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iPods and Creativity in Learning and Teaching: An Instructional Perspective

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Creativity is a term that has many interpretations yet is seen as crucial to the development of students in higher education. As part of a wider research project entitled "Podagogy" at the University of Wolverhampton, a number of individual projects were undertaken within the performing arts subjects. The focus of the projects was to explore the potential use of iPod technologies to support student learning. This article analyzes to what extent the instructors' use of the iPod can nurture creativity in learning and teaching. Using an interpretative approach, the research has found that the iPod is a powerful tool 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 iPod, the study also considers certain conditions that need to prevail in the wider institutional environment if iPods are to be adopted as a learning technology. The study also proposes a number of areas for future research.

It has been widely acknowledged that creativity is a complex concept for which there is no comprehensive definition (Prentice, 2000). Prentice comments on how it has become a buzzword that is deemed as either good for an individual to have who is linked causally to an improvement in the economy. Although, it should be noted that defining the word is seen by some as being irrelevant and obscures the "idea" of what creativity actually is (Cowdray & de Graff, 2005). Even though there is some contention whether creativity can actually be taught (Eagan-Hunter, 1993), the need to develop graduates who demonstrate creativity as opposed to purely knowledge-based skills is seen as crucial to the development of society (Freeman, 2006). It is also argued that creativity results in a deeper understanding among learners (Sawyer, 2004). Therefore, it is widely contended that developing creativity should be an explicit part of the higher education process (Jackson et al., 2006). Indeed, the need to nurture creativity within higher education has gathered much momentum in recent years and this is reflected in the number of university mission statements that have the word creativity embedded within them, the author's own institution being one. The level of debate surrounding creativity has rose to such an extent that a national conference was staged at the University of Wales Institute Cardiff in the UK discussing the creativity agenda (Tyson, 2007). For instructors operating in an increasingly challenging higher education system, finding new ways to develop creativity within students is crucial to their overall development as individuals within society.

New technologies can play an important role in developing the creativity of learners. In analyzing the use of new technologies for developing creativity, Tacchi (2004) contends,

> As notions of creativity are spread more widely, the nature of production and consumption is seen to be changing from mass to networked models … network architectures and the network economy are seen by many to offer opportunities for innovation and creativity along with exponential growth, and new technologies are seen to offer unprecedented freedoms and levels of access. (p. 91)

Indeed, previous research has argued that information technology should be used to foster creativity within education (Ogunleye, 2002). Sutherland et al. (2004) also argue that new technologies can act as part of the creative production of new and innovative teaching and learning practices. Though Grainger et al. (2004) still contend that "teachers need to be convinced that creativity is a critical component in a world dominated by technological innovations" (p. x).

Since 2005, a team of performing arts instructors at the University of Wolverhampton have been engaged in research into the use of iPods as a learning technology. This article intends to analyze how these instructors have perceived the use of the iPod in their subject areas, as a device for developing creativity amongst their students and in their own teaching and learning practices. The performing arts subjects are particularly useful for analysing the concept of creativity as there has often been a strong association between the two areas (Prentice, 2000). Though several studies have investigated the use of iPod technologies with students (Blaisdell, 2006; Duke University, 2004) no studies have reflected on instructors' experiences concerning their use. Gaining an instructor's perspective is crucial; ultimately, the adoption of new technologies, like the iPod, is based upon the receptiveness of instructors to their usefulness in learning and teaching. The article will begin with an initial review of the literature relating to creativity before proceeding to discuss the findings of the empirical research.

The Notion of Creativity

It is useful to acknowledge the different theoretical studies that pertain to an understanding of what creativity is within the context of education. Jeffrey and Craft (2004) note how, in its characterization of creative teaching, the National Advisory Committee on Creative and Cultural Education (NACCCE, 1999) made a distinction between teaching creatively and teaching for creativity. Jeffrey and Craft (2004) state the definitions of both. The former definition as "using imaginative approaches to make learning more interesting and effective" and the latter is defined as "forms of teaching that are intended to develop young people's own creative thinking or behaviour" (p. 89). However, Jeffery and Craft note the danger of polarizing the concept of creativity in this way and argue from the perspective of their own research that the relationship between the two is interrelated. Drawing further on the NACCCE's broad understanding of creativity as an "[i]maginative activity fashioned so as to produce outcomes that are both original and of value" (NACCCE, 1999, p. 29), Prentice (2000) identifies four key areas.

Prentice (2000) notes the first area, imaginative activity, can be developed through a sense of play which has often been regarded as a frivolous activity and not directly related to learning. Second, the production of outcomes and the art of making, Prentice argues, requires a need to tolerate ambiguity and uncertainty as part of the process. Third, originality can be measured when compared to previous efforts, when it is applied to an innovative context and also the extent to which it contributes to knowledge in a given field. Fourth, value is placed upon the outcome of the creative activity which involves a high degree of reflective practice. For creativity to be encouraged, Prentice continues to suggest that learners need to be actively engaged in the process of their own learning and central to this is the acts of enquiry, reflection, and criticism. This requires a combination of time and a supportive learning environment for confidence levels to be raised sufficiently for this to occur. Alternatively and from a psychological perspective, Donnelly (2004) defines creativity within higher education "as putting things that are already together in a different way by being generative, innovative, expressive and imaginative" (p. 156). From a review of the literature, Donnelly notes there is still no consensus as to whether creativity is located in a person, product, or process and identifies three different perspectives on creativity: "Conceptual replication" which involves a variation on a current theme or perspective, "forward incrementation" which concerns the progression of a particular idea to the next stage in its theoretical development, and "reinitiations" which are a radical shift in perspective on a particular problem and how it is perceived.

