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Editorial

Innovation and Creativity

Donald G. Perrin

Much effort in teaching and learning is focused on strategies for building cognitive structures and processing information. In teaching, we organize knowledge and skills into curricula; we apply tools such as Bloom's Taxonomy of Behavioral Objectives to structure cognitive learning from basic knowledge to higher order thinking skills. To this we add physical (psychomotor) skills and social values. We apply a host of strategies to facilitate memorization and concept building – advance organizers, questions, inquiry, participation, feedback, collaboration and interaction.

For higher levels of learning, we use the scientific method to collect, verify and classify data, develop concepts, and build and test hypotheses. We set up models and experiments. We observe events and behaviors in the natural world. We process our findings with inductive and deductive reasoning and creative problem solving to prove or disprove hypotheses and draw conclusions. If a solution is not feasible, we look for gaps and discrepancies in the data and flaws in our reasoning. Then we repeat the scientific process starting from the beginning.

We customize teaching and learning for individual students based on differences in mental abilities, aptitudes, prior knowledge and experience, learning styles, and motivation. With knowledge comes the responsibility to use it wisely. We mold social behavior and values to apply our intellectual assets in an ethical and responsible manner. We resolve conflicts and competing demands by research and discussion. We learn to respect different opinions and cultural values.

Creative accomplishments require analysis and synthesis and problem solving. As we approach the unknown, we need creative tools such as synectics, brainstorming, mind maps, chaining, affinity diagrams, and quality function deployment. Artificial intelligence and computers can model thought processes. We do not yet have algorithms to explain insight, genius and creativity and their role in innovation and invention. But we can identify great thinkers in almost every field of human endeavor. Expression of new ideas involves risk, personified by Galileo whose vision did not mesh with existing theories of the universe. For progress to occur, we must encourage free expression to embolden creative thought and action.

What can educators do to foster creativity?

First, we must capitalize on the curiosity and high energy of children to explore their environment and express themselves freely – characteristics we often suppress in order to "control" children, especially in classrooms. To foster freedom of expression, we can use subjects like drawing, music, theatre, nature study, the physical sciences, and ancient civilizations. We can offset limitations of classroom environments with regular access to community resources including inspirational leaders and activities in social services, business, industry and government.

Communities and learning spaces should be a culture of innovation that places a high value on exploration, experiment, model building, and discovery. We must encourage free expression and acceptance of different points of view. We must provide tools and resources for invention.

What made the Silicon Valley in Northern California a crucible of innovation? Curiosity, knowledge, skills, freedom of expression, and collaborative effort caused an experiment in a garage to become the Apple Computer company. Through sharing and competition the Silicon Valley became a bastion of seemingly endless creativity and a major force in the world economy. Thousands of cities around the world have unique expressions of innovation and creativity, both past and present. Are today's educational institutions taking adequate measures to foster innovation and creativity in their students?

Editor's Note: Since the beginning of time, man has used tools and technologies to extend his ability to communicate, teach, learn, and record the human experience. Spoken, written and visual communications and thought have been amplified by technologies ranging from movable type to electronic and digital media. Global computer networks provide instant access to all of recorded history, current events, and the ability to communicate interactively, at light speed, with people and ideas everywhere. Powerful digital tools are changing how we learn, what we learn, and our ability to expand the knowledge universe.

Blogs, Wikis, Podcasts:
Harnessing Technology for Enhanced Learning Achievement through Powerful Web Tools

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Abstract

Technology and the employment of etools within the education domain have brought about unprecedented impact on educational deliverables and deliverances. Teaching and learning have equally been enhanced. Learning theorists have suggested tool-use has contributed to the evolution of human language and cognitive development (Wertsch, 1985).Tool-use extends our sense of self-identity, social identity, and our experiences of social relationships within particular places. Education professionals use specific kinds of technologies (analogue and digital) and are influenced by particular characteristics of the technologies they use (Watson, 2001). Our social and cultural understanding of *tools* and complex digital technologies affect our ability to use them for learning (Pierson, 2001). The context and conditions of these understandings affect how we know when, where, and why ICT belongs in our educational practices. A number of advantages of using blogs, wikis and podcasts have been identified which translates to the fact that technology has brought with it more convenience, independence to students learning and enable students to reveal their natural propensity to show their creativity.

Keywords: education, blogs, wikis, podcasts, pedagogy, enhance, e-tools

Introduction

For a long time, technology in educational institutions consisted of a room (or lab) where computers were situated and students had to leave their classroom learning environment and move to that room for a scheduled period of time. The contemporary higher education arena has many agendas to fulfil, including the need to maximise quality assurance processes, to ensure the research integrity of institutions, to meet the needs of a diverse student body that have higher expectations of their learning experience, and to endeavour to equip students with the necessary employability skills.

Digital technology plays a significant role in shaping the teaching and learning landscape in higher education. Indeed, it is expected that digital technology will play an increasingly significant role in higher education as members of the millennial and digital generations enter college, bringing with them new approaches to learning and consequent expectations of the classroom instructor (Caruso & Kvavik, 2005; Caruso & Salaway, 2007; Howe & Strauss, 2003; Oblinger & Oblinger, 2005; Prensky, 2001). The vast array of digital technologies with the potential to impact the teaching/learning process includes learning management systems, personal response system technologies, discussion boards, blogs, wikis, social networking sites, podcasts, and a plethora of web-based tools. The pervasiveness of information technology in today's world complicates the multiple demands on faculty by adding expectations of technological proficiency that far exceed the days of index card library catalogs that more senior faculty experienced as

undergraduates. For example, many faculty grapple with the demands of learning new software to prepare digital course materials (Hanna, 1998; Twigg, 2003). The temptation for higher education faculty who must struggle to satisfy the customary triple requirements of research, teaching, and service is to relieve the pressure on themselves in the teaching area by teaching in a manner that reflects both their own learning experiences and preferences. This gives them more intellectual space for the research endeavor (Ouellett, 2004) but arguably fails to keep their teaching abreast of current understandings of what constitutes pedagogical best practice for their students.

This paper explores the potential use of e-tools such as blogs, wikis and podcasts technologies to support student learning. The article analyzes to what extent the instructors' use of these e-tools can nurture creativity in learning and teaching. Using an interpretative approach, the research has found that cited e-tools are powerful tools for developing creativity within the learning and teaching environment. In addition to identifying a number of factors that can be associated with the notion of creativity when using the tools, this study also considers certain conditions that need to prevail in the wider institutional environment if the cited tools are to be adopted as learning technologies. This paper attempts to present e-tools as an exciting new way of teaching and learning and demonstrate how Web tools can generate exciting new learning formats. It explains how to apply these tools in the classroom to engage students in synchronous and asynchronous world that provides information feeds and interactive learning. It offers specific teaching applications for online photo galleries.

Literature Review

Use of General Information and Communication Technologiers (ICT)

To support student learning, lecturers are encouraged to use ICT to create constructivist environments built upon constructivist learning principles. They use tools such as forums, chat rooms, wikis and blogs. Many of these are part of Learning Management Systems such as Sakai and Blackboard. Therefore, university staffs need professional development in ICT skills, and in the pedagogical use of ICT, to ensure that affordances offered by these tools can be realised. Furthermore, professional development must be continuous because ICT is ever changing. In response, a number of projects have been implemented at UNE with the aim of: identifying the challenges debilitating staff and students against pedagogical ICT use, formulating frameworks for staff professional development and enhancing student active learning through the use of ICT.

Studies in ICT in education are plentiful and often include models of evaluating ICT (e.g., Mandinach, 2005). Concerns include the complexity of the 'interaction between disciplinary content, learning outcomes and online, computer-based learning environments' (Sims, Dobbs & Hand, 2002: 137). This interaction is also illustrated in Muwanga-Zake (2007: 31), indicating an intercourse between curriculum, ICT and subject matter components. The curriculum dimension considers student learning styles, needs and preferences; provision of quality learning as perceived by stakeholders in an institution; enabling interactivity between participants in a course; and opportunities for assessment and feedback. ICT specifically has potential towards student-centred learning and research (Sims, 2006: Richardson, 2004). However, successful practical pedagogical applications beyond the communication of information are scarce, particularly in specific educational contexts. One reason for this scarcity is that the ICT industry rarely designs tools for specific pedagogical applications. There is a dearth of critical analyses of praxis beyond rhetorical ICT potentials. However, there is a need for research in ICT-supported pedagogy to keep pace with developments in ICT.

A need for continuous research for the most appropriate pedagogy for each ICT tool exacerbates the misuse of ICT in education, and leads to inter alia:

- New or no rules or procedures / processes;

- Ad hoc, trial and error;
- Students becoming co-designers;
- Continuous revision of ICT in education policies; and
- ICT competing for more time, diminishing time for reflective assimilation of ICT in education

Critically, universities often expect lecturers to use ICT in education without allocating enough time for continuous professional development. Thus, ICT are acquired and implemented without the adequate training of staff (Sims et al., 2007: 136). In many HEIs, events involving the use of ICTs are motivated by the premise that the application of blogs and other e-tools within these institutions can be adopted without a clearly pre-determined pedagogical framework or any appropriate level of professional development of staff.

Blogs, Wikis and Podcasts as Learning Tools

The emergence of the internet came with it numerous advantages to the enhancement of learning deliverances within the education, communication and marketing realms. In addition to pave the way to the creation of virtual learning environments, these etools have shown the propensity of technology to change the face of learning deliverables and deliverances. However by introducing new technology advancements and applying them within the education sector, this does not imply replacing traditional modes of classroom instructional methods. Research has indicated that no one way can be viewed as the best. Consequently educationists has realised that merging traditional and modern technology-propelled pedagogical methods have produced effective results. Blogs, wikis, podcasts, chat-rooms and other etools have proved not only effective and convenient, but has proved that technology can make learning a lot of fun as students and academics experiment with various tools.

Reardon (2008) refers to, “Tools such as community networks, social book-marking, wikis and blogs, podcasting, digital story-telling, project based learning initiatives, video blogging and other new technologies, as enablers of people to be producers of information” (Anderson & Weert, 2002). The National Centre for Education Statistics from the U.S. Department of Education titled its statistical analyst report (2000), “Teachers’ Tools for the 21st Century: A Report on Teachers’ Use of Technology” (*Teachers' tools for the 21st century: A report on teachers' use of technology*, 2000). In much of review of literature, it has been found, for the most part, an unquestioning and over-use of *tool* in reference to digital technologies and ICT. Consequently, the use of e-tools has reached unprecedented levels from the end to the 20th century and is even gaining more ground as more tools and applications are being invented.

Blogs as a Teaching and Learning Tool

Communication is a fundamental part of learning. As instructors, academics need to communicate with each other, as well as with students, who also interact with lecturers and each other. Additionally, it could be argued that communication is a fundamental aspect of the human experience. It is not surprising therefore that a wide variety of IT-based communication tools have been developed, and that many of these have found application in the context of learning.

It is also true that, at least in more traditional "chalk-talk" forms of learning, participating (or chatting) by students is discouraged or prohibited. Furthermore, even when IT-supported communication is accepted in the andragogical (learning through life experience) space, the "older" tools such as email tend to dominate. Recently developed tools such as instant messaging and weblogs are often relegated, perhaps by virtue of their perceived informality, to a less preferred status. However, over the last few years, many academics have successfully incorporated blogging assignments into the coursework component of their classes.

A blog is a website where entries are written and displayed in a reverse chronological order (Scott, 2001). Blogs were introduced in the mid 1990s (Farmer, Yue, & Brooks, 2006: 263) and are easy to use because the user does not need sophisticated technical knowledge to create or maintain them (Bartlett-Bragg, 2003: 2). Blogs are primarily personal journal and opinion entries, which enhance a feeling of social interaction. Through a blog, a person gets a feeling of belonging in a wide range of professional activities such as psychological therapy, law, journalism, and research (Bartlett-Bragg, 2003: 2; Derkeley, 2008). To provide a justification for the pedagogical use of blogs, Papacharissi (cited in Farmer, et. al., 2007: 263) considered blogs to be 'transformational communicative technologies', which, according to Framer et al., (2007: 263), 'allow users to connect and become part of an active social corpus, while exercising and legitimating their personal expressive spaces'. Blog users inherently expect social transactions, communication, personal assertion and empowerment through blogs.

The high activity in the educational use of blogs is exemplified at university web sites across the globe and many leading ICT pedagogy experts, such as Ferdig & Trammel (2004), Armstrong, Berry & Lamshed (2007), Downes (2004), Richardson (2004), Kennedy (2003), O'Donnell (2005), and Bartlett-Bragg (2003) claim a myriad of pedagogical blog potentials such as:

- Exchanging insights and information, which publishers are too critical to print;
- Collaboration between diverse communities. Blogs can encourage integration of personal, peer, and expert narratives;
- Hosting e-portfolios, archives and student publications;
- Reflective or journal writings as an alternative to "traditional" forums or bulletin boards;
- Group work, which could be synchronous or asynchronous within or between groups;
- Learning portals;
- Assignment submission and review; and
- Sharing course-related resources

These blog potentials could enrich learning experiences and lead to deeper learning. Rosie cited in Bartlett-Bragg (2003: 2-3) elaborated that deep learning involves constructing connections between concepts in a context. Rosie added that deep learning is unlike surface learning where students 'complete the minimum content necessary to meet assessment requirements'. Furthermore, 'blogs offer a socially situated, student centred, contemporary, technical solution' (O'Donnell, 2005), and catering for individual self-expression and socially driven learning (Farmer, *et al*., 2007: 262). Student-centred learning is enabled in blog monologues that enhance constructivist cognition and meta-cognition (higher order thinking).

Moreover, students are conscious of their unrestricted postings to the public and are more careful about the way 'they say things, how they collect their thoughts and summarise their understanding' (Armstrong, *et. al.,* 2007). Consciousness to the public relate with dialogues characteristic of Vygotsky's social constructivism. Ferdig & Trammell (2004) highlights blog roles in social interaction and pedagogy, stating that:

> *'... knowledge construction is discursive, relational and conversational in nature. Therefore, as students appropriate and transform knowledge, they must have authentic opportunities for publication of knowledge'.*

O'Donnell (2005), drawing on Papert's constructionism, explains that students converse about the transformation of their ideas for public participation – the ideas become artefacts, chronologically ordered by the blog, which are ecological environments of minds and constructs. O'Donnell quotes Lowe, who believed that a constructionist blog is able to cater for personal knowledge management within a social context. Thus, blogs could provide an opportunity for engagement and scaffolding within and outside classrooms. An example is a blog community about a book, which involved students and their parents (Richardson, 2004). Another example is a blog journal

project, which encouraged tutor-student engagement in dialogue and so increased students' participation by offering an additional mode of response and feedback, while monitoring and guiding individual students' learning (McGuinn & Hogarth, 2000). Hence, teachers use blogs in place of standard class web pages to enhance deep learning (Downes, 2004).

At universities, blogs have become part of managing courses and learning especially through Learning Management Systems (LMS) such as the Blackboard and Sakai, and university students seem to be adopting these and other blogs. Successful pedagogical uses of blogs have been abundantly reported (e.g., Richardson, 2004; Bartlett-Bragg, 2003). Pedagogically successful and valuable blogs involve careful planning and considerations (Bartlett-Bragg, 2003: 6). Ways of creating successful pedagogical blogs include making blogs mandatory and cultivating educationally sound perceptions of blogs among students (Cheung, Li, Lui, & Choy, 2006). Additionally, O'Donnell, (2005) advises for blog-use across 'classes over the duration of a degree course', instead of focussing on a 'specific assignment or a single semester'. These approaches allow students to grow into blog communities where they co-construct and define the course and learning strategies.

