Creating Engaging Virtual World Simulations for Collaborative Healthcare Education

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Breakout Session 1
Learning about virtual world applications

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- No conflicts of interest to disclose

Learning Objectives

- Understand the potential applications of virtual simulation in a variety of health care settings
- Know the potential applications of virtual environments for collaboration and information sharing

Outline

- Review examples of Virtual World applications to teaching in the health professions
- Small group discussion on the ways that these examples could apply to local needs

Case Studies

- Practice & Simulation
- Collaboration/Distance learning
- Role-Play/Dramatization
- Visualization
- Gaming

PRACTICE & SIMULATION

- Faculty training in simulation management (Weiner, 2010)
- Ease transition to manikin-based simulation or clinical practice (Brydges, 2010)
- Technical training for surgical residents (Alwadani, 2012; Akdemir, 2014, Al-Noury 2012)
- Basic Laboratory Skills (SWIFT Lab)

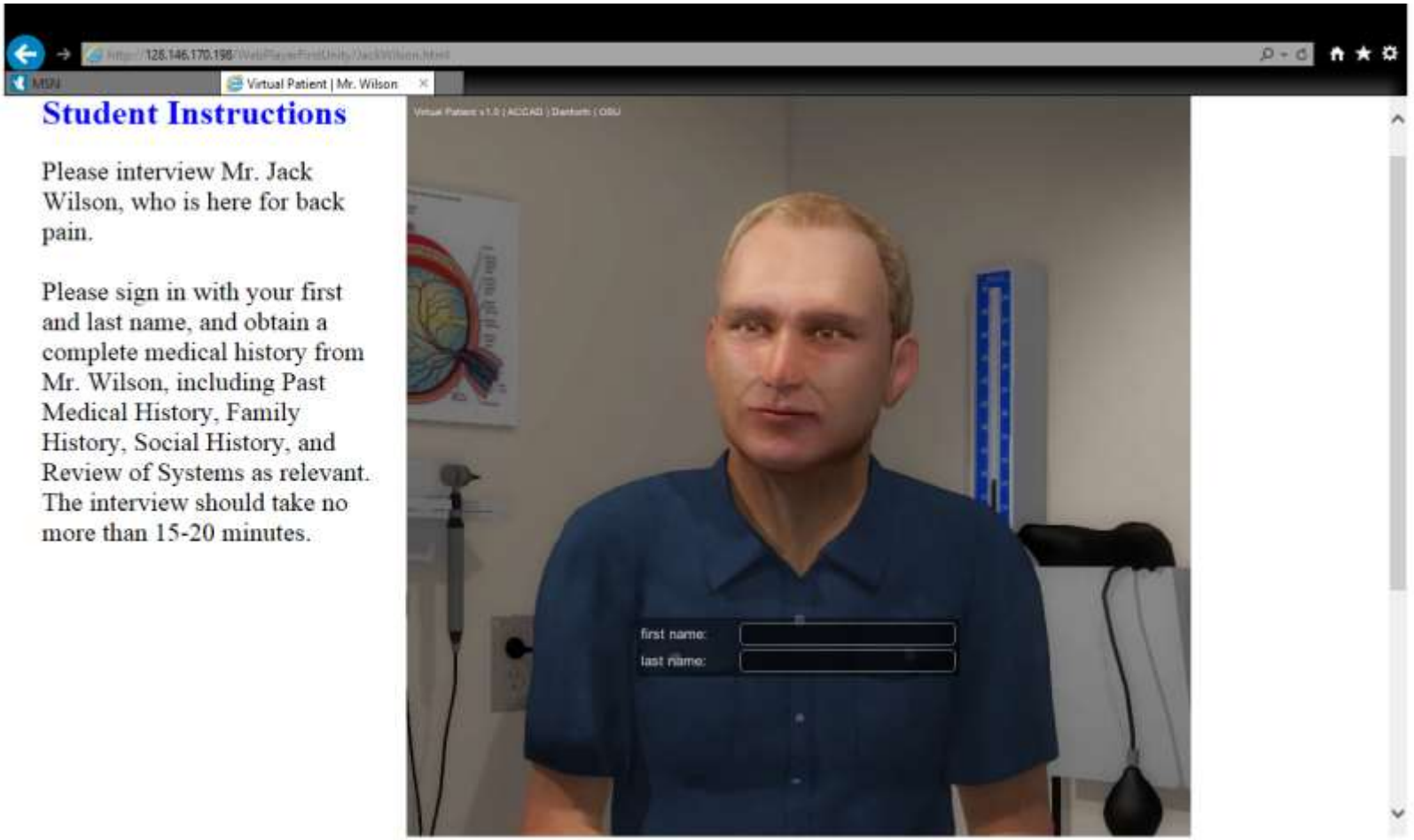
Communication Training and Practice

- Empathy (Lim, et al 2011; Andrade et al 2010)
- Delivering bad news (Jarmon, et al 2009)
- Motivational Interviewing (Mitchell, et al 2011)
- Cross-cultural communication (Fors, et al 2009)

