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Abstract: Few university entry-to-practice professional health programmes utilize the broad range of computer technology to enhance student learning. One Canadian Occupational Therapy Programme is an exception and is unique in its breadth and depth of usage. In this paper we present as learning tools, WebCT Vista, YouTube™, Skype™, digital video recordings, iClicker®, Second Life®, ePortfolios, wikis, blogs and Facebook and discuss the way in which these computer technologies supports entry-to-practice preparedness for practice. We provide examples of creative use by students and academics. Computer technology is used in innovative approaches to learning, preventing teacher-centred ‘sage of the stage’ grandstanding but, rather, requiring students to focus on constructing their learning through the personal involvement that is required when computer technology is exploited for this purpose. The benefits of computer technology, in educational terms, are increased collaboration with peers and health care colleagues and increased active engagement in the learning process.

Introduction

Three major trends have affected the education of health professionals in the past 20 years: (1) a conceptual shift in higher education from teaching to learning, from educator-centred to learner-centred education; (2) increased awareness of the importance of collaborative and interdisciplinary work; and (3) the development of instructional technologies (Royeen, 2001).

People with experience and exposure to technologies and information-gathering techniques are part of the Net Generation (Tapscott, 1998). The Net Generation is not a specific age-group, but rather a cohort of individuals who have the ability to acquire information on virtually anything within moments.

The occupational therapy programme at the University of Alberta has responded to educational trends by leveraging the skills of Net Generation students and, in the process, has become a Canadian pioneer in using technologies and developing materials for educating health professionals and encouraging the use of
such technologies for collaboration. Educational content is delivered in a range of formats with less time
being taught by the ‘sage on the stage’ in classrooms, and more time involved in collaborative learning
between students, between students and clinicians, and between students and patients/clients as educators.
Formats include a variety of instructional technologies, including sophisticated audio visual learning
resources as well as web-based tools that allow synchronous and asynchronous interaction between
students, faculty, and clinical partners (Hollis & Madill, 2006). Using online computer technology students,
who are on fieldwork/clinical placements, are able to keep in touch with their peers and the department.

Few health care faculties or departments have embraced technology in their entry-to-practice programmes
so thoroughly and robustly. This paper links the use of computer technology with our major educational
objectives to demonstrate the added-value to health professionals’ learning.

The Context

The development of technology in the Occupational Therapy Programme at the University of Alberta
started over a decade ago. At that time it was not always easy to have access to patients/clients with
particular health problems who would be willing to come and speak with our students. One of the authors
of this paper developed a series of video case studies and associated exercises for learning and assessment
purposes. At the same time it became clear that some students needed to hear information more than once
to understand it and, in response, a number of narrated PowerPoint presentations were developed and made
available for reviewing material. These narrations were also useful for those who missed class or who
wanted to learn at a distance. On-line course outlines, quizzes and readings, discussion forums using
WebCT, and access to professional resources such as assessment tools have made learning more
manageable and, because of the immediacy of these resources, enhanced the learning experience.

Professors in the occupational therapy department have now progressed to other computer technologies
such as virtual worlds, wikis, and blogs. This natural progression came about because of changes in:
educational trends; the need for sustainable learning resources for current and future students; the desire for
collaboration with clinicians and academics from further afield; the expertise and expectations of students;
and importantly the enthusiasm and e-technology knowledge of faculty. As educators, we understand that
many clients of future practitioners will be using this technology and that students may also already be
using this technology for leisure, collaboration with each other, or even in addressing the goals of
patients/clients while on fieldwork/clinical placement.

This presentation provides examples of computer technology, used in a health professional programme, for:
managing the basic educational information, allowing practice of skills in safe environments, enhancing
understanding, monitoring learning, providing for self assessment and self reflection, and enabling the
sharing of information for knowledge generation and transfer. Computer technologies allows for depth and
breadth of interaction that can change ideas, beliefs, feelings, and actions and enable continual review our
understanding of ourselves in a process of transformative learning. Here we link computer technologies
with our educational objectives.

Technologies for Learning and Teaching
Learning Management Systems

The main Learning Management System (LMS) being used at the university of Alberta is WebCT Vista.
As with most Universities we use the LMS to contain course outlines, reading material, lecture outlines,
discussion forums, to make announcements, conduct quizzes and link to information on the Internet. The
LMS contains the foundation information and ensures that students have access to the relevant and
necessary information to help frame their learning before and between classes.