From a higher education teacher perspective, McGoldrick (as cited in Donnelly, 2004) notes, creativity is viewed in terms of newness, excitement, useful, pleasurable, moral, and hard work. Jackson (2006) also identifies a number of factors that academics associate with the notion of creativity including being imaginative, original, curious with an enquiring disposition, resourceful, able to combine, connect, synthesize, to think critically and analytically, and being able to represent ideas and communicate them to others. However, Cowdray and de Graff (2005) note how taxonomies, such as these and the NACCCE examples, that exist for understanding the idea of creativity often focus on the process of creativity as opposed to the end product in itself. Furthermore, and as mentioned earlier, it is often believed that creativity is associated with the arts; assumptions are then made on how it can be applied to other subject areas (Prentice, 2000). Within the context of the arts, Freeman (2006) contends, "creativity is reliant upon the choices made within a working manipulation of instinct and intelligence" (p. 100). However, as he continues to argue intelligence, due to its quantifiableness, is often given priority over instinct and intuition. In addition, just as "creative moments" (Grainger et al., 2004) may occur, there can also be "points of creative frustration" (Freeman, 2006) where students feel unable to develop creatively and regress to a state of following the norm. This can be further exacerbated by the tensions that can exist within educational contexts and which prohibit the development of creativity.

Creative Tensions

The drive by governments to develop a creative society has often been at odds with the highly administrative and regimented education systems that have been developed (Prentice, 2000). Indeed, it could be argued that the higher education system has created many barriers to developing creativity (Jackson, 2006), including the development of insular cultures and bureaucratic systems (Feldman, 2001). In his analysis of developing a culture of creativity in higher education, Jackson (2006) notes five key problems: (a) creativity is taken for granted, (b) teachers' creativity is rarely celebrated, (c) creativity is rarely an explicit objective for assessing students as part of the learning and teaching process, (d) teachers can lack understanding about what creativity means and how this can be embedded within the subject, and (e) developing more creative approaches can be seen as more work by teachers themselves.

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

upon completion of their studies. However, in pursuit of these objectives, Watkins (2006) has argued that the higher education system has become bound up in managerialism and performativity, and there is a need for teachers to reclaim learning. This system has arguably led to poor staff morale and a desire for some to stay within the comfort zone, thus constraining creativity. Furthermore, the "McDonaldisation" of education (Ritzer, 1998) has generated a system of blocks of learning that are tested by learning outcomes. Even though such a system enables the transparency of learning outcomes and assessment procedures and standards, it also prohibits the assessment of creative ability (Cowdray & de Graff, 2005). Indeed, it could be argued that the higher education system has conditioned students to take a passive approach to their learning experience (Donnelly, 2004) and developed "instrumentalist learners" (Dale and McCarthy, 2006; Ottewill, 2003) who have become adept at playing the system, stifling their own creativity in the process.

However, it is commonly argued that employers require individuals who can clearly demonstrate creative ability (Ogunleye, 2002), and, there is often the assumption that once in employment, it is up to the organization to develop individuals' creative energy and not the academic institution from where they have graduated (Gundry & Kickul, 1996). Though, philosophically, van der Veen (2006) contends that the drive to develop creative learning could fuel instrumentalism further within society as organizations desire new products and production methods. Although there is a growing body of knowledge on the importance of developing creativity within the workplace, how this translates to the classroom environment is still at an embryonic stage (Donnelly, 2004). Within learning and teaching, creativity can often be seen as an elusive concept that is rarely prioritized, and when it is, it is often related to the concept of problem solving (Davies, 2006). This has been compounded further by the absence of any accepted criteria for assessing creative ability (Cowdray & de Graff, 2005). The factors that foster the development of creativity, therefore, require closer scrutiny.

Developing Creativity

Acknowledging factors that can influence the development of creativity is important for understanding how it can be further imbued within individuals and the wider learning and teaching environment. It has been argued that people who are creative are intrinsically motivated (Amabile, 1996; Donnelly, 2004; Priest, 2006). Priest (2006) notes how extrinsic rewards can actually act as constraints, as success or failure is often perceived to be external rather than internal. Creative adults have "cultural curiosity" and are self-motivated to learn from given situations (Prentice, 2000). Davies (2006) recognizes that high levels of creativity exist "when an individual moves the boundaries of a domain of knowledge and convinces the field (authorities) who know the rules of their domains and act as gatekeepers to them" (p. 41). Hasse (2001) further argues that creativity is a "dialectical relationship between the human being and his or her social environment" (p. 200). She argues that creative acts cannot be confined merely to an individual but are defined by the social system within which that individual interacts with. As will be discussed, the use of technology and, in particular, the iPod can enable individuals or groups of individuals to develop creative acts that would be difficult to pursue otherwise.

