Innovations in Simulation: Virtual Reality

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Disclosure

Overview

1. Definitions and background related to virtual reality (VR) simulation.

2. Current use of virtual environments including nursing and healthcare education.

3. Development considerations for using VR in nursing education.

Virtual Reality

"The use of computer technology to create and interactive three-dimensional world in which the objects have a sense of spatial presence; virtual environment and virtual world are synonyms for virtual reality...a computer-generated three-dimensional environment that gives and immersion effect." (SSIH, 2016, p. 40)

Virtual Reality Simulation

"Simulations that use a variety of immersive, highly visual, 3D characteristics to replicate real-life situations and/or healthcare procedures; virtual reality simulation is distinguished from computer-based simulation in that it generally incorporates physical or other interfaces such as a computer keyboard, a mouse, speech and voice recognition, motion sensors, or haptic devices" (SSIH, 2016, p. 40)

Virtual Reality

"Also known as computer-assisted simulation, computer-based simulation. A computer generated reality, which allows a learner or group of learners to experience various auditory and visual stimuli. This reality can be experienced through the use of specialized ear and eyewear."
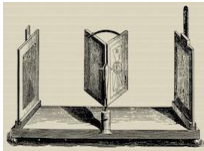(INACSL. 2016, p. S40)

Not a New Idea
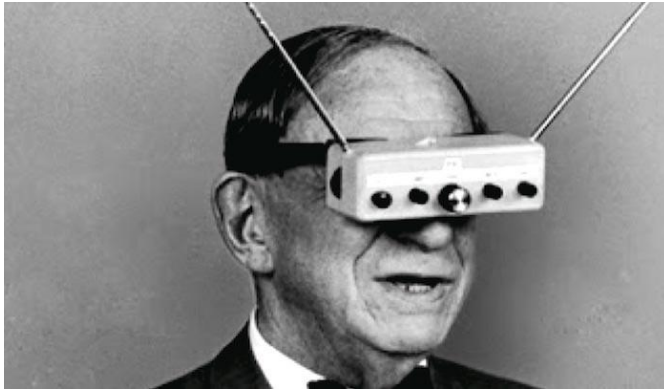
Virtual Reality Society (2017). History of virtual reality. Retrieved from https://www.vrs.org.uk/virtual-reality/history.html

History of Virtual Reality

Virtual Reality Society (2017). History of virtual reality. Retrieved from https://www.vrs.org.uk/virtual-reality/history.html

Stereoscopic Photos & Viewers

Virtual Reality Society (2017). History of virtual reality. Retrieved from https://www.vrs.org.uk/virtual-reality/history.html

1929 – Link Trainer
The First Flight Simulator

Virtual Reality Society (2017). History of virtual reality. Retrieved from
https://www.vrs.org.uk/virtual-reality/history.html

The First VR Head Mounted Displays

- 1960 – The first VR Head Mounted Display
- 1961 – The VR with motion tracking
- 1965 – The Ultimate

Virtual Reality Society (2017). History of virtual reality. Retrieved from https://www.vrs.org.uk/virtual-reality/history.html

Morton Heilig's Sensorama

Virtual Reality Society (2017). History of virtual reality. Retrieved from https://www.vrs.org.uk/virtual-reality/history.html

1968 – Sword of Damocles

Virtual Reality Society (2017). History of virtual reality. Retrieved from
 https://www.vrs.org.uk/virtual-reality/history.html
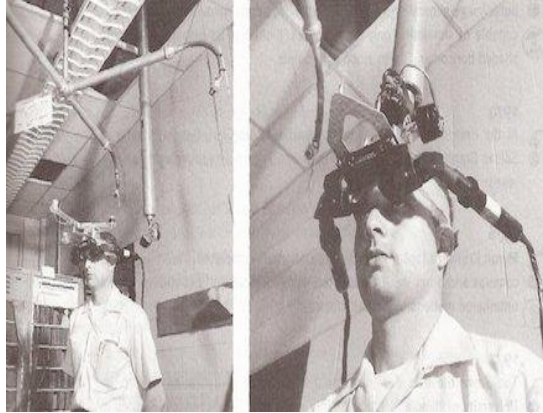
1987 – Virtual Reality "the name was born"

(Virtual Reality Society , 2017).

