhD RN NPD-BC CNE CCRN-K
Tess McKinney AAS
We have no financial relationships.

2


Objectives
Identify benefits and limitations of IVR Educational Technology
Develop a plan to integrate IVR into their current curriculum.
Discuss multiple different ways to incorporate IVR into Health professional curriculum.
Describe the advantages of IVR related to interprofessional education

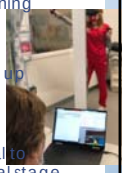
3

Immersive Virtual Reality

- Immersive Virtual Reality (IVR) uses interactive software and hardware, providing a realistic, immersive simulation of a 3-dimensional environment.
- VR is controlled and experienced by body movements and hand controller transporting the learner into the IVR environment via a head-mounted apparatus that prevents the learner from perceiving surrounding elements of the real world (Sitterding, Raab, Saupe, & Israel, 2019)
- IVR incorporates the layers of the NCSBN clinical judgment model, which include recognizing cues, analyzing cues, prioritizing hypothesis, generating solutions, taking action, and evaluating outcomes(NCSBN.org, 2015).

4

Literature



- The realism and authenticity of virtual reality contribute to learning through engagement and experiential learning (Verkuyl & Hughes, 2019).
- Content can be reviewed at a time that is convenient for the learner, flexibility, scalability, decreased effort of simulation set up and coordination of resources, and expenses associated with hands-on simulation training (Ferguson, Davidson, Scott, Jackson, & Hickman, 2015; Liaw et al., 2019; McCarthy & Uppot, 2019).
- Clinical virtual simulation in nursing education has the potential to improve knowledge retention and clinical reasoning in an initial stage and over time, while increasing satisfaction with the learning experience among nursing students (Padilha, Machado, Ribeiro, Ramos, & Costa, 2019; Verkuyl, Atack, Mastrilli, & Romaniuk, 2016).

5

Literature (continued)

- Using virtual patients increased the nursing student's awareness of what to focus on during their clinical practice (Forsberg et al., 2016).
- Interprofessional multi-user virtual reality has been shown to be a useful tool for collaborative learning (Liaw et al., 2019).
- Significant higher engagement scores in the MUVE group (mean 3.61, SD-1.13) compared to the asynchronous learning platform (mean=3.49, SD=1.08, t (1766) =2.21, $p < 0.05$). Cognitive presence appeared to be the principle factor associated with the increase in engagement, rather than social presence (Clamen, 2015).

6

Developed a Plan

- How would we use it?
- Software
- Headsets
- Hardware
- Faculty Involvement
- Space
- How to clean

7

Simulation Planning

- Identified Faculty team
- Planning meetings
- Determined Space
- Faculty orientation
- Student orientation on Canvas

8

Simulation

- Pre work
- Prebrief
- Review Headset and hand controls
- Monitor "buddy"
- Worksheet/QSEN questions
- IVR Sims
- Debrief
- Post Survey

9

Survey

Did you feel you were learning?
Playing the simulation increased my understanding.
The simulation helped me learn
How hard were you concentrating?
It provided content that focused my attention
How much did you enjoy what you were doing?
Interacting with it was entertaining
Interacting with it was fun
How interesting was the simulation ?
Did you feel bored with playing the game (reverse coded)
Did you wish you were doing something else (reverse coded)?
How immersed were you in the VR?
I lost track of time playing it.
I became very involved in the VR forgetting about other things
Was it challenging?
Playing it stretched my capabilities to the limit
I was not very good at the VR
How skilled were you at the VR?
I was very skilled at the VR

Domains
- Learning
- Engagement
- Immersion
- Challenge
- Skill

Additional Questions
- Continue IVR Simulations
- Attend Orientation
- Previous Experience

10

Survey Results (n=83)

- No statistical difference between students that attended, orientation, previous use of IVR headsets or both then students that had no experience
- No correlation between skill in using the game and learning, engagement, immersion, or challenge
- Correlation between learning and engagement
- Did you feel you were learning?
  - Mean 4.3, 93% Strongly Agree/Agree
- Playing the simulation increased my understanding.
  - Mean 4.2, 83% Strongly Agree/Agree
- The simulation helped me learn
  - Mean 4.3, 88% Strongly Agree/Agree
- Would you want to continue to use VR as a learning modality
  - Mean 4.2, 81% Strongly Agree/Agree