Interviewing mother with a sick baby in local hospital setting

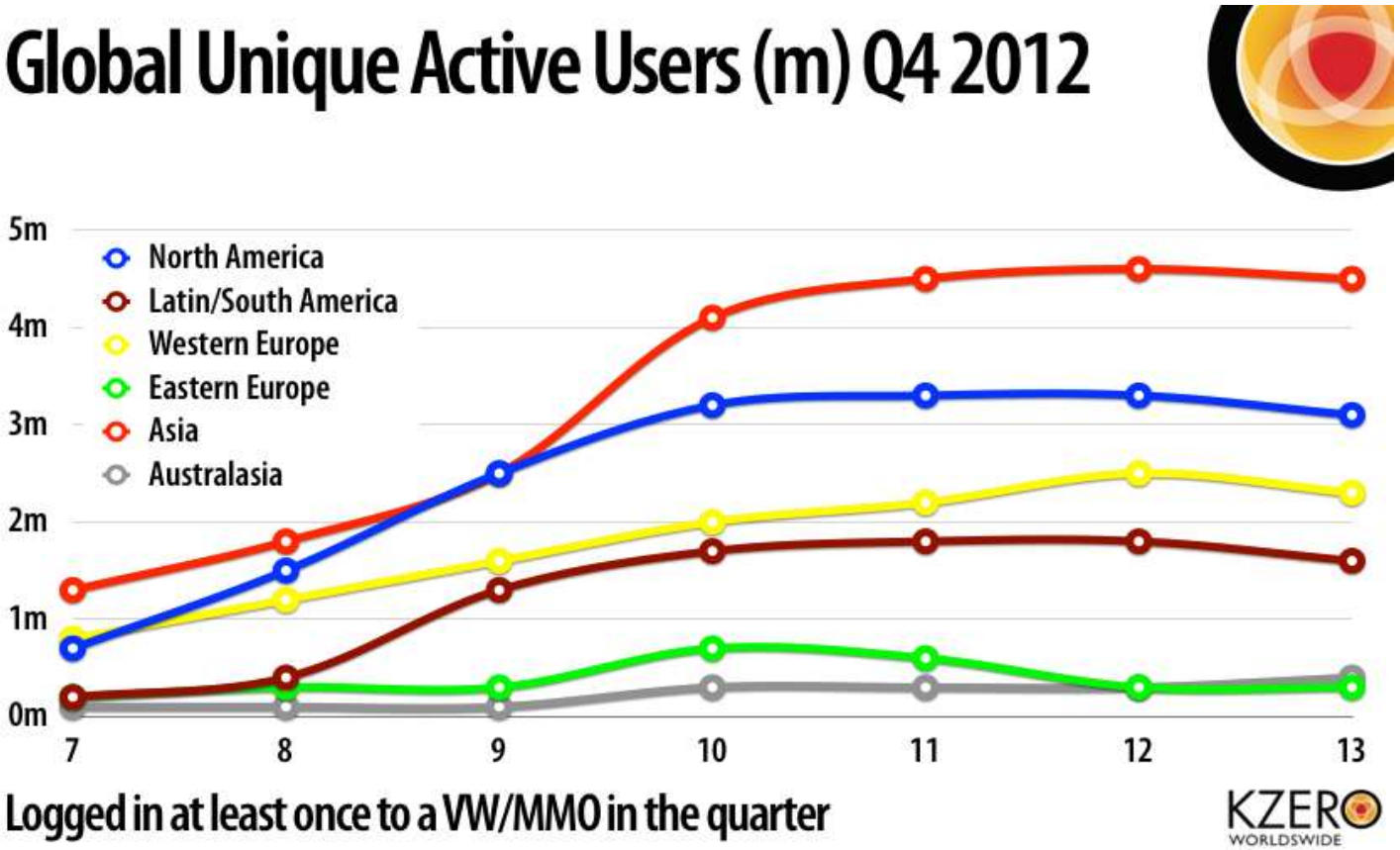
Practice patient interview using web-based Unity3D platform

[Ohio State University Virtual Patient]