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 humor 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. Within the context

of this study, the iPod is a device that epitomizes this representation and can be used for work, leisure, and learning while not bound by any fixed location or proximities.

The Podagogy Project

The iPod and other mobile listening devices have become a major feature of popular culture (Sterne, 2006), to the extent where iPod users utilize their music players to control time and space (Bull, 2005). Farnsworth and Austin (2005) recognize these devices as "miniaturized hybrid assemblages" incorporating a combination of audio, image, and text technologies, enabling enhanced flexibility of interaction with different media. Many have acknowledged the contribution iPods can make to the process of lifelong learning (Pownell, 2004). Within a classroom environment, Slykhuis (2006) recognizes that the iPod is useful for playing music, for use as a portable hard drive, for displaying pictures, and for recording audio. iPods have also been viewed as a "disruptive technology" (Berry, 2006) challenging the conventional practices of educators. Indeed, since Duke University successfully piloted the use of iPods with all their first year students during 2004 (Duke University, 2005), a number of other institutions have subsequently followed suit in adopting iPods and podcasting as an educational medium (Blaisdell, 2006).

Podagogy has been defined previously as a portmanteau term to describe the notion of podcasting and pedagogy (Anon, 2006). However, podcasting is just one aspect of being able to support student learning. For the purposes of this article, podagogy is defined more broadly as the use of iPod technologies to develop pedagogical practices in learning and teaching. The research was based around three projects, each of which took a different approach to using the iPod with students. Each of these projects will be explained to offer a context to the research study.

The first project was based within the popular music subject where podcasting and vodcasting was used with second-year students studying for a Bachelor of Arts degree in Popular Music. Each student was given an iPod video at the beginning of the academic year. Teaching sessions were supplemented with enhanced podcasts incorporating visual materials and supplementary resource weblinks with which students could interact. A particular focus was placed on students creating their own collaborative podcasts of popular music bands that could subsequently be shared with others. Students were also encouraged to video their own musical performances and upload these onto the iPod for the purposes of critical reflection.

The second project used the iPod Photo with second-level drama students studying a Scenography module. The students developed a dramatic performance that could be visualized as part of a reconstructed installation. The installation took the form of a shock-like situation where a sequence of disturbing visual images were conveyed to the audience by means of a television screen situated in the corner of a room. The audience would listen to the narrative of the visual images via means of the iPod to convey extra meaning to what was being presented on screen.

The third project used the iPod video with third-level Dance and Performance degree students studying a module called "Dance, Video, and Technology." Students used the iPod video to create three- to four-minute dance performances specifically for the small screen, which could then be compared with their reproduction for the larger screen. The comparison would enable an assessment to be made on whether the relocation of performance to a small portable viewing facility would impact the process of performance-making through dance and video.

Methodology

The notion of creativity is a fluid and, to some extent, an emotive term and is a construction of social realities and meanings that have been associated with it (Bryman, 2004; Robson, 2002). The research has, therefore, taken an interpretative approach in design. This will enable different "ideas" (Cowdray & de Graff, 2005) concerning the meaning of creativity to emerge inductively from the research. As no previous studies have been conducted in this area, the research takes a descriptive approach to the analysis of the data. This will enable the accumulation of knowledge to be generated on this particular field (Anderson, 1998).

So as to generate a rich stream of views and opinions on the research topic, a qualitative approach was chosen for the collection of data. A qualitative approach would enable an analysis of the cross-contextual generalities (Mason, 2002) to emerge from the research projects involved in the use of the iPod as learning technology. Semi-structured interviews were selected as the preferred method of data collection. The semi-structured approach is argued to be the most common form of conducting interviews (Arksey & Knight, 1999) and allows for further exploration of points made by the interviewee(s). This, therefore, allows a more flexible approach to gathering data (Robson, 2002). According to Gray (2004), sampling in qualitative research tends to be purposive rather than random. This was particularly the case for this research, which focused on the three specific projects involved in the research. Semi-structured interviews were conducted with each of the instructors involved in the projects.

As suggested by Bryman (2004), an interview guide was compiled that included a number of question themes, which had emerged from the review of literature. These broad themes included what is

understood by creativity within learning and teaching, the extent to which the iPod promotes creativity within the instructor's respective subject, and issues concerning the conditions required for using the iPod as a learning technology. The interview process followed a series of protocols as outlined by Arksey and Knight (1999). Each instructor was approached beforehand and invited to attend an interview in an informal setting away from any distractions. When conducting interviews, one of the greatest challenges to ensure reliability and validity is the way in which the questions are communicated and received (Anderson, 1999). The interviewer ensured the interviewees were put at ease and the interview topic was introduced with an outline of the topic areas to be investigated. Each interview was allocated a number to allow identification of individual comments and experiences during analysis. However, interviewees were assured that their comments would remain anonymous when writing up the analysis. Once the interview was underway, points made by interviewees were occasionally paraphrased to ensure validity of the intended message (Anderson, 1999). The interviews lasted approximately 30-40 minutes and were recorded using an iPod connected to an iTalk recording device. The unobtrusiveness of the device in the recording environment allowed for comments to be uninhibited by unnecessary distractions (Bryman, 2004). Interviews were subsequently transcribed for data analysis.