One of the universities renowned for applying blogs for teaching and learning purposes, the University of Sydney (at http://blogs.usyd.edu.au/support/getblog.shtml) advises that:

> *'...the most successful blogs are those which consistently address a well-defined topic. A good blog will reflect that topic in its title, descriptions and (obviously) the content of its posts'.*

That is, the pedagogical objectives of a blog should be clarified to students before they start to blog. As an example, Farmer, *et al.* (2007: 264) instructed students at the inception of a blog to 'reflect upon and discuss course content that arose out of their learning experiences'. Thereafter, students should be scaffolded on creating good posts and feedbacks right from the blog creation (Huann, John, Yuen, 2005). To achieve blog growth, Bartlett-Bragg (2003) recommends five stages of students' guidance including: establishment; introspection; reflective monologues; reflective dialogue; and knowledge artefact. Bartlett-Bragg (2003) emphasises a need to pose structured questions as guides, especially focussed on students' experiences or recollections, adding that these motivate students. In fact, Farmer, *et al.* (2007: 263) integrated blogs into formative assessment exercises. Similarly, Armstrong *et. al.* (2007) advise that the invitation for responses should be structured for serious thoughts. Passive invitations such as 'Comment' should be minimised in favour of reflective terms such as 'Discuss' or 'What do you think?' Thus, students' opinions, 'critical thinking and deep reflective qualities of learning' should have surfaced by the 'knowledge artefact' stage, which is recommended in Bartlett-Bragg (2003: 8). Thus, O'Donnell (2005: 1) conceives activities in blogs as a part of new ways of thinking that is happening through cyber cultural phenomena.

While blogs could encourage the freedom of expression as an important element of reflection, such a freedom could also be perceived as a potential weakness. Part of the weakness emanates from unrealistic expectations, exacerbated by the failure to provide clearly defined blog objectives and lack of developmental work with students. There is concern that the freedom accorded to students and staff to blog could lead to the misuse of blogs (Cheung, *et. al.,* 2006), for example, for indecent discussions. There is also concern, as evidenced by Gartner's Hype Cycle (Drobik, 2009) of a possible loss of enthusiasm for blogs once their use is seen as being ordinary. Ordinary use of blogs includes a focus on personal celebrations of individual egos (O'Donnell, 2005).

Thus, Glenn (2003) argues that blogs lack rigorous scholarly work. Moreover, dissatisfaction with privacy and security might lead to a loss of interest to the extent that few blogs survive beyond a year (12 months) (Richardson, 2004; Downes, 2004). Hence, O'Donnell (2005) reports

a complaint that blogs end up being "forced writing"*;* as lecturers try to make blogs pedagogically useful. Consequently, there is 'a gap between blog rhetoric and blog practice' (O'Donnell, 2005). Furthermore, as with other ICT, O'Donnell (2005) identifies a possible conflict of interest between a lecturer's desire to improve pedagogy, and administrative interests to save money through the use of blogs. Often an institution's perception of blogs as 'an advancement over previous online learning environments' (Farmer, *et al.*, 2007: 263) comes at the expense of the quality of pedagogical improvement blogs could make. Additionally important are technical design considerations, which include the blog capacity to up load photographs, drawings and documents, as well as students' immediate access to blogs the moment they have thoughts to post (Armstrong *et. al.,* 2007; Richardson, 2004; Downes, 2004). In consideration of the above, O'Donnell's (2005: 1) question about the location of blogs in pedagogical practices and Sims' (2006) suggestion of rethinking and remodelling pedagogy around blogs and other ICT, should be seriously researched.

Enhancing Course Content Through Wikis

Wikis, short for Wikipedia, have also presented positive outcomes for learners within the higher education domain. In recent years there has been a growing trend to use *wikis as a learning* and assessment *tool* in Higher Education. Wikis are gaining ground as a learning tool in higher education (HE) (Bower, Woo, Roberts, & Watters, 2006; Choy & Ng, 2007), but relatively little is known about factors that affect the way students use wikis in the context of a course. Outside of Academia, there are at least two common ways in which wikis are used: as social software and as a tool that provides support for group projects and activities, with the former usually associated with open access and the latter associated with restricted (or authenticated) access (Elgort, 2007). The first use is best demonstrated by *Wikipedia* (http://en.wikipedia.org/) – a large collections of interlinked editable web pages that are created and kept up-to-date by users world-wide. Open-access wikis also exist for more specific knowledge areas, such as culture and art, education, politics, travel, science and technology. Key principles of wikis as social software are voluntary participation and bottom-up (or self-) regulation (Elgort, 2007).

An important factor affecting the nature of the wiki environment in such large scale projects as the *Wikipedia* is the sheer number of users that are able to freely contribute to the construction and management of a knowledge base. This type of open-access multi-user environment is able to self-regulate using for example such mechanisms as *soft security*, where the community of users insures the accuracy and appropriateness of the published information (Lamb, 2004). This factor also affects the type of navigation used in wikis: hierarchical or linear navigation options are not suitable because wikis are created and edited by a large number of users and deal with a wide range of user defined topics (Elgort, 2007). The most common way to navigate wikis is through hyperlinks, words or phrases linked to corresponding areas of a wiki. In addition, such large-scale wikis are usually work-in-progress, as they keep growing and changing, often in an *ad-hoc* way. Therefore it is not practical to read a wiki "from beginning to end", and users are more likely to search for a topic of interest and read around it (Elgort, 2007).

Restricted access wikis, on the other hand, can be viewed and/or edited by a limited number of trusted users. For example, a wiki can be used as a tool that allows a group of dispersed users, such as conference organisers, to work together to draft and fine-tune the details of an upcoming event, or for a group of authors or researchers to collaboratively work on a report or publication. Wikis are also used as a meeting management tool, which allows participants to suggest and negotiate an agenda and to publish minutes and comments after the meeting. Demarcation between the two types of wiki uses described above is not clear-cut, with some large restricted-access wikis (for example, organization-based wikis) being closer to social software than to a group project tool. The use of wikis in a formal course of study, such as a university course, has

common aspects with both of these two types of uses, but is also conditioned by the fact that it is perceived as a learning or assessment activity.

What is different about the use of wikis in the context of a course is that in the HE context, student learning and/or assessment activities conducted using wikis must adhere to such general principles of academic study as academic integrity, evidence-based argumentation, critical thinking and quality of sources (Elgort, 2007). However, students who are new to wiki-based learning, but who have used wikis in their private lives, are more likely to perceive them as a social software tool having little to do with academic rigour. Based on these prior experiences, when using wikis students may be inclined to give more weight to communicating an original opinion than to demonstrating that their opinions are based on sound research-based evidence, or to refer to web pages rather than journal articles, or to take a more relaxed approach to acknowledging sources (Elgort, Smith, & Toland, 2007). Thus a conflict may arise between students' approaches to wiki-based course work and lecturers' expectations in relation to the standards of student work in a university course. Furthermore, *learning* activities imply that students engage with information and resources using a particular learning environment (such as wikis) in order to achieve a pre-defined learning outcome, and "it is the planned outcome which makes learning a purposeful activity" (JISC: Designing for eLearning). However, the idea of an externally pre-defined outcome is not easily reconciled with the ethos of wikis as social software (Elgort, 2007).

Consequently, examples of university courses that use wikis in assessed group projects can determine the context of an academic course, as well as the nature of the task and instructions given to students influence their decisions about the structure and navigational aspects of group project wikis.

Use of Podcasts as a Learning Tool

This section of the paper looks at how podcasts could be used for learning purposes in various subject areas and disciplines. In addition to enhancing practical experience and skill in using technological gadgets, the podcasts enable students to develop independent learning skills. There are six different models for using podcasts within th education domain. These are lecture support where the lecturer identifies a select group with which to work. The lecture support uses screen-casts, short summaries and video podcasting. Secondly, podcasts can be used to supplement field work during which the learners are based at a specific location from where they can hold interviews with an identified population of respondents. Thirdly podcasts can be used for practical lessons where visual guides to GIS software can be used in place of written instruction, video cast for specimens' examination. Topical issues can also be taught through podcasts such as the prevalence and prevention of the HIV/AIDS pandemic within a specific community. Podcasts can also be used as a means of assessment where students podcasts instead of fieldwork reports. Podccasts can even be utilised when providing feedback to student assignments or assessments.

The impact of podcasts on teaching/learning has been overwhelming. On learning the impact has been identified as providing flexibility and easier learner control where students are able to look at podcasts at their own time convenient to them and be able to do their work gradually and piece-by-piece thereby creating freedom of learning. Podcasts also provide a new and convenient way of assessing students. Additionally, podcasts enhance comprehension of subject matter and enable students to re-visit matter already learnt. Through the use of podcasts students are able to capture informal knowledge, thereby helping cover knowledge gaps and missed material. It also promotes personalised learning experience of learners thereby inculcating an enriching learning environment. A virtue of the podcast system is that it is, to some extent at least, a push technology, contrasting with the pull technology that is characteristic of many internet

applications. The podcasts are automatically delivered to the student; the student does not have to remember to fetch them each week.

There are several lessons to be learned about the pedagogy of using podcasts. First, a podcast is (currently at least) an audio event only. It lacks the impact of an audio visual presentation. This means that podcasts should be *short*, and should contain material that is *vivid* and *arresting*, and supplementary to what has been covered in class. Secondly, the material delivered in a podcast should be *provocative* and should aim to make students *think.* Thirdly, it should be remembered that, immediately after listening to a podcast, the student will most likely listen to music. This means that thinking time needs to be included within the podcast itself. Do not be afraid to leave gaps of silence embedded in your podcasts. If you want your listeners to think about a question, give them time *within* the podcast to do so - they won't do it afterwards. Fourthly, the podcasts should be *embedded* in the curriculum; students should see that there is advantage to them in listening. In my course, this advantage was apparent in that assessment was by way of a learning journal, and students knew they could get ideas for this journal by following thinking leads given in the podcasts.

Developing Creativity

Research has shown that exposure to a myriad of computer applications results in the provocation of the inherent propensity in human beings for experimentation. Cognitivists, social constructivists and behavourists have also concurred that human beings have an inherent instinct for experimentation, especially with concepts that they will have been exposed to but would take the concept a step further in an attempt to have a better understanding of their environment. The same applies to students as they experiment with technology beyond what they will have been taught. Within the context of using blogs, wikis and podcasts, students are able to draw numerous lessons and skills, thereby enhancing their capacity to be creative. A number of studies have attempted to consider how the learning and teaching environment can influence the development of creativity. For instance, Grainger et al. (2004) identify what they describe as a cocktail of ingredients in developing a creative teaching environment. This cocktail includes a combination of enhancing the session content, teaching styles, and the learning experience. Other techniques for stimulating creativity within the learning and teaching environment have also been suggested. These techniques include preventing groups of friends from working together to circumvent conformity and exclusion, allowing free flowing discussion about ideas and opinions, having a relaxed learning environment, and using humour to parody situations (Grundy & Kickul, 1996; Morrison & Johnston, 2001). Donnelly (2004) argues for a paradigm shift from teaching to learning and that creativity in the curriculum design process is crucial to this. As part of this process, he argues that risks need to be taken. Technology can be influential in developing creativity amongst learners. In her comprehensive review of the role of information communication technologies (ICT) to support creativity in learning, Loveless (2002) notes six features of technologies that can be used to support creativity: provisionality, interactivity, capacity, range, speed, and automatic functions. Novelty could also be added to this list of features (Allen, 2003). However, Allen notes the assumption that new e-learning technologies can provide better instruction and further comments that actually, new technologies can "expose instructional deficiencies and exacerbate their weaknesses" (p. 196). Nevertheless, Allen further argues that the novelty of technology can draw attention, develop curiosity, and make experiences memorable. In identifying a number of "damaging dichotomies" when trying to understand creativity, Prentice (2000) suggests that the popular distinctions between work and play are inhibiting and need to be reconsidered. Prentice continues to suggest that information communication technologies have blurred the boundaries between work and non-work and between leisure and learning.

Student Expectations in Today's World of Learning

Digital educational technology is poised to play a significant role in the lives and work of both students and faculty in higher education (New Media Consortium [NMC] & EDUCAUSE Learning Initiative [ELI], 2008). Current college students, members of the millennial and digital generations (Howe & Strauss, 2003; Oblinger & Oblinger, 2005), bring with them the expectation of being engaged with new digitally mediated approaches to learning (Caruso & Kvavik, 2005; Caruso & Salaway, 2007; Levin & Arafeh, 2002; Prensky, 2001, 2005). By the time our current kindergartners enter college, they are likely to have amassed considerable exposure to such digitally mediated learning. For instance, Oblinger and Oblinger (2005) noted that among the "Net Generation (NetGen)" students, 20% began using computers between five and eight years of age. Ouellett (2004) suggested that, in contrast to the dominant teaching modality when faculty themselves were students, today's students prefer to learn in an environment that favours activity and experience and fosters immediate engagement. Today's college students have highly formed perspectives and expectations about the role technology should play in their learning (Oblinger & Oblinger, 2005; Salaway, Katz, Caruso, Kvavik, & Nelson, 2006). Consequently, faculty who are not prepared to adjust their classes and curricula to the demands of an increasingly diverse and digitally aware student population may well marginalize the relevance of their fields (Howe & Strauss, 2003; Levin & Arafeh, 2001). Kuh and Hu (2001) noted the connection with prior technological experience in their finding that older first-year college students were less likely to use digital technologies to complete assignments or discuss course topics with peers and instructors than their younger academic peers.

Challenges and Opportunities Drawing From Using E-Tools in HEIs

Despite successes that have been posted by e-tools, there remain challenges which users and HEIs and other users have got to contend with. Although the potentials of ICT such as blogs seem to be obvious, universities find challenges in using them pedagogically (Muwanga-Zake, et al, 2010). The authors further note that there is dissonance between blogging and pedagogy, or rather a gap between rhetoric about blog potential and blog practice, which has prompted this investigation and professional development in the use of blogs at various HEIs in different countries Preliminary research findings have shown that fundamental implications for professional development exist in pedagogical uses of Information and Communication Technologies (ICT). Blogs can also be a fantastic way to record one's progress on projects, take notes, shares findings. Younger students, being the more tech-minded people, can help make this happen within their learning environments. But we may have a few hurdles to jump before we can get there. However, blogs have been found to present some challenges.

There is a number of the obstacles users face in using blogs in institutions. First, blogs do not seem to be very popular in institutions as a way of communication or marketing of products In the private sector. They tend to be very personal and cannot be used for professional communication or interaction. It has been observed that while many companies have executives and employees who blog regularly, but this is still more of the exception than the rule. Second, users are either hesitant or scared to use new tools like blogs and RSS readers. Third, people assume blogs are time consuming and require expert writing skills which do not seem to be the case. Fourth, in blogging and RSS reading, users get overloaded with unstructured information hitting them in every direction resulting in some cases in confusion and mix-ups. The last thing they want is another resource or web site to worry about. However, despite the aforementioned setbacks and apprehension son the part of users, need to figure out how to communicate the fact that blogs and RSS are essentially highly-focused channels of information that, when used properly, can be more powerful than other forms of communication.

In reality, most students write many more entries than the minimum required. They also read each other's entries, and comment on them, as do the instructors. While the blog writing is motivated as a class assignment, student enthusiasm for the activity is contagious: Once a critical mass of active student bloggers is established (and of course, there are some who steadfastly refuse to have anything to do with it, incentives and penalties notwithstanding), off they go! The learning that occurs is at least bifocal. Firstly, when the students reflect on what they have learned in class, they are in the position to extract some of their tacit understanding and explicitly document it in the form of a blog. That this reflection is at least in part organizationally focused is an extra benefit, because the students often pepper their entries with details about their work contexts and why (or why not) a particular IT application would be appropriate. Secondly, by both reading and commenting on others' blogs, so they start to learn from each other—without the instructor being too directly involved. Lecturers also read and comment on each blog entry as well, independently of the students, giving constructive and positive feedback where possible. This can be a time-taking exercise, depending on the size of the class. It is best to check the blogs every few days or less in order to prevent an overflow of unread, uncommented new blog entries from building up.

Weblog tools are ideal brainstorming applications: Simply create the discussion topics as entries in the class blog and then ask everyone to login and go to the class blog. They can see the discussion topics—and submit their brainstorm ideas as comments. They can also comment on each other. For introvert students this provides a much less threatening opportunity for them to communicate and share ideas at their own pace. It is all down to communication—and finding the right tools for the right people at the right time for the right task. But blogs are versatile and definitely deserve greater attention in the classroom.

