

---

# Vignettes from the Massively Multiplayer University

---

Danny Fekete

Presented to Clare Brett  
CTL 1608  
March 30, 2010

---

## Foreword

Hello, Clare. There will be a few problems with this paper at the outset. For one thing, the form and methodology are unpractised for me: I'd like to flesh out an idea I had last year called "the Massively Multiplayer University," which takes its name from the genre of computer game that features an immersive virtual space large enough to accommodate hundreds or thousands of players at once and typically persists indefinitely (save for episodic maintenance). The current mainstream exemplar is Blizzard Entertainment's *World of Warcraft*, which hosted more than ten million subscribers worldwide as of January, 2008 (Alexander, 2008). The paper will be unusual for me for two reasons that have spurred procrastination and dread. First, when researching, I typically build my thesis after I've looked at my resources, whereas in this case I've developed a clear idea of the final project I'd like to advocate and need to find works after the fact to support it. This feels academically disingenuous, so I wanted to disclose it here. Second, after pretty extensive and frequently involuntary consideration, the format I think best serves this exploration is a series of vignettes depicting what I imagine this environment to be from the point of view of an undergraduate student within it; these vignettes will be interspersed with elaboration and justification backed up with research where available.

Another issue is that my insight into the structures of a Higher Education Institution have developed chiefly by studying scholarship that uses a different vernacular than was my experience in CTL 1608. Piaget and Vygotsky, communities of practice, the zone of proximal development, etc., are less salient than discussions around access, retention, engagement, satisfaction, and a terrifyingly ambiguous but heavily invoked use of "success." While I will avoid that last term, I will probably focus on the others, as I'm more conversant with them, particularly and regrettably one OISE term distant from our CTL course. I hope this will be acceptable from your position for the time being; if effective, my intention is to use this paper as a launching point for my thesis work. (I suspect a research context conversant with the terminology used in the Higher Education department will be expedient toward that end, too, but I certainly plan to take advantage of the theorists I've studied in CTL.<sup>1</sup>)

Finally, and even considering the worst conceivable outcome of this paper—that you are forced to reject it, that I am ejected from OISE in disgrace, and that OSAP repossesses my funding in the form of kneecaps and kidneys—please accept my thanks again for the allowances you've already made and for your compassionate advice in December. I'm still so surprised and grateful.

---

<sup>1</sup> Looking back after I've finished the paper, it turns out that my research is so thin in so many places that this is probably the least of my problems. Sorry in advance.

## Extant Virtual Learning Environments

Considering the classroom, Dewey (1933) wrote “Whether we permit chance environments to do the work, or whether we design environments for the purpose makes a great difference.” Dewey has not been the only theorist to consider the impossibility of a neutral learning environment for students (see, for example, Strange and Banning (2001)’s development of educational environment theory). The physical elements of learning spaces so scrutinized by theorists considering a traditional, face-to-face context could be of interest to architects working within a virtual milieu, particularly as the conjunction of increased availability of Internet bandwidth and graphical processing power with exploding demand for higher education make possible and perhaps imperative the establishment of large-scale virtual environments capable of replicating, enhancing, or replacing that traditional context (Nagy, 2005; Caswell, Henson, Jensen, & Wiley, 2008).<sup>2</sup>

Immersive virtual environments in recent years have demonstrated a marked ability for participant retention in their “massively multiplayer,” persistent commercial iterations like *World of Warcraft* (<http://www.worldofwarcraft.com/>, mentioned in the foreword, above), and have consequently been the subject of recent academic scrutiny as candidates for the next design direction for VLEs (characterised for our purposes as “digital simulations that involve representations of teachers, students, and or content, for learning applications” (Bailenson, Yee, Blascovich, Beall, Lundblad, & Jin, 2008, p. 103). Among the most promising commercial platforms is *Second Life* (<http://secondlife.com/>) (Childress & Braswell, 2006), an environment which departs from typical online worlds in that members are able to author and import unique content and can design whole regions of the world according to taste and purpose (for a monthly fee depending on the amount of space required; “non-land-owners” can become members for free). The environment incorporates a sophisticated virtual conferencing interface, employed notably at the Virtual Worlds Conference at Stanford in 2008, which included a real-time video stream of the