Online Video-Sharing: YouTube™
YouTube™ is the one of best known online video-sharing web-sites and has the single largest collections of videocasts on the Internet. It is a source of information and real life stories that can be used to enhance teaching. Registered users can upload videos to the site, designating them as either private or public. Individuals, universities, government agencies and businesses use the service for a variety of purposes.

Literature about the use of YouTube™ or similar online video-sharing sites in healthcare education is limited. Burke, Snyder and Rager (2009) surveyed faculty in a health education department at a U.S. university and reported that faculty members felt that YouTube™ was an effective tool for facilitating class discussions and debates and providing information. Similar to the descriptions of Hansen and Erdley (2009) in nursing education, the University of Alberta Occupational Therapy Programme uses YouTube™ to both access videos created and posted by others and for posting videos created by faculty and students.

In our programme, YouTube™ is used in first year as a tool for teaching students observation skills. Students have the opportunity to repeatedly observe videos of individuals and consider the clinical inferences. YouTube™ is also utilized in a second year course that requires students to observe a child at play, review and discuss case information, write a report, develop an intervention plan and negotiate that plan with a clinician acting as a parent. Previously student groups had to share DVDs that we had produced, showing video footage of a child playing. Wanting to improve access for students, professors in the department looked for possible ‘reusable learning objects’ on YouTube™ rather than devoting time and finances to creating our own. We found a set of public videos of a child with autism that were perfect for our purposes. The instructor informed the mother of the child how we were going to be using the videos.

These videos, along with structured case-study information and discussion groups in the LMS, require students to identify what they observed and the questions they would ask the mother. A clinician with experience in autism participates in the discussion group and, using Socratic questioning, helps the students to clarify their ideas and understanding. Students upload a written report, integrating observations and case notes and develop an intervention plan to be communicated to and negotiated with a parent. In preparation students work in groups to research best practice and use a LMS discussion group to ask further questions of the child’s ‘mother’. These YouTube™ videos are an excellent tool for engaging student interest. We have been impressed by how much time students spend reading their classmates postings and commenting on them. Students with previous experience working with children with autism share their knowledge. Instructional scaffolding comes from engaging in a compelling task, made real and immediate by YouTube™, and from having support not only the instructors and clinical experts but also from peers. Students in our programme have also used YouTube™ to share videos that they have created which are relevant to practice. YouTube™ provides an option to create private channels for students to document their work and to share it with individuals they select.

In our programme we use Bloom’s Taxonomy to guide our curriculum and YouTube™ has been instrumental in helping us achieve the authenticity that is necessary for students’ engagement in complex and demanding tasks at higher levels of cognitive ability.

Bloom’s Taxonomy was developed to reflect levels of knowledge development. During the 1990s, Bloom’s Taxonomy was updated by a group of cognitive psychologists, curriculum theorists and instructional researchers (Forehand, 2005) and is presented as Table 1.

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<th>Bloom’s taxonomy: The Cognitive Process Dimension</th>
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<td><strong>The Knowledge Dimension</strong></td>
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Like Anderson and Krathwohl (2001, p.67-68) we illustrate the objectives of our Masters level curriculum by reversing the usual taxonomy. In Figure 1 we indicate the need to focus on the higher levels of the taxonomy and thus the need to spend a larger proportion of time on Masters level achievement. YouTube™ helps us to portray real people with clinical conditions in everyday environments, doing everyday tasks. In other words, YouTube™ allows us to reflect the reality of life and engages students in the process of collaboration for creating the best intervention and so requires students to achieve the higher cognitive levels of applying, analyzing, evaluating and creating.

Voice over Internet Protocol (VOIP)

Computer technology makes it easy to invite guest speakers and experts to class using online programs such as Skype, Adobe Connect and Elluminate®. In one course this year we invited authors of the course textbook to speak with the students and answer questions. We used a combination of pre-recorded and live interviews. Pre-recorded interviews provided a scaffolding of learning for the students and the live sessions enabled students to explore concepts more fully with the author. We used eCamm recorder™ to pre-record interviews on Skype™ and were able to replay them in class and also upload the file to the LMS for repeated viewing.

Live interviews bring theory to life and encourage students and educators to learn together with the invited expert. This is an example of transformative learning: “[a] community of knowers [are individuals who are] united in a shared experience of trying to make meaning of their life experience” (Loughlin, 1993, p. 320-321).
In addition to meeting authors and clinicians using VOIP, students have used this technology to attend class when infectious but well enough to participate (e.g. through the recent H1N1 season). Students negotiate with a friend to log them on to class via Skype™ or Elluminate® and the student turns their laptop towards the front of the class so that they can see the speaker. PowerPoint notes are already posted on the LMS so the student can follow along. Students logging in via Skype™ can also ask or answer questions.