Students who have used the podcasts at one time or another have reported that they found podcasts immensely helpful. However these students were in the minority. This seems to be because the facility is most useful to students who have their own PC (and ideally also an MP3 player), and broadband access. However, while the podcasts can be downloaded on a dial-up connection, this is slow. Broadband access is of course a problem for many students living in private rental accommodation, since broadband providers typically impose a 12 month contract.) Of course, students could access the audio clips through the virtual learning environment, but many did not do so - presumably because this is a reversion to a pull technology. In these respects, podcasting may be a learning technology for the future rather than the present. Nonetheless, the results of my experiment suggest that the podcasts have, for the students that access them, measurable pedagogical merit.

Wikis have also presented both opportunities and challenges for users. The use of wikis can be used as a platform for student course work is also complicated by the absence of a formal structure in a wiki, as, in its core, a wiki is simply a collection of individual web pages. One may argue that the structure of an essay or report presented in the form of a traditional text document also needs to be created from scratch. However, an important difference between creating a structure for a text document and a wiki is that conventions about the structure of an academic essay or a project report are reasonable well established, while this is not at all the case for wikis. Furthermore, as a rule, the reader approaches a written essay in a linear manner, following the sequence prescribed by the author. Even if the reader decides to circumvent the linear approach and to go directly to a specific section of the written work, using the table of contents, the reader still has a clear sense of where s/he is within the overall body of the work. In developing a wiki, on the other hand, decisions need to be made not only about how information is structured but also what navigational support (if any) is provided to the reader, and these decisions are crucial to the ways in which the reader interacts with the wiki. Navigational metaphors for a wiki may be borrowed from different genres of communication, such as a paper-based document or a conventional website - a decision which is likely to shape the way the wiki is perceived by the

viewers. On the other hand, as outlined above, a *native* wiki approach to navigation is through non-linear hyperlinks and using the search function. The question arises, however, whether such non-structured navigation is compatible with conventions adopted for course-based work, e.g. for an academic assignment.

Implications For Professional Development and ICT Pedagogical Use

The increased number of online courses at various HEIs across the globe has led to the increased expectation and demand that lecturers use blogs in their teaching. However, there are challenges concerning workloads and the provision of support and time allocation for professional development. This has been exacerbated by the increasing number of student seeking opportunities and skills in HEIs. Furthermore, as adult learners, it is likely that staff themselves will be the ones who will make the choices about when and what they want to learn about blogs. In the light of this, the provision of an open blog policy makes sense as it provides staff with the opportunity to experiment with blogs. Although the *laissez-faire* blog could be manifestations of freedom of expression, academia has yet to extend blog use to pedagogical discourse. To do so, entails professional development that includes blog technical skills, and planning for blogs that involve students in social constructivist and active learning blog environments. Therefore, further professional development is planned at UNE. This will be in accordance with Bartlett-Bragg's (2003) model on planning and designing pedagogical blogs, and will also draw from Framer *et al.* (2007). As a first step, a blog on blogs, named Blogging @UNE (http://blog.une.edu.au/blogs/) has been developed to provide guidance and links to exemplars of pedagogically successful blogs. Blog seminars and workshops can also been organised. Staff have been encouraged and supported to start pedagogical blogs. Additionally, questionnaires have been applied to staff and students to understanding of the challenges and needs to create pedagogical blogs. It has been realised that professional development activities such as those described above require designated time as matter of policy. However, UNE needs to identify and employ ICT specialists to support staff on a daily basis. Furthermore is has been recommended that ICT in Education lecturers be designated time to highlight the pedagogically useful features of blogs and ICT in general. Other imperatives include; managing change among staff to re-examine their teaching strategies with a view of incorporating ICT in a manner that supports constructivist and active learning; and shifting towards virtual and open spaces in which the distinction between lecturer and students is obscure. As UNE tends towards more online and off-campus distance education, UNE is planning to improve its ICT capacity. For example, more LMS platforms are being tested and blog capacity can on request be extended to upload larger files. The short ICT life spans have to be considered too. For example, the cost-effectiveness of staff to perfect the use of a selected few ICT tools, such as blogs, than to adopt every new ICT on the market is being investigated.

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Editor's Note: New media are often criticized for perceived weaknesses. When shortcomings are overcome, the result is a superior learning tool. The virtual classroom was initially criticized for isolating students and professors; tools for community building and interactivity now favor distance learning for many subjects. The virtual classroom and asynchronous activities enable mid-career professionals to integrate meaningful learning experiences into their busy schedules; it also opens up college programs for persons anywhere who are unable to attend on-campus programs. Instructional designers, teachers, and administrators are anxious to optimize their contributions to this new learning environment. They have great interest in what research can tell us from the point of view of instructors and students.

Do you teach in a Virtual Classroom?:

Measuring student's perceptions of the features and characteristics

Michele A. Parker, Emily R Grace, and Florence Martin

USA

Abstract

Student learning is a key element of instructional technology, yet little is known about the Virtual Classroom, including student's perception of its features and characteristics. Therefore, reliable and valid instruments are needed to measure these attributes. The researchers assess the reliability and validity of a survey designed to address this. The sample consisted of 57 students from three classes at a Southeastern University in the United States. Face and content validity were established by a panel of experts. After data collection, internal consistency reliability was determined for the features (α =.92) and characteristics: interactivity = .70, synchrony =.70, usefulness and ease of use =.76 and sense of community = .77. Although the 4 characteristics were reliable, some items within each construct need further investigation due to low item-to-total correlations (<.30). The results are discussed along with implications for future Virtual Classroom research.

Keywords: e-learning, online education, Virtual Classroom, simulated classroom, synchronous, real-time instruction, validity, reliability, survey development, instrument construction

Introduction

In the fall of 2008, over 4.6 million college students in the United States were enrolled in an online course. There was a 17% growth in online enrollment in one year (Allen & Seaman, 2009). This growth can be attributed to the flexibility and convenience that online courses offer students and instructors. With a variety of digital learning environments and platforms; classrooms may be physical, digital, or a combination of the two, and instruction can be synchronous or asynchronous (Clark & Gibb, 2006). Although online instruction is rapidly gaining acceptance as an alternative and supplement to traditional instruction (Arbaugh, 2000), one of the major challenges that educators face is designing effective online courses (Muirhead, 2004; Keefe, 2003).

According to Liaw, Huang, and Chen (2007) there are three main considerations for online instruction: autonomous learning, multimedia, and teacher-lead learning. An online environment that captures these principles, which is rapidly growing in popularity is the Virtual Classroom (Flatley, 2007; Gilmore &Warren, 2007; Arbaugh, 2000). The Virtual Classroom (VC) enables students and instructors to interact in real-time as if they were face to face in a classroom. In order to use the VC an instructor and his/her students must have internet access and log-in to the software at the designate time(s). Many virtual classrooms (e.g., Horizon Wimba, Dim Dim) include audio, video, text chat, application sharing, content display, polling and other features. These interactive features allow users to simulate traditional instruction while maintaining the flexibility of online environments.

In 2010, Author and Author examined instructional technology students' perceptions of the features and characteristics of the VC in order to learn more about this instructional tool. In the study, the characteristics of the VC were grouped in four main categories—usefulness/ease of use, synchrony, interaction, and sense of community. A similar grouping developed by Arbaugh (2000) was used in prior studies on the VC with MBA students. With the explosion of online enrollment (Allen & Seaman, 2009) and the increasing use of the VC, it is important to understand this learning environment. In this study, the researchers discuss the reliability and validity of the Virtual Classroom Instrument, which can be adapted and used in subsequent studies.

Literature Review

VCs have been known to promote synchrony, interaction, and sense of community in different contexts (Clark, 2005; Constantinos & Papadakis, 2009; Author & Author, 2010; Rovai, 2005). Scholars have also discussed the ease of use and usefulness of many technologies in relation to adoption and student learning (Arbaugh, 2000; van Raaij & Schepers, 2008). The following literature covers these characteristics as they relate to the VC.

Usefulness and Ease of Use

Usefulness and ease of use are significant factors in the acceptance and use of new technologies. Perceived usefulness increases as users gain experience so that computer anxiety decrease and personal innovativeness increases (van Raaij & Schepers, 2008). Dufrene, Lehman, Kellermanns, and Pearson (2009) found that perceived usefulness and perceived ease of use are positively associated with perceived learning outcomes. Arbaugh (2000) found that perceived usefulness is associated with student satisfaction, while perceived ease of use is not associated with student satisfaction. This aligns with research by van Raaij and Schepers (2008), who found that perceptions of ease of use decreases after initial training, but perceptions of usefulness increase as users gain experience in online course platforms. Student perceptions of the usefulness and ease of use of technologies can provide guidance for instructors to develop and carry out online instruction more effectively.

Interactivity

Interaction is an important aspect of learning and is essential in virtual learning (Ng & Murphy, 2005). A variety of interaction is available in VCs. This includes text chat, vocal exchanges, and real-time video streaming. This interactivity provides increased opportunities for collaborative learning. There is less competition for attention from the instructor, less wait time to participate, increased participation from introverted students and decreased anxiety during interactions (Arbaugh, 2000; Gilmore & Warren, 2007). The use of student teams, which is feasible in the VC, can also influence the quality of online interaction (Dineen, 2005).

Online interactions are influenced by the structure of the course and the role of the instructor (Arbaugh, 2000; Dineen, 2005; Lee & Rha, 2009; Rhode, 2009). Ng and Murphy (2005) found that faculty used online interaction more for clarification than promoting student's higher order thinking. In contrast, student-to-student interaction can be an effective way to communicate learning in online courses and it is not necessary for the teacher to participate in all interactions (Lee & Rha, 2009). Rhode (2009) found that informal interactions were as important as formal interactions in online learning. Enhanced interaction includes compensating for the lack of visual and non-verbal cues (Bielman, Putney, & Strudler, 2003). For example, using emoticons to show facial expressions, all capital letters, acronyms, exaggerated spelling, splitting messages as if pausing for a breathe, or other tools available on the course platform.

Sense of Community

Virtual communities are composed of individuals that share information, knowledge and common interests (Ardichivili, 2008). Virtual communities are social constructions created through the interaction and activity of the members of the group (Vygotsky, 1997, as cited in Bielman, Putney, & Strudler, 2003). The formation of a sense of community can be facilitated by the instructor's awareness of the student needs and vulnerabilities in an online course and through social tasks using message boards, chat rooms, internet lectures and personal web pages (Falvo & Solloway, 2004). Even a low degree of moderation by an instructor can enable online groups to form community with an element of camaraderie, support and warmth (Winograd, 2000).

Strategies to increase a sense of online community include building rapport, decreasing feelings of isolation and enhancing interaction (Bielman, Putney, & Strudler, 2003). Building rapport may involve providing choices for student assignments and using student names. To decrease feelings of isolation, the instructor can use collaborative activities and encourage students to share experiences. Study groups also strengthen the development of a community of learners (Knupfer, Grum, & Largen, 1997 in Tallent-Runnels et al., 2006). Group work can increase the sense of community in online classrooms so long as it includes instructor support, structured format and the development of social tasks (Cameron, Morgan, Williams, & Kostelecky, 2009).

Synchrony

Synchronous technology connects users at the same time. The real-time communication in synchronous courses enables students to receive direct, immediate feedback (Mikulecky 1998; Tallent-Runnels et al., 2006). Additionally, shy students are more likely to participate in discussions and express opinions in synchronous courses versus face to face classes (McBrien, Jones & Cheng, 2009). However using too many simultaneous modes of communication may over stimulate students and cause confusion (McBrien, Jones, & Cheng, 2009). Chat options in synchronous online course are actually quasi-synchronous as there is lag time with the person typing, reading, and server delays. Pauses in synchronous communication can mean emphasis, compliance or confusion, which may differ from face to face communication (Markman, 2009). The real time communication in synchronous courses can be threatened by technology issues (McBrien, Jones & Cheng, 2009). Yet, the challenges involved in synchronous technologies are outweighed by the many ways that it supports student learning.

Purpose of the Study

Two characteristics integral to measurement are reliability and validity (American Educational Research Association, 2004). Literature on the reliability and validity of instruments are prevalent in the literature (e.g., Clapper & Harris, 2008; Ioannou, 2009; Ludlow, Enterline; & Conchran-Smith, 2008; Suhonen, Schmidt, & Radwin, 2007 and Yukay-Yuksel, 2009). The purpose of the study was to assess the reliability and validity of the Virtual Classroom instrument (VCI). The instrument was designed by the researchers to understand student's perceptions of the VC. As previous research has shown, students attitudes are related to course satisfaction and learning (Liaw, Huang, & Chen, 2007; Arbaugh, 2000). The VCI contains questions about VC features and four characteristics—interactivity, synchrony, usefulness and ease of use, and sense of community.

Methodology

In the Fall of 2008 the VCI was developed by researchers at a Southeastern University. A group of technology specialists determined the face and content validity of the instrument. During a cross sectional study, the VC instrument was administered electronically to 101 students enrolled

in an undergraduate instructional technology course. Fifty-seven students participated in the study, resulting in a 56% response rate.

Context and Procedure

The respondents were enrolled in three sections of an instructional technology course designed to teach student how to integrate technology effectively in K-12 education. The course material is divided into eight topics, which include integrating educational technology into the curriculum; communication and networks; application software and productivity tools, and hardware for educators. Each section of the course required the same textbook and assignments. The instructors of the course had taught using the *Horizon Wimba* virtual classroom prior to the study. The students were introduced to the VC during one class session and used on three other occasions for similar content across sections. Toward the end of the semester, students received an email with a brief message about the purpose of the study and a hyperlink to the VCI (hosted by Survey Monkey ©). The instrument was available for a three-week period and weekly email reminders were sent to each student.

Instrument Construction and Description

The *Horizon Wimba* software guide was used to identify each of the features available within the VC (Wimba, 2009). A thorough search of the e-learning literature revealed these four characteristics and their respective dimensions. This information was used to construct items that reflect the meaning of each characteristic. We paid close attention to the number of items attributed to each feature and characteristic to ensure representativeness (Carmines & Zeller, 1979). Items were positively and negatively worded. The positively worded items were written to address the *advantageous* aspects of the VC. The researchers expected students to agree with these items and to disagree with the negatively worded items that were conceptualized and written to represent *less favorable* aspects of VC instruction. Another rationale for the negatively worded items was to reduce social desirability bias, by requiring students to contemplate the meaning of the item carefully prior to responding (Ludlow, Enterline, & Cochran-Smith, 2008).

Establishing Validity

Four experts were asked to provide feedback regarding the validity of the VCI. Two experts were instructional technology faculty with an average of 8 years of experience in the field; 2 were experts on instrument construction, each having designed questionnaires and published survey research. They were asked to make suggestions regarding the clarity of the instrument and its ability to ascertain student's perceptions of the features and characteristics of the VC. The experts were also asked to comment on the overall presentation of the electronic survey, which was deemed appropriate and easy to navigate. The first version of the survey included 15 items in section 1 (features of the VC), and 34 items in section 2 (characteristics of the VC). The feedback from the 4 experts resulted in one amendment, which was eliminating the item "viewing the video streamed by my instructor" as this was considered a process rather than a feature of the VC.

Content validity was established through the feedback from 2 instructional technologist employed at other universities. They were asked to provide comments regarding the format and comprehension of each item. The amendments involved changing words or revising sentence structure to increase clarity and understanding. In the characteristic section, several items overlapped categories. Items were either removed or shifted to mutually exclusive categories. The second part of the survey was reduced from 34 to 23 items.

The VCI consisted of two sections that used a 4-point Likert scale (4=strongly agree, 3=agree, 2=disagree, and 1=strongly disagree). The first section of the VCI asked students to respond to 14 statements about the features (e.g., the use of emoticons, the e-board) of the VC. The second section consisted of 23 statements wherein students were asked to rate their VC experience. The

items pertained to interactivity, synchrony, usefulness and ease of use, and sense of community within the VC.

Data Analysis

For the statistical analyses the researchers used SPSS 16. Negatively worded items were reverse scored (R) so that higher ratings corresponded with disagreement. The ratings for each item were tallied to create a score for each characteristic that was used in the analyses. Descriptive statistics (means, standard deviations, and 95% confidence intervals) were used to summarize the data. Cronbach's alpha was computed for internal consistency reliability. We used a Cronbach α coefficient set a prior at .70 to analyze the features (as a whole) and the four characteristics (Santos, 1999; Nunnally, 1978). Each item was also analyzed with an item-to-total correlation, which was regarded as acceptable if the correlation was above .30 (Clapper & Harris, 2008; Ferketich, 1991).