---

<sup>2</sup> Sir Daniel’s (1996) quotation in Brown and Adler (2008) remains strident:

“More than one-third of the world’s population is under 20. There are over 30 million people today qualified to enter a university who have no place to go. During the next decade, this 30 million will grow to 100 million. To meet this staggering demand, a major university needs to be created each week.”

proceedings to an auditorium rendered in *Second Life*, and had moderators who could feed questions and discussion to the presenters, essentially building a two-way communication bridge between physical and virtual attendants. At present, Harvard,<sup>3</sup> Stanford, George Washington University, and New York University have virtual campuses within *Second Life* where full courses are offered and taught virtually for credit, and McMaster University is in the process of extending its reference desk online in a similar manner (Hudson, 2009).

In February of 2010, Ken Hudson, Managing Director of Virtual World Design Centre at Loyalist College, presented at OISE on his latest work in Sudbury, describing his dubious introduction to *Second Life* and his subsequent re-design of the Justice Studies Program: Borders Service Officer Education (Hudson, 2009). Virtual environments were considered as a vehicle for officer education when practicum became impossible because of security increases following September 11, 2001, and in-class role-playing proved unsatisfactory. As part of Hudson's project, a border-guard setting was reconstructed in *Second Life* to exacting detail based on systematic photographs and topological data from *Google Earth*, with information and documents like passports, license plates, and stolen vehicle registry calls represented on appropriate terminals or displayed in disembodied document windows (in a similar way that operating system interfaces display numerous applications). Car internals and contraband were rendered and could be searched and occupants interrogated.

Despite general scepticism and some hostility expressed by students given the option of participating in the virtual course (all of whom nonetheless eventually agreed), feedback upon completion was uniformly positive and interview test scores for students averaged 86% as compared with the previous year cohort's 58%. Hudson cautions, however, that extensive planning and preparation is necessary for a course to be successful, and advises at least a three-month construction timeline to bring the elements of a course together, test applications, and introduce students to the interface and expectations. This depiction of

---

<sup>3</sup> Harvard's *Cyber One* program is perhaps one of the better known executions of accredited higher learning within *Second Life*. It is taught in a virtual extension of Harvard's Birkman Campus in parallel with a face-to-face iteration on the physical campus. "Extension Students" take the course wholly online and mediate the same material, using blogs, wikis, and podcasts to communicate and collaborate (Hudson, 2009; Brown & Adler, 2008).

higher education in a state-of-the-art VLE is hopeful in that its interface will likely be perfectly suited to many of the students and children now growing up in similar gaming environments (Hudson, 2009), that infrastructure to support community building exists at its foundation,<sup>4</sup> and that design space is limited only by the imagination of a would-be instructor or facilitator.

What follows is the description of another possible VLE, which, unlike *Second Life*, is designed specifically for the purpose of fostering postsecondary learning, instruction, and undergraduate student experience.

---

<sup>4</sup> On this point, see also Steinkuehler (2004)'s "netnography" of spontaneous teaching and learning in non-educational virtual gaming environments.

## Features of the Nucleate Environment

Brünnhilde logs into the *Nucleate* environment from her home desktop in response to a private tweet informing her that her 2:00 seminar will begin shortly. Because she's running late, she selects a default outfit for her avatar (including a t-shirt skin sporting her university's colours and logo that she downloaded with her frosh package) and is about to teleport directly to her seminar space when she remembers that she'll be one of the thirty-five presenters on today's readings. She'll need to design a quick meeting stage, so instead of heading to class, she pops into her residence space.

The most basic element of the Nucleate environment is empty space in which other elements navigate. *Spaces* are empty, self-contained environments that host avatars and stages, and function akin to private and public channels within a chat program. Typically, host institutions provide the servers to support spaces, but this may be done independently as well for students wishing to host their own environments but who are unaffiliated with an institution. Except in the case of privately hosted or permission-locked spaces, students may teleport instantaneously and freely from space to space, but may occupy only one at a time.