To ensure validity of the research approach, methodological triangulation of the research was adopted. This enables multiple methods to be used to ensure validity of the data (Searle, 1999). Focus groups have been regarded as an effective method for triangulating data (Wilson, 1997). Therefore, a focus group interview was conducted which comprised all of the iPod research project leaders and included the overall leader of the podagogy research project. Focus groups, according to Yates (2004), are able to elicit information in ways that allow researchers to find out why an issue is salient as well as what is salient about that issue. As a result, the gap between what people say and what they do can be better understood. This is particularly relevant for this research as any viewpoints made in the focus group can either reinforce or counter those which had been made in the interviews, thus further validating the research process. The focus group took place after all the interviews had been conducted and was based upon the further exploration of issues that had emerged from this data.

An accepted limitation of the research is that the author conducted the interviews. It is important to take note of this association so as to take an "active reflexivity" approach to the researcher's own critical role in the research project (Mason, 2002). Indeed, a sense of trust and rapport had already been developed with the interviewees enabling an openness of views to be gained (Arksey & Knight, 1999). Though conversely, reliability of the data could be compromised due to the closeness of the researcher to the interviewees and thus generating bias in responses (Robson, 2002). However, this was minimized by the researcher acting in a professional and impartial manner so as not to influence the interviewees' responses. As the sample group was relatively small, only certain inferences about the generalizability of the research findings can be made (Arksey & Knight, 1999).

The data has been analyzed using thematic content analysis. This method enables common themes to be generated (Bryman, 2004). However, it needs to be recognized that the manipulation of the data via this process can distort the actual social reality from where it has emerged (Holliday, 2002). Holliday acknowledges that the researcher needs to recognize this fact when analyzing the data and needs to present the data in such a way that reflects a core underpinning argument. The data has been organized so it reflects the themes emanating from the literature review.

Findings and Discussion

Defining Creativity

Though it was generally acknowledged by the instructors that defining creativity is challenging, a common theme that emanated from the research is that creativity is about "trying things out," "being experimental," "being spontaneous," and "playing with ideas." The following instructor comment highlights this point: "They're (students) playing around with ideas and from that playing comes other ideas, challenges and questions."

This confirms Prentice's (2000) notion of play as being a crucial part of the creative learning process. Irrespective of the educational level, a sense of play and spontaneity can be argued to be important for promoting a creative learning experience. Instructors also believed that there are certain limits to the extent to which creativity can be nurtured and working within those limits is, therefore, the creative challenge as the following comment from one of the instructors conveys: "The creative challenge is accepting that there are some limits and trying to work within those limits creatively." Furthermore, within the context of the performing arts, the importance of separating the creativity of the learning process from the creativity of the performance piece itself was also noted as being important, as the following instructor comment reiterates: "That's learning for creative process as opposed to learning through a creative process."

Developing Creativity using the iPod

Instructors viewed the relative newness and "coolness" of the iPod as a key factor for students

wanting to embrace the device as a learning technology. The coolness of the iPod (Reppell et al., 2006) has made them socially acceptable according to Clark and Walsh (as cited in Chan & Lee, 2005) to the youth of today who are often referred to as the "iPod generation." The newness of the device meant that learning how the technology could be used creatively was a reciprocal process between instructor and students. One of the instructors commented, "It's a journey, the students and I are on a level with this in terms of our expertise and knowledge of how we can exploit this thing – we're on the same learning curve and that's great and creative because I'm learning from them."

From a teaching perspective, it empowers instructors to take a fresh perspective to the way in which they conduct their learning and teaching methods. In addition to traditional methods of approaching teaching and learning via, for example, lectures and seminars, all the instructors viewed the iPod as a device that added another level of engagement to the learning experience: "It challenges you to redevelop your curriculum material." Similarly, another of the instructors reflected upon the fact that they "had to think and had to create a new way of using technology that would support student learning and for me it's (the iPod) been really creative."

When analyzing the use of the iPod for the development of creativity, it enables the students to explore their subject in an original way (Prentice, 2000) that goes outside the boundaries of the topic. In doing so, it also allows students to engage in a process of "forward incrementation" (Donnelly, 2004). The iPod technology has enabled the students to explore their subject in a way that previously they would have found it difficult to do: "This technology has allowed them to venture into areas that they wouldn't have gone before in quite the same way."

The device was able to develop a sense of creativity by enabling a more flexible, deep, and personalized approach to learning while also intrinsically motivating the students. The flexibility of the device, in that it can be used "anytime, anyplace, anywhere," enabled students to take a more creative approach to facilitating their own learning experience. A instructor commented that "it gave students access to materials which they could listen to, they could revise they could try out and because they could gain access to it at anytime and anyplace they chose, it promoted that sense of creativity…they think I'll sit at the keyboard, I'll sing, I'll try these ideas out which they can't really do in a lesson or a lecture."

Instructors also acknowledged that the creative use of the iPod promoted a deeper learning experience amongst students confirming the thoughts of Sawyer (2004) and the relationship between creativity and deeper learning. The following comment, based upon the students development of dance performances for the iPod video, illustrates this point: "A different sized screen meant they actually considered they're filmmaking much more deeply perhaps more thoroughly."