11

Data Table

Correlations

		Learning	Engage	Immersion	Challenge
Engage	Pearson Correlation	.746**			
	Sig. (2-tailed)	0.000			
	N	83			
Immersion	Pearson Correlation	.466**	.517**		
	Sig. (2-tailed)	0.000	0.000		
	N	83	83		
Challenge	Pearson Correlation	.389**	0.188	.325**	
	Sig. (2-tailed)	0.000	0.090	0.003	
	N	83	83	83	
Skill	Pearson Correlation	0.193	0.149	0.056	0.016
	Sig. (2-tailed)	0.081	0.180	0.616	0.884
	N	83	83	83	83

****. Correlation is significant at the 0.01 level (2-tailed).**

12

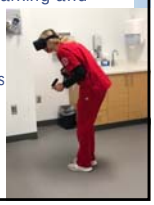
Debriefing

- Really put them with the patient
- It made them "think for themselves"
- Safe place to make a mistake
- They couldn't "rely on others but had to be the responsible one, the real nurse",
- It felt "real",
- "Like a dream",
- A little like magic
- It was gnarly (which I think is good) and a little discombobulating,
- They learned, critically thought, problem solved, and had to prioritize.

13

Conclusions

- IVR lead to a high level of perceived learning
- Did not need to have a high skill level to perceive learning
- Engagement, Immersion and challenge influenced learning and were rated high
- Majority students wanted to use IVR in the future
- Need to plan for students that experienced symptoms



14

Alternative uses for VR

The College of Nursing partnered with a group of creative Computer Science and Engineering (CSE) Senior Design students to develop two Immersive Virtual Reality (IVR) games.

Sepsis Escape Room

Rollover Ranch

Funding for this project was provided by the Central State Center for Agricultural Safety and Health, a National Institutes of Occupational Safety and Health AFF Center, Grant U54 OH010162)

15

Rollover Ranch https://sidequestvr.com/app/3813/rollover-ranch

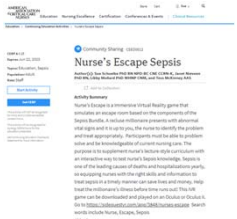
- Haskell Lab Family Field Day

- Brownfield News
- Farm Progress
  - https://www.farmprogress.com/safety/farm-safety-name-game
- Will be attending Husker Harvest Days

16

Sepsis Escape Room https://sidequestvr.com/app/3848/nurses-escape

- American Association of Critical Care Nurses Website https://www.aacn.org/education/ce-activities/community-sharing/csed0012/nurses-escape-sepsis?target=ce-library



17

Future Thoughts

New American Association of Colleges of Nurses Essentials 2030

- Develop immersion or synthesis experiences that allow students to integrate learning and gain experience
- Immersion experiences may afford the student an opportunity to focus on a population of interest and clinical role.
- Simulation experiences represent an important component of clinical education, serving as a valuable augmentation to direct and indirect care within healthcare settings.
- Simulation learning experiences should align with best practice standards such as those developed by the International Nursing Association for Clinical Simulation and Learning (INACSL) or the Society for Simulation in Healthcare.

18

Interprofessional

- Multiuser
  - Involve various colleges
  - Do not have to be on the same campus
- Avatar of another profession
  - Trialing this in the fall
- Single user with voice options.
  - Call the physician, CCU nurse, Radiology, Therapist etc.

19

Future Research

- VR sequencing with Manikin simulation
  - VR/ Mannikin - Mannikin/VR
- Interprofessional
  - Develop Partnerships with various colleges
- Public Health Opportunities
  - Applied for funding for a Headset mail out program

20

How can you get started?

- Head-mounted Displays (HMD)
- Our Pick: Oculus and Oculus 2
- Technical Requirements and options.
- Laptop options
- IT considerations
- Virtual Reality and Immersive simulation resources

21

Head-mounted Displays

- Which HMD is right for me?
  - Oculus (Best Standalone HMD in 2021)
  - Vive (Cable Tethered and expensive)
  - Varjo (New Virtual and Mixed Reality HMD-Expensive)
  - HP Reverb: (Highest Resolution HMD PC Connected)
  - PlayStation: (Game playing)
  - Phone Only VR/AR: (Merge or Google Cardboard)


Oculus


Vive


VARJO


HP Reverb


PlayStation

Merge

22

Our HMD: Oculus and Oculus 2

- Oculus vs Vive: Why we chose Oculus
- Cost: Consumer: $300-400 and Business: $600-800 with recurring fee
- Business and Consumer HMD's: Which is best for me?
- Where to buy them: CDWG, NewEgg or Best Buy
- Contacts