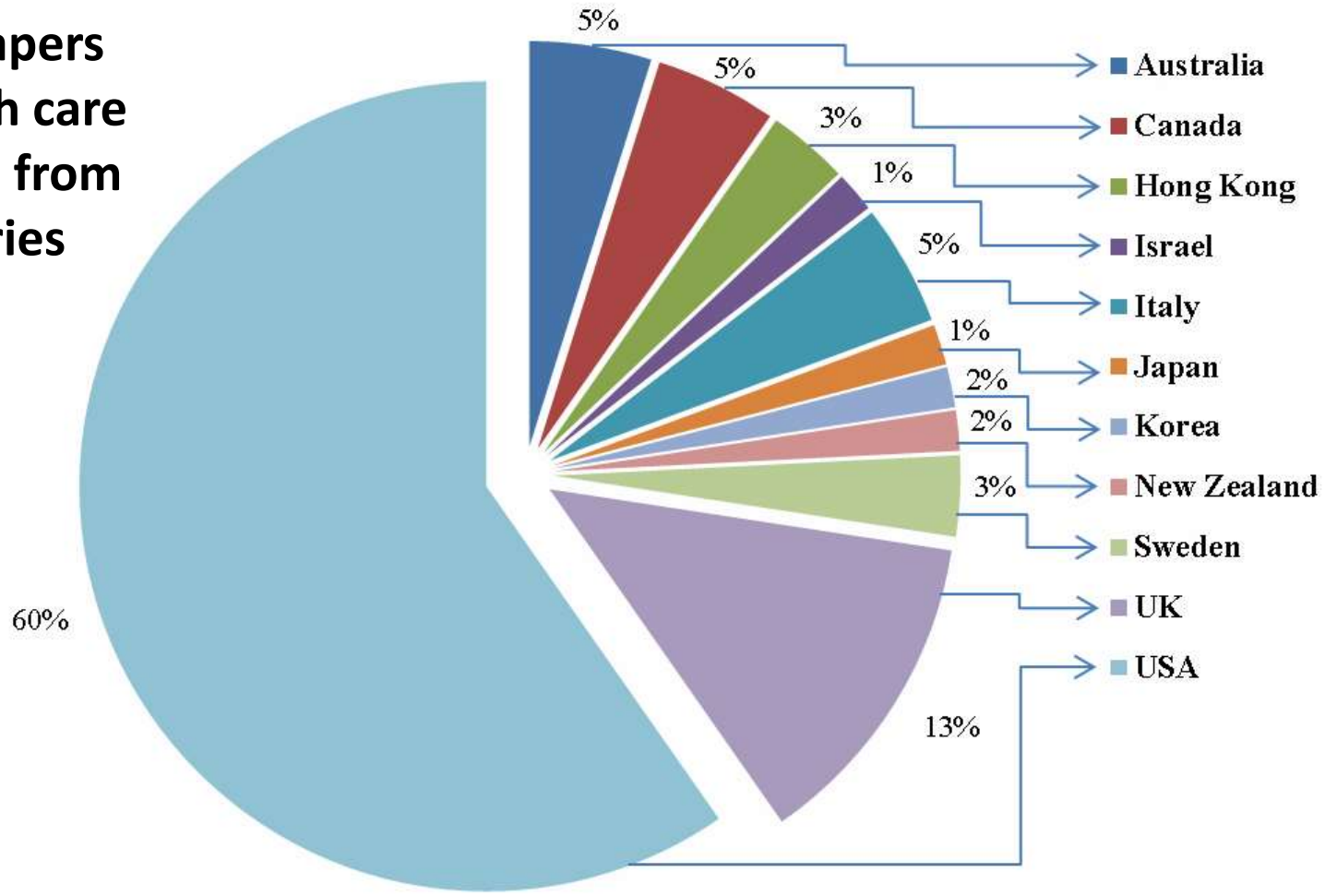
COLLABORATION/DISTANCE LEARNING

Interact with educators and students from other countries



Collaborate on international educational and research projects

Frequency of papers on virtual health care related projects from different countries



Ghanbarzadeh et al., 2014

Virtual Worlds Education Roundtable

Meeting Weekly Since 2008!

OpenSimulator Community Conference

November 8 - 9, 2014

VIRTUAL WORLDS

best practices in education

7th Annual

April 9-12, 2014

ROLE-PLAY/DRAMATIZATION

Teamwork Training through role-play in virtual hospital setting

TeamSTEPPS® 2.0

Team Strategies and Tools
to Enhance Performance
and Patient Safety

Agency for Healthcare Research and Quality
Advancing Excellence in Health Care • www.ahrq.gov

Defense Health Agency

Objectives

To create a virtual 3D site for health professional education

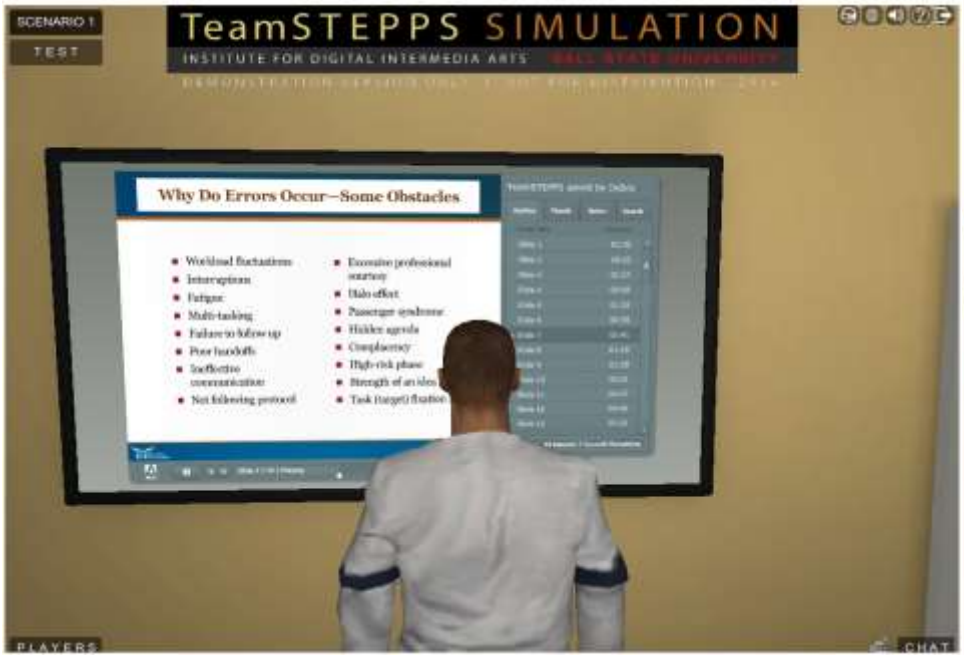
To determine usability of the site

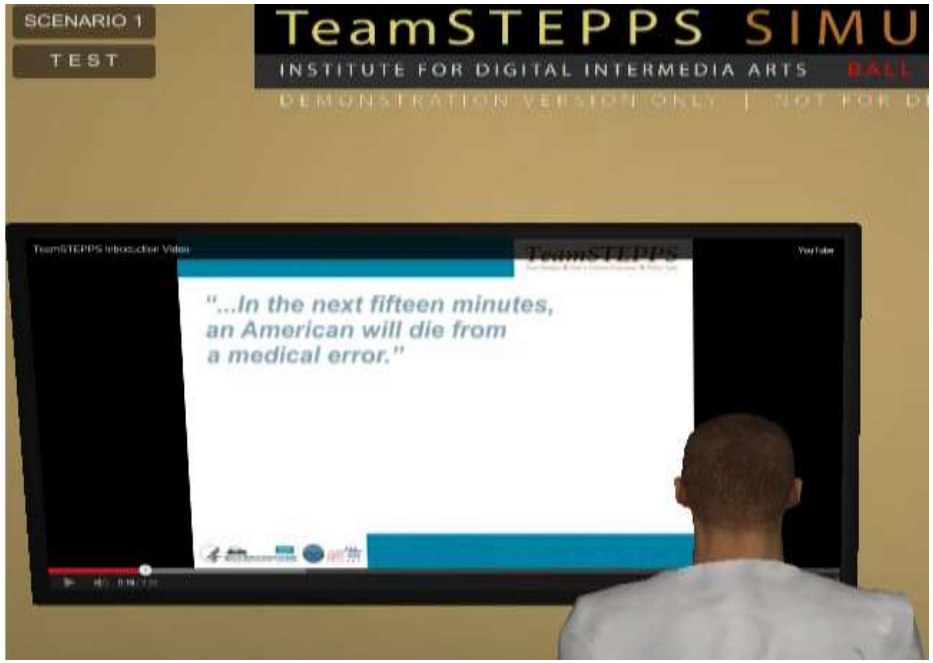
To determine effect on learners' attitudes to teamwork