Another major factor was the level of motivation that students gained from using the device and which intrinsically motivated them to be creative in their learning processes (Amabile, 1996; Priest, 2006). For example, in the popular music project where students would create their own vodcasts, there was a sense of self-esteem and confidence building by having your creations next to the videos of famous musicians and groups: "With students writing their own material and performing and watching their performances on the iPod. You've got U2 on your iPod then you've got you, it amalgamates your material with those who you aspire to be like and that's quite a motivating factor and there's less this barrier of mega star act and personal material."

This motivation was further enhanced by the personal nature of the device itself and the intimate learning experience that can be had from using the iPod: "Students see it as a very personal interaction because they use it in a very personal way on an iPod." The ability of students to share their creations on the iPod with friends and family, which they may not normally do with other traditional forms of assessment such as essays and reports, was also viewed as another motivating factor. Furthermore, instructors commented on how the use of the iPod within the modules did not feel like work for the students: "Because they had a personal copy of it they were able to show it to other people who would not normally see it…members of their family and friends." Another instructor commented that

> All the feedback I've had from the students the work with the technology doesn't seem like work. Because the students were making work for the iPod, they would upload work onto it and then show it to people who they wouldn't normally share their university work with. Their family and friends for example. They were still thinking about their subject, but it didn't feel like it.

Since the iPod assignments did not feel like work to the students, it was easier to motivate students and draw them into the instructional process.

As mentioned earlier, reflection and self-criticism is argued to be a key part of the creative process (Donnelly, 2004) and instructors noted the effectiveness of the iPod as a tool for enabling reflective practice to occur. Those in the performing arts often "think in qualities" (Prentice, 2000). Dance and drama students are kinaesthetic learners and learn through doing, whereas music students learn through sound. However, the use of the iPod has blurred these boundaries further by students being able to use a variety of senses to reflect upon their creation of

shared learning objects. According to the instructors, students were more able to reflect and critique their performances via the use of the iPod: "It was being used as a creative instrument in that sense it was used to reflect upon what they did." Another of the instructors also stated, "It definitely informed their practice….It seems a really positive thing for them, they were asking whole different layers of questions."

Creative Conditions for using The iPod

A number of conditions were highlighted to ensure that a "culture of creativity" (Jackson, 2006) for using iPods within teaching and learning practices could be successfully achieved. First, the instructors acknowledged that time is a key factor when considering the use of the iPod in learning and teaching. This is due to having to learn how to use the technology itself which must also include the associated programs that support its use (e.g., iTunes, Garageband, Final Cut Pro). In addition, there needs to be sufficient time to think creatively about how the device can be used to support learning and teaching within the respective subjects. Time also needs to be made to actually produce the creative works for the device itself. This includes, for example, the development of podcasts or film footage and sound recordings for the iPod. Second, there needs to be sufficient technical and institutional support to be able to use the iPod and its related programs. Instructors commented on the lack of support institutionally for software programs such as iTunes. When using technological innovations like the iPod, this can act as a major barrier to the development of a creative learning environment. It is often the bureaucratic structures systems of institutions, as noted earlier by Jackson (2006) and Donnelly (2004), that can impede the fostering of creativity. Third, the rate of obsolescence of the technology is an issue for the continual development of its use for promoting creativity within the subject. As others in the field replicate the use of the technology within their own subject, it can become increasingly difficult to sustain the same level of creativity. Therefore, instructors acknowledged that considering ways in which you can further develop creativity is a time consuming process. Finally, it should be recognized that the iPod itself can, in some respects, act as a barrier to the development of creativity. One of the instructors commented on the functionality of the iPod, which can sometimes inhibit the freedom of being able to use the device in a creative way.

Conclusion

The study has explored the notion of creativity within education with a specific focus on how the iPod can be used for developing creativity. Though creativity is extremely difficult to define, the study has found that, when using the iPod as a learning device, creativity can be associated with play, novelty, flexibility, deeper learning experiences, and the desire to be intrinsically motivated. This, to a large extent, confirms previous studies in the area of creative learning (Jackson, 2006; Prentice, 2000). From the perspective of instructional technology and the development of creativity amongst learners, a number of observations can be made. In terms of curricula design, the results indicate that technological innovations, such as the iPod, can be used to deliver a more creative learning and teaching experience (Sutherland, 2004). The adoption of the iPod in the curricula was risky, but, as mentioned previously, taking risks is an important factor for developing a more creative learning environment (Donnelly, 2004). Indeed, the iPod offers instructors a fresh and innovative perspective to their teaching and learning practices. For students, it stimulates their creative processes and does not seem like work, thus motivating them to engage more deeply with the subject matter. However, time is a factor that should be acknowledged as crucial in developing a creative learning environment. A number of further conditions are also necessary for a creative learning environment to occur, many of which focus on the institutional support systems necessary for the successful implementation of the iPod as a learning technology. When these conditions are fulfilled a culture of creativity can be nurtured (Jackson, 2006) and further "creative moments" (Grainger et al., 2004) that have been observed by instructors as part of this research project will continue to occur elsewhere in higher education.