Within the Nucleate environment, whereas a student's *avatar* is a private and unique personal identity, *stages* are malleable constructs that blur the boundaries between individuals and communities. The Basic Stage consists of a square metre tile on which an avatar stands, and is fully mobile and re-orientable along all axes (a magic carpet in zero-gravity is a good image for this element). The Basic Stage features a private control panel that provides amalgamated access to a customizable array of widgets, including instant messaging, web and document browsers, storage, space-wide notices/alerts, etc.). Larger stages resemble the Basic Stage but may be constructed of multiple tiles in various configurations. They continue to be characterized by complete mobility and a lack of walls or ceiling; for example, during orientation it's likely that host institutions will offer a "dormitory" stage to students, which could consist of the standardized layout of a private room and would be customizable with objects and textures either provided by the university or downloaded/designed by the student.

By means of connecting adjacent edge tiles in a process called *Nucleation*, stages can be linked together to form temporary modular environments, allowing avatars to visit each others' "rooms." Additionally, host institutions (or the equivalent of traditional residence life coordinators and dons) could provide large commons-themed stages within dedicated residence spaces onto which students could nucleate, creating semi-permanent communities. By making these spaces default entry-points for students during the login process and encouraging pride in the customization of dorm stages, a sense of having a home base or habitual meeting space could be provided to distance-education students for whom this may not be otherwise realistic. Similarly large, institutionally-managed spaces could serve as virtual environments for student associations, library interfaces, lecture halls, picturesque meeting areas, campus shops, etc.

Students would have the ability to design or download customized stages, including features like furniture, widget interfaces, and displayed resources (furniture that links to a particular resource file, like a painting that can open a high-resolution image when clicked on, a hi-fi system that functions as an internet radio interface widget and broadcasts audio within a given radius, etc.). Although under normal circumstances a student could host only one stage at a time, she could store an unlimited number of such configurations and switch between them at will.

## Synchronous and Asynchronous Classes in the Nucleate Environment

After slapping together a discussion stage in an Edwardian Study motif, including a central table strewn with several spare copies of the assigned readings (marked up with her annotations), some chairs, a whiteboard (a multi-user text/graphical interface for collaborative note-taking and diagramming), and some peripheral, comfy-looking chairs for students who might like to watch the discussion but would prefer to remain inconspicuous, Brünnhilde stores the layout and teleports to her seminar's space aboard her Basic Stage. Despite her last-minute setup, she arrives early enough to watch the "classroom" materialize: the centre of the dark, 1km<sup>3</sup> environment is occupied by the Leader's Locus—a luminous sphere magnifying the facilitator's stage, areas/documents selected for focus, etc. Like a full moon, it's unignorable in the sky above Brünnhilde tile. Gradually, like the stars of a globular cluster winking into being, the basic stages of the rest of the seminar's arriving students appear. Occasionally some are brighter than others, and a notice appears on Brünnhilde's contact roster to indicate that her (designated) friends are arriving. Like several other stages in the swarm of students surrounding the Leader's Locus, Brünnhilde and her friends navigate towards each other and many of them nucleate with Norbert, who's hosting an observatory stage he designed to view lectures. This seminar's facilitator usually likes to talk at the students for five minutes before breaking into smaller groups to discuss the readings.

Brünnhilde and her friends like Norbert's observatory. He's set the default communication parameters to whispered acoustics, so for those students speaking into headsets, the messages grow attenuated after about two metres of distance and it's important to pick seats near friends whose commentary Brünnhilde *wants* competing with the facilitator's spiel. In the translucent chat widget interface available for communicating without headsets, text is incrementally dimmed to likewise reflect distance (although students can "focus" on a speaker beyond their acoustic threshold and receive the communication clearly if they so desire). She takes her seat, which Norbert designed like a planetarium chair: it tilts backwards and automatically reorients Brünnhilde's perspective to the space above the stage occupied by the Leader's Locus, which she clicks on. A widget interface opens to expand the contents of the Locus into a dominant portion of her screen's real-estate. She watches the facilitator speak into his web-cam, occasionally switching out the video feed of his face for a text interface of the assigned reading, where he highlights the portions he's discussing in real-time.