- Hypothesis: Students' will show an increase in post-test scores on the Teamwork Attitudes Questionnaire compared with pre-test scores
- Study Design: Pre-/Post-test

Methods

- Conducted at Indiana University and Ball State University (Indiana) within Unity3D environment
- 145 health professional students (Medicine/Nursing/ Social Work/Health & Rehabilitation Science)
- Reviewed *TeamSTEPPS* concepts





- Students completed three scenarios designed to enable individual practice of teamwork principles
- Scenarios required them to apply their knowledge of the *TeamSTEPPS* tools

Study participants

School	18-24 years	25-30 years	31-35 years	36-40 years	40+ years	Total
Ball State School of Nursing	40 88.9%	2 4.4%	1 2.2%	2 4.4%	0 0.0%	45 31.0%
IU School of Medicine	10 76.9%	3 23.1%	0 0.0%	0 0.0%	0 0.0%	13 9.0%
IUPUI School of Social Work	2 28.6%	2 28.6%	1 14.3%	0 0.0%	2 28.6%	7 4.8%
IU School of Health & Rehab Sciences	45 56.2%	27 33.8%	6 7.5%	2 2.5%	0 0.0%	80 55.2%
Total	97 66.9%	34 23.4%	8 5.5%	4 2.8%	2 1.4%	145

The sample was predominantly female (79.2%) and Caucasian (89.7%). While the Ball State students were college seniors, the students at the other schools were in graduate programs.

Results: Positive change in attitudes to teamwork

Teamwork Principles		Mean	Std. Dev.	Mean Difference	n	P-value
Team Structure	Pre	4.33	.361	.055	144	.026
	Post	4.38	.409			
Leadership	Pre	4.47	.406	.109	144	<.001
	Post	4.58	.411			
Situation Monitoring	Pre	4.31	.420	.121	144	<.001
	Post	4.43	.444			
Mutual support	Pre	4.11	.517	.208	144	<.001
	Post	4.33	.567			
Communication	Pre	4.22	.396	.156	143	<.001
	Post	4.37	.447			

Umoren, et al. Unpublished data

Student Feedback

- This simulation provided good information about different ways of handling situations that could happen in reality
- The case study was a better way to learn about the TeamSTEPPS. Sitting through the hour + of the man speaking [TeamSTEPPS lecture] was not a productive way to spend my time
- This is a very cool and interesting learning tool!
- I enjoyed the life-like interaction

VISUALIZATION

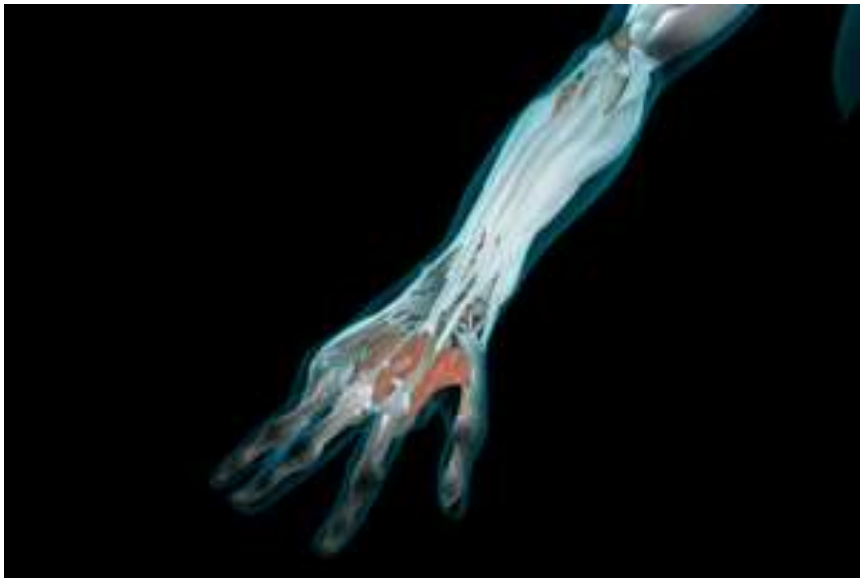
Anatomy

OpenSim simulates human movement with robotics

By: Alexis Garduno November 7, 2011 0 Comments

Tweet 6 Like 0

Stanford researchers have developed an open-source, human-inspired robotics technology that simulates human movement and can be scaled to match individual body sizes, ages and genders.