A number of areas are recommended for future research. To triangulate the research further, it would be useful to explore the views and opinions of students on creativity and the use of the iPod. This would discover whether the suggested themes about creativity and the use of the iPod are common to those that may be experienced by students. The research is focused on the performing arts subjects and, therefore, it has to be recognized that the analysis is biased towards this particular view. Further research needs to explore other subjects to see if the themes generated from this research are common or different to other discipline areas. It could be argued that the instructors' experiences of the iPod for developing creativity may be short term. This maybe due to the perceived novelty and newness of the device as referred to earlier in the paper. Therefore, it would be useful to take a longitudinal approach to the research to assess the extent to which creativity using the iPod is developed over the long term.

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The Three P's of Pedagogy for the Networked Society: Personalization, Participation, and Productivity

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Web 2.0 and its associated applications and tools have, in many areas, brought about and are continuing to bring about significant shifts in the way people communicate, create, and share information. Pervasive access to broadband Internet connectivity and communication services has created new forms of relationships and patterns of communicating and learning. The expanding lexicon of Web 2.0 applications (podcasts, web logs, wikis, mashups, etc.) signal changes in the learning landscape, where learners are active participants, creators of knowledge, and seekers of engaging, personal experiences. In what has been called a culture of participation, the line separating consumers and producers of content is becoming blurred and we are witnessing a new wave of "prosumers," very often learners, who are actively creating and sharing content and ideas. By adopting an innovative learning paradigm that the authors call Pedagogy 2.0, teaching and learning strategies can enable greater engagement of learners in shaping the education they receive through participatory choice, personal voice, and ultimately, "co-production."

Student Perspectives

For better or for worse, Web 2.0 is reshaping our intellectual, political, and commercial landscape.
(Keen, 2007, p. 185)

Along with these changes, tertiary student profiles indicate that most students now juggle work and study, are technology savvy, and use social networking tools as a central part of their academic and social lives (Windham, 2005). We are witnessing a blurring of the distinctions between learning, work, and play as mobile computing devices are omnipresent, and an "always-on" culture facilitated by broadband Internet capacity is a reality. The label "digital natives" (variously referred to as "Net-Geners," "Gen-Xers," and "millennials"), although now almost a cliché, describes the characteristics of a new generation of learners, capable of operating at "twitch speed" and able to multitask, imagine, and visualize while communicating in multiple modalities (Prensky, 2001). In their desire to collaborate with one another, to exercise creativity, and with this, to gain celebrity, today's learners are also seen to belong to "Generation C" (Trendwatching.com, 2005). While we must be wary about making assumptions and generalizations, and basing claims on anecdotal evidence (see Lohnes & Kinzer, 2007; Mather, 2007; Owen, 2004), student perspectives are now a well-researched aspect in higher education, and the messages are too frequent to be ignored (Alexander, 2006; Oblinger & Oblinger, 2005). As Conole and Creanor (2006) report, students "have high expectations of how they should learn, selecting the technologies and learning environments that best meet their needs with a sophisticated understanding of how to manipulate these to their advantage" (p. 11).

In this learning landscape, there is a need to rethink models for teaching and learning in order to replace outmoded "closed classroom" models, which place emphasis on the delivery of information by an instructor and/or from a textbook rather than being learner-centric. Clearly, many popular learning management systems (LMS's) used by educational institutions to support e-learning replicate these models, conforming to a "student-as-information consumer" model in their design, thereby reinforcing instructor- and curriculum-centered approaches to teaching, learning, and knowledge. As such, the authors believe that many LMS's, despite their attempts to incorporate purportedly "Web 2.0" features, are quickly becoming outdated in the Web 2.0 era. Tim Berners-Lee (2000), the inventor of the World Wide Web, foreshadowed a more open, active suite of tools that is not simply about passive downloading and consumption of information when he stated, "I have always imagined the information space as something to which everyone has immediate and intuitive access, and not just to browse, but to create" (p. 169).

In addition to the openness of Web 2.0, there is an "architecture of participation" (Barsky & Purdon, 2006; O'Reilly, 2005), which entails sharing of digital artifacts by groups, teams, and individuals, ensuring that the Web is responsive to users. It thrives on the concept of collective intelligence, or "wisdom of the crowds" (Surowiecki, 2004), which acknowledges that when working cooperatively and sharing ideas, communities can be significantly more productive than individuals working in isolation. For example, in *Wikipedia* (2007), users create and evaluate content for other users, resulting in a dynamic and ever-expanding repository of shareable, communal information.

What, then, are the implications of Web 2.0 for education? As Web 2.0 is participatory and collaborative, reflecting the way youth engage with technologies and connect with multiple social worlds, there is an increasing gap between the formalized interactions that occur in educational establishments and the modes of learning, socialization, and communication taking place in the everyday world. Siemens (2007b) states,

> Our institutions need to change because of the increasing complexity of society and globalization. Schools and universities play a dual role: accommodating learner's method and mode of learning *and* transforming learners and preparing them to function in the world that is unfolding. (para. 6).

This globally connected world is characterized by constant social mobility and diversification of life trajectories, where individuals are expected to have multiple career paths and to engage in re-skilling at various stages. Available Internet connectivity, lifelong learning, and flexible working hours are drivers of learning on-demand (Punie & Cabrera, 2006). In such a digital world, powered by ubiquitous computing and demand-driven learning, there is a need to expand our vision of pedagogy so that learners become active participants and co-producers rather than passive consumers of content, and learning processes are participatory and social, supportive of personal life goals and needs. Part of the change needed is to recognize the potential of Web 2.0 to enable the transformation of pedagogy, design of learning tasks, and promotion of learner autonomy and creativity (Leadbeater, 2006).