Oculus

Oculus 2

23

Consumer Pros and Cons

Pros

- Cost is significantly cheaper
- Setup 1-2 Days
- SidequestVR is available to load programs on them

Cons

- Time: Creation of Facebook accounts that aren't really tied to anyone
- Keeping Track of Facebook Accounts and passwords
- Can't lock them down without 3rd party software
- Anyone with login can put software on them
- Manually login to each Headset
- Warranty and Support run out after a year

COST: $300-400

24

Business Pros and Cons

Pros

- Device Manager- Easy to use. All headsets controlled in device manager, gives you status of each device, shows battery life, split into groups.
- Device Manager ID: You can give a certain ID number to a developer so they can send you an app invitation.
- Great for Developer Mode (If you create custom VR experiences you can try it out on the headset in developer mode, you can't on a consumer headset)
- 24/7 Customer Support
- Tracking of Headsets- (If you lose one, you can lock it down)
- 24-month warranties/ exchange program
- Workplace is a great place to connect with your team, but you can use Teams or Discord.
- Naming of Headsets and putting each headset into various groups.
- Oculus App Lab for apps: https://developer.oculus.com /blog/introducing-app-labs-a-new-way-to-distribute-oculus-quest-apps/

Cons

- Cost is significantly higher
- Time: It takes some time to setup- 2-3 days.
- Phone Purchase: You need to buy an Android Phone(dummy/burner) to set it up using the Oculus For Business application.
- Can't sideload software but can use Oculus App Lab

COST: $600-900 Depending on HMD and fees
Recurring fee each year for support

25

Technical Requirements

- Android Phone to connect to Oculus Business account: Doesn't need to have a mobile network, just a basic phone that you can connect to the internet.
- Create Facebook dummy accounts for consumer headsets
- Strong Wi-Fi connection or multiple connections
  - Doesn't have to be connected to the internet unless using multiplayer mode
  - Could be using an IOT (Internet of Things Wi-Fi)
  - Internet lag when 4-5 HMD's on at the same time.
- Standalone wireless routers if possible
- Tech on site to troubleshoot issues and errors
- Students: We made students come in a try out the HMD's before putting them in the scenarios. Just to trial the Headset first.

26

Laptops

- Graphics/tech specs
  - Purchased: Dell XPS 7390 2-1 G3 15 Gaming Laptop: 16 GB
  - Cost: $1090 per laptop (4) and then one at each remote site)
  - Other Recommendations: Razer Blade, HP Pavillion Gaming PC, Lenovo Legion Y740, Alienware M17 R4
  - Recommendation for Developer PC's/Laptops:
    - Advanced GPU, NVIDIA GeForce RTX 2070 GPU or Higher, Intel Core i5-i9, and minimum 160GB of DDR4 Memory, though I prefer 32 GB.
- Why is it good to have
  - You need to have these laptops if would like to develop VR for these headsets, or load software updates from various software companies on the headsets.
  - It is also great to use to SidequestVR projects that aren't complete and in the Oculus Appstore.
  - It also allows you to showcase what you are seeing in the headset via SidequestVR stream.
  - Run diagnostics on the Headsets

27

IT Considerations

Things we learned:

- Headsets at full power usually work for 4 hours. Controllers with new batteries will last all day. Charge HMD's when you can.
- Keep Laptops plugged in at all times.
- Have extra batteries on site for each controller
- Buy the Case/ Don't buy the Display Chargers
- Keep the hand controllers with the right headset at all times. We put identifiers on both the headset and the controllers to make sure they stay all together.
- Print off a guide for what all the buttons do on the controllers
- Have user try out headset demo before use
- Buy the Cleanbox: https://youtu.be/eOqyYYy_hRA

28

Virtual Reality and Immersive simulation resources

SIMX
https://www.simxvr.com/
Ryan Ribeira, CEO
Ryan.ribeira@simxar.com

Merge Cube:
https://mergeedu.com/cube
Andrew Trickett, CEO
Andrew.trickett@mergvr.com

EducationXR
https://educationxr.com/
Cory Heizenrader, CEO
cory@heizenrader.com

The Cool Kids Table:
https://coolkidstable.webs.com/
Tess McKinney, Leader
tess3825@hotmail.com
Tess.mckinney@unmc.edu

https://www.thevrara.com/

UNMC NeVRNER
https://www.unmc.edu/nevrner/
Joseph Siu/Tess McKinney/Beth Beam/Mike Kozak
Tess.mckinney@unmc.edu

CleanBox
https://cleanboxtech.com/
Joy Morton
Joy.morton@uvcleantech.com

Let them know where you heard about them. They will be happy to assist you with any questions.