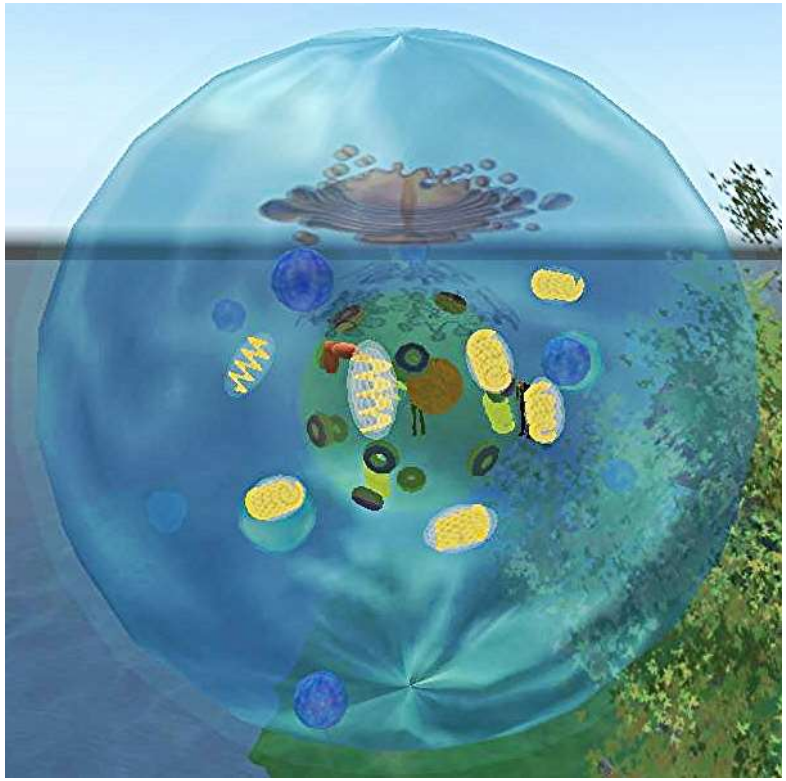


Astym 3D Visualization
An animation created using Unity3D to visualize specific effects and treatments of tendonosis

