Virtual/Augmented Reality for Health Professions Education Symposium

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Continuing Nursing Education

International Nursing Association for Clinical Simulation & Learning is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center’s Commission on Accreditation
DISCLOSURES

• **Conflict of Interest**
  
  • Michelle Aebersold, Associate Editor for Clinical Simulation in Nursing
  • Salam Daher, reports no conflict of interest
  • Cynthia Foronda, Nursing Education Consultant for Wolters Kluwer, Macy Foundation Faculty Scholar
  • Jone Tiffany – Nursing Education Consultant for Wolters Kluwer
  • Margaret Verkuyl, reports no conflict of interest
  
  • Mindi Anderson (INACSL Conference Administrator) reports no conflict of interest
  • Erin Killingsworth (INACSL Lead Nurse Planner) reports no conflict of interest

**Successful Completion**

  • Attend 100% of session
  • Complete session evaluation in app
LEARNING OBJECTIVES

Upon completion of this educational activity, participants will be able to:

1. Define terms associated with virtual and augmented reality simulation technologies in nursing and health professions education.
2. Describe two-three examples of virtual and augmented reality simulation technologies available for nursing and health professions education.
3. Identify available resources to assist in the use, design, and/or evaluation of the various virtual and augmented reality simulation technologies existing for nursing and health professions education.
4. Summarize the literature associated with existing virtual and augmented reality simulation technologies.
5. Provide at least one example of how to integrate a virtual and an augmented reality simulation technology into their program.
6. Identify debriefing strategies following a simulation-based experience using virtual and augmented reality simulation technologies.
7. Discuss approaches that incorporate virtual and/or augmented reality simulation technologies into traditional on campus vs. distance-based educational programs.
Kahoot.it

Click here
Introductions
Who Are You?

GO TOWWW.MENTI.COM AND USE THE CODE 14 13 68
Schedule

0800-0820: Introductions
0820-0830: Overview of the day
0840-0915 History
0915-0945: Systematic review
0945-1000: Examples
1000-1015: Break
1015-1045: Examples
1045-1215: Process
1215-1300: Lunch
1300-1400: Experience VR / AR
1400-1500: Art of Serious Games Design
History and Background
Reality-Virtuality Spectrum

- Completely Digital
- Virtual Reality
- Diminished Reality
- Mixed Reality
- Augmented Reality
- Real Reality
- Completely Real
Computer-Based (Non-VR, Non-AR)

- Real World Irrelevant
- Monitor, Speakers
- Keyboard, Mouse
- Input devices
- Hand controls view
- Player moves only virtually
- Brain Converts 2D to 3D visuals

Player
Virtual Reality (VR)

- Real World Replaced
- VR Headset
- Head controls view
- Player can move physically or virtually
- No 2D to 3D Conversion of Visuals

Player
Augmented Reality (AR)

Real World Part of Simulation

AR Headset or Spatial AR

Head controls view

Player physically moves

Player

No 2D to 3D Conversion of Visuals

Augmented Reality

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Player moves physically

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Virtual Reality

completely replaces the user's real-world environment with a simulated one
Virtual Reality Nursing Scenario
Augmented Reality

A view of a physical, real-world environment whose elements are augmented by computer-generated sensory input (e.g. visual, auditory, haptic, olfactory)
AR-HoloLens
HoloHeart
Mixed Reality

Mixed reality is the result of blending the physical world with the digital world

https://docs.microsoft.com/en-us/windows/mixed-reality/mixed-reality
Diminished Reality

is a term used to describe the control over one's reality and the ability to block out real or digital information.
Head-Mounted Displays (HMDs)

are a type of computer display devices that are worn on the head meant for a total immersion of the user no matter where the user’s head may turn.