Aspects of Immersion

- Inclusion
- Extension
- Surrounding
- Vividness
- Matching

(Miller & Bugnairu, 2016).

http://blogs.3ds.com/perspectives/wp-content/uploads/sites/22/LIVES_Sensivise1.jpg

Levels of Immersion

2D: Mouse and Keyboard

- Numerous signals indicating presence of device
- Stimuli not spatially located
- Limited field view

Levels of Immersion (cont'd)

3D: Head Mounted Display/CAVE
- Large-screen projection with extended field of view or Head-mounted device or surround projection
- Limited signals indicating the presence of device(s) in the physical world
- Accommodates >2 sensory modalities (e.g., auditory, visual, motor/proprioceptive); stimuli are spatially oriented
- High fidelity and visual/color resolution; closely replicates simulated environment

Sense of Presence

- Immersion refers to a set of technical manipulations

- **Presence** refers to a user's individual experience.

  -Subjective perception of being there in a scene depicted

  Thornson, Goldiez & Le (2009)

How Does it Work?

- Head Mounted Display: Creates 3D realistic environment
- VR Headsets Either:
    - -two feeds sent to one pixelated display OR
    - -two LCD displays, one per eye

    Lenses which are placed between your eyes and the pixels, which is why the devices are often called goggles.

Motion Sensing

- Head Tracking
    - o gyroscope, accelerometer and a magnetometer
- Infrared sensors track hand movements
- Cameras track motion of the body
- Matrix of sensors on each controller to detect gestures such as pointing and waving.

VR Gear

- Virtual reality glasses or goggles
- Data gloves
- Controllers
- Head mounted displays (HMD)
- Data suits
- Workbenches
- Joysticks

Applications: Military

Virtual Reality Society (2017). History of virtual reality. Retrieved from
https://www.vrs.org.uk/virtual-reality/history.html

Virtual Reality in the Military

Virtual Reality Society (2017). History of virtual reality. Retrieved from
https://www.vrs.org.uk/virtual-reality/history.html

Augmented Reality War Games

Virtual Reality Society (2017). History of virtual reality. Retrieved from
https://www.vrs.org.uk/virtual-reality/history.html

Flight Simulator

Virtual Reality Society (2017). History of virtual reality. Retrieved from https://www.vrs.org.uk/virtual-reality/history.html

Classroom

Stevens, J.B. (2016). Retrieved from http://www.jaclynbstevens.com/blog/science-fiction-is-reality-with-vr

Other VR Applications

- Visualizations, e.g. geographical
- Weather forecasting
- Historical, e.g. re-creating ancient civilizations
- Data analysis, e.g. financial data

Healthcare

- Human simulation software
- Diagnostics
- Robotic surgery
- Dental training
- Medical education
- Nursing education
- Surgery simulation

- Phobia treatment
- PTSD treatment
- Autism treatment
- Addiction Treatment

http://currents.plos.org/disasters/files/2013/02/Virtual-Reality-Mass-Casualty-Triage.png

## Why VR for nursing education?

- Nurse educators have been called upon to transform nursing education to prepare students for complex healthcare environments
- Virtual reality (VR) is one strategy for preparing nurses for future practice with technology that is:
 - Accessible
  - Flexible
  - Realistic

Selected Nursing Education VR Studies

▶ Positive perceptions of use of Second Life among graduate students (Benham-Hutchins & Lall, 2015)

▶ Importance of design, sequencing, and authenticity critical factors in VR design (Peddle et al., 2016)

➢ Positive effects on nursing knowledge and performance related to disaster skills (Farra et al., 2013; Smith et al., 2016)