http://idialab.org/astym-3d-visualization/

Physiology

BIOME Region
Giant Cell

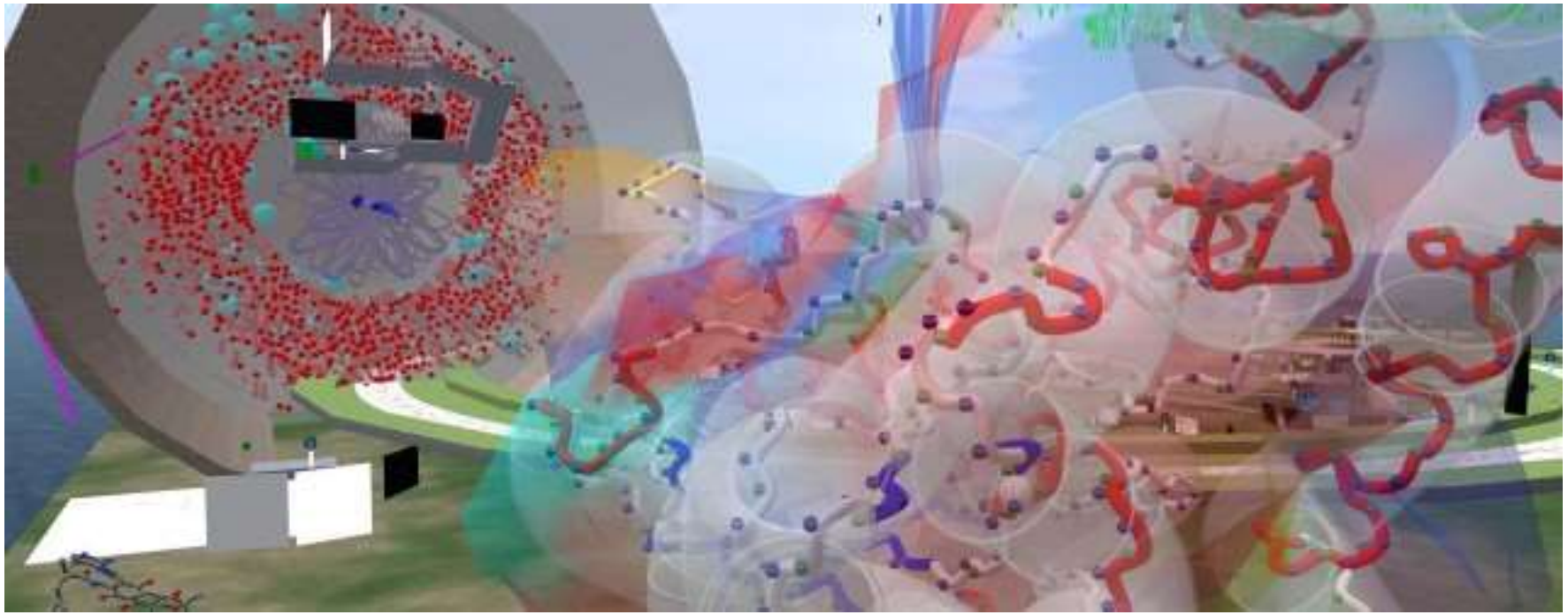


Courtesy: Carolyn Lowe/VIBE

BioZone Region

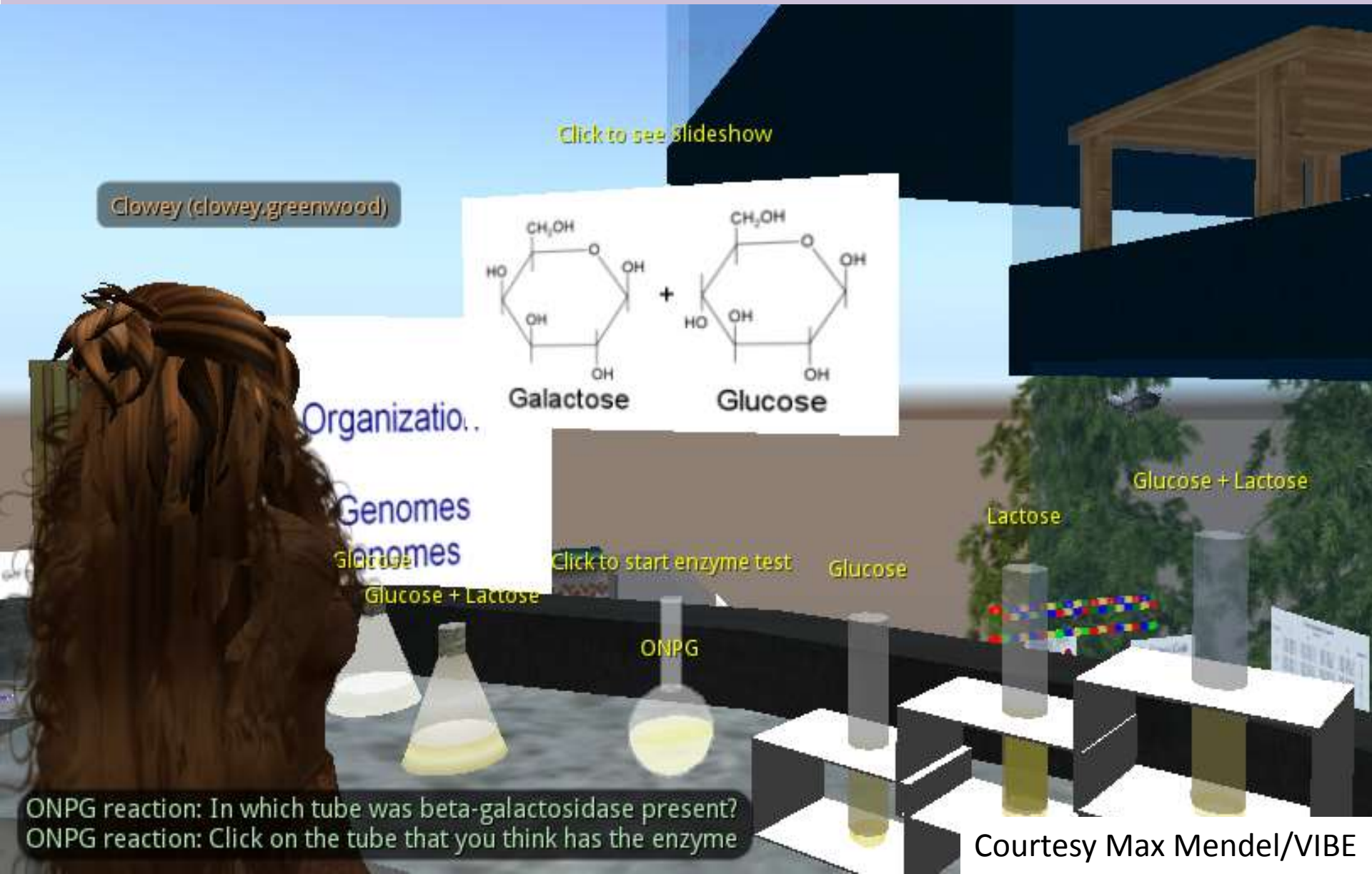
Focus on Mycobacterium tuberculosis

Displays include a giant cell, giant genome, large molecules and metabolism model



http://opensim-edu.org/blog/2012/01/biozone/

Biochemistry/Genetics (Genome Island)



Courtesy Max Mendel/VIBE

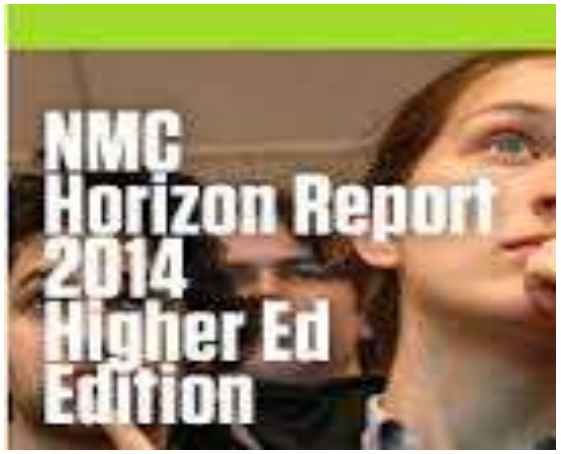
Psychiatry

Virtual Hallucinations (UC-Davis)

Allows students to experience the life of a schizophrenic patients through visual and auditory hallucinations

http://www.youtube.com/watch?v=s33Y5nI5Wbc

EDUCATIONAL GAMES



Time-to-Adoption Horizon: One Year or Less

> Massively Open Online Courses
> Tablet Computing

Time-to-Adoption Horizon: Two to Three Years

> Games and Gamification
> Learning Analytics

Time-to-Adoption Horizon: Four to Five Years

> 3D Printing
> Wearable Technology

Gamification

Hughes, A. Using Virtual Worlds and Gamification to Enhance Learning. VWBPE 2014

Categories of Educational Games

Hughes, A. Using Virtual Worlds and Gamification to Enhance Learning. VWBPE 2014

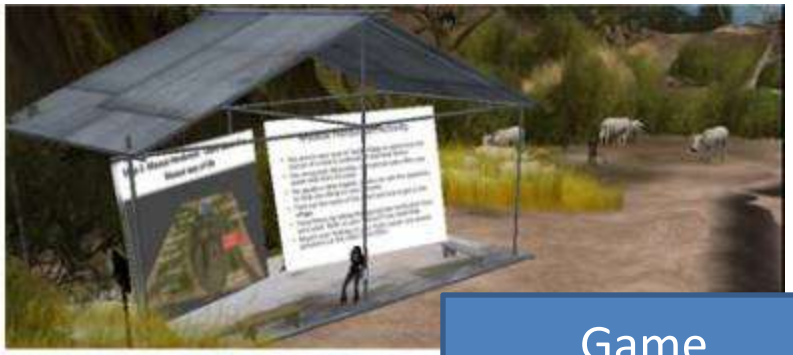
East Africa Travelers' Safety Activity

This is a virtual 3D simulation which uses Open Sim technology. The simulation gives new and experienced travelers an opportunity to test their knowledge of tropical diseases they may encounter and to practice their cross-cultural communication skills.

https://sites.google.com/site/globalhealth3dgrid/

- LEARNING OBJECTIVES:
  - Know the etiology, prevention and treatment of common tropical diseases endemic to the East African Region
  - Become familiar with and avoid common risk factors for acquiring tropical diseases
  - Prepare to interact with the local community in a culturally sensitive way, for the purposes of health care, health education and research.