**AR Headsets (examples)**
- HoloLens
- Magic Leap

**VR Headsets (examples)**
- Oculus
- Vive
Areas of AR/VR in Healthcare

• **For the Patient**
  • Physical Rehabilitation (e.g. Gait, extremities, Amblyopia)
  • Psychological Rehabilitation (e.g. PTSD, Phobias, autism)
  • Addiction
  • Distraction
    • Pain management
    • Companion / Virtual Assistant
  • Familiarization
    • With procedure
    • Virtual coaching
Areas of AR/VR in Healthcare

- **For the Provider (Learning / Training / Assessment)**
  - Outside of the Patient (e.g. PVP, shader lamps)
  - Inside of the patient (e.g. virtual colonoscopy)
  - The Patient’s view (e.g. retina simulation)
  - Interaction with environment (e.g. battle field, ER, Trauma center)
  - Interaction with Peers
Benefits of using AR/VR

• Engaging / distracting
• Interactive
• Repeatable / Controllable
• Safe Practice
• Use of Physical Space
Drawbacks of using AR/VR

- Cybersickness
- Eye strain
- Neck strain
- Trip Hazard (wires)
- Mismatch of Physical Space with Virtual Space
- Pain desensitization
The Research
Synthesis of Research

Virtual simulation

- **Improved knowledge** compared to customary methods (Gu, Zou, Chen, 2017)
- **Decreased time** to skill achievement (Farra, et al., 2015)
- **Increased retention** of material over time (Farra, Miller, Timm, & Schafer, 2013)
Systematic Review

Team of 5 individuals
Reviewed articles from 1996-2018
Applied PRISMA Guidelines
Rated articles using Melnyk and Fineout-Overholt’s Levels of Evidence
“How does virtual simulation impact learning outcomes?”

Records identified through database search (n=286)
  PubMed n=35, CINAHL n=87, Web of Science n=54, ProQuest n=110

Records identified through ancestral search (n=163)

Records after duplicates removed (n=396)

Records screened (n=396)

Records excluded based on abstract (n=279)

Full-text articles assessed for eligibility (n=117)

Full-text articles excluded, with reasons (n=37)
  - Not a research study n=17
  - Not with virtual Simulation n=13
  - Study participants not nursing students n=5
  - Focus on instrument development n=2

Studies included in the review (n=80)
Rating the Evidence

**Evidence Pyramid.**

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Systematic Reviews &amp; Meta-analysis of RCTs; Evidence-based Clinical Practice Guidelines</td>
</tr>
<tr>
<td>Level 2</td>
<td>One or more RCTs</td>
</tr>
<tr>
<td>Level 3</td>
<td>Controlled Trials (no randomization)</td>
</tr>
<tr>
<td>Level 4</td>
<td>Case-control or Cohort study</td>
</tr>
<tr>
<td>Level 5</td>
<td>Systematic Review of Descriptive and Qualitative studies</td>
</tr>
<tr>
<td>Level 6</td>
<td>Single Descriptive or Qualitative Study</td>
</tr>
<tr>
<td>Level 7</td>
<td>Expert Opinion</td>
</tr>
</tbody>
</table>

Results

Level of evidence of the research studies

- Level 4-6: 50%
- Level 2-3: 50%

High Level

Lower Level

Results

Research study publication by year
Results

Level of learner of the reviewed studies
Results

Number of times the outcomes were investigated in the reviewed studies
Results

The majority of the evidence ($n=69$ studies, 86%) suggested that the intervention of virtual simulation resulted in improved student learning outcomes.
Results

When looking at the 17 RCT’s, the majority (n=12, 70%) of studies demonstrated that virtual simulation lead to statistically significant gains in learning outcomes when compared to traditional methods.
Areas of common bias identified:
- Identify the effect size/s
- Conduct a power analysis to determine adequate sample size
- Blind study personnel
- Identify confounding factors
- Report confidence intervals
- Examine perceptions of learning instead of hard metrics/objective measures of student learning
Limitations

Limited search terms
Over-reporting of positive findings
Only examined nursing education
Wide range of uses prohibiting a meta-analysis
Recommendations

1) Attempt to decrease bias
2) Use Simulation Research Reporting Guidelines
   (Cheng, et al., 2016)
3) Express description of the simulation components including
   a) level of fidelity,
   b) immersion, and
   c) bodily form of the patient
   (Cant, et al, 2019).
Conclusion

Use of virtual simulation is increasing in nursing education.