In another course, students use Skype™ to meet with a client to complete a group project. Last year the assignment was to design and develop a piece of assistive technology for a person with a functional limitation. One group worked with a group member’s grandmother who lived in Hong Kong. The students met the grandmother online with other family members and together they worked on designing their assistive device. After creating the device the students posted it to Hong Kong and again met with the student’s grandmother to observe her while she trialed the device. The interviews were able to be recorded and reviewed by the students as they completed their assignment. The process allowed us to actualize Kolb’s ‘experiential learning’ (Kolb, 1984, p.41) by enabling students to use personal experience to fast-track their insights and understanding in preparation for the next interaction, as depicted in Figure 2 below.

We will show an example of a Skype recorded clinical interview, in Quicktime format.

**Video and Audio Recordings**

Digital video and audio recordings can be uploaded to a computer easily and saved as files and used for a variety of purposes. We use digital video recording for observing students in Objective Structured Clinical Examinations (OSCE). In this type of examination students are observed working with a ‘standardized patient’, who is a trained actor undertaking the role of the patient. By recording the student with the ‘patient’ there is the opportunity to review the video footage for more accurate grading and feedback, and then for the student to review the video footage themselves and reflect on the experience (Franzese, 2008). These digital recordings are small enough files for students to take a copy on a USB stick to review. The quality of the vision and audio is high enough that students can clearly hear and see what occurred.

This process allows us, once again, to actualize Kolb’s learning cycle (1984) by enabling students to use personal experience to fast-track their insights and understanding in preparation for the next interaction.

![Figure 2. Kolb’s Learning Cycle](image)

We will show an example of a video used for experiential learning.

Interestingly there is a direct correlation between performance in this type of task and performance on fieldwork/clinical placement. Technology allows us, as educators, to detect students who are more likely to struggle in clinical fieldwork and/or have difficulties when they graduate and begin occupational therapy.
practice. We can use the feedback provided by digital video recordings, proactively, to enhance student skills in verbal and non-verbal communication, and in problem solving unexpected situations. We have 8 HD videocameras available for students who want to present course projects using online and multi-media technologies to achieve a quality and compelling result. Recent projects where students used e-technology include photo-essays, video clips, raps, and songs.

We will show an example of a video recorded student project.

The LMS used by the University of Alberta has functions that allow educators to create and store narrated PowerPoint presentations and podcasts. Inspired by Anderson (2008), one of the authors has also tried using voice commenting on student assignments using a digital recorder app in her iPhone. While students seem to respond much more frequently to these verbal comments than to written ones, it can be time consuming to upload these audio files to the LMS when compared to sending document files with text comments. A detailed and more systematic analysis of the time spent writing comments on student papers, versus recording comments is required.

**Audience Response Systems (ARS)**

iClicker® is the audience response system used at the University of Alberta and it enables us to collect students’ opinions, administer quizzes and engage students in collaborative learning. The use of clickers is most effective when students are challenged to think about their understanding of the topic so that instructors see if the students have grasped a concept correctly and to identify and work on areas of misconception (Barber & Njus, 2007).

One of the authors uses clickers to teach students how to score assessment tools. Students come to class having completed pre-reading, watched a video of an assessment and completed an online quiz about the assessment tool. The instructor then reviews each question in the assessment protocol and gathers the students' responses anonymously using clickers, and encourages discussion around the results. Clickers encourage interaction between students and the learning material, reflection on what is being learned, self-awareness of one’s learning progress, and problem solving during the in-class activity. This is an example of a constructivist approach to teaching (Hamilton & Burwash, 2008). A social constructivist approach (Merriam and Caffarella, 1999) focuses on learning as socially constructed through discussion and requires collaborative work on jointly-owned problems and tasks as opposed to individual, and often isolated, learning. Candy (1991, p. 275), describes social constructivist ideas as they translate into teaching adults, as a process of acquiring meaning structures relevant to society, and in our entry-to-practice educational program, the profession. Candy further notes that since knowledge is socially constructed, individual members augment or modify the general pool of knowledge for the whole.

As students are being challenged to test application of their knowledge in front of their educators and peers it is important that these classes are conducted in a way that students feel safe to defend their reasoning if they find that their answer is not the same as others. This is an important skill for clinical practice. Students reported that using iClickers® in class was “fun”, “exciting”, “motivating”, and “challenging”.