This would be an excellent place for a discussion of facilitator techniques in an online environment. I don't have the resources to embark on such a discussion here, but I would like to flesh this section out as I work toward a more comprehensive description of the system.

Finished with his introduction, the facilitator asks students to nucleate into small groups around the designated leaders. Brünnhilde and thirty-four other students in the swarm begin to glow, and she disembarks Norbert's observatory aboard her basic stage amidst jeers from her friends about being "the chosen one." A notice on her task-roster widget indicates that the facilitator has moved the class to the second point on the meeting's itinerary—discussion of the readings—and reminds her that she is one of today's discussion leaders, offering her the option to download a generic

meeting stage if she hasn't prepared her own.

Brünnhilde proudly swaps her basic stage for her Edwardian drawing room and soon notices several keen students already nucleating with its edge tiles and taking their seats. Several of her friends have elected to remain on Norbert's observatory, which drifts with several other stages to occupy the space above her and orients to face the table from above. Because Brünnhilde is a leader, an alert pops up to inform her that she is hosting a Locus, which drifts automatically into a region among the stages and lookers-on calculated to optimize its visibility and begins to transmit Brünnhilde's point of view and dominant widget interface (in this case, a text window containing her annotated readings). Throughout the seminar space, thirty-four similar Loci appear like electrons around an atom, and for those paying attention to the central Leader's Locus, it's possible to see where the facilitator's attention is directed as the contents shift to broadcast the view of the various discussion leaders. Brünnhilde finds this distracting and stressful, so she tends to ignore it and focus on her more immediate surroundings.

Several students are grouped around the whiteboard, building an answer in the shared interface to a question she posed. In the region around her stage, individual students are nucleating into impromptu whiteboard stages or joining with larger stages like Norbert's that are already hosting a whiteboard. On the observatory, one of the students broadcasts a question to the others aboard (thereby bypassing the acoustic rules) but finds no one has a satisfying response, so Norbert indicates that someone on his stage wants the discussion-group's attention. The stage glows a colour to indicate the nature of the query<sup>5</sup> and Brünnhilde shifts her focus so that the student is able to broadcast his question the group, featuring him on her Locus to facilitate students on stages not oriented toward the Observatory. Once asked, Brünnhilde throws the question out to the group and highlights one of the students in the comfy chairs who's indicated that she'd like to respond. The discussion continues in this way until the facilitator calls the class back and highlights some of the points he observed.

Class is dismissed. As she prepares to teleport back to the residence space, Brünnhilde notices the first of the Ghosts start to straggle in, nucleate with each other, and vanish.

While the learning environment described above depicts a class arranged around synchronous discussion, clearly not all students who wish to take part will be able to, and may wish to review the discussion or collaborate with other students who were unable to attend the seminar event "in person." Host institutions may take it upon themselves to record elements of the seminars (like the content of Loci, assuming a complete recording of all activity is completely impractical due to memory requirements) and provide playback facilities to students who wish to review them or possibly engage in the activities after the fact. These students enter the seminar space as "Ghosts" who can nucleate with others joining for the same reason, and then view a shared iteration of the recording with the

---

<sup>5</sup> Perhaps options here could be informed by Scardamalia and Bereiter's scaffolding categories.

option to fast-forward, slow down, or pause playback to work through the content as a small group (or individually). If facilitators divide their classes into discreet task-steps, as was the case for Brünnhilde, these could serve as chapters.

While “Ghosting” doesn’t provide all of the benefits of an asynchronous learning environment (since the majority of students will presumably participate in seminars in real-time), this seems like a workable compromise for those most impinged by scheduling conflicts. Moreover, when Ghosts nucleate to work through a recording together, they retain some opportunity for collaboration even if full interactivity isn’t possible.

## **Student Life Outside of the Classroom: Work-Study and Cultural Events**

Since 2000, systems of financial aid in Canadian higher education have been shifting precipitously away from externally-awarded grants and bursaries, and toward institution-controlled funding schemes, resulting in an increased student reliance on work-study programs (Baker, 2010). This trend seems like it would be particularly punishing for distance students, as the nominal hours and benefit to student engagement of campus involvement provided by work study are preferable to juggling full-time study with a part-time or full-time job elsewhere (Baker, 2010). Moreover, the most salient non-research-based jobs that could be done at a distance might include work on web-based resources like faculty/institutional web pages and development of VLE resources, which may require more specialized skills than would be demanded of a typical, on-site work study student who could acquire skills as she went.

