

Toward a Personal Cyberinfrastructure

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## Toward a Personal Cyberinfrastructure

### **Introduction**

This paper will outline the need for supporting students and faculty in developing and maintaining their own personal cyberinfrastructure, as well as describing risks and implications to both individuals and institutions as a result of such practice.

For the purposes of this paper, "personal cyberinfrastructure" will be defined as a customizable, individually managed infrastructure based upon distributed computer, information and communication technology (modified after National Science Foundation, 2003 [NSF]). This infrastructure can include commercially hosted services such as Tumblr.com, Flickr.com or Wordpress.com, but emphasizes personally managed software, usually open source, deployed on available webserver resources. Typically, this infrastructure includes a web server running content management or weblog software such as WordPress or Drupal to publish content to the public Internet.

Januszewski and Molenda (2008) define educational technology as “the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources.” This paper will primarily address the management of technological resources, and the implications of shifting the locus of control from the institution to the individual.

I propose that in order for students and faculty to fully take ownership of their digital identities, to be responsible for what they create, to participate fully in a meaningful set of communities, and to integrate their formal and informal learning, it is essential for individuals to craft and manage their own personal cyberinfrastructure.

### **Literature Review**

The design of institutions of higher learning, and of the infrastructure that make them up, contributes to the atmosphere, roles, and activities that take place within them. As we move more courses online, universities are extending their infrastructure to provide institutional spaces to conduct course-related activities. This is an artificial extension of the limitations inherent in physical spaces - classrooms are expensive, and large institutions must provide them - into the online environment where there are no such physical constraints nor requirements for large-scale institutional support. The design of physical structures that make up the rooms and buildings of a school do not need to be translated literally into the online environment used by the classes of that school (Wilson, Liber, Johnson, and Beauvoir, 2007).

The traditional classroom is designed with straight rows of chairs, to ensure students face the teacher. Designers of physical classrooms have shaped the nature of interactions taking place within them (Sommer, 1969). Learning management systems (LMS), such as Blackboard, are intended to replicate the walls, seats, and namesake blackboards of a classroom. These are all structures largely designed to restrict access and focus student's attention on the activities of the teacher, as well as to manage, control, and restrict the activities of a cohort of students within the digital confines of a defined course or program.

Mott (2010) described the LMS as being central to the business of colleges and universities, and simultaneously coming to represent and reinforce a higher learning status quo. The scale and scope of the LMS leads participants to consider it too inflexible (Mott, 2010), while being frustrated by their insensitivity to and fatalistic acceptance of this rigid classroom environment (Sommer, 1969).

While the early, and now entrenched, e-learning efforts largely replicated the traditional classroom, new tools and technologies offer a more decentralized and individualized alternative to this industrial model (McLoughlin & Lee, 2007), focusing on collaboration and network-enabled communication rather than isolated silos of prescribed and managed activity. While the traditional design of schools, and their online counterparts, focused on individual student's abilities, it has largely ignored the social structures and dynamics necessary for "progressive, communal knowledge building" (Scardamalia & Bereiter, 1993).

Campbell (2009) proposed a model of personal cyberinfrastructure, where individuals manage their own resources as part of the professional practice of teaching and learning:

In building that personal cyberinfrastructure, students not only would acquire crucial technical skills for their digital lives but also would engage in work that provides richly teachable moments ranging from multimodal writing to information science, knowledge management, bibliographic instruction, and social networking.

This proposal is consistent with Postman's (1969) suggestion that we learn what we are permitted to do, through our perception of what we are allowed to build. As part of this process, we assume attitudes and positions that are shaped by the limitations and possibilities of our environment. To follow this line of reasoning, our students are learning a sense of fatalism and helplessness through their use of rigidly controlled institutional digital infrastructure - or, more specifically, that the sense of control and empowerment that they feel in their personal lives is not relevant or appropriate in an educational context (Mott, 2010).

The primary function of an institutional learning management system is to restrict access to content and conversations to just that subset of a cohort who are authorized by the institution

to be able to temporarily interact. This structure of regulated access control “acts against the drivers of lifelong and lifewide learning, which seeks to unite the experiences of learning in the workplace and home, and of cross-organizational learning” (Wilson et al, 2007). Further, this model of access control often extends into the temporal, with content unavailable to the participants themselves after they leave the course.