Results

Participants

Ninety-one percent of the students were female and 8% were male. One percent of the participants were 18 and younger, 73.7% of the students were between 19-24 years old, 14% were 25-31 years old, and 10.5% were 32 or older. Seventy four percent of the students used the VC for the first time, 19.3% used the virtual classroom for 2-4 semesters, 5.3% had never used it before, and 1.8% used it for 5 or more semesters.

Virtual Classroom Features

Descriptive statistics for student's perception of VC features are listed in Table 1.

Table 1
Descriptive statistics for student's perception of Virtual Classroom features

Feature	M (SD)	95% CIs
View slide presentations posted by instructor	3.09(.71)	2.90-3.28
Using the whiteboard tools in class	2.74(.64)	2.57-2.91
Reading messages from members in text-based chat	2.84(.68)	2.66-3.02
Posting or replying to a message in a text-based chat	2.82 (.69)	2.64-3.01
Interacting privately using text-based chat	2.49(.63)	2.32-2.66
Talking to the others using the audio chat option	2.60(.88)	2.36-2.83
Asking the moderator questions by raising my hand	2.86(.88)	2.63-3.09
Using the polling feature to respond to questions	3.02(.72)	2.83-3.21
Using emoticons and other activity indicators	2.56(.78)	2.35-2.77
Viewing archived virtual classroom sessions	2.88 (.89)	2.64-3.11
Viewing the desktop shared other participants	3.09(.76)	2.89-3.29
Using the breakout room in a virtual class session	2.51(.63)	2.34-2.68
Viewing websites loaded within a session	2.84(.65)	2.67-3.01
Able to moderate a virtual class session	2.68 (.71)	2.50-2.87

The respondents rated the features using a four-point Likert scale (4=strongly agree, 3=agree, 2=disagree, and 1=strongly disagree). Their average responses ranged from 2.49-3.09, which

indicated a fairly positive view of this learning environment. The ability to view the instructor's slide presentations (*M*=3.09) and sharing one's desktop (*M*=3.09) were more beneficial than the other features. On the contrary, one-to-one private chats (*M*=2.49) and using the breakout rooms during VC sessions (*M*=2.51) were the least beneficial features. The 14 items pertaining to the features of the Virtual Classroom had a Cronbach's alpha of .92.

Virtual Classroom Characteristics

It was expected that each inter-total correlation would meet the set criteria (.30 < r) (Ferketich, 1991). Item-total correlations for the interactivity scale revealed that only one item "my typing hindered me" was under the .30 threshold. Similarly, one item on the synchrony scale, "the class was monotonous," had a correlation below .30. The *usefulness and ease of use* and *sense of community* scales also had one item-total correlation that were less than the criteria, r=.21 and r=.28 respectively.

Table 2
Item Analysis for Virtual Classroom Characteristics

Item	Mean(SD)	Scale Mean if Item Deleted	Alpha if Item Deleted	Item-total correlation
Interactivity				
Facilitated instructor to student Interaction	3.09 (.81)	20.09	.61	.64
Facilitated student to student Interaction	2.82 (.68)	20.35	.61	.68
The quality of class discussions were High	2.75 (.91)	20.42	.58	.74
I learned from my fellow students in this class	2.70 (.82)	20.47	.63	.58
Instructor frequently attempted to elicit student interaction	2.70 (.82)	19.81	.65	.53
My typing hindered me (R)	3.21 (.62)	19.96	.75	-.06
It was easy to follow class discussions	3.00 (.87)	20.18	.59	.72
I could not talk freely because I could not see my classmates face to face	2.23 (.82)	20.95	.83	-.41
Synchrony				
It reduced my travel time to the campus to attend face to face class	1.83 (1.01)	12.4	.579	.63
It reduced my travel cost	2.86 (.99)	12.39	.565	.66
It helped me collaborate with peers without having to be in the same location	3.00 (.87)	12.25	.588	.63
I had bandwidth limitations	2.02 (.72)	13.23	.684	.33
I had technical problems	2.21 (.90)	13.04	.698	.30
The class was monotonous	2.32 (.71)	12.93	.753	.03
Usefulness and Ease of Use				
It enhanced my effectiveness	2.63 (.84)	11.42	.693	.61
It improved my performance	2.65 (.83)	11.40	.686	.63
It was easy for me to become skillful in using VC	2.93 (.65)	11.12	.697	.62
I found it easy to get the virtual classroom to do what I want it to do	2.82 (.68)	11.23	.677	.68
I was not confident using the VC (R)	3.02 (.77)	11.04	.827	.21
Sense of Community				

I felt isolated	2.21 (.796)	7.49	.594	.78
There were not many collaborative activities	2.18 (.71)	7.40	.719	.58
I did not feel a sense of belonging in the classroom	2.30 (.68)	7.53	.638	.73
I worked on my own for most of the projects	3.02 (.767)	6.68	.867	.28

While item analysis focuses on the individual item in a composite instrument (Ferketich, 1991), it is equally important to consider the composite scores. Scales were computed by adding the ratings for each subset of items representing a characteristic. Since the number of items varies for each characteristic the original values were converted to 0-100 scales to facilitate comparing the mean and standard deviation of the scales with one another. *Usefulness and ease of use* had the highest average rating (M=70.5), followed by *sense of community* (M=67.5), *interactivity* (M=65.3), and *synchrony* (M=63.3). Responses for all the scales generated a Cronbach's alpha between .70 and .77. See Table 3.

Table 3
Descriptive Statistics and Reliability of Virtual Classroom Characteristics

Scales	Range	Mean (SD)	Means (SD) Converted scale 0-100	95% CIs	No. items	Alpha
Interactivity	1-32	20.9 (3.81)	65.31(11.9)	19.9-22.0	8	.70
Synchrony	1-24	15.2 (3.31)	63.3 (13.79)	14.4-16.1	6	.70
Community	1-16	10.8 (1.04)	67.5(6.5)	10.5-11.0	4	.77
Useful and Ease	1-20	14.1(2.72)	70.5(13.6)	13.3-14.8	5	.76

SD, standard deviation; CI, confidence interval; Alpha, Cronbach's alpha coefficient, r, correlation coefficient

Discussion

Although the VC is growing in popularity (Arbaugh, 2000; Flately, 2007), there are few studies on the Virtual classroom with different populations and in various contexts (Arbaugh, 2000; Author & Author, 2010). The data from this study provide information on the validity and reliability of the Virtual Classroom Instrument, which was designed to measure students' perceptions of the features and characteristics of this e-learning environment.

Additional improvements may strengthen the VCI further. For instance, eliminating certain items, using the criteria set for item-analysis, will increase the reliability estimates of the respective scales (of the characteristics). Two examples illustrate this phenomenon: For the interactivity scale deleting the item "I could not talk freely because I could not see my classmates face to face" increases the reliability coefficient from .70 to .83. This item may be problematic for conceptual reasons as well as how it is worded. Conceptually, the item may be less about interaction and more about introversion/extroversion or individual preferences for instruction. In terms of wording this item combines two negative statements. The reliability of the synchrony scale (α=.70) increases to .75 by removing the last item "the class was monotonous." A class that is boring or mundane is different than instruction that is delivered simultaneously to a group of individuals.

The sense of community scale contained one item that fell outside the criteria (.30 < r) recommended by Ferketich (1991). We suggest reconsidering the item "I worked on my own for most of the projects" (r=.28). On the surface this item seems related to community. Upon closer

scrutiny it could also be about individual work habits or preference rather than formation of community. Another plausible rationale for the low correlation pertains to the class in which this study evolved. In the instructional technology class students were required to submit projects individually, which is counterintuitive to developing a sense of community. It is suggested that future studies consider the nature of the class as it relates to this domain. Despite the explanation, the items within the sense of community scale may be need to replaced or modified prior to subsequent use of the instrument and then retested for reliability and validity.

The items that are crafted will need to adhere to instrument construction guidelines. As such, they should avoid double negatives like the one item that was suggested for deletion in the interactivity scale. Statements like this often confuse respondents and can increase measurement error (Dillman, 2000). Other researchers may want to add other questions that are relevant to study such as prior online course enrollment, type of delivery method (fully online class, hybrid, etc), frequency of VC use, and student's familiarity with other forms of technology to see how these variables correspond with student's perceptions of the VC.

Both face validity and content validity can be limited ways of ascertaining whether or not a measurement tool is valid. Other types of validity may provide stronger evidence. For example, instrument(s) that deal with the same constructs can be administered to respondents and used to determine convergent validity. Alternatively, construct validity can be determined by conducting factor analyses. While this study does not have the adequate sample size to accomplish this, promoting the use of this instrument in future studies can lead to its use with larger samples. Once the appropriate sample size is obtained this manner of validation can occur. According to the prescription (Burns & Grove, 2001) a minimum number of 10-15 participants for each item is suggested. Based on the items that represent the VC characteristics in this study (n=23) the sample should consist of a minimum of 230 respondents (10 x 23).

Limitations

The researchers acknowledge the lack of generalizability of this study due to the nature and size of the sample. However due to the novelty of the Virtual Classroom obtaining larger samples is difficult. Ferketich (1991) acknowledges the difficulty in finding 200-300 subjects, for item-analysis, when an instrument is designed for rare populations. In clinical populations, item-analysis usually is conducted with far fewer subjects. While one-source and social desirability response bias may be present, these are inherent in survey research that is used in this capacity (Boardman & Sundquist, 2009). While this study does not have the adequate sample size for factor analysis, which would validate the constructs on the VCI, the authors sought experts to help determine face and content validity. Although the items were valid, few items appear problematic. These items have been identified and can be addressed in future iterations of the instrument.

Conclusion and Future Research

Despite these limitations the data can be used by instructors, researchers, and practitioners who are interested in student's perceptions of the Virtual Classroom. This study provides evidence of validity and acceptable reliability for measuring student's perceptions of the VCI. However several items within the characteristics need more testing to further establish the reliability and validity of the VCI. Making improvements to the existing instrument will strengthen the quality of data on the VC. In the future, researchers who collect data from larger samples may elect to examine whether demographic characteristics such as sex, age, and previous online course enrollment reveal significant perceptual differences in the features, characteristics, or other aspects of the VC. Other research directions include the need for more cross-disciplinary studies on the VC and studies that investigate course outcomes.

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Editor's Note: Learning Management Systems (LMS) allow websites to provide much more than syllabus and course materials; they integrate a wide range of learning resources including library and audiovisual, learning laboratories, interactive multimedia and simulators, databases, communication tools such as email, threaded discussions, blogs and wikis, and social media such as MySpace and Facebook. LMS facilitate advisement, admission, registration, financial aid, counseling, testing and evaluation. The following research investigates doctoral program websites in Educational Technology in their present stages of evolution.

Doctoral Program Websites in Educational Technology:
An Investigation of the Information Availability and Accessibility

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Abstract

This research identifies the type of information prospective doctoral students in educational technology seek; examine the extent to which the discipline's current doctoral program websites include relevant information, and the degree to which the websites are accessible to disabled students. Fifty doctoral websites in educational technology were examined. Results show variability in the type of content available and show that many sites have elements that are inaccessible to disabled students. Recommendations are provided.

Introduction

The Internet and its related software and systems have extensively changed the way individuals interact with the world. The Internet is the fastest growing communications medium in our history (Bell & Tang, 2000), and as a consequence, the way in which higher education institutions interact with prospective students has also fundamentally changed. In particular, the web presence of an institution has been a topic of investigation in many disciplines and from many perspectives (Poock & Lefond, 2001; Cavanaugh & Cavanaugh, 2002; Acquaro, 2004; Hans, 2001; Poock & Andrews, 2006; Sibuma, Boxer, Acquaro, & Creus, 2005). A university or college website may be the most important marketing tool to solicit prospective students in the information age, and as noted by Abrahamson (2001), strong evidence suggests that modern students use the information to inform decision-making.

Perhaps the most authoritative work on college and university websites was conducted by Poock (2001, 2003, & 2006) and his colleagues. Poock's research has systematically investigated the characteristics of effective websites in the context of higher education and surveyed prospective undergraduate (2001, 2006) and graduate students (2003) to determine which characteristics were most important to the target audience. The research investigated the following relevant factors from a student perspective: content, site architecture and organization, ease of navigation, download speeds, focus on audience, distinctiveness of the website, and the impact of graphics. Overall, the two most important characteristics were the website's content and site architecture/organization (Poock & Lefond, 2001).

Another important area of discourse has been the accessibility of college or university websites (Acquaro, 2004; Sibuma et. al., 2005). Because many colleges or universities are public entities, their websites should conform to the requirements stated in Section 508, a law amended by congress in 1998 requiring that federal entities must make their web sites accessible to people with disabilities (Section 508, 2008). Accessibility has become such an important topic, the World Wide Web Consortium (W3C) has developed the Web Accessibility Initiative (WAI) to assist developers in making websites accessible (WAI, 2008). Research in this area has provided

recommendations on designing accessible websites (Cavanaugh & Cavanaugh, 2002; Acquaro, 2004; Sibuma et. al., 2005), but few have documented whether the sites are truly accessible.

In practice, universities divide website responsibilities into a hierarchical system in which departments or specialized academic units are charged with creating and maintaining information specific to their students and programs. However, when attempting to identify research on the quality of individual department websites, which often house the relevant information specific to students within a program, there is little to no documented empirical research available. One published study was identified in the discipline of family sciences. This study aimed at identifying 1) the information potential graduate students would seek on a department website, and 2) determining the extent to which current department websites meet those expectations (Hans, 2001).

The purpose of this research, in distinction to previous studies, is 1) to identify, by means of an extensive review of literature and review of existing doctoral program websites, the information prospective doctoral students in the area of educational technology seek on doctoral program websites, 2) to examine the extent to which the current doctoral program websites in the area of educational technology include the information, and 3) the degree to which the websites are accessible to disabled students. The goals of this research are to gauge the status quo of the educational technology doctoral program websites in an effort to assist programs in improving their doctoral program websites.

Theoretical Framework

Information Availability

To address the first purpose of this research (*identifying* information prospective doctoral students seek), a review of existing research literature on factors that influence graduate student decisions (Kallio, 1994; Pock & Love, 2001) and a review of ten existing doctoral program websites in educational technology were used. The review of current doctoral program websites informed this process in how these factors are currently manifested on websites.

Pock and Love (2001) identified 27 important factors that influence doctoral student enrollment in higher education programs from a sample of 125 doctoral students. Kallio (1994) identified 31 factors that influence enrollment decisions in graduate programs from a sample of 2,834 students admitted into masters and doctoral programs. Those factors that could manifest themselves in a web presence were incorporated into the framework. Some factors were not incorporated into the framework because they were outside the control of a program. For instance, input from a spouse/partner (Pock & Love, 2001) may be an important factor for a student enrollment decision, but this factor is outside the control of a program.

The factors were structured into a content framework that includes six content dimensions: admissions; curriculum and offerings; program requirements; student opportunities, resources, and financial assistance; program reputation; and faculty credentials. The result of this synthesis process is shown in and includes the content dimensions, the researchers and the factors. Each of these content dimensions was traced to items that could be available on websites to assist student decision-making.

Admissions*:* The admissions content dimension refers to information about the minimal requirements for a prospective student to gain acceptance into the doctoral program and the process surrounding admissions, such as the deadlines, and documents that must be provided for an admissions decision. Pock and Love (2001) emphasized ease of admission process and speed of acceptance as relevant factors while Kallio (1994) identified the overall admissions process and policies as important factors.

Table 1
Student enrollment factors in graduate education.