Web 2.0: Affordances for Learning

While Web 2.0 does not involve radical changes in the technical specifications of the Web, most proponents of the concept describe it in terms of new possibilities and applications. O'Reilly (2005) believes that these new applications have emerged due to a changing socio-cultural context, giving rise to the perception of revolutionary new uses for the same technologies. Web 2.0-based social software tools such as weblogs (blogs), wikis, social networking sites, media sharing applications, and social bookmarking utilities are also pedagogical tools that stem from their affordances of sharing, communication, and information discovery. An affordance is an action that an individual can potentially perform in their environment by using a particular tool (Affordance, 2007; Gibson, 1977, 1979). In other words, an affordance is a "can do" statement that does not have to be predefined by a particular functionality and refers to any application that enables a user to undertake tasks in his/her environment. For example, blogging entails typing and editing posts, which are not affordances, but which enable the affordances of idea sharing and interaction. Norman (1998) distinguishes between "real" affordances, which are affordances inherent in an object or latent in an environment, whether known or unknown to a user, and "perceived" affordances, which represent a more relational, rather than subjective or objective, concept. Perceived affordances are closely tied to the mental and perceptual capabilities of the user, and are ultimately what determines usability.

Similarly, in considering the educational affordances of Web 2.0, social software, and other ICT tools for learning, it is necessary to acknowledge that these affordances are ultimately dependent on the views and perceptions of users (learners). In other words, how learners perceive the possibilities of the tools and their "ideal" use(s) in the context of their learning may be markedly different to the ideas and intentions of the educators and educational technologists who design them. According to Kirschner (2002), educational affordances can be defined as the relationships between the properties of an educational intervention and the characteristics of the learner that enable certain kinds of learning to take place. It is imperative to acknowledge that technologies are intricately related to many other elements of the learning context (such as task design) that can shape the possibilities they offer to learners, how learners perceive those possibilities, and the extent to which learning outcomes can be realized.

In the words of Anderson (2004), "The greatest affordance of the Web for educational use is the profound and multifaceted increase in communication and interaction capability" (p. 42), which is even more evident in Web 2.0 when compared to the set of linked information sources that characterized "Web 1.0." The terms "co-creation" and "users add value" can be said to sum up the philosophy and ethos of Web 2.0, showing that it is not just an assembly of tools, software, and digital strategies but a set of concepts, practices, and attitudes that define its scope. This can be exemplified by contrasting two sites, *Encyclopædia Britannica Online* (2007) and *Wikipedia* (2007), the former maintained by a commercial organization and the latter by an open community. In Wikipedia, an example of community publishing, users can participate and create content, and in doing so become "prosumers" (both consumers and producers). This openness is the characteristic hallmark of Web 2.0, as it allows users to mix, amend, and recombine micro-content (Leene, 2005; Lindner, 2005), collaboratively and open to a global audience, inviting revision and commentary. The added dimension of scale means that the more people using the tools, the greater the network

effect – the combined efforts of hundreds of individuals in production of Wikipedia entries illustrates the power of the "wisdom of crowds." In contrast, Encyclopædia Britannica has earned its reputation as an authoritative source of scholarly knowledge through its policies of tight control, editing, and regulation, and by allowing contributions only by a closed group of carefully selected experts. While this approach has obvious benefits in relation to the validity and reliability of information, a recent investigation by *Nature* (Giles, 2005) found Wikipedia and Encyclopaedia Britannica to be about as accurate as each other on science. Moreover, as stated by Berinstein (2006, "Apples and Oranges," para. 2-3),

> The inconvenient reality is that people and their products are messy, whether produced in a top-down or bottom-up manner. Almost every source includes errors … People are becoming more aware of the perils of accepting information at face value. They have learned not to consult just one source. They know that authors and editors may be biased and/or harbor hidden agendas.

Social Software: ICT Tools that Enable Participation, Personalization, and Production of Content

As alluded to earlier, among Web 2.0 technologies are the socially-based tools and systems referred to collectively as social software, a term that has gained increased currency in recent years. The attributes of these new software tools make possible a new wave of online behavior, distributed collaboration, and social interaction, and they are already having a transformative effect on society in general and education in particular, triggering changes in how we communicate and learn. Researcher/theorist Mejias (2005, p. 1) observed that "social software can positively impact pedagogy by inculcating a desire to reconnect to the world as whole, not just the social part that exists online," referring to the isolating and decontextualized experience of much text-based traditional education.

Mejias adopts a broad definition of social software that includes the categories listed in Table 1, which encompass both Web 1.0 and 2.0 technologies. For the purposes of the current discussion, the focus is on social software that enables participation, communication, personalization, and productivity (e.g. content creation), as these are elements of what it means to be educated in a networked age (Bryant, 2006). For example, one of the most basic social software tools, the blog, used to teach composition, reflective writing, and collaborative exploration, has been a resounding success in many schools and universities (Ganley, 2004; Richardson, 2006). With this rich and varied functionality in mind, it is useful to consider the educational affordances and potential value adding of Web 2.0 applications for millennial learners. Table 1 depicts a range of social software tools and categories and their corresponding pedagogical applications. It is important to remember that these tools can be used in combination, and engage people through communication, co-production, and sharing. Customization, adaptation, and innovative use of these social software tools are not merely individual pursuits or interests; they are becoming core requirements of digital literacies and creativity in the Web 2.0 era (New Media Consortium, 2005).