- YOUR MISSION:
  - Follow instructions on the signs
  - Pick up your supplies
  - Answer questions on the radio
  - Stay on the path
  - When directed, communicate with members of the local community who are non-player characters (NPCs) by typing in the local chat



Game Motivation

- HEALTH RISKS:
  - You will encounter biological and environmental health risks.
  - Your supplies include a green exposure tracker to monitor your health and exposures, a backpack with emergency medications and a manual for reference.

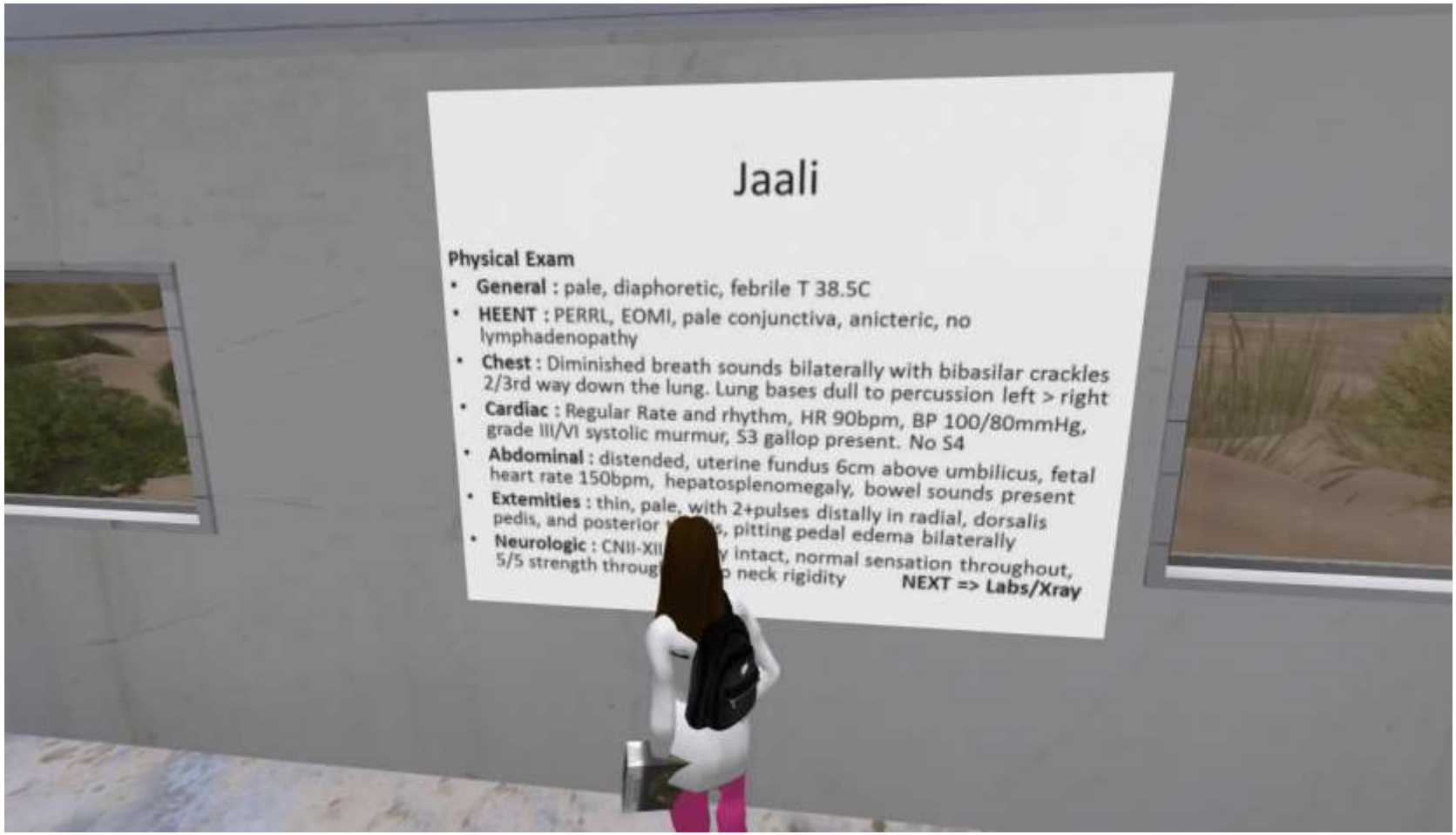
- QUESTIONS? Contact Rachel Umoren at rumoren@iu.edu

Meeting the Maasai herdsman (Exposure to brucellosis)

Local water sources (Exposure to Salmonella at the community well)

Diagnosing a patient at the local hospital

Physical examination findings are provided



Small group discussion

- Keeping in mind the broad categories below write down one or two ways that you would like to use virtual simulation in your field
  - Practice & Simulation
  - Collaboration/Distance learning
  - Role-Play/Dramatization
  - Visualization
  - Gaming

References

1. Wiecha J, Heyden R, Sternthal E, Merialdi M. Learning in a virtual world: experience with using second life for medical education. *J Med Internet Res.* 2010;12(1):e1.

2. Richardson A, Hazzard M, Challman SD, Morgenstein AM, Brueckner JK. A "Second Life" for gross anatomy: Applications for multiuser virtual environments in teaching the anatomical sciences. *Anatomical sciences education.* 2011;4(1):39-43.