Wilson et al (2007) describe the conflict between constrained environments and personal, lifelong learning:

The course-centric organizational model and the limits on learner’s ability to organize the space combine to create a context which is greatly homogeneous; all learners have the same experience of the system, see the same content, organized in the same fashion, with the same tools. This replicates the general pattern of education that places emphasis on the common experience of learners within a context. This contradicts the desire often expressed under the general heading of lifelong learning for an individualized experience tailored to personal needs and priorities.

While the models of education have become entrenched, technology has continued to develop. Where large scale, enterprise class systems were once required, organizations are now able to deploy lightweight open source applications. Where companies had entire departments devoted to the care and maintenance of applications, individuals can now rent or even borrow space on shared servers and deploy a wide variety of applications to suit their needs. The balance of ‘power’ in terms of learning interventions is returning to the learners, with students being able to control and participate in the flow of interaction rather than having it dictated to them (Phipps et al., 2008).

This shift has implications for education. Where the learning management system offered institutional control and rigid access restriction, simple applications such as “a weblog which is maintained by a single individual can function as that individual’s representation on the web. This representation can form the basis of socialization on the web” (Daalsgard, 2006).

With individuals managing their own software, they are able to become exposed to people outside the context of a given course, program, or institution. They “can gain significant reputation in their community by ‘being seen’ publicly creating valuable artifacts that are of use to new members of their group” (Klamma et al, 2007). The connections formed between people extend beyond traditional organizational structures, and these personal networks often remain as people are bound together based on their common experience (Lee et al, 2006). These personal tools and networks come to be seen as manifestations of the learning process, and personal tools are essential for these networks to form (Daalsgard, 2006; Cormier, 2008). Such active, personal, and socially based technologies provide a means to encourage, live, and make visible the social construction of knowledge (Duffy & Bruns, 2006; McLoughlin & Lee, 2007).

With students publishing their work on the public Internet, they are inviting their peers to review and discuss their work. These discussions are different than those that happen within a closed discussion forum, as they are situated within the context of a student’s own personal space rather than in a communal, institutional one (Daalsgard, 2006). In addition, discussion with individuals outside of the course-based cohort is possible, as well as inclusion of content and activities that would not occur within the isolated sandbox of the discussion board. Since the individual student is in control of the visibility of content in their space, they are able to

determine which pieces are visible to which audience, which provides the opportunity for private and directed discussions (Scardamalia & Bereiter, 1993).

Campbell (2009) posits that personal cyberinfrastructure is essential to a student's evolving lifelong learning strategies:

Pointing students to data buckets and conduits we've already made for them won't do.

Templates and training wheels may be necessary for a while, but by the time students get to college, those aids all too regularly turn into hindrances. For students who have relied on these aids, the freedom to explore and create is the last thing on their minds, so deeply has it been discouraged.

### **Analysis**

Traditionally, the management of resources in education, and specifically in educational technology, has been a top-down process involving departments, staff, and budgets (Donaldson et al, 2008). While this structure of management is essential for the large scale enterprise systems that are used to run the operations of an institution such as a university, they are not well suited to the management of educational resources, nor of education itself. Technological developments in the last few years have made it possible for individuals, including both teachers and students, to manage their own educational technology and resources with little technical knowledge, and little or no budget. The flexibility and responsiveness required to support pedagogically sound educational practices is possible, without the artificial constraints imposed by enterprise-wide systems management.

Although it has become technologically possible for individuals to effectively and easily manage their own infrastructure, it remains a fringe activity. There are many possible factors contributing to this, including a lack of successful examples of the model, an unwillingness for learners to take the initiative to shift the locus of control, a sense of fatalism regarding the perception that the institutional learning management system is preferred, and a lack of awareness regarding available alternatives.

The author has maintained personal cyberinfrastructure for nearly a decade, and has used personalized tools as mechanisms for participating in various communities, groups and networks. Items published on a weblog serve as kernels to initiate discussion with peers at other institutions. By renting inexpensive web hosting from a commercial provider, it has been easy to deploy applications such as wikis, photographic websites, even full versions of learning management systems, without requiring the intervention of an institutional department, nor requiring additional technical support. The activities revolving around this suite of personal tools has become essential to meaningful participation in various networks and communities of practice, and extends across professional, academic, and personal aspects of life.