**Web 3.0 (3 Dimensional Virtual Worlds)**

Virtual Worlds (VWs) are often erroneously confused with Virtual Reality (VR). VWs are immersive environments that allow for social interaction, object permanence and a complex level of environmental interactivity. VR is typically less flexible and does not allow the user to interact with other participants, or perform tasks such as build objects and form physical spaces to meet user requirements.

Videotaped standardized patient scenarios, as described above, offer the potential for greater interactivity than a paper case study, but the videotaped interaction is primarily one way. Web 3.0 media takes interactivity one step further by providing for real time interactions in addition to a sense of reflexivity, where students have to deal with avatar reactions to students questions, the assessments they selected, and
proposed interventions, giving them less opportunity than is available for preparation based on a paper case study, or one based on a single interview. Preliminary evidence suggests that this is an effective means of learning with other health care professions and that it may be a trend favouring student expectations towards increased realism in clinical simulations (Kashani, 2008). Pharmacy students have used similar human patient simulations to observe the consequences of provider communication with the ‘patient’ (Seybert, et al. 2008). Some continuing medical education (CME) using the Second Life® (SL) platform have revealed that it can be an effective means of delivering case presentations (Heyden, 2009).

We use VWs with occupational therapy students at the University of Alberta to: simulate interactive client avatars; create interactive displays for the purposes of learning; special events on specific topics which occur in real time; collaboration to create 3D interactive reusable learning objects (RLO); and the ability to create client narratives, while maintaining client’s anonymity as their avatar can have a different name, sex or markedly different appearance than in real life. Clients who may not be otherwise comfortable telling their story can do so, or participate in forums that may not be comfortable in real life. Last academic year one group project used a combination of using SL and a screen capture program, Camtasia® to convey a client’s life narrative of facing religious persecution in his home country, immigrating to Canada, being physically injured and then learning to live with a mental health diagnosis. As there is a considerable amount of flexibility in a VW environment, students were able to depict the client flying, moving from a lush, green environment to a desert wasteland, crashing to earth and even relaying some of his experiences with the medical system, including a scene where antidepressant medication rained from the sky. The screen capture was narrated using the client’s own story and he confirmed with the group that the VW based narrative told his story accurately. An unexpected benefit of the project was that the VW itself interested the client educator enough that he signed up for SL and began using it as a means of replacing other leisure activities his injury had curtailed.

In this presentation we will show an example of SL for collaboration on an RLO.

ePortfolios

Professional portfolios are constructed by all students in the program. Tasks are linked to the professional practice course and to fieldwork/clinical placement. Grades are given for quality of reflection and observable learning. In 2009, all students completed their portfolio online.

First year students submit a portfolio with prescribed sections using the Red Engine LMS. In second year, students continue with the preparation of their portfolios. Content guidelines are provided however students can use any online tools they wish in preparing and submitting the portfolio. ePortfolios are a purposeful way to compel students to engage in reflective practice, requiring them to reflect on concrete experiences as well as assumptions, beliefs, ideas, feelings, actions, and behaviors that are elicited by the experience (Kinsella, 2001) and to work their way around Kolb’s experiential cycle (1984). Students have created YouTube™ clips of role plays demonstrating gains in interpersonal communication or documenting their progress in teaching a new skill to another. They have scanned or photographed images and works of art to represent their progress in professional skills or to reflect on continuing challenges, and housed these portfolio artifacts and descriptions in blogging programs such as Wordpress and Blogger, in web-sites or wikis, or in an e-portfolio tool called Pebble Pad. Unlike materials developed in the LMS these materials are, in the main, portable, and can be re-used by the student as they enter practice. The capacity to reflect on action so as to engage in a process of continuous learning is a defining characteristic of professional practice (Schön, 1995).

We will show an example of an e-portfolio, using Pebblepad.

Wiki

Wiki means "hurry" in the Hawaiian language and is an example of software that facilitates collaborative writing. Wikis are interactive websites that require minimal technical ability to use. A wiki is a collection
of linked webpages that can be contributed to, edited or updated by its users (Kamel et al., 2007; Kamel et al., 2006). Wiki users can have different levels of access such as reader, writer, editor or administrator. All additions to the site are incorporated into the whole site and the changes are evident when you view the ‘history’ of the wiki. The history can be used to roll back to previous versions of the wiki, which is useful if an unwelcome contribution has been made or clarification is needed. Wikis are used to house information, work collaboratively in groups, and create resources for use in practice. Over the past two years all occupational therapy students in our program have been taught to work in a wiki.