Content Dimension	Kallio, 1994	Pock & Love, 2001
Admissions	Admissions process and policies	Speed of acceptance Ease of admission process
Curriculum and Offerings	Diversity of course offerings Particular field of study available Geographic location	Availability of evening classes Diversity of course offerings Location
Program Requirements	Program structure and requirements Length-of-time to degree Ability to pursue studies part-time Ability to continue in current job	Flexible program requirements Able to continue working in job Able to pursue studies part time Time required to complete program
Student Opportunities, Resources, and Financial Assistance	Social cultural opportunities Library and facilities collections Research and computer facilities Sensitivity to minorities and others Research opportunities Opportunities to teach	Amount of assistantship stipend Opportunity for assistantship Library and facility collections
Program Reputation	Institution's academic reputation Value of degree Size of the department Quality of students in program Post graduate job placement	Reputation of program Academic accreditations Faculty-to-student ratio Input from students in program Input from employer Rigor of program
Faculty Credentials	Reputation of department's faculty Quality of teaching Opportunity to work with faculty	Reputation of faculty

Curriculum and Offerings*:* The curriculum and offerings dimension refers to the diversity of courses available within the curriculum, the frequency upon which they are offered, and the flexibility of the course offerings (e.g., night classes or distance options). Pock and Love (2001) and Kallio (1994) discussed the diversity of courses offerings, and location as relevant factors. Location was included in this dimension to capture the availability of distance learning options. Pock and Love (2001) also emphasize the availability of course offerings, while Kallio (1994) highlights particular areas of study available.

Program Requirements*:* The program requirements content dimension addresses the structural and time requirements of the program, such as residency requirements. Pock and Love (2001) and Kallio (1994) both emphasize that the length-of-time to completion, and flexibility of program to permit prospective students to work part-time or pursue their current positions as important factors.

***Student Opportunities, Resources, and Financial Assistance**:* Student opportunities, resources, and financial assistance describes the opportunities for students to attain financial assistance (e.g., fellowships or assistantships), the openness to international and minority students, opportunities for research and teaching, and the facilities available to students. Pock and Love (2001) and Kallio (1994) both highlight the importance of facilities. Kallio (1994) addresses social or cultural, minority, and international student opportunities as well as general research and teaching opportunities. Pock and Love (2001) emphasize the importance of assistantship opportunities as well the award amounts.

***Program Reputation**:* The program reputation content area refers to the dimensions that define academic prestige and a program's reputation in the academic and professional community. Pock and Love (2001) and Kallio (1994) state that the reputation of the program is an important factors in enrollment decisions. More specific items include the value of a degree, size of the department, quality of the students within the department, accreditation, job placements, faculty-to-student ratios, and input from students within the program and employers (Kallio, 1994; Pock & Love, 2001).

Faculty Credentials: The faculty credentials dimension addresses the relevance of the faculty in influencing student choice. Both Pock and Love (2001) and Kallio (1994) underscore the reputation of faculty as a factor. Kallio (1994) adds the quality of teaching and the opportunity to work with a specific faculty member as key factors. Faculty research areas and specializations play an important role in student choice at the doctoral-level.

Accessibility

Evaluating the accessibility of websites involves many different approaches ranging from color blindness checks to automated online validation of markup. The authoritative canon governing web accessibility, as previously noted, is the Web Accessibility Initiative (WAI) guidelines published by the W3C. Included in the WAI resources is a suite of tools to assist web developers and publishers in evaluating the accessibility of their site. One such tool was developed by the Adaptive Technology Resource Center at the University of Toronto, known as the Web Accessibility Checker (WEC).

The WEC provides automated validation of accessibility of a website using the WAI and Section 508 guidelines along three levels of severity: known problems, likely problems, and potential problems (WEC, 2008). Known problems include basic dysfunctional elements such as an image tag not including the alternative text used by screen reading software and are detected with certainty. Likely problems refer to functional problems such as an image tag containing non-descriptive information that must be verified using the software tool. Finally, potential problems are things that the software cannot check for certainty. For example, using an alternative description for an image that is too lengthy and potentially unnecessary requires the manual judgment of a web developer or publisher.

Method

Instrument

Using the theoretical framework as a guide, an instrument was developed to document the presence of relevant content dimensions on the doctoral program websites. The instrument has 73 items and is organized into six different sections along with general information (e.g., URL of the doctoral program). All of the items are dichotomously scored using "Present" and "Not Present" with a "Not Applicable" option used in cases where the information was not consistent with the program's structure. For example, some programs may not require a letter of intent for admissions into the doctoral program.

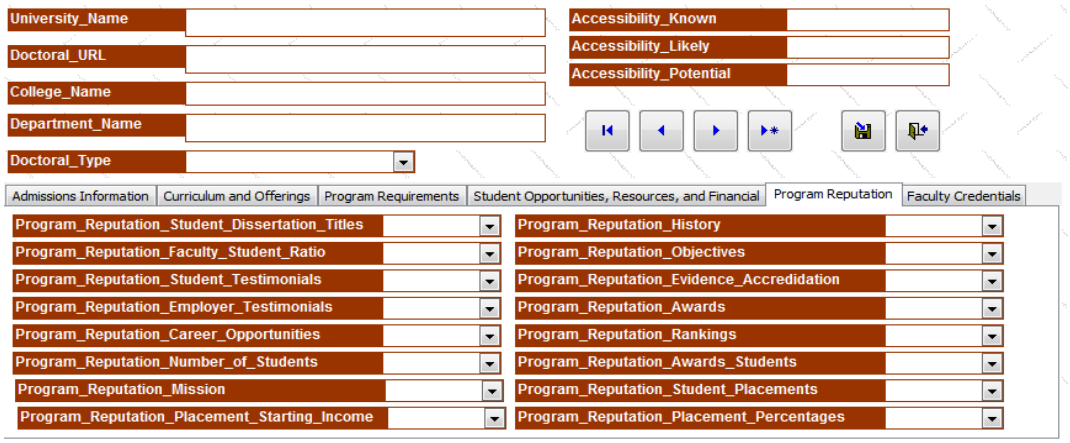

Figure 1. Doctoral program website collection instrument

To facilitate the data collection process, the instrument was implemented using a Microsoft Access © database and its form features. A screen shot of the instrument is shown in Figure 1. The data was coded by four different raters with a cumulative inter-rater reliability of 82%. The K-R 20 measures of internal consistency reliability are shown in Table 2. The program reputation and student opportunities, resources, and financial assistance content dimensions did not exhibit high internal consistency reliability (K-R 20 > .7) for these data.

Table 2
Internal consistency reliability for content dimensions

Content Dimensions	Items	K-R 20
Admissions	13	0.79
Curriculum and Offerings	9	0.70
Program Requirements	12	0.78
Student Opportunities, Resources, and Financial Assistance	14	0.60
Program Reputation	16	0.56
Faculty Credentials	9	0.77

Data Source

The websites used in this investigation were published to the Degree Curricula in Educational Communications and Technology, a specialized information directory maintained by the Association of Educational and Communication Technology (AECT). The directory includes a wealth of curricula related information, open to the public, to help define the contours of the discipline. The directory also includes a link to institutions that currently have doctoral programs. This information was used to define the boundaries of the dataset. Any institutions that did not indicate a doctoral program were not included in the data collection efforts. Only institutions within the United States were included in the analysis.

The data was merged with information published to the Carnegie Classification website (Carnegie, 2008). The resulting sample included 50 doctoral program websites. Fifty percent of the doctoral programs included doctor of philosophy degrees, 24% offered doctor of education degrees, and the remaining offered both degree programs. Eighty-two percent of the sample was public institutions and the remaining was private. Forty-four percent of the programs were in institutions classified with “very high research activity,” 36% were classified as “high research activity,” 6% were classified as masters colleges and universities large, and the remaining had a broad doctoral research university classification.

Procedures

To define the boundaries of the research, some assumptions had to be made in the execution of the data collection. First, the definition of a doctoral program website is the Uniform Resource Locator (URL) of the academic unit (e.g., department of educational technology and leadership) website that offers the doctoral degree. In many cases, the program information was shared with other programs, in which general admissions pages are provided. The information had to be available from the academic unit URL. All the relevant information had to be available within the sub domain or one link away from the academic unit URL. Thus, for example, linking to a general graduate school website that included admissions deadlines was acceptable given that the URL was only one click away.

Second, the WEC was applied to only the first page of the program website. Third, not all information was available for each item, and thus a 50% threshold was set to code the data. For example, a doctoral program might have 16 different courses listed, and provide example syllabi for only 8 of those courses. In this case, the 50% threshold was reached and the institutions would have received a "Present" for the availability of example course syllabi. These assumptions were made to make the coding consistent and manageable.

Results

Admissions Information

The majority of doctoral programs in educational technology-related disciplines included an admissions contact within the program website as well as an email address, and mail-point. Seventy-two percent of the program websites posted Graduate Record Examination (GRE) requirements, 72% requested all transcripts from previous institutions, and 64% included specific grade-point average (GPA) requirements.

Thirty-six percent of the programs requested professional statements from potential students, and 26% requested a letter of intent. Only 58% of the doctoral program websites included admissions deadlines on their program website, and a mere 22% included an admissions timeline indicating how long it would take for program decisions to be made.

Courses and Offerings

The courses and offerings content dimension was one that was particularly influenced by the 50% threshold criteria. Some programs did include, for example, student products or example assignments as a way to illustrate the types of skills and knowledge that would be acquired upon completion of the program. However, 50% of the courses had to do this in order to be counted, and none met this criterion. As can be gleaned from Figure 3, most programs included course titles, descriptions and credit hours on their websites. Substantially fewer schools provided a timetable of when these courses would be offered (36%), example syllabi (12%), and clearly noted distance learning offerings (22%).

Program Requirements

Doctoral programs vary widely in their structure and requirements. Seventy percent or more of the doctoral program websites evaluated included residency requirements (76%), a specified number of dissertation hours (72%), qualifying examinations (70%), and a required course sequence (70%) as shown in Figure 4. Only 42% of the websites evaluated included specific doctoral committee structure information, and only 42% provided a comprehensive overview dissertation requirements.

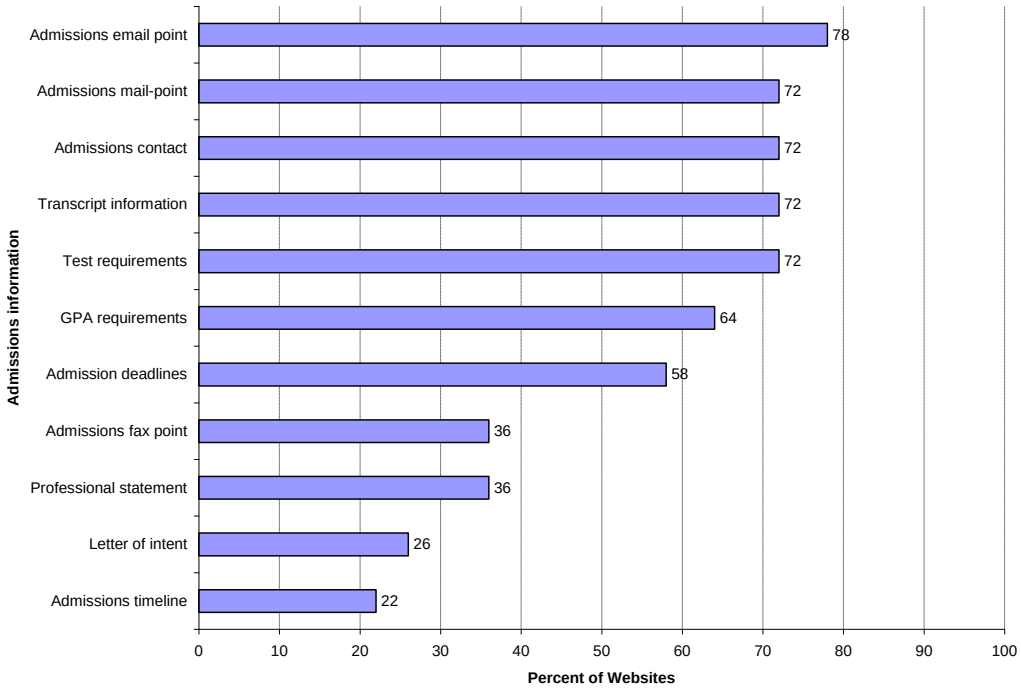

Figure 2. Percentage of Websites including Admissions information

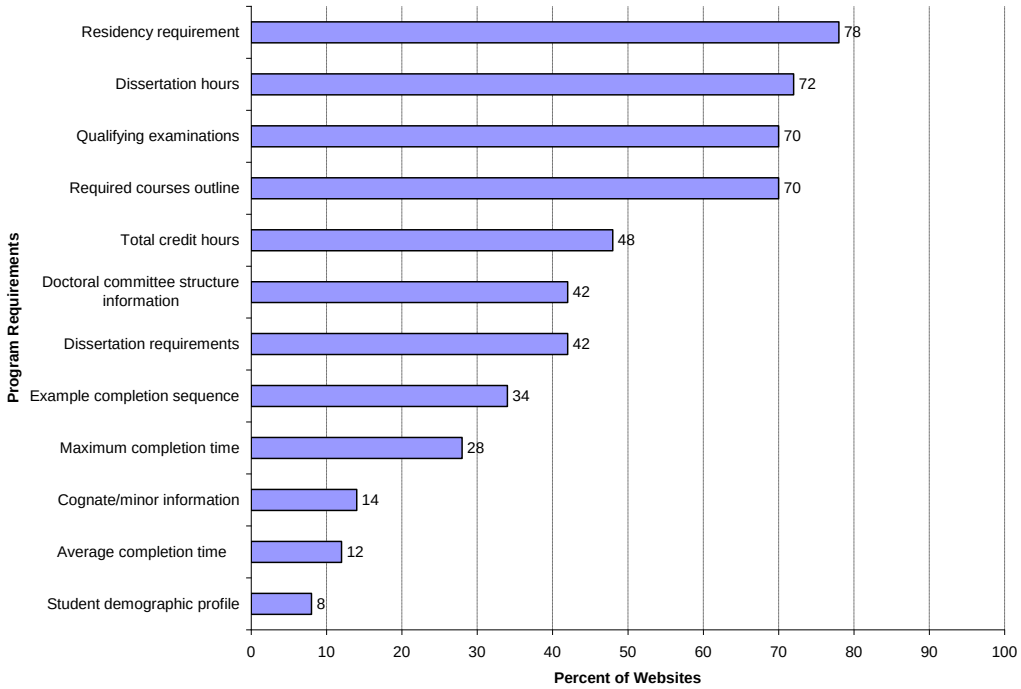

Figure 3. Percentage of Websites including Courses and Offerings information

Thirty-four percent of the program websites provided example completion sequences, from the start of the program to completion of dissertation. Twenty-two percent of the programs specified a maximum completion time, and 12% provided the average time it takes for a student to complete the program. Only 14% of the websites outlined potential minors/cognates and the requirements for the minors, and only 8% of the websites provided a demographic profile of the students currently enrolled in the programs.

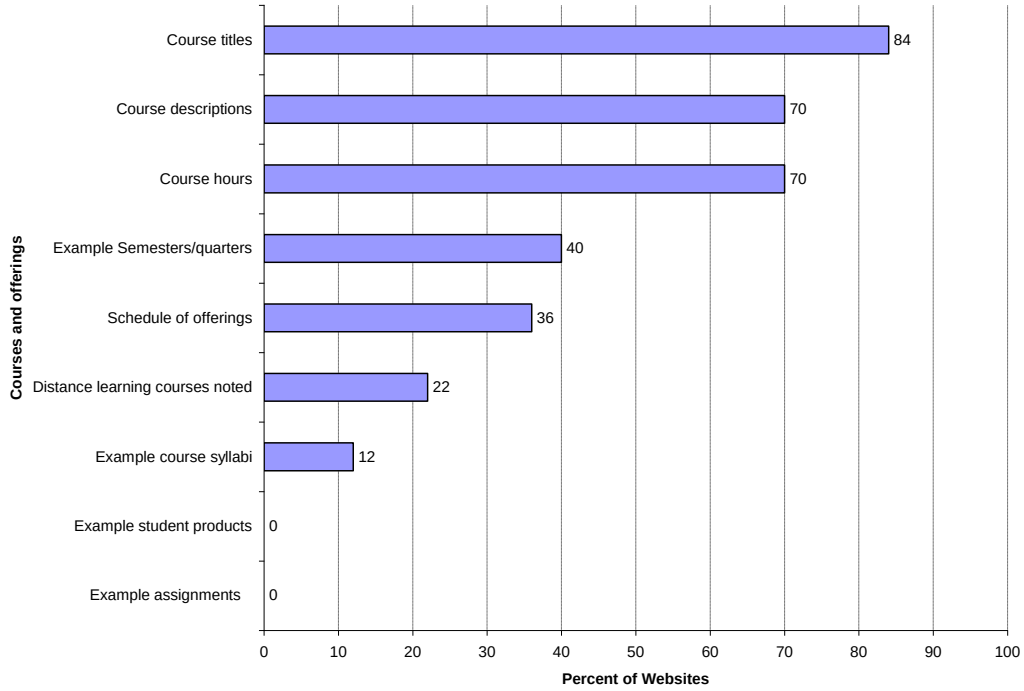

Figure 4. Percentage of Websites including Program Requirements information

Student Opportunities, Resources, and Financial Assistance

Perhaps the most important area influencing a student's decision to enroll in a doctoral program is the type and quantity of resources available. Forty-two percent of the program websites included research assistantship opportunities, 34% outlined fellowship opportunities, and 24% outlined teaching assistantships available to students in the program. However, none of the program websites outlined the percentage of students currently receiving financial assistance within the program.