The shift away from centralized infrastructure does not need to be sudden, nor absolute. There are intermediate steps possible. Susan Crichton used a “course blog” website to teach a graduate level education course on “Technology and Society” at the University of Calgary in the fall of 2009. In planning the course, she decided that conducting it within the institutional learning management system would be against the outcomes of the course, since the LMS is not a technology used outside the restricted context of a given course (personal communication, 2009). A central website was created for this course using WordPress Multiuser, hosted on a

university server, and maintained by staff at the Teaching & Learning Centre. Students were given accounts to create, publish, and edit content on the website. The website was visible only to those participating in the course, providing a private, safe place for students to experiment with the technology without the fear and apprehension of working on a fully public website. Crichton was the administrator of the website, and was responsible for its configuration and structure.

Course content was published by instructors, with responses published collaboratively by students. Discussion took place within the blog posts of the website, with comment threads created in response to items posted by students. Anecdotally, the nature of discourse within this course website was substantively different than had previously been seen in the learning management system's discussion board. Students posted more thoughtful, linked, and integrated blog posts, with students actively engaged in posting comments throughout the site.

As an example of a design based on a more distributed personal cyberinfrastructure, Jim Groom is teaching a course, "Digital Storytelling<sup>1</sup>," at the University of Mary Washington in the winter of 2010 using a hybrid centralized/decentralized model. The course is based on Campbell's (2009) description of a personal cyberinfrastructure, as framed by Groom (2010):

So, rather than focusing specifically on the art of storytelling with digital media from the outset, I've started off with a slightly different approach that each student should start off with a space of their own to manage and consider the implications of becoming the owner of their own story. Of [sic] take some responsibility and possession of the work they will do for the next 15 weeks, and to this end each student has signed-up for their own web

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<sup>1</sup> Digital Storytelling, a course offered by the University of Mary Washington. Accessible at <http://digitalstorytelling.umwblogs.org>

hosting service and domain as a means to create their own storytelling/experimental platform.

On the first day of the course, the students set up their own web servers through commercial hosting providers, and installed software to be used for the course. Students typically installed open source weblog software such as WordPress in order to manage and present their content easily. As the course progressed, the students crafted their digital stories on their own websites, on their own servers, hosted on their own Internet domains. They integrated whatever forms of media they needed to, using any third party services required.

This model has the potential of being a noisy, difficult to follow, confusing mess of disjointed weblog posts and comment threads. To prevent that, and to provide a contextual layer to tie the various student's weblogs together as a meaningful course experience, a central website was set up to aggregate posts from all weblogs into one place. This "hub" website was constructed, pulling activity and content published on the decentralized student websites into a single place to make it easy for students and instructor to monitor activity.

Further, this kind of personal storytelling and level of ownership over what each student produces would be difficult if not possible in a conventional learning management system environment, as a result of the homogeneous and uniform institutional boundaries constructed there. Content published within the LMS does not belong to the student, as much as it becomes available to those in a cohort, and remains at the mercy of the institution. A personal space allows for an individual to craft the presentation, to construct a context, and to control and own the destiny of what they produce.

### **Conclusion**

Students and faculty need to be able to manage their own personal cyberinfrastructure, such that they are able to participate fully in the networks and communities that support their lifelong learning, both inside and outside of the classroom and institution.

It becomes essential to conduct further research on the effectiveness of distributed online discourse, as opposed to that which occurs in the centralized learning management system. Research is necessary in order to understand if and how the nature of discourse changes when individual participants are able to own and control their own personal spaces, as well as any effects this shift in locus of control may have on the practice of teaching and learning. Teachers and administrators will need to understand how to support and integrate these decentralized personal spaces in the context of an educational program, as well as implications for professional development of faculty and staff.

If online learning is to be connected, social, and networked, we need to break out of the rigidly structured, institutionally managed sandboxes provided by conventional learning management systems, and move the discourse and content creation activities into student's own personal spaces. If we are to value and integrate both formal and informal learning, and to truly honour and respect lifelong learning, then we must use platforms and models that are not bound by the artificial physical constraints of a given institution, nor of a given course or program. We must allow, encourage, and even require students and faculty to manage their own personal cyberinfrastructure so that they will be able to own what they do, in every sense of the word.

The question then shifts from "will students be able to manage their own infrastructure," to "how will we integrate open environments as depicted by personal cyberinfrastructure with

the traditional online classroom?” In addition, there are implications for student assessment, program design, copyright policy, professional development, mentoring and support of faculty, as well as organization of the institution itself. How will this shift be accommodated by the traditional educational institution?

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