Brünnhilde has managed to harmonize her position on her residence life social council with her work-study job designing environmental features and furniture for her host institution. After coordinating with Betty-Lou over the instant messaging service, the two women meet up in one of the university's common spaces and broadcast a bulletin to all students in that space and those subscribed to the Environmental Artistry News Feed that they're about to begin working. Within a few minutes, several avatars and stages have congregated in the common area around Brünnhilde, controlled by students some of whom are merely curious, but many are training or shopping for similar work-study programs themselves and have been encouraged to observe more advanced students on the job when opportunities are available.

Brünnhilde starts with a standard request that she and Betty-Lou not be interrupted while they work. Questions can be answered by other observers or left until the end if there's time. She then sets the acoustic rules for the zone near herself and Betty-Lou: within a small radius external discussion will be muted while their discussion will continue to transmit as normal. Then, the two women get to work. Betty-Lou imports the skeleton of a three-dimensional object she's built to augment the resources available to environmental designers and student decorators—in this case a lectern capable of displaying a single resource; this will be employed at the university's library stage to highlight newly available documents. With a few suggestions from Brünnhilde with regard to the library's dominant architectural style, minor changes are made and then the prototype is turned over to Brünnhilde for skinning. She selects surface graphics and textures from the open resource bank and style guide provided by the university and finishes the lectern in the conservative steel and glass motif that the university is so fond of (like many students with an interest in graphic design, she normally wouldn't be caught dead decorating a space with one of the university's prefabricated textures, preferring to design her own and ensure a tasteful uniqueness to her furniture; since this is a piece of furniture that will reside in a common area rather than one of her personal stages, and particularly because the library is likely to be visited by students affiliated with other institutions, a sense of stylistic cohesion and cultural representation has been indicated as necessary by her commissioners).

The physical features of an environment tacitly communicate norms, expectations, history, and the ubiquity of community, possibly (as Mehrabian (1981) suggests) in a more powerful or apparently authentic way than do explicit and obviously deliberate verbal cues like plaques, instruction signs, or descriptive documents (Strange, 2010). If a distance student encounters his institution through an exclusively online interface, experiencing that institution only through static images, formal mission statements, accounts, and policy guides, this visceral avenue to engagement is in danger of being constrained.

The objects that comprise a student's physical environment can have both a practical and symbolic significance (Banning & Bartels, 1993). Strange (2010) gives the example of classroom layout, where a dominant podium set before rows of desks communicates an expectation of passive receptivity, while a more flexible seating arrangement (including moveable chairs and tables, blackboards occupying different walls, etc.) may not only be practically conducive to group discussion, but also suggests an anticipation of it. In a virtual classroom that replicates these configurations, the symbolic impact of environmental features seems far greater than their practical functions, especially if there's no necessary connection between a virtual object's perceived function and its impact on the student: a virtual space full of desks—even desks at which students' avatars may be seen to sit or work—have at best a only a suggestive bearing on the students' physical comfort, direction of focus, ability to organize scholastic materials, etc. Having one's avatar contribute to a space occupied by several desks at which several other avatars are seated, however, *does* have a possible bearing on the student's sense of scholastic identity and possibly resultant ability to concentrate and contribute in a valuable way (see Bailenson (Bailenson, Yee, Blascovich, Beall, Lundblad, & Jin, 2008; Why Digital Avatars Make the Best Teachers, 2008) for experiments in concentration and engagement using a virtual reality classroom with simulated students demonstrating varying overt degrees of engagement).