3. Kidd LI, Morgan KI, Savery JR. Development of a Mental Health Nursing Simulation: Challenges and Solutions. *Journal of Interactive Online Learning.* 2012;11(2):80-89.

4. Connor K. Immersive virtual environments for perioperative nursing. *Perioperative Nursing Clinics.* 2012.

5. Phillips J, Berge ZL. Second life for dental education. *Journal of dental education.* Nov 2009;73(11):1260-1264.

6. Oultram S. Virtual plagues and real-world pandemics: reflecting on the potential for online computer role-playing games to inform real world epidemic research. *Medical humanities.* Apr 12 2013.

7. Weiner E, McNew R, Trangenstein P, Gordon J. Using the virtual reality world of second life to teach nursing faculty simulation management. *Stud Health Technol Inform.* 2010;160(Pt 1):615-619.

8. Brydges R, Carnahan H, Rose D, Rose L, Dubrowski A. Coordinating progressive levels of simulation fidelity to maximize educational benefit. *Academic Medicine.* May 2010;85(5):806.

9. Palmer E. The design, development and evaluation of an online, interactive, formative assessment tool for medical education. 2011.

10. Chapman DD, Stone SJ. Measurement of outcomes in virtual environments. *Advances in developing human resources.* 2010;12(6):665-680.

11. Kalz M, Schmitz B, Biermann H, Klemke R, Ternier S, Specht M. Design of a game-based pre-hospital resuscitation training for first responders. 2013.

12. Dev P, Youngblood P, Heinrichs WLR, Kusumoto L. Virtual worlds and team training. *Anesthesiology clinics.* Jun 2007;25(2):321-336.

13. Conradi E, Kavia S, Burden D, et al. Virtual patients in a virtual world: Training paramedic students for practice. *Med Teach.* Aug 2009;31(8):713-720.

14. Cohen DC, Sevdalis N, Patel V, Taylor D, Batrick N, Darzi AW. Major Incident Preparation for Acute Hospitals: Current State-of-the-Art, Training Needs Analysis, and the Role of Novel Virtual Worlds Simulation Technologies. *The Journal of Emergency Medicine.* Dec 2012;43(6):1029-1037.

15. Moreno-Ger P, Torrente J, Bustamante J, Fernández-Galaz C, Fernández-Manjón B, Comas-Rengifo MD. Application of a low-cost web-based simulation to improve students' practical skills in medical education. *International Journal of Medical Informatics.* Jun 2010;79(6):459-467.

16. Creutzfeldt J, Hedman L, Medin C, Stengard K, Fellander-Tsai L. Retention of knowledge after repeated virtual world CPR training in high school students. *Stud Health Technol Inform.* 2009;142:59-61.

17. Creutzfeldt J, Hedman L, Felländer-Tsai L. Effects of pre-training using serious game technology on CPR performance–an exploratory quasi-experimental transfer study. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine.* 2012;20(1):1-9.

18. Andrade AD, Bagri A, Zaw K, Roos BA, Ruiz JG. Avatar-mediated training in the delivery of bad news in a virtual world. *Journal of palliative medicine.* Dec 2010;13(12):1415-1419.

19. King S, Chodos D, Stroulia E, et al. Developing interprofessional health competencies in a virtual world. *Med Educ Online.* 2012;17:1-11.

20. Heinrichs WL, Youngblood P, Harter PM, Dev P. Simulation for team training and assessment: Case studies of online training with virtual worlds. *World Journal of Surgery.* Feb 2008;32(2):161-170.

21. Creutzfeldt J, Hedman L, Medin C, Heinrichs WL, Felländer-Tsai L. Exploring virtual worlds for scenario-based repeated team training of cardiopulmonary resuscitation in medical students. *Journal of medical Internet research.* 2010;12(3):e38.

22. Lim BT, Moriarty H, Huthwaite M. "Being-in-role": A teaching innovation to enhance empathic communication skills in medical students. *Medical Teacher.* 2011;33(12):e663-e669.

23. Jarmon L, Traphagan T, Mayrath M, Trivedi A. Virtual world teaching, experiential learning, and assessment: An interdisciplinary communication course in Second Life. *Computers & Education.* Aug 2009;53(1):169-182.

24. Mitchell S, Heyden R, Heyden N, et al. A pilot study of motivational interviewing training in a virtual world. *Journal of medical Internet research.* 2011;13(3):e77.

25. Fors UG, Muntean V, Botezatu M, Zary N. Cross-cultural use and development of virtual patients. *Med Teach.* Aug 2009;31(8):732-738.

26. Butina M, Brooks D, Dominguez PJ, Mahon GM. Utilization of virtual learning environments in the allied health professions. *J Allied Health.* Spring 2013;42(1):e7-10.

27. Solomon P, Baptiste S, Hall P, et al. Students' perceptions of interprofessional learning through facilitated online learning modules. *Medical teacher.* 2010;32(9):391-398.

28. Loke S-K, Blyth P, Swan J. Student views on how role-playing in a virtual hospital is distinctively relevant to medical education. Paper presented at: ascilite Conference2012.

29. Lloyd J, Persaud NV, Powell TE. Equivalence of real-world and virtual-reality route learning: a pilot study. *Cyberpsychology & behavior : the impact of the Internet, multimedia and virtual reality on behavior and society.* Aug 2009;12(4):423-427.

30. Hauer KE, Chou CL, Souza KH, et al. Impact of an In-Person Versus Web-Based Practice Standardized Patient Examination on Student Performance on a Subsequent High-Stakes Standardized Patient Examination. *Teaching and Learning in Medicine.* 2009/10/26 2009;21(4):284-290.

31. Bayraktar F, Amca H. Interrelations between virtual-world and real-world activities: comparison of genders, age groups, and pathological and nonpathological Internet users. *Cyberpsychology, behavior and social networking.* May 2012;15(5):263-269.

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