Collaborative Online Multimedia Problem-based Simulations (COMPS)

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Abstract

COMPS is a web-based application prototype designed for teaching medical diagnoses and management skills in a collaborative online problem-based learning environment. Our model aims to bring together two of the strongest features of gaming and simulation, engagement and immersiveness, with one of the strongest features of face to face learning - social interaction. By combining these three features, we hope to create a new learning system and to examine how students learn in this online environment. This paper provides a rationale for this approach and outlines the features of the software platform.

Simulations

As simulations are designed to represent a real or imaginary environment or system (Alessi & Trollip, 1991), they enable learners to experience the world that cannot be experience directly because of a variety of reasons such as costs, danger, and accessibility or time. The goal of simulations is to allow learners to navigate and explore a model of a particular environment by practicing skills, or gathering data, or both. Online simulations have the potential to add those values to training environments. Often simulations are fun and engaging and help students to internalize knowledge by practicing new skills in a risk-free environment. Through simulations, learners gain experience when facing a similar decision making process in the real world. In general, simulations are most successful where judgment skills, not facts are being taught.

There can be many benefits gained from simulations. These benefits have led to a long tradition of simulation in medical education curricula (Lane, Slavin & Ziv, 2001). Specific advantages of using simulations in medical education include:

- Opportunities to learn essential clinical skills in an authentic clinical setting that might otherwise be limited.
- Simulating where understanding may be hindered by the lack of real people with specific or unusual diseases, or where there is no possibility of having access to a real person (e.g., patient or specialist)
- Simulating expensive or complex processes, where understanding may be hindered by the mechanical details of performing the process, or where there is no possibility of using the real equipment.
- Modelling situations where the cost of actually performing the activity would be prohibitive, or where performing the activity frequently would be beneficial
- Implementation of skills combined with a knowledge base in clinical reasoning.
- A more uniform clinical experience.
- A more representative patient mix
- Effective environments for teaching basic patient-centered skills of history taking, interpersonal skills, communication skills and physical examination skills.

Rationale

The health care system is undergoing massive changes on a global level, forcing health educators to adapt their programs and teaching methods. Medical schools are experiencing the brunt of these changes. In two papers (Kamin et al., 1999; Kamin, 2004), the authors provide a rationale for employing a technology-based (web plus CD) approach to problem-based learning (PBL) in a clinical setting. The main points of this rationale are summarized below and further elaborated.

Clinical Teaching

Patients spend less time in hospital settings and physicians need to see more patients in shorter clinical visits. Many medical problems are seasonal, such as Pediatric patient problems. Students see different types of clinical problems depending on the site, while some essential competencies are not being adequately taught and seen during a limited 6-8 week clinical rotation. Finally, there is variability in the quality of clinical teaching

Problem-based Learning (PBL)

PBL uses a student-centered approach to develop competencies in adapting to change, dealing with problems, reasoning critically, adapting a holistic approach, appreciating the other person's point of view, collaborating in groups, and self-assessment. PBL can serve as a valuable supplement to clinical teaching as a means of ensuring that students see a variety of conditions necessary to meet course objectives. PBL offers an ideal practice field for social negotiation and reflection – two of the activities that promote high-quality thinking. (Hawley Orrill, 2001)

Technology

Cases that use digital video rather than text provide information to students in a more realistic format, and supplies contextual anchoring to students. Students can observe cues from the patient, learn from the actions of the doctor, and study the patient-doctor interactions. Distributed learning through the web allows both students and faculty to participate asynchronously and provides flexibility in selecting the best time to work through the case (Curran et al., 2001). The appropriate blending of technologies can provide both individual and collaborative learning opportunities to students. Finally, the ability to record students' discussion comments allows instructors to examine students' reasoning in the case.

Multimedia

Multimedia in educational software uses a variety of different *media* (text, graphics, animation, video, sound, speech) to present information. Multimedia software can be a powerful tool in enhancing learning (Jha & Duffy, 2002). This software is usually "interactive", allowing the content or direction of the program to respond to some input from the student. The levels of interactivity range from "object interactivity", where the system responds to a mouse click by playing a sound or displaying an image, to a form of interactivity that allows the user to play a role in a simulated environment. In this case, input from the user provides the opportunity to experience changes in the environment that result from the manipulation of conditions. The user interacts directly with the content (exploring, answering questions, performing activities, inserting data) and can receive immediate feedback.

Narrative

Our model proposes to integrate narrative into problem-based learning process. Designing a problem as a story or an open-ended narrative is a new way to think about developing problem-based learning (PBL) scenarios that few have explored. Presenting a problem as a story may help to create a more holistic approach to medical education by engaging learners in more authentic, patient-centered problems. Narrative is thought to have a number of advantages for learning. Stories can help make sense of our world and help us learn, remember, and extrapolate from experience. Stories create an emotional connection and empathy between the users and the characters (Swenson & Sims, 2000). Stories provide a context that helps us to learn and remember. Stories create an emotional connection and empathy between the users and the characters (Swenson & Sims, 2000). Finally, stories provide a context that helps us to learn and remember. (Schank, 2001).