29

References

- Clamen, F. L. (2015). The impact of multiuser virtual environments on student engagement. *Nurse Education in Practice, 15*, 13-16.
- Ferguson, C., Davidson, P., Scott, P. J., Jackson, D., & Hickman, L. D. (2015). Augmented reality, virtual reality, and gaming: An integral part of nursing. *Contemporary Nurse, 51*(1), 1-4.
- Forsberg, E., Ziegert, K., Hult, H., & Fors, U. (2016). Assessing progression of clinical reasoning through virtual patients: An exploratory study. *Nurse Education in Practice, 16*, 97-103.
- Hamari, J. S., Rowe, E., Coller, B., Asbell-Clarke, J., & Edwards, T. (2016). Challenging games help students learn: An empirical study on engagement, flow and immersion in game-based learning. *Computers in Human Behavior, 54*, 170-179.
- Hayden, J. K., Smiley, R. A., Alexander, M., Kardong-Edgren, S., & Jeffries, P. R. (2014). The NCSBN national simulation study: A longitudinal study randomized controlled study replacing clinical hours with simulation in prelicensure nursing education. *Journal of Nursing Regulation, 5*(2), S1-S64.
- Kron, F., Gjerde, C., & Sen, F. (2010). Medical students' attitudes toward video games and related new media technologies in medical education. *BioMed Central Medical Education, 10*(50).
- Liaw, S. Y., Soh, S. L., Tan, K. K., Wu, L. T., Yap, J., Chow, Y. L., . . . Wong, L. F. (2019). Design and evaluation of a 3D virtual environment for collaborative learning in interprofessional team care delivery. *Nurse Education Today, 81*, 64-71.
- McCarthy, C. J., & Uppot, R. N. (2019). Advances in virtual and augmented reality-exploring the role in health-care education. *Journal of Radiology Nursing, 38*, 104-105.

30

Padilha, J. M., Machado, P. P., Ribeiro, A., Ramos, J., & Costa, P. (2019). Clinical virtual simulation in nursing education: Randomized controlled trial. *Journal of Medical Internet Research, 21*(3), 1-11. doi:10.2196/11529

Pomerantz, J. (2019). *XR for Teaching and Learning: Year 2 of the EDUCAUSE/HP Campus of the Future Project. ECAR research report.* Louisville, CO: EDUCAUSE.

Shernoff, D. (2013). *Optimal learning environments to promote students' engagement.* New York: Springer.

Sitterding, M. C., Raab, D., Saupe, J. L., & Israel, K. (2019). Using artificial intelligence and gaming to improve new nurse transition. *Nurse Leader*, 125-130.

Verkuyl, M., & Hughes, M. (2019). Virtual gaming simulation in nursing education: A mixed methods study. *Clinical Simulation in Nursing, 29*, 9-14.

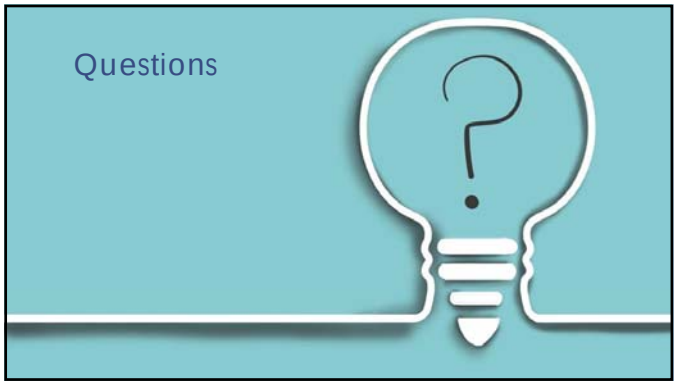
Verkuyl, M., Atack, L., Mastrilli, P., & Romaniuk, D. (2016). Virtual gaming to develop students' pediatric nursing skills: A usability test. *Nurse Education Today, 46*, 81-85.

Verkuyl, M., Atack, L., McCulloch, T., Liu, L., Betts, L., Lapum, J. L., . . . Romaniuk, D. (2018). Comparison of debriefing methods after a virtual simulation: An experiment. *Clinical Simulation in Nursing, 19*, 1-7.

Verkuyl, M., Romaniuk, D., & Mastrilli, P. (2018). Virtual gaming simulation of a mental health assessment: A usability study. *Nurse Education in Practice, 31*, 83-87.

31

Questions



32