Within the Nucleate environment, the avatars of students currently editing a document (while note-taking, for example) will be shown to be interacting with a notebook. Students with open documents tagged as resources will be shown to have books or other media

open in front of them. This will only be possible at designated virtual “surfaces” like desks, tables, carrels, lecterns, etc, and so a limitation on the number of documents that can be open may be placed in a context-sensitive way. The value of this (seemingly arbitrary) bottleneck is to (a) enhance the symbolic impact of various objects and (b) to make possible proximal resource sharing and over-the-shoulder snooping.<sup>6</sup>

To complete the lectern, Betty-Lou attaches some basic programmed functionality: the object is a container with a capacity for one document which will be accessible for viewing and commenting but not editing; an image of specific dimensions may be imported to occupy the lectern's faceplate—otherwise, the feature will default to a logo of the host institution; finally, for fun, a remote illumination toggle is added to allow the displayed resource to be spot-lighted on command (should a curator wish to demonstrate dramatic flourish during a presentation, for example). The object is imprinted with the designers' names and the name of the host institution for attribution and branding purposes, and is then uploaded to the host institution's open content repository. Brünnhilde broadcasts the address of the resource in case anyone wants to download it, modify it, and use it for his own purposes, and then closes the presentation with a brief question and answer period for other aspiring environment artists.

Strange and Banning (2001) posit a hierarchy of purposes and objectives for designers of scholastic environments wherein the principle concern is to provide a safe, secure space “followed by structures that promote involvement and then conditions of community” (Strange, 2010). Within a virtual space, assuming the more violent trappings of massively multiplayer online games are omitted (it is, after all, off-putting to be slain by a pixie while think-pair-sharing) safety entails system stability and user confidence with the complexities of operation. Assuming a robustness and polish is achieved by the Nucleate interface, what more directly concerns us is “structures that promote involvement” and “conditions of community.”

Astin (1985) (quoted in Strange, 2010) argues that “without environmental structures of involvement, students risk detachment from any investment in or responsibility for their

---

<sup>6</sup> I get my inspiration here from the “Neighbourhood” display-mode on XO Laptops running Negroponte's customized Sugar OS. Here, students are provided with a graphical representation of all laptops currently connected to the ad-hoc mesh network and are shown what activities (programs) are being engaged in. Every activity can support collaborative, multi-user access, which is represented in the interface by multiple avatars clustered around a single document/activity icon. For images and a better explanation, see <http://laptop.org/en/laptop/software/index.shtml>.

own learning, key requisites for powerful educational outcomes.”<sup>7</sup> It is from that involvement that community can develop (Strange & Banning, 2001), from the signifiers and artifacts of culture and shared experience that very often reconstitute the learning environment itself: artwork, monuments and memorials, decorated (or built) student lounges, graffiti, and unintentional scorch marks serve as reminders that students are a part of the living history of an institution, and indeed, are (alarmingly) co-authors of their post-secondary educational experience. Given the disengagement and attrition that disproportionately afflict distance learners (Dutton, Dutton, & Perry, 2001; Carr, 2000), it seems particularly important that this group have ways of constructing an identity connected with their institution and peers, and of leaving their mark.

Brünnhilde teleports into her Residence Life Social Committee’s members-only space and nucleates with an enormous stage currently under construction for a poetry reading and showcase scheduled for that evening. This stage is communally editable, and Brünnhilde is soon met by a few of the other committee members engaged in the decorating, as well as a few of the presenters who wanted to confirm that their submissions have arrived on time and will be included in the evening’s programme. She imports the library lectern she recently finished with Betty-Lou and modifies its programming to include the contact information of the poet whose work it will display, and finally re-skins it to match the streetlamp-and-cobblestone motif that’s been selected for the venue. The programme is finalized as a task-list which will be broadcast to attendees and serve as an index of chapters for Ghosts who wish to view the event later (the host institution allocates enough memory to Brünnhilde’s residence committee to store one or two such events each month). The MC is designated and given control of a Locus for the stage; it will be her job to maintain and broadcast a focus on presenters and highlighted resources, although, if turnout is good, she’s encouraged to sweep over the nucleated and grouped audience stages, especially during applause or laughter. The acoustic rules and zones are implemented, the stage is stored by the MC, and then she imports it into the public residence space.

Norbert’s observatory and other “semi-private box” stages jockey for a position near the event stage while others simply nucleate with it and the students direct their avatars to take one of the available floor seats or peruse the showcased documents. Event subscribers and residence members receive their programmes and are informed that the recital is about to begin.