Collaborative Learning

Collaborative or group learning refers to situations where students are encouraged or required to work together on academic tasks (Kaufman et al.,1997). Working in groups allows learners to share ideas and develop new, authentic solutions to problems they are trying to solve while acquiring useful knowledge of theories and concepts. Learning is thought to occur through collaborative social interaction and the social construction of knowledge (Brown, Collins & Duguid, 1989). Collaborative learning is especially beneficial in situations where the domain knowledge is complex and ill structured and the transfer of knowledge or the application of that knowledge to new situations can be problematic for the individual learner (Feltovich et al.,1996).

User Interface Design

There are a number of important features in COMPS.

- **Display Screen**: The screen displays class information and main function windows.
- **User Orientation**: Introduces the features of the COMPS platform.
- **Case Scenario (Main Tab)**: Information about the case.
- **Patient Information**: Patient information is presented through text/graphics, multimedia including audio or video conferencing, or as a 3D Interactive, real time experience.
- **Physical Exam Tools**: The physical exam information, the questions, and the tools can range from text/graphics only to 3D interactions between patient and doctor.
- **Lab & Medical Records**: These records will vary from text/graphic to interactive (e.g., participants can change results by altering patient information).
- **Expert Resource Persons**: Participants will have access to experts using text/graphics (e.g., email), multimedia (e.g., video conferences), or in a virtual 3D environment (e.g., Traveller).
- **Web Publishing Tool**: Participants can create a website either using text/graphics only or text and multimedia (e.g., film, streaming video, camcorder).
- **Web Messaging Tool**: This includes text/graphic email, text chat, audio messaging and video messaging. Participants can discuss cases or exchange information synchronously.
- **Synchronous Collaboration**: This interaction can vary from text/graphic based chats to 3D interaction via a program such as Traveler.
- **Asynchronous Collaboration**: This interaction primarily takes place in online forums using text or audio messaging tools.

Conclusion

This project is intended to afford individual students with an opportunity to apply concepts presented in case studies in an engaging and interactive learning environment and to create learning environment that encourages humanistic values and a more holistic understanding.

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References

Alessi, S. M., & Trollip, S. R. (1991). Simulations. In S. M. Alessi (Ed.), *Computer-based instruction: methods and development* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Brown, J.S., Collins, A. & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Research*, 18. 1. pp 32 –42.

Curran, V., Kirby, F., Allen, M., & Sargeant, J. (2003). A Mixed learning technology approach for continuing medical education. *Medical Education Online*: Vol 8, No 5. http:www.med-ed-online.org

Feltovich, P.J., Spiro, R.J., Coulson, R.L., & Feltovich, J. (1996). Collaboration within and among minds: Mastering complexity, individually and in groups. In T. Koschmann (Ed.), *CSCL: Theory and Practice of an Emerging Paradigm*, pp. 25-44. Mahwah, NJ: Erlbaum.

Harasim, L. (1993). Collaborating in Cyberspace: Using computer conferences as a group learning experience. *Interactive Learning Environments*, 3 (2)(2), 119-130.

Hawley Orrill, C.(2001). Supporting Online PBL: Design Considerations for Collaborative Problem-Solving Communication Tools.

Jha, V., & Duffy, S. (2002).”Ten golden rules’ for designing software in medical education: Results from a formative evaluation of DIALOG. *Medical Teacher*, Vol 24: No. 4: 417 – 421.

Kamin C.S., Deterding R.D., Wilson B., Armacost M., Breedon T. (1999). The development of a collaborative distance learning program to facilitate pediatric problem-based learning. Med Educ Online [serial online]; 4,2. Available from URL http://www.Med-Ed-Online.org

Kamin, C.S. (2004). A comparison of critical thinking in groups of third-year medical students in text, video, and virtual PBL case modalities. *Academic Medicine*. Feb;78(2):204-11.

Kaufman, D. M., Sutow, E., & Dunn, K. (1997). Three approaches to cooperative learning in higher education. *Canadian Journal of Higher Education*, *27*(2/3), 37-66.

Lane, L J, Slavin, S. & Ziv, A. (2001) Simulation in medical education: A review. *Simulation and Gaming,* Vol 32, Issue 1 , 297-314.

Schank, R., & Neaman, A. (2001). Motivation and failure in educational simulation design. In K. D. Forbus & P. J. Feltovich, (Eds.), *Smart machines in education: the coming revolution in educational technology* (pp. 37-69). Cambridge, MA: MIT Press.

Swenson, M. & Sims, S.L. (2000) Toward a Narrative-Centered Curriculum for Nurse Practitioners. *Journal of Nursing Education*, 39 (3).