

Towards Open-Source Virtual Worlds in Interdisciplinary Studies

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INTRODUCTION

Interdisciplinary studies involve synthesizing distinct perspectives, knowledge, and skills found in two or more academic disciplines or fields. These studies focus on complex questions, problems, and topics that can only be addressed by seeking connections between seemingly exclusive domains. An interdisciplinary course, by definition, has an interdisciplinary theme as its nucleus. Typically theme-based, these courses intentionally address issues that require meaningful engagement of multiple academic disciplines and frequently use inquiry or problem-based learning. The application of different methods and concepts is the key for learning experiences that demand in-depth exposure to the methodologies of distinct intellectual disciplines, and the creative application of these methodologies to specific problems. To promote interdisciplinary collaborations and an interdisciplinary campus culture and to provide students with multiple perspectives, interdisciplinary courses should be team taught—for instance, co-teaching, using expert guest lecturers on campus (and during site visits, as appropriate), or learning communities—by more than one faculty member from two or more disciplines.

Virtual worlds as educational platforms have advanced higher education, as they are a natural way to facilitate interdisciplinary learning in these courses, as well as to incorporate play (Lansiquot, 2009, 2011, 2012; Lansiquot, Blake, Liou-Mark, & Dreyfuss, 2011; Lansiquot, Liou-Mark, & Blake, 2014; Smith & Lansiquot, 2010). The concept of play is an important aspect in the development of interdisciplinary courses for technology students. This article will detail how technologies that support interdisciplinary studies, specifically virtual worlds, can be effectively implemented to facilitate and to extend learning in urban technology classrooms as well as how to move towards open-source applications.

BACKGROUND

Constructivism posits that knowledge is created in the mind of the learner by reflecting on experiences, constructing understanding, generating rules, and making sense of experiences (Bruner, 1990/2007; Piaget, 1973). Building on this perspective, cognitive flexibility theory focuses on the ability of a learner to restructure knowledge in adaptive responses to situational demands, thus focusing on the transfer of knowledge and skills beyond an initial learning situation (Spiro, Feltovich, Jacobson, & Coulson, 1991).

A crucial component of dynamic interdisciplinary learning is problem-based learning (PBL), an instructional approach that offers the potential to help students develop flexible understanding learning skills. PBL can also be an effective method for improving classroom engagement (Ahlfeldt, Mehta, & Sellnow, 2005; Duch, Groh, & Allen, 2001). Students learning through the experience of solving problems can acquire both content strategies and thinking strategies. In the process of facilitated problem solving, students collaborate to identify what they need to learn in order to solve a problem. They engage in self-directed learning, apply their new knowledge to the problem, and reflect on what they learned and the effectiveness of the strategies employed. Instructors facilitate the learning process by guiding, monitoring, and supporting (Vygotsky, 2006), helping students develop flexible knowledge, successful problem-solving skills, self-directed learning skills, effective collaboration skills, and intrinsic motivation (Hmelo-Silver, 2004).

Enrollment in interdisciplinary courses has been shown to improve overall student learning (Elrod & Roth, 2012; Klein, 2010; Lattuca, 2001; Lattuca, Voigt, & Fath, 2004; Project Kaleidoscope, 2011). Collectively, interdisciplinary courses encourage students to purposefully connect and integrate across-discipline knowledge and skills to solve problems in ethically

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and socially responsible ways; synthesize and transfer knowledge across disciplinary boundaries; comprehend factors inherent in complex problems; gain comfort with complexity, uncertainty, and varied perspectives; and think critically, communicate effectively, and work collaboratively. Interdisciplinary studies via the platform of interdisciplinary technologies such as virtual worlds—that is, multi-dimensional environments consisting of open communities in which people can establish a sense of presence, learn, socialize, and collaborate (Downey, 2012; cf. Schroeder, 2008; Spence, 2008)—are an innovative and effective way to address technology learning goals.

INTERDISCIPLINARY OPEN-SOURCE VIRTUAL WORLDS

Issues, Controversies, Problems

Students in the technologies are faced with two conflicting and simultaneous courses of study: they must learn how to employ complex tools and why they need to use these technologies. This large task frequently leads to student frustration and loss of motivation. Traditional applications usually include developing models that reflect some component of external reality, and then allowing students to use this model to create and manipulate communities. These simplistic models show a limited awareness about how to exploit the technology and the expected learning outcomes are usually not in line with the technology platform, but instead are based on the content component. In contrast, when lesson plans include objectives that map partially

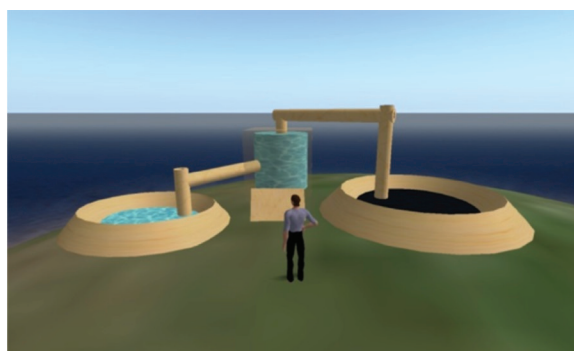
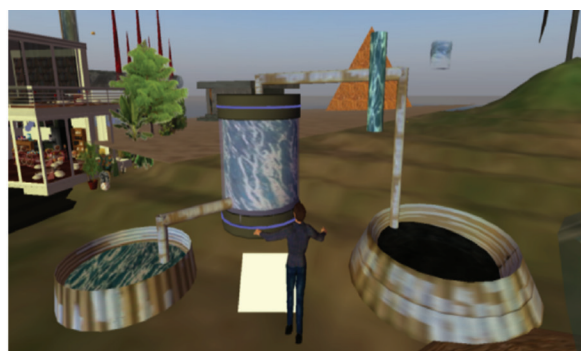
onto the underlying technology platform, learning can become more recursive and self-referential. Combining outcomes with process in this way presents a much more optimized pedagogy (Lansiquot, in press; Smith & Lansiquot, 2010). Such a pedagogical approach is facilitated by the following three interdisciplinary studies used in the virtual world Second Life and the open-source applications *OpenSimulator*, *Drupal*, and *Visual Understanding Environment*.

Advanced Technical Writing

As a foundation, the inherently interdisciplinary Advanced Technical Writing course is a required course for students majoring in computer systems. This course puts emphasis on digital media platforms to communicate technical information to a variety of professional audiences and focuses on effective technical writing applications in science, technology, engineering, and mathematics. Students analyze a wide range of technical deliverables, practice advanced online research methods, and develop both individual and collaborative writing projects and presentations. In this course, after researching and writing a scientific process description (e.g., how water purification works; cf. Figure 1), students were given the following project instructions:

1. Both with your group mates and on your own, explore Second Life (SL) and teleport to locations related to your scientific topic. Discuss your topic with SL residents to gather information, narrow down your topic, and gain user perspectives. What kind of audience are you catering to—technical or non-technical?

Figure 1. A water purification process modeled in Second Life (left) and OpenSimulator (right)



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