Thirty-six percent of the program websites included links to affiliated production and research centers within the institution, and 36% highlighted computer resources or labs available to students. Forty-two percent of the websites provided links to relevant professional associations (e.g., Association of Educational and Communication Technology), and 22% included links to relevant student associations. Only 8% of the websites included evidence of student presentations and publications, and none of the sites included any information about student patents that had been awarded. Only 16% of the sites included any notable international student information, and fewer included any information relevant to minority students (12%).

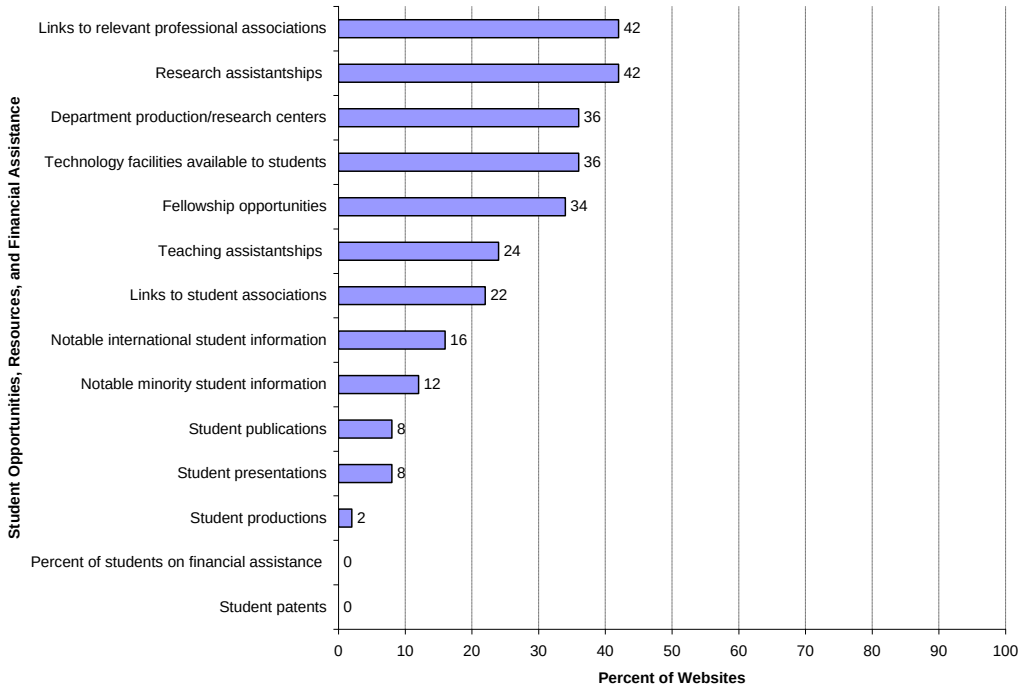

Figure 5. Percentage of Websites including Student Opportunities, Resources, and Financial Assistance information

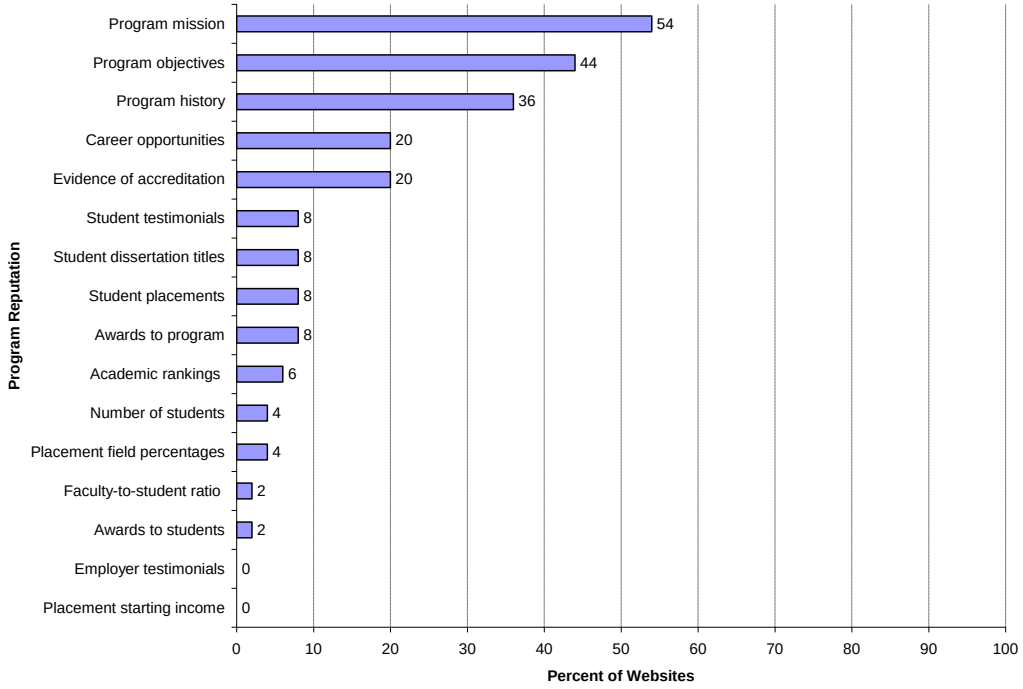

Figure 6. Percentage of Websites including Program Reputation information

Program Reputation

A program's reputation can be presented in many different ways on a doctoral program website as shown in Figure 6. Fifty-four percent of the program websites evaluated included a mission

statement, 44% provided specific program objectives, and 36% provided a short history of the program. Only 20% of the program websites provided accreditation information, and 6% provided academic ranking information. Twenty percent of the program websites described potential career opportunities upon completing the program, yet only 8% listed student placements, only 4% placement percentages, and none included employer testimonials or starting salary information.

Most doctoral program websites did not include much ancillary information about the program's reputation. A mere 4% of the programs highlighted the number of students currently in the program, and only 2% provided a faculty-to-student ratio. Eight percent of the doctoral program websites included students testimonials about the program, 8% also listed the dissertation titles of graduates and awards that had been conferred to the program, and 2% highlighted specific awards that had been acquired by students within the program.

Faculty Credentials

As shown in Figure 7, most doctoral program websites provided the names of the faculty members (94%) within the program, faculty email addresses (88%), faculty pictures (78%), and the faculty research areas and specialties (78%). Links were provided to faculty websites on 66% of the websites examined and faculty rank was available on 64%. Forty-eight percent of the websites included faculty publications and 30% highlighted faculty awards. This section included most of the relevant information relative to other content dimensions.

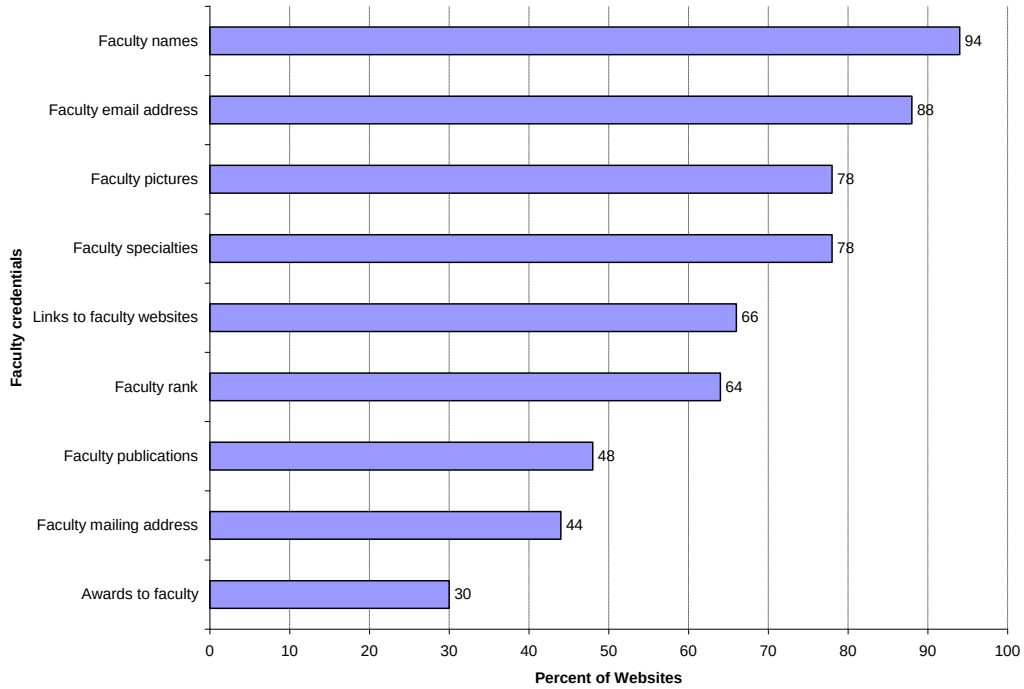

Figure 7. Percentage of Websites including Faculty Credential information

Website Accessibility

Accessibility appears to be a major problem area for doctoral program websites in educational technology-related disciplines. The doctoral program websites ranged in known accessibility errors from zero to 68 with an average of 10.86 (*SD*=14.91) on each program website. The average number of likely errors was 3.16 (*SD*=8.3) and ranged from 0 to 50 on the main program website. Finally, the range of potential errors was from 11 to 242 with an average of 107.64 (*SD*=51.55) on each doctoral website. The types of problems ranged from the missing alternative

text descriptions for images to the use of tables for formatting that make it difficult for screen reading software to read the textual information.

Discussion

Interpretation of these results must be considered in light of the limitations of this research. This research measured only the information available in doctoral program websites at one instance of time, so it provides more of a picture of the status quo. Additionally, from a data collection perspective, it was difficult if not impossible to discern whether the absence of information from a website meant it was not a program requirement (e.g., admissions) or whether the website simply did not include the information. Finally, this research did not investigate the usability or navigability of the program websites – only the availability of the information.

So, what can be concluded from this research? One of the primary purposes of this research was to document the type of information that should be made available on doctoral program websites in educational technology-related disciplines. This research resulted in six content dimensions with more than 73 specific pieces of information. The content dimensions include: admissions; curriculum and offerings; program requirements; student opportunities, resources, and financial assistance; program reputation; and faculty credentials. It is conceivable that these dimensions would be similar in other disciplines. Thus, future research should aim at extending and using the instrumentation developed in this research to document the status quo of other disciplines.

The results of the data collection efforts show that doctoral program websites vary widely in the type of information made available to potential and current students. Most doctoral program websites in educational technology provided much of the necessary admissions information, and the sites were also, relative to other content dimensions, stronger in highlighting the unique credentials of their faculty members. This is not to say that there is not room for improvement in these areas, but the websites contained much of the relevant information in these content areas.

Three content dimensions that beckon improvement include the courses and offerings, student opportunities, resources, and financial assistance; and, program reputation. Few doctoral program websites provided evidence of student scholarly products like conference presentations or publications. Further, many program websites did not include information to help students garner whether financial assistance would be made available to them while in the program. Finally, much more effort could be placed on highlighting the reputation of the programs. For instance, providing the titles of student dissertations and their academic placements would require minimal administrative effort.

The final purpose of this research was to gauge the accessibility of the doctoral program websites. This research provides strong evidence that doctoral program websites in educational technology do have major accessibility problems. This is especially problematic for our discipline, which emphasizes the value of web accessibility and assistive technology. At minimum, doctoral program websites should aim at correcting known accessibility problems on their program websites.

The authors do not want this research to communicate that our doctoral program websites are inadequate or do not meet the unique needs of potential students. Rather, the authors believe that there is substantial room for improvement on our doctoral program websites, and that we should be mindful of factors that influence student decisions when creating them. Finding similar research studies to compare with these results has been a fruitless effort. It is hoped that this paper will encourage more participation from researchers in addressing this important problem.

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Editor's Note: ePortfolios are a natural extension of web resumes to display representative skills, activities and products to potential employers and professional associates. They are the basis of professional networks such as LinkedIn and in a less formal sense for social networks such as Facebook. They reflect the change in educational philosophy toward performance objectives and rubrics for evaluation.

Launching Towards a University-wide Implementation of an ePortfolio System

Deepak Prasad
Fiji

Abstract:

The explosive growth of ePortfolio in the recent years has occurred in response to continuously increasing demand for reflective practice and social activity in education. ePortfolios are now a part of almost every high school and university student's daily life. Every educational institution wants their students to be successful in life and contribute positively towards the community. The University of the South Pacific (USP) is no different, one of the university's vision is 'to provide the foundation for Pacific peoples to be proud of their heritage and take pride in creating their future, the heritage for the next generation'. ePortfolio is one such promising tool that can contribute towards achieving this dream and much more. For generations Pacific people have used stories, songs and dances as a satellite to transmit their precious customs and traditional wisdom from one generation to the next. Now ePortfolios can be used as a global suitcase that can not only be used to archive the rich customs and wisdom but also transmit these to future Pacific generations and the rest of the globe.

In educational context, ePortfolios provide students with a virtual place to integrate knowledge, experiences, and reflective practices over courses, and programs and document their achievement of graduate attributes. It also provides students with the opportunity to communicate with others to build their social, educational, and professional networks. Through ePortfolios students can proudly showcase their academic, professional, personal skills, and experiences to future employers. With all these possibilities offered through ePortfolios, the USP conducted an evaluation and testing of 3 ePortfolio softwares in 2009. The selected system, Mahara, is being piloted on one 300-level undergraduate law course in semester 1, 2010. This paper reports the steps taken on the journey so far, including aims and objectives of the project, selection process, and justifications.

Keywords: ePortfolio, Moodle, reflective practice, social activity, open source, evaluation, testing, selection

Introduction

In today's digital age educators and governments around the globe are rightfully demanding for more reflective practice and social activity in education. Research has shown that, ePortfolios promote reflection (Batson & Chen 2008; Stefani, Mason & Pegler 2007) and social activity (Gerbic & Maher 2008; Zeichner & Wray 2001) in teaching and learning. ePortfolios are shared, reflected and provides a means for students to be mobile and lifelong learners and the types depend of their multiple purposes. In light of these possibilities, ePortfolios has gained major traction in high schools and universities and are becoming increasingly "viable institutional instructional technology to facilitate student learning" (Dordelly-Rosales 2010, p.12). ePortfolio is therefore a promising technology for any educational institution that aspires to meet the demands of educators and governments in today's very dynamic learning and teaching environment.

In its efforts to enhance learning and teaching at University of the South Pacific (USP), the Centre for Flexible and Distance Learning (CFDL) has been probing ePortfolios since 2007. In May 2008, an expert on e-portfolios, Sarah Lambert from the University of Wollongong, conducted a series of presentations on ePortfolios at the invitation of CFDL to USP faculty and management.

More specifically, plans for including a unit on e-portfolios in the new ICT generic course (UU100 to be rolled out in semester 2, 2010) called for some serious exploration of best ePortfolio solution/practices. In addition, this exploration exercise was seen as dovetailing with the University's efforts in developing its graduate profile and attributes as well as the newly setup USP alumni association. The current evaluation and testing exercise is one of the first phases of the ePortfolio rollout at USP. This phase started with an initial meeting of the ePortfolio Working Group on August 24, 2009.