---

<sup>7</sup> “... powerful educational outcomes.” Blech.

---

## Bibliography

- Alexander, L. (2008, January 11). *World Of Warcraft Hits 10 Million Subscribers*. Retrieved March 26, 2010, from Gamasutra: The Art and Business of Making Games: [http://www.gamasutra.com/php-bin/news\\_index.php?story=17062](http://www.gamasutra.com/php-bin/news_index.php?story=17062)
- Astin, A. (1985). *Achieving Educational Excellence: A Critical Assessment of Priorities and Practices in Higher Education*. San Francisco: Jossey-Bass Publishers.
- Bailenson, J. (2008, April 4). *Why Digital Avatars Make the Best Teachers*. Retrieved March 30, 2010, from The Chronicle of Higher Education.: <http://chronicle.com/weekly/v54/i30/30b02701.htm>
- Bailenson, J., Yee, N., Blascovich, J., Beall, A., Lundblad, N., & Jin, M. (2008). The Use of Immersive Virtual Reality in the Learning Sciences: Digital Transformations of Teachers, Students, and Social Context. *The Journal of the Learning Sciences* , 17, 102-141.
- Baker, M. (2010). Student Financial Assistance and Scholarship Services. In D. Hardy Cox, & C. C. Strange (Eds.), *Achieving Student Success: Effective Student Services in Canadian Higher Education* (pp. 55-65). Montreal and Kingston: McGill-Queen's University Press.
- Banning, J., & Bartels, S. (1993). A Taxonomy for Physical Artifacts: Understanding Campus Multiculturalism. *The Campus Ecologist* , 11 (3), 2-3.
- Brown, J., & Adler, R. (2008). Minds on Fire: Open Education, the Long Tail, and Learning 2.0. *EDUCAUSE Review* , 43 (1), 17-32.
- Carr, S. (2000). As Distance Education Comes of Age, the Challenge is Keeping the Students. *The Chronicle of Higher Education* , 46 (24), A39-A41.
- Caswell, T., Henson, S., Jensen, M., & Wiley, D. (2008). Open Educational Resources: Enabling universal education. *The International Review of Research in Open and Distance Learning* , 9 (1).
- Childress, M. D., & Braswell, R. (2006). Using Massively Multiplayer Online Role-Playing Games for Online Learning. *Distance Education* , 27 (2), 187-196.
- Daniel, J. (1996). *Mega-Universities and Knowledge Media*. Oxon: Routledge.
- Dewey, J. (1933). *How We Think: A Restatement of the Relation of Reflective Thinking to the Educative Process*. New York: D.C. Heath.
- Dutton, J., Dutton, M., & Perry, J. (2001). Do Online Students Perform as Well as Lecture Students? *Journal of Engineering Education* , 90 (1), 131-136.

- Hudson, K. (2009, February 3). *Creating a Virtual World for Teaching with Second Life*. Retrieved March 30, 2010, from Education Commons, OISE; Webcast Portal: <http://142.150.98.64/OISE/20090203-100542-1/rnh.htm>
- Mehrabian, A. (1981). *Silent Messages* (2nd Edition ed.). Belmont, CA: Wadsworth.
- Nagy, A. (2005). The Impact of E-Learning. In P. A. Bruck, Z. Karssen, A. Buchholz, & A. Zerfass (Eds.), *E-Content: Technologies and Perspectives for the European Market* (pp. 79-96). Berlin: Springer.
- Steinkuehler, C. A. (2004). Learning in massively multiplayer online games. *Proceedings of the 6th international conference on Learning sciences* (pp. 521-528). Santa Monica, California: International Society of the Learning Sciences.
- Strange, C. C. (2010). Theoretical Foundations of Student Success. In D. Hardy Cox, & C. C. Strange (Eds.), *Achieving Student Success: Effective Student Services in Canadian Higher Education* (pp. 18-30). Montreal & Kingston: McGill-Queen's University Press.
- Strange, C. C., & Banning, J. (2001). *Educating by Design: Creating Campus Learning Environments that Work*. San Francisco: Jossey-Bass Publishers.