The preponderance of evidence suggest it improves learning outcomes.

Virtual simulation is a pedagogy of the now and the future!
Technologies Applications
vSim for Nursing®

Digital Clinical Experiences®

Virtual Gaming Simulations
Anatomage
Anatomage

https://www.youtube.com/watch?v=hHy9pMJ_sgQ&list=PLt_lLiLQ3dXEyDFSL1LkMBaDDC5ua59fD6&index=1
Device and Workflow

Microsoft HoloLens was utilized as the AR device. AprilTag was placed on the head of the mannequin to project the AR facial model. KEG was applied to stabilize the model. Stop tracking after the model was stable.
Augmented Reality

Physical Virtual Patient
Physical Virtual Patient (“capillary refill”)
Physical Virtual Patient (regions)
Physical Virtual Patient (tug lips)
Physical Virtual Patient

Physical Virtual Patient
HMD AR vs. Spatial AR

**HMDs**
- Narrow Field of View
- Heavy
- Look funny
- Synchronization across multiple users
- Cybersickness

**Spatial AR (Projection)**
- Occlusion (front projection)
- Distortions
Innovation in Learning, Inc. Used by permission. (2019)
www.simtabs.com
Inclusivity Assignment
Virtual Public Health Clinical
That's what makes me so scared. What do you think it will be like when I have to leave here and go back to Johnny? Like - I'll REALLY be looking pregnant then. How do I stay safe and protect my baby?
BRINGING HEALTHCARE EDUCATION TO LIFE
Through innovative technology, proven curriculum theories, and designed learning experiences, the ARISE project is bringing a new dimension to educating our future healthcare professionals.

Augmented Reality Integrated Simulation Education

http://ariseproject.com/
Heart VR - Immersive VR
Virtual Simulations in Education

Clear objectives that align with curriculum
Introduction
Faculty prep
Grading
Prebrief
Enactment (simulation)
Debrief
Introduction
Faculty Prep (new research)

Understand content
Thorough knowledge of virtual simulation (recent play)
Understand how to ‘play’ the virtual simulation
Excited about the virtual simulation
Support person re: virtual simulation & technology
Prebrief

Learning outcomes
Technology
Access to virtual simulation
How to play
Expectations
Support

Oral, Written, Video Tutorial
Enaction (Simulation)

Different Formats for Playing Virtual Gaming Simulations

Margaret Verkuyl, MN, NP:PHC, Nancy McGee, MS, RN, Tara McCulloch, MEd, RN, Joyce Tsui, MN, RN, Briana Layard, BScN, RN

Virtual simulation is an emerging field in nursing with an expanding body of literature. Similar to in-person simulations, virtual simulations deal with a specific clinical experience; however, rather than being played in person, they are played on a computer. Virtual gaming simulations (VGSs) are virtual simulations enhanced with gaming features. The gaming elements allow the user to interact with specific characters in the clinical environment to make decisions related to specific learning objectives. These VGSs have documented

**KEY POINTS**

- Virtual gaming simulation closely resembles an interactive clinical experience.
- Nursing students played virtual gaming simulations in different formats: individually, in pairs, and in a larger group.
- The format for playing virtual gaming simulations may influence the student experience and needs to be further explored.
Debriefing

Why Debrief
- Where the **learning** occurs
- Make connections to practice

Questions related to debriefing virtual experiences.

  What way do we usually debrief?