This paper will be presented in four sections. The first provides the literature review that guided the study. The second will provide aim and objectives of the study and the third section will examine the evaluative approach and will present findings from the evaluative process. The final section of the paper will present the conclusion and recommendations of areas for further investigation.

ePortfolios: A Review of the Literature

There are numerous terms being used for ePortfolios (or e-portfolios). Other terms used are 'electronic' or 'digital' portfolios, 'webfolios' and even 'on-line personal development plans' or 'digital notebook' (Malita 2009). There are also numerous definitions of ePortfolios, but it is imperative to know and remember that an ePortfolio is best defined by its purpose and the purpose determines what ePortfolio tools to use. Barrett (2007) expressed that research and literature regarding ePortfolios in education is complicating because of the fact that there are many purposes of ePortfolios such as, ePortfolios that center on learning, assessment, employment, marketing, and showcasing best work. Recently there seems to be a general consensus of three major types of ePortfolio. Maher and Gerbic (2009) identified three different types of portfolio: (1) a 'learning portfolio', where the focus is on student learning and includes students reflecting, evaluating and interacting with their peers and the teacher in giving and receiving feedback; (2) a 'showcase portfolio', where the purpose is to demonstrate competence and achievements, emphasis here is on showing, rather than evaluating, and on the product rather than the process of learning; and (3) 'assessment portfolio', where the focus is on external evaluation or judgment, this generally includes authentic assessment and involves the use of criteria and standards which are most widely recognized through graduate attributes and registration and certification standards. A more general purpose definition from an educational context, as expressed by Brown, Anderson, Simpson and Suddaby (2007), an ePortfolio is essentially an online collection of reflections and digital artifacts that students can use to demonstrate their development over time to various audiences.

An ePortfolio can be integrated within a learning management system or they can exist outside it. According to Lorenzo and Ittelson (2005), those who have adopted ePortfolio claim they are the biggest educational technology development since the adoption of learning management systems. There are four kinds of 'ePortfolio softwares' or 'ePortfolio tools' used for ePortfolio systems including, commercial software, proprietary systems, open source software, and open source common tools (Stefani, Mason & Pegler, 2007). Some of the commercial ones include PebblePad, Desire2Learn and the built-in ePortfolio module for learning management systems such as Blackboard. Proprietary systems are often designed by universities and examples include the University of Denver Portfolio Community (DUPC) system (https://portfolio.du.edu/pc/index) and University of Nebraska eportfolio system (http://portfolio.unomaha.edu). There are several open

source systems available, some of the most common ones are Elgg, Mahara, Sakai, Mystuff, and OSPI. Tools such as Blogs, Wiki, eJournals and Dreamweaver are also used as ePortfolio systems. As with any software, numerous aspects need to be considered for a successful implementation. Sweat-Guy and Buzzetto-More (2007) asserted that there are a number of considerations that may influence the ePortfolio implementation process. They suggested that that each institution will need to carefully consider the role and purpose of ePortfolio within their own context before selecting ePortfolio software. As a guide for selecting the most appropriate ePortfolio software for any institution, Himpsl and Baumgartner (2009, p.16) have raised five critical questions:

1. Which kind of software best suits the intended portfolios?
2. Shall existing learning platforms or content management systems be used for portfolio work?
3. Or is it better to fall back on Web 2.0 applications?
4. Which aspects are more important: individual or institutional ones?
5. Which criteria can an institute of higher education utilize to determine which kind of portfolio software is science-based and forward-looking?

The above issues were taken into account and a decision was reached to explore open source software that could be integrated with Moodle, USP's learning management system. The subsequent section discusses the aims and objectives of the project.

Project Aims and Objectives

The aim of the ePortfolio system research and evaluation was to research the available ePortfolio systems and recommend the system most suited for use in USP. The specific focus was on Open source. Integration of these tools with Moodle was an important criterion as well as how systems could integrate the USP's (Schools) matrix of graduate attributes and support and enhance learning for the USP learner in achieving their learning goals.

- The specific objectives of the project were initially focused on evaluation:
- Define a list of criteria to evaluate ePortfolios.
- Use the criteria to collect evaluative data during the research stage.
- Evaluate the data, reporting upon the successes and issues around different ePortfolio. systems
- These were subsequently employed to achieve the following outcomes:
- Select top three ePortfolio systems for installation, testing and evaluation.
- Generate a report defining key issues and success factors.
- Choose ePortfolio tool that best fits USP's context.

Selection Process: Comparative Evaluation

An initial list of criteria to evaluate ePortfolios tools was synthesized and used by the ePortfolio Working Group to choose top three open source ePortfolio tools that was to be locally installed and further tested using the criteria in Table 1.

Table 1
ePortfolio Software Evaluation Criteria

Criteria	Notes
CONTENT MANAGEMENT/CUSTOMISE	
Annotate	User can add captions and notes on uploaded files.
Navigation/ease of use	Is it intuitive from students and staff perspective? (example: ajax instead of needing to play with html or CSS).
Presentation Modify	Can you do presentations and can you modify these?
Artifacts	Are multiple file types supported?
Able to devise Matrix/Rubric	Is it possible to facilitate communication of mastery of learning/program outcomes?
Ability to assign and control access	How easy/hard is it to control who gets to view portfolios?
Installation	Ease of installation and maintenance.
TEMPLATES	
Create and modify templates	How easy is it to devise and modify templates for different views?
Reflection	Can reflections on artifacts be easily done?
Career/Resume	Is there an attractive publish to web option?
Blogging	Are there templates for Blogging?
Evaluation	Are there evaluation templates to support rubrics for scoring artifacts and or providing feedback?
Goal setting	Can users have different views for each goal?
PUBLISH/SHARE	
Access types (permissions)	The types of controls of access for users or groups.
Publish to Course	Publishing to a course enables content resources from a portfolio to be made available inside of a course management system where the user has permission to add files. Once published then the access control system of the course management system enables others to view or use the resource
Publish to Web	Publishing to a course enables content resources from a portfolio to be made available inside of a course management system where the user has permission to add files. Once published then the access control system of the course management system enables others to view or use the resource
Commenting	Commenting enables other users to leave comments for the author on portions of a shared or published portfolio
Archive/Download/ Pack-up portfolio	Can it easily transfer portfolio artifacts between systems or installations
Share templates	Sharing templates allows other users to make use of created or modified templates. Depending on system, this sharing may be implemented as a shared template folder.
Group work	Group work feature can take many forms from a group portfolios, a wiki, peer reviews, peer circles, peer commenting, to specialized group presentation support.
Multiple portfolios	This feature involves ability for a user to create multiple portfolios simultaneously within the portfolio system, either packaging components from the same collection of artifacts for different audiences or creating multiple versions of a portfolio.
Syndicate	Syndicate feature provides for weblog style publishing where new content is quickly made available to subscribed clients
External Notification	External notification enables users to contact individuals outside of the system from within the system
Internal Notification	Internal notification enables users to contact other users inside of the system.
Searching and browsing	Searching and browsing feature supports ways of finding information and making it available.

ORGANIZE	
Collection space	Collection space a work space for users to collect and store artifacts (samples of work from various sources; all types of files), to use in portfolios.
Categorization (taxonomy/tagging)	Can you tag individual files and folders?
Sequencing	Can you arrange views or files in certain orders?
Mapping	Mapping functionality enables the making of links between content resources that may be as simple as one-to-one alternatives to a more complex network of interconnecting links analogous to a map of roads linking destination resources.
Bookmarking	Bookmarking feature includes a variety of approaches from user bookmark list to elaborate navigation supports.
Selecting	Selecting functionality supports the user decision processes to pick out and thereby value some content resources over others.
Reuse/Remix	Reuse/Remix feature supports reusing and combining content from sources both inside and outside of the portfolio system or systems.
ANALYSIS TOOLS	
Tracking	Tracking feature includes systems for tracking and reporting page hits and other usage indicators such as where the hits are coming from depending on the system.
Reporting	Reporting functions can be used for describing status of portfolios in the system.
Summarizing	Summarizing functionality enables a user to just deal with the more central or important commonalities of content resources.
Comparing	Comparing functionality makes it more possible for a user to notice differences and similarities between content resources. Sometimes this functionality takes the form of side by side visual comparisons in the same view.
Surveys (internal)	Are surveys possible?
Privacy and security	How secure are user's artifacts and information?
SUSTAINABILITY	
Support community and documentation	How active is the support community and is the documentation helpful?
System integration	Integration with Moodle
Migration and export	Migration and export supports are often in the form so support for standard formats such as those provided by IMS which can be expected to be available in the future. One aspect of this is exporting portfolios to another portfolio system so that the users can change systems.
User Higher Educ.	Is the system widely used in Higher education?
Staffing requirements	Staffing requirements include the number of full time equivalent technical staff and help desk support staff that are recommended to support the size of the installation.
Orientation/Training/ Help	Orientation/Training/Help refers to the system installation training of technical staff and the orientation of new users to the system as well as the context sensitive or other help subsystem.
Digital rights management	Are there provisions for managing copyright?
TECHNICAL REQUIRMENTS	
Authentication (login/password)	Ease of use.
Authorization (permissions)	Can the administrator suspend and delete student's accounts and change password?
Storage	Storage limitations can include limitations on the number of megabytes, the file types supported, potential for digital preservation.
Server and OS requirements	Server and OS requirements include the capacity of the server arrangement recommended to support the product at the expected load as well as which operating system is required.
Database requirements	Database requirements are the specifications for the database software needed for the portfolio system.
Other software requirements	Other software requirements include such requirements as specific browser software versions of IE, Netscape, Firefox, Opera, etc. or other software not included in the portfolio software system package.

The initial evaluative criterion is reproduced below:

- Integration with Moodle.
- Easy Navigation (intuitive, example ajax instead of needing to play with html or CSS).
- Archival/pack-up/download/transfer portfolio artifacts.
- Able to devise Matrix (to facilitate communication of mastery of program outcomes).
- Ability to assign and control access.
- Active support community.
- Ability to create template.

After initial evaluation period the ePortfolio Working Group met to discuss the finding and choose three top-choice ePortfolio tools: Mystuff, Elgg, and Mahara. These tools were to be installed and further evaluated using the criteria and explanations contained in table 1. As part of the ePortfolio evaluation process, 51 criterion evaluative matrix (see table 1) was developed by referring to 69 ePortfolio features available on EduTools website (http://eportfolio.edutools.info/glossary.jsp?pj=16). In 2006, Bruce Landon indentified and defined 69 ePortfolio features that were used by EduTools and ePAC International to review seven ePortfolio products.

After finalising the evaluative criteria the ePortfolio Working Group was divided into three teams: MyStuff, Mahara, and ELGG. Other members of the CFDL department were allotted into these teams to help with the installation, evaluation, and testing. The teams used the evaluation criteria (Table 1) to review respective ePortfolio tools. Below is the summary of each group's findings.

ELGG Evaluation

ELGG (started in 2004) is an open source web publishing application combining the elements of weblogging, e-portfolios, and social networking.

The following are the team's findings:

- ELGG has just been released as version 1.0 on August 2009. In terms of this, the application is still pretty much new from the ground up. There are new schemas, APIs and interface and it is a significantly better release.
- The aim of ELGG however has, at least in the team's opinion, shifted somewhat and more focused towards being a social networking/community builder application at its core. This was always an objective in the past, but more so now.
- Most people using the ELGG are doing so to create new Ning (http://www.ning.com/) style portals rather than portfolio based systems.
- ELGG currently does not support the creation and use of templates. Templates are an important feature of an e-portfolio system.
- ELGG features are very rich for blogging and social networking.
- Thus the following is the team's recommendation:
- ELGG has its strengths and weaknesses but may not be suited for an ePortfolio system that it integrated with Moodle at USP.
- However ELGG can be considered as a blogging or social networking application at USP.

MyStuff Evaluation

MyStuff is the ePortfolio system used by the Open University and is a highly customized version of Mahara. Despite its many great features, the team could not install MyStuff into a local server

at USP because it the high customization. MyStuff was disqualified because it did not meet the most basic of criteria: ease of installation.

Mahara Evaluation

Mahara is an innovative open source ePortfolio system originating in New Zealand around 2006. The team reported that Mahara ePortfolio tool:

- Offers feature-rich digital portfolios to students (caters for every file type).
- Enables reflection on uploaded artifacts.
- Integrates seamlessly with Moodle.
- Enables one to devise a skills Matrix (to facilitate communication of mastery of program outcomes).
- Enables students and staff to assign and control access (allows for students to display their portfolio content and achievements to relevant stakeholders such as prospective employers).
- Is easy to navigate (intuitive).
- Is easy to use to build e-portfolios (ajax instead of needing to play with html or CSS).
- Is building it's capabilities for Archival/pack-up/download/transfer portfolio artifacts.
- Is supported by a growing and active support community of developers.
- Is easy to install.
- Allows for the easy use and the copying of templates.
- Enables the building of different resumes.
- Supports personal blogs.
- Supports social networking (has features similar to facebook example, wall, messaging).

Some features that could be improved on in Mahara are:

- The addition of an html editor in the responsibility/jobs section of the resume feature (could allow for formatting and bullet points).
- Reflection could be made into a java script that appears when hovering over an artifact.
- Inclusion of reporting or survey tools.

Conclusions and Future Directions

The ePortfolio Working Group selected Mahara after a thorough evaluation of the ePortfolio options because it is the best fit to the needs of USP and integrates well with USP's learning management system (Moodle). Furthermore, because it is open source, it has the capability to easily evolve with changing requirements and has a growing and active support community of developers to enable that. The selected system, Mahara, has been installed (http://www.eportfolio.usp.ac.fj/) and is being piloted on one 300-level undergraduate law course in semester 1, 2010.

Below are some recommendations of areas for further investigation:

- Ways to fit learning ePortfolios into USP teaching and learning strategies,
- How to utilize showcase ePortfolio,
- Ways to use assessment ePortfolio,
- Design themes to match USP (and faculties), and
- F2F/Online training and support.

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About the Author

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Editor's Note: Suitably designed video games are excellent learning tools. I remember my children playing adventure games such as Odyssey on their Apple II computer. In 1982, I studied the flourishing PC industry in the role of a technical writer with a particular interest in graphics and what became video games. In 1996, the Ngee Ann Polytechnic in Singapore shared its facilities and students with makers of computer games to enriching their teaching programs. Over the next decade, excellent software for interactive graphic and video presentation was developed. Flash and related software accelerated the process for students and small budget producers. Among others, the University of Southern California Integrated video games into their School of Cinematic Arts program of study. Educational Video Games have not enjoyed the commercial success of the home product, but the capability exists for profound learning experiences.

Video Games in the Classroom:
Pre- and in-service teachers' perceptions of games in the K-12 classroom

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Abstract

Games are no longer played just 'for fun', rather, they are seen as learning tools that can capture students' interest and keep their attention. As a result, educators have been experimenting with these virtual environments to examine their place in the K-12 classroom. This study sought to examine both pre-and in-service teachers' perceptions of gaming in the classroom environment. Based on the literature review an 18-question Likert-scale survey was developed to coincide with traits of gaming on student learning and classroom use. 98 participants (53 In-service and 45 Pre-service teachers) completed the survey and four open-ended questions. Findings from this study revealed that both pre- and in-service teachers felt that gaming is a good use of technology for enhancing learning and motivating students. However, only around half of the participants indicated that they have or intend to use gaming in their teaching. Nevertheless, a majority of both pre- and in-service teachers felt that gaming in the classroom would grow in the next 5 years. It is our hope that results of this study will help fill a gap in the literature on gaming in the K-12 environment.

Introduction

The use of video games in the classroom has increased substantially in the last decade (Simpson, 2005; Squire, 2005). Many agree that games can support learning and it has been well documented that the use of games and simulations for training dates back to the war games of the 1600s where armies and navies played games to prepare soldiers and leaders for combative situations (Gredler, 2004; Shubik, 1975). Much like war games of the past, computer games engage students in virtual worlds where they can apply their knowledge, skills, and thinking in virtual situations. Games are defined as "competitive exercises in which the objective is to win and players must apply subject matter or other relevant knowledge in an effort to advance in the exercise and win" (Gredler, 2004, p. 571).