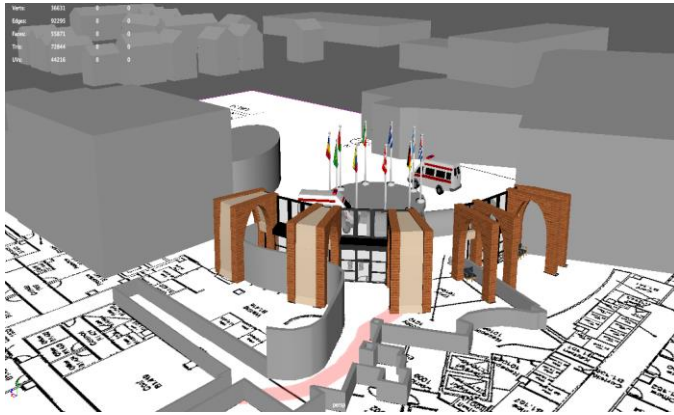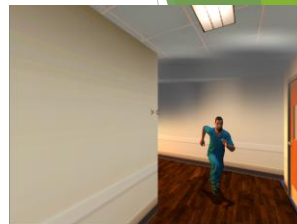➢ Increase in pediatric knowledge and self-efficacy (Verkuyl et al.,
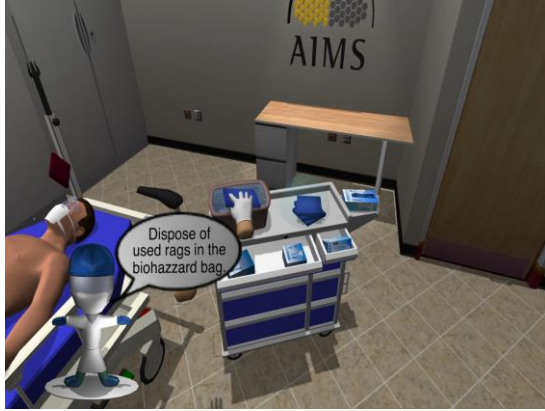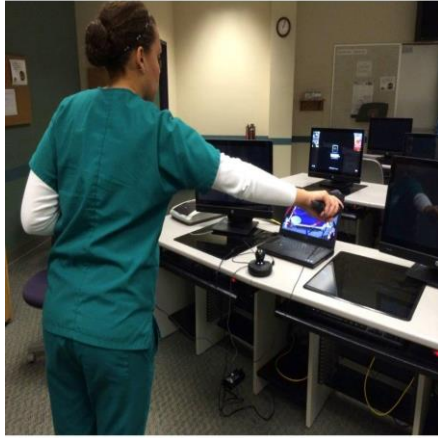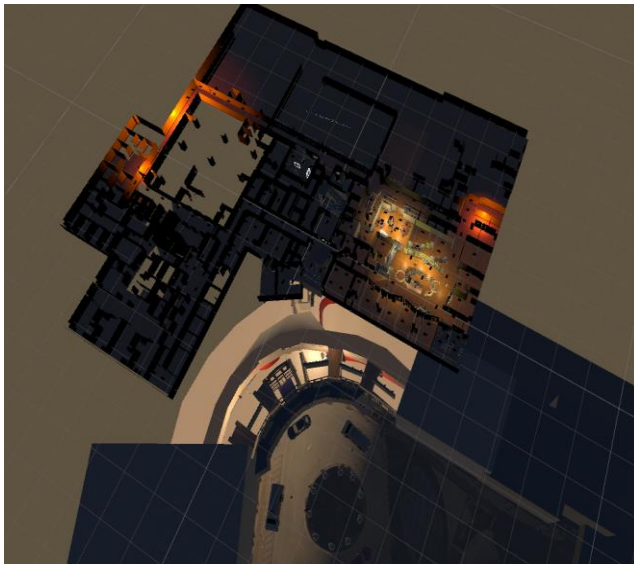
Development Considerations

- ► INACSL Best Practice Standards
- ► Objectives
- ► Types of equipment
- ► Debriefing/Reflective techniques

Interprofessional Development Teams

- Content experts
- Education experts
- Simulation experts
- Technology experts

Storyboard Development

▶ VRS 4 Storyb

Objective	Scene	Action	Challenge	Redirect: Formative Feedback Facilitation
		Choose your role: a. **MT** b. **Respiratory Therapist (RT)** c. **Bedside Nurse/Clinician** *the learner will need to click an onscreen*	Selects role and arrive in that section of VRS. The scenario for each role is highlighted in yellow and in a dashed box	

http://sbt.blob.core.windows.net/storyboards/anna-warfield/blank-film-storyboard-template.png?utc=131110776859170000

Limitations of VR

▶ Access to right team

▶ Costs

▶ Technical limitations

▶ Motion sickness

▶ Faculty and student development

▶ Faculty resistance

Conclusions

▶ Use of VR is increasing
▶ Standards of simulation must be incorporated
▶ Simulation must fit objectives
▶ Need for interprofessional teams

Acknowledgements

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Questions?

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