  What is the problem with virtual simulation??
Virtual Simulation Debriefing Options

In-person debrief

Self debrief

Synchronous virtual debrief

Asynchronous debrief
In-Person Debriefing

The gold standard
Four to ten participants
Two debriefers

Self-Debriefing

Integrated throughout
Offered at the end with guided questions (offers immediate debrief)
Identifies learner’s strengths and challenges
Synchronous Virtual Debriefing

Virtual platform
Similar format to in-person

Asynchronous Virtual Debriefing

Discussion board
Specific debriefing questions
Identified number of postings in an online learning system/Blog
Time limits
Debriefing Research

Clinical Simulation in Nursing (2018) 19, 1-7

Featured Article

Comparison of Debriefing Methods after a Virtual Simulation: An Experiment

Margaret Verkuyl, MN, NP, PHC, Lynda Atack, PhD, RN, Tara McCulloch, MEd, RN, Linda Liu, MN, RN, CPMHN(c), Lorraine Betts, MN, RN, CHSE, Jennifer L. Lapum, PhD, RN, Michelle Hughes, MEd, RN, Paula Mastrilli, PhD, RN, Daria Romaniuk, PhD, RN

aCommunity of Health Studies, Centennial College, Toronto, Ontario M1K 5E9, Canada
Debriefing Research

Clinical Simulation in Nursing (2018) 20, 7-14

Featured Article

Virtual Gaming Simulation: Exploring Self-Debriefing, Virtual Debriefing, and In-person Debriefing

Margaret Verkuyl, MN, NP:PHC, Jennifer L. Lapum, PhD, RN, Michelle Hughes, MEd, RN, Tara McCulloch, MEd, RN, Linda Liu, MN, RN, CPMHN(c), Paula Mastrilli, PhD, RN, Daria Romaniuk, PhD, RN, Lorraine Betts, MN, RN, CHSE
Combination of Debriefs (Study Results Coming Soon!!)

Self-debrief plus in-person small group
Self-debrief plus in-person large group

Timing of Combined Debriefs

Immediate self-debrief
1-2 weeks later group debrief
Process of Using Virtual Experiences

Enactment or simulation
- Individual
- Pairs
- Group

Debrief
- Self-debrief
- Synchronous virtual debrief
- Asynchronous online debrief
- In-person group debrief
- Combine debriefing methods
Questions for all Faculty?
Lunch Break-12:15-1pm
Table Activities
The Art of Serious Game Design

Naza Djafarova, Leonora Zefi, Mariam Ahmed, Anastasia Dimitriadou, Margaret Verkuyl
Outline

Intro

Game Design Demo

Debrief
The Art of Serious Game Design

A hands-on workshop for developing educational games: Facilitator guide

Digital Education Strategies, The Chang School of Continuing Education, Ryerson University

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Intro

https://de.ryerson.ca/games/research
Intro
Play Time!

Game Design Demo
Icebreaker

Introduce yourself to your design group. Share your name and the name of your favourite game.
Brainstorming #1
Use the cards to generate ideas for your game in 5 minutes.
Decide on a topic in nursing to make into a Game.

2 minutes
Brainstorming #2
Use the cards to refine your ideas for your game in 5 minutes.
Paper Prototyping

Draw a prototype based on your ideas in 5 minutes.
Feedback

1. What did you learn during the process?
2. What key items should you consider when creating or choosing games for nursing?
Serious Games Development Process

Development

Simulation Design
- Objective
- Case / Scenario

Technical Development
- References
  - Logic Programming
- User Interface
- Testing
- Assets (arts)
  - Visuals
  - Sounds
  - Responses

Debrief
- Feedback


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• Margaret Verkuyl, mverkuyl@centennialcollege.ca Twitter: @VerkuylMargaret
Free Resources VGS

All Virtual Gaming Simulations Found in the Virtual Healthcare Experience and more will be added as they come available
https://de.ryerson.ca/games/nursing/hospital/

Mental Health Modules and VGS
https://de.ryerson.ca/games/nursing/mental-health/

Pediatric VGS
https://de.ryerson.ca/games/nursing/post-op/

Maternity Series Modules and VGS
https://de.ryerson.ca/games/nursing/maternity/

Prenatal VGS Only
https://de.ryerson.ca/games/nursing/maternity/prenatal/game/#/

L&D VGS Only
https://de.ryerson.ca/games/nursing/maternity/labour-and-delivery/game/#/

Post Partum VGS Only
https://de.ryerson.ca/games/nursing/maternity/postpartum/game/#/
THANK YOU

Please complete the survey for this session in the app.