In recent years the video gaming industry has exploded. The NPD Group estimates that video game sales reached $21.8 billion in 2008, a 19% increase from the previous year (Nawaz, 2009). In addition to the increase in growth and popularity, research has shown that video games can be as effective as tutorials and drills for transfer of learning and can improve motivation and efficiency, while being safe, convenient, and controllable over real experiences. (Alessi and Trollip, 2001). Additionally, games have been shown to capture students' attention and teach them in a manner that they find enjoyable (Squire, 2005). However, much of the research on the effectiveness of gaming on learning is inconclusive at this point (Fletcher and Tobias, 2006). Potential reasons include: each game is unique (i.e., objectives, technology, look/feel, target

audience, etc.), there are a limited in number of empirical studies on the topic, and many of the studies are either anecdotal or hypothetical (Ke, 2008). Nonetheless, these technologies have much potential in education and are increasingly being implemented by teachers for classroom use (Squire, Giovanetto, Devane, and Shree, 2005). While gaming is becoming more popular in K-12 education, scant research has examined how educators perceive it's use in the classroom (Can and Cagiltay, 2006). Understanding teachers' attitudes towards gaming could prove beneficial, thus, there is a growing need for research on this topic.

Computer and Video Games as Learning Tools

Recent studies suggest that computer games can be effective for teaching and learning (Freitas and Griffiths, 2008). For example, Tuzun et al. (2009) examined how video games could be used as the basis for teaching twenty-four, 5th and 6th grade students, world continents and countries. The study found that the geography game led to student learning - similar to traditional teaching methods, and increased motivation. The authors noted that students became less focused on grades and became more independent when working in the game environment. Ke (2008) conducted a case study on computer gaming for math learning. The results of this five-week case study showed that students developed positive attitudes towards math learning, however, there was no significant effect on test performance when compared to traditional teaching methods. Similar findings, concluding that games can be just as effective as traditional teaching methods, have been reported throughout the literature (Dempsey, Rasmussen, and Lucassen, 1996; Tuzun, 2007).

In addition to studies on games for learning, researchers have explored the principles of game design (Foss, 2009) . For example, Munoz-Rosario and Widmeyer (2009) studied the design principles for constructivist gaming environments. The researchers observed and tested the interactive use of five Massivily Multiplayer Online Games (MMOGs). Their work concludes that the constructs of social negotiation, inquiry learning, reflective thinking, authenticity of learning, and ease of use are essential for effective educational games. Additional studies on game design have found that well designed games should include a fantasy environment, player control, goals, rules, elements of competition, and be attractive (Dempsey et al., 1996; Dickey, 2007; Dondlinger, 2007). An educational computer game that combines these features with an intended learning outcome should be most desirable to educators seeking to implement a game for classroom use.

Perceptions of Gaming in the classroom

While the literature base on teachers' perceptions of gaming in the classroom is limited, there have been several studies that have attempted to examine the topic. For instance, Can and Cagiltay (2006) examined 116 pre-service teachers' perceptions of gaming on classroom use in Turkey. They utilized a survey format and found that pre-service teachers believe that games have value and purpose in the K-12 classroom. Additionally, they found that most participants planned to utilize gaming in their teaching. The participants also highlighted some disadvantages to classroom gaming, which included poor classroom management and questions about the effectiveness of current video games as learning tools. The authors suggest that further study of teachers actually in the classroom is needed to confirm their findings. Scrader, Zheng, and Young (2006) found similar results in their survey, which included 203 pre-service teachers. They found that pre-service teachers value games in the classroom, yet feel that current video games, such as massive multiplayers are not good learning tools. Again, this study did not include teachers currently in the classroom, rather, it's participants were pre-service teachers.

Much is known about game design and use, however, little research has examined pre- and in-service teachers' perceptions of gaming, thus, we propose that the question still remains: What are pre- and in-service teachers' perceptions of gaming in the classroom? More research is needed to

determine how games can efficiently and effectively support learning. Research confirms that games are successful for learning, they provide a new dimension of integration into the classroom, and many students develop positive learning attitudes when using games. Because teachers are often the gatekeepers of what technological tools are used in their classrooms, it is important to understand their perceptions and attitudes about how games might help them to teach and help their students to learn (Can and Cagiltay, 2006).

Method

Participants

In total, 98 participants completed the survey. The population consisted of 53 in-service (currently teachers) and 45 pre-service (students in progress of their teaching degree) teachers from a mid-atlantic university. The in-service teachers were pooled from three graduate level educational technology classes. The pre-service teachers were pooled from three undergraduate educational technology classes. There were a total of 30 males and 68 females. The mean age of participants was 26 years old. Additionally, participants were asked if they had used or were interested in using games in the classroom - 91% responded yes.

Materials and Procedures

A survey was developed to help answer the important question uncovered during a review on the literature on gaming: What are pre- and in-service teachers perceptions of gaming in the classroom? The survey consisted of 22 questions (18 Likert scale and four open-ended questions). The survey instrument was developed to reflect the review of literature in this study and was reviewed by content experts for validity. The Likert scale questions asked participants how strongly they agreed or disagreed on statements about the use of gaming in the classroom and was based on a 5 point scale. The Likert-scale survey was designed to examine game design, learning, and use. A reliability analysis of the Likert-scale questions revealed a Chronbach's Alpha of .902.

The four open-ended questions asked participants: 1) How do you define gaming? 2) What are the advantages of gaming as a classroom tool? 3) What are the disadvantages of gaming as a classroom tool? 4) Do you have other thoughts about gaming as a classroom tool? These were designed to help qualify findings from the Likert-scale questionnaire.

Participants took this survey online during class, and their responses were submitted electronically. Participants were first presented with a demographic survey, followed by the Likert-scale questions, and finally were given the open-ended questions.

Results

Descriptive statistics for each group (pre- and in- service teachers) were calculated via SPSS. The descriptive statistics are displayed in Table 1.

Likert-scale analysis

The following 18 Likert-scale questions were aimed at analyzing participants' perceptions of games on learning, use, and design.

Results of the descriptive analysis revealed that a majority of both in-service (85%) and pre-service (84%) teachers agreed that gaming was a good use of technology for learning. They also both agreed (in- 85%, pre- 86%) that gaming enhances students' learning. Accordingly, they both agreed (91%) that gaming motivates students. Three quarters of the participants agreed that gaming is more effective with today's generation of students.

Table 1
Descriptive statistics for participants' perceptions of games on learning, use, and design.

Questions	In- Service			Pre- Service		
	Mean	SD	MD	Mean	SD	MD
Gaming in the classroom is a good use of technology for learning	1.9	.69	2.00	1.83	.75	2.00
Gaming in the classroom enhances student learning	1.88	.64	2.00	1.79	.74	2.00
Gaming in the classroom motivates students	1.69	.64	2.00	1.7	.7	2.00
The use of gaming is more effective as a learning tool with today's students than previous generations of students	2.10	.87	2.00	2.09	.86	2.00
Pictures, diagrams, and graphics included in teaching enhance learning	1.56	.69	1.5	1.67	.1	2.00
Games and simulations are an effective way to incorporate pictures and graphics in teaching	1.71	.6	2.00	1.93	.76	2.00
Prior or foundational knowledge are required to make a gaming environment effective for teaching	1.85	.6	2.00	1.89	.75	2.00
Games should be designed to address individual learners' needs and issues including learning styles	1.79	.57	2.00	1.95	.78	2.00
Games must be adaptable and user-friendly if they are to be used for teaching	1.52	.54	1.5	1.69	.71	2.00
When using a game for learning, winning should be based on knowledge or skills, not random factors	1.65	.76	1.00	1.84	.8	2.00
When using a game for learning, the game should address important content, not trivia	1.87	.86	2.00	2.04	.89	2.00
When using a game for learning, students should not lose points for wrong answers	2.63	1.15	3.00	2.35	.99	2.00
Games should not be zero-sum exercises, if students demonstrate substantial learning they should be recognized as winners	2.12	.83	2.00	1.95	.77	2.00
To be effective in teaching, games and animations must be designed based upon what is known about principles of learning	1.65	.62	2.00	2.11	.84	2.00
When using a game for learning, the dynamics of the game should be easy to understand and interesting for the players but not obstruct or distort learning	1.56	.54	2.00	1.82	.78	2.00
I use gaming in my teaching (If pre-service – do you intend to use gaming in your teaching)	2.67	1.16	2.00	2.25	1.12	2.00
I believe that gaming is a valuable use of instructional time	2.02	.64	2.00	2.11	.81	2.00
The use of games for teaching and learning will likely grow in the next five years	1.58	.63	1.5	2	.78	2.00

- Likert-scale ranged from 1-5 (1 = Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = Strongly Disagree)

A majority of pre- (88%) and in- (98%) service teachers agreed that visual representations, such as pictures and diagrams, enhance student learning. Pre- (80%) and in- (92%) service teachers agreed that games are an effective way to incorporate visual representations into learning.

Participants agreed that prior knowledge (pre- 82%; in- 88%) is required for games to be effective for learning. Additionally, participants felt that games should be designed to address learning styles (pre- 81%; in- 90%), games must be user-friendly (pre- 90%; in- 98%), winning should be based on knowledge and skills rather than random factors (pre- 80%; in- 83%), games should address important content and concepts rather than trivia and facts (pre- 71%; in- 79%), and that students should be recognized as winners if learning takes place (pre- 77%; in- 73%).

However, only about half (pre- 59%; in- 49%) of the participants felt that students should not lose points for incorrect answers. Additionally, a majority of participants (pre- 75%; in- 91%) felt that games should be designed based on what is known about learning and that the dynamics of the game should not distort learning (pre- 82%; in- 98%).

Around half of the participants (pre- 60%; in-55%) stated that they have or intend to use gaming in their teaching. However, a majority of the participants believe that gaming is a valuable use of instructional time (pre- 71%; in- 77%). Additionally, more in-service (92%) teachers felt that gaming use will grow in the next 5 years than did pre-service (73%) teachers.

Open-Ended Questions

The Open-Ended questions were designed to help qualify findings from the Likert-scale questionnaire. The open ended question were coded and analyzed for common themes using the constant comparative method (Glaser and Strauss, 1967). Results of the open ended questions helped confirm the findings from the literature review and Likert-scale survey.

Question 1: How do you define gaming?

Pre-service teachers defined gaming as a tool used for winning, competition, and learning. For instance, a participant mentioned, “Competing to win using knowledge or skills that have been taught prior to playing the game.” In-service teachers defined gaming as a means to develop a goal/learning strategy. Example responses from the in-service teachers included, “Gaming is the use of traditional games or web-designed activites that are adapted to fit the learning goals in an instructional setting. Gaming allows students to work together and embraces the concept that students have diverse learning styles that instructors should consider when delivering course instruction” and “Interactive strategic exercises oriented toward a specific goal, the ability to interact, have fun and at the same time learn new ideas.”

Question 2: What are the advantages of gaming as a classroom tool?

Pre-service teachers consistently indicated that the advantages of games were that they are fun, motivating, and involve learning/teamwork/participation. Responses included, “Gaming allows students who may not participate in traditional classroom discussion to participate, give feedback, take on leadership roles, etc. It is also a way to engage students in a non-traditional and more exciting manner” and “Collaborative learning, teamwork (especially using something like Jeopardy). Quick and easy to use - good for retention or reinforcement of certain concepts.” In-Service teachers stressed the idea that games are exciting and motivating. Sample responses included, “Most students love to be on the computer, therefore it would keep their interest and help them learn” and “Gaming as a classroom tool could be a way of reaching all students. It will interest students that are proficient in computers; the students that do not have computers at home will more than likely want to use the computer more and enjoy more technologically advanced presentations.

Question 3: What are the disadvantages of gaming as a classroom tool?

Pre-service teachers indicated that a disadvantage to using games in the classroom was that they were a distraction to students. Sample responses included, "Sometimes students can get carried away. They might become easily distracted" and "Some students may get carried away with the available medium of technology. Many students are linked into web based networking, such as Facebook, Myspace, Friendster, etc., so instead of staying on task they may be tempted to visit these sites, thus abandoning their classwork." In-service teachers reported similar responses stating that games can be a distraction and that they should not replace lectures. Example responses included, "Games cannot be used solely in place of lecture and preparation on the parts of the instructor and students. A solid grounding in the material must be set" and "Students can easily get carried away with the game and loose sight of its purpose. May be difficult to control the classroom and keep everyone on task."

Question 4: Do you have other thoughts about gaming as a classroom tool?

Both pre- and in- service teachers indicated that games are fun, motivating, and the future. Sample pre-service responses include, "Gaming is good and can make students want to be in class and want to learn. And any time you have a student saying 'I can't wait to go back to school or class' is a good thing!" and "Classroom gaming rocks!" Sample in-service responses include, "It is here and is the future and we must adapt" and "Anything that motivates learners is the way to go and gaming is a perfect example of bringing learning and fun together."

Discussion and Conclusion

The video game industry is currently growing by tremendous proportions (Nawaz, 2009). Similarly, the use of games as training and learning tools is increasing at a rapid rate. Games are no longer played just 'for fun', rather, they are seen as learning tools that can capture students' interest and keep their attention. Prior research has shown that games support learning and increase student motivation, however, scant research has examined how teachers perceive these games. As a result, this study sought to examine how games were being perceived by both pre- and in-service teachers.

Findings from this study confirmed results from prior research (Can and Cagiltay, 2006) and revealed that teachers are using games in the classroom and see them being implemented more in the near future. This finding was not surprising considering the large volume of game sales and number of schools pushing technology use in the classroom. Thus, as the gaming industry continues to grow, the use of games in education will follow. Furthermore, as the cost of development decreases and demand increases, there will be more customizable games available, which could cover more content areas to meet state and national scholastic standards.

Participants indicated that gaming was a good use of technology for enhancing and motivating students during the learning process. Similar findings were uncovered by Ke (2008), who found that gaming enhanced students' motivation and attitude towards math education. As a result, utilizing games in the classroom may increase motivation and might be best used in subjects that students often do not have motivation to perform well in or with students who lack motivation.

From a design standpoint, the participants of this study felt that games should address learning styles, must be user-friendly, should address high level learning rather than factual recall, and should involve teamwork. Munoz-Rosario and Widmeyer (2008) uncovered similar findings in their study which found that games must be easy to use and should address high level learning in order to be successful. As a result, common classroom games should focus on high level learning. Many times simple games, such as Jeopardy in PowerPoint, only address factual information.

These games need to be developed to address higher levels of learning. Additionally, computer-based games should be easy to use. Simple classroom games are usually very easy to use. However, many current games on video game systems have a high learning curve. These types of games may not be appropriate in learning settings where class time is an issue and may exhaust students' cognitive resources on game play rather than learning. Thus, teachers trying to implement console games into the classroom should first consider the resources needed to play the game.

Only around half of the participants surveyed felt that they have or intend to use gaming in their teaching. However, the majority felt that gaming is a valuable use of instructional time. Thus, there are educators that do not plan to use games for classroom use. Participants indicated that games could be distracting and that they should not replace lectures. If students are too distracted and excited to use games in the classroom the learning value may be diminished. Additionally, games should not be designed to replace lectures or education practices that are successful. Rather, they should be used to enhance the learning process (Pivec, Dziabenko, and Schinnerl, 2003). Future studies should examine this further to discover what barriers teachers face when trying to implement games into their class environment. Nevertheless, its important to note that both the pre- and in-service teachers felt that gaming in the classroom will grow in the next 5 years. This indicates that while not all participants intend to use games, a majority see them being utilized more often in the next several years within schools.

The rise of simple computer-based games has grown in use because game programming is becoming easier and demand has increased. The trend for easy development will help get educators who are not computer experts to feel comfortable using technology in their classroom and to create their own games. As this trend of easy development is combined with a broader understanding of how games can help teaching and learning, the use of computer-based games in classrooms will likely grow. If these tools are to live up to their promises to improve teaching and learning, we must strive to understand the ways that designing and using them impacts quality teaching and learning in schools.

Future research on gaming in the classroom should focus on case studies where teachers are implementing games in classroom settings. This would help determine barriers, pitfalls, and successes. Since game research is usually technology specific (each game can be very different), research should focus on implementation, use, and design guidelines common to most educational games. This would help educators who are considering implementing this technology and ensure that they can use it successfully.

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