Students are introduced to using wikis during orientation to the program and are then required to collaborate in pairs using a wiki on an early assignment. Student teams construct and present a shared understanding of the signs, symptoms and treatment of a specified mental health condition; they also start to form an understanding of what it means to truly collaborate. Basic knowledge can be collaboratively researched, documented and stored in programs such as a wiki.

We will show examples of two wikis: one developed by students for use by the clinical community and one of a mental health project developed by students for use by students.

This is another example of a social constructivist approach. Occupational therapy students in our programme are often asked to work with others on tasks designed to assist them in constructing their knowledge of occupational therapy theory and practice through interaction with academic and clinical faculty, student colleagues, clients, and though leaders within the profession and society.

In a follow up assignment students again use a wiki to plan, advertise and then review a group activity for the same mental health course. The groups post reflections about the experience and may also share resources, evidence from the literature, and photos/videos on the wiki. The wikis are available to students as clinical resources when they are on fieldwork/clinical placement and want to try out a new therapeutic activity designed and already tested by their peers.

Blogs

Blogs (weblog) are websites that individuals known as ‘bloggers’ create and maintain (Hendron, 2008). Usually a blog is about a single topic or theme and items are posted on a regular basis with the most recent entries appearing at the top. Each entry is called a ‘post’ with most bloggers allowing others to comment. Blogs can be developed and maintained by individuals or groups with little technical know-how or experience. A blog can be either private, with the blogger deciding who can view their blog, or public being open for viewing by anyone with Internet access (Hamilton & Penman, in press). A blog can include text, pictures, video, audio, Internet links, RSS feeds that stream updates from selected websites back to the blog without having to visit external sites. This list of functions grows as technology advances (Hamilton & Penman).

In our occupational therapy programme we have a number of short courses, called modules, which students can elect to take. Those taking part in the module called ‘Web 2.0 for Occupational Therapists’ learn how to create a reflective blog and how to teach others to safely blog. Interestingly most students do not continue to blog after they complete the module. This trend is supported by recent research reporting that young adults (18-29) prefer Facebook to blogging (Lenhart, Purcell, Smith, & Zickuhr, 2010).

However a growing number of healthcare practitioners do maintain a professional blog. Many report that they have discovered other people with similar interests through their blogs and have formed international online communities of practice (Kamel et al 2007). This trend has also occurred in other populations and groups where people share stories and offer to support to others experiencing a similar life event (Hamilton & Penman, in press). It is important for student occupational therapists to understand the role of blogging as a therapeutic intervention for use with clients. Tan (2008) reports that blogging can facilitate mental health benefits similar to those achieved through psychotherapy.
Social Network Sites

As each new cohort of student arrives in our program we see increasing numbers using Facebook and most tell us they intend to continue using Facebook after graduation. One of the most important lessons for students working in Facebook is to learn how to create professional boundaries in the online social network environment.

In 2009-2010 Facebook became a new area to trial online collaboration. We created a group called ‘First Year Forum’ where students and educators could meet and share information. The forum does not require educators or students to be ‘friends’ in Facebook and see each others’ personal details. Therefore being in the forum is likened to ‘chatting in the hallway’ at the University, and is a safe and semi-public place to share information. Posts made by both educators and students in the first year forum focused on sharing information and stories relevant to occupational therapy (for example stories on YouTube about people who have overcome significant barriers, or technological advances in rehabilitation). Postings of a social nature were rarely made in this forum as students had another forum for this purpose. Educators deliberately avoided sharing personal information or making personal comments in the forum.

Of a total 86 students and 5 faculty who joined the group, a core group of 2 faculty and 16 students have been contributors to the ‘First year forum’ and 6 students and 2 faculty have posted regularly. Despite the low rates of visible participation in the forum, a mid-year survey revealed that the majority of students would join such a group again in second year if it was offered. A few students reported that they only joined to ensure they didn’t miss out on information and some reported that using Facebook for University-based discussions created one too many places to have to check for information. However, for a small but very active group of students it proved to be useful forum for posting topics, links and articles of broad interest to occupational therapy. A detailed and more systematic analysis of effective, appropriate and voluntary use of online social networks, such as Facebook, is required.

Summary and Conclusion

Technology has been a cornerstone in the augmentation of the occupational therapy curriculum at the University of Alberta and has enhanced our capacity to develop students’ competency. We have outlined a range of computer technologies that we use to encourage interaction and that have the potential to expand our capacity for understanding, acceptance and compassion in a transformative learning process. Computer technology has also allowed us, as students and academics, to develop resources with each subsequent cohort of students building on the resources. Computer technology and educational objectives are not only compatible in health professional education, they are synergistic.

References