Many current social software applications straddle the virtual and real social worlds, as they entail both online and offline interactions and visual/verbal connectivity. For example, Flickr and YouTube facilitate the sharing of photos and videos with both "real world" and "virtual" friends; social networking sites like MySpace, Facebook, Ning, and Friendster allow users to build an online identity by customizing their personal profiles with a range of multimedia elements, as well as interacting with existing contacts and establishing new relationships. Another social networking site, Stickam, additionally allows users to interact in real-time using their web cams and microphones. These new practices are being harnessed for knowledge sharing, development of ideas, and creative production, while allowing for personal sense making and reflection. (Specific examples are presented in Appendix A.)

The "new" pedagogy is therefore not a matter of simply offering learners the technologies they are likely to use in the knowledge economy – these, like the knowledge itself, are subject to rapid change. According to Beetham and Sharpe (2007), it involves engaging learners in apprenticeship for different kinds of knowledge practice, new processes of inquiry, dialogue, and connectivity. Practices underpinning effective, innovative pedagogy will differ depending on the subject area or professional discipline in which learners seek to become proficient but are likely to include some or all of the following:

- digital competencies that focus on creativity and performance;
- strategies for meta-learning, including learner-designed learning;
- inductive and creative modes of reasoning and problem-solving;
- learner-driven content creation and collaborative knowledge-building;
- horizontal (peer-to-peer) learning and contribution to communities of learning (e.g., through social tagging, collaborative editing, and peer review).

TABLE 1
Types of Social Software

Social Software Category	Examples	Potential Pedagogical Applications
Multi-player online gaming environments / virtual worlds	Multi-User Dungeons (MUDs); Massively-Multiplayer Online Games (MMOGs – e.g., Second Life, Active Worlds, World of Warcraft, Everquest)	Simulation; role play; visualization; collaboration
Discourse facilitation systems	Synchronous: Instant messaging (IM, e.g., Windows Live Messenger, AOL Instant Messenger, Yahoo Instant Messenger, Google Chat, ICQ, Skype); chat Asynchronous: Email; bulletin boards; discussion boards; moderated commenting systems (e.g., K5, Slashdot, Plastic)	Communication (verbal and written); engagement with multiple global communities; socialization; tracking of information flow; peer-to-peer exchange and feedback
Content management systems	Blogs; wikis; document management systems (e.g., Plone); web annotation systems	Creation and dissemination of ideas; collaborative writing, publishing, and peer review
Peer-to-peer file sharing systems	BitTorrent; Gnutella; Napster; Limewire; Kazaa; Morpheus; eMule; iMesh	Sharing, review, and collaboration
Learning management systems	Blackboard/WebCT; ANGEL; Moodle; .LRN; Sakai; ATutor; Claroline; Dokeos	Communication, groupwork; distribution and sharing of resources
Relationship management systems	MySpace; Friendster; Facebook; Faceparty; Orkut; eHarmony; Bebo	Establishing and maintaining social contacts, connectivity; spaces for communication and creation of identity
Syndication systems	List-servs; RSS aggregators	Multi-modal access to information; maintaining links with new content; filtering and customized display of content
Distributed classification systems ("folksonomies")	Social bookmarking sites (e.g., del.icio.us, Digg, Furl); many media sharing and social networking sites also make use of tag-based folksonomies to organize and classify content	Tagging/categorizing resources; maintaining sharable collections of resources; reuse of resources; development and joint exploration of common interests

Note. (adapted from Mejias, 2005, p. 3)

As further evidence of the emergence of the need for new pedagogies, the report *A Global Imperative* by the New Media Consortium (2005) places great emphasis on the development of 21st Century literacy as "a set of abilities and skills where aural, visual, and digital literacy overlap … the ability to understand the power of images and sounds, to recognize and use that power to manipulate and transform digital media, to distribute them pervasively, and to easily adapt them to new forms" (p. 2). While this manifesto targets new forms of language and communication, there are distinct calls for a rethinking of pedagogy to meet the demands of an era where ubiquitous computing and social connectivity mediated by ICT is reshaping academia. For example, some theorists consider heutagogy, the concept of truly self-determined learning, to be the next stage in the evolution of andragogy (Hase & Kenyon, 2000), particularly given the current tertiary education climate in which the value of textbooks and other prescribed content is being questioned (Fink, 2005).

New Metaphors, Emerging Paradigms, and Innovative Theories for Teaching and Learning

Calls for change and innovation in pedagogy are representative of an emerging view of learning as knowledge creation (Paavola & Hakkarainen, 2005) and mirror the societal shift towards a knowledge age, in which creativity and originality are highly valued. Applying social software tools to teaching and learning compels us to reconsider how the affordances and interconnectedness offered by Web 2.0 impact on pedagogy and opens up the debate on how we conceptualize the dynamics of student learning. Sfard (1998) distinguishes between two metaphors of learning: the acquisition metaphor and the participation metaphor. The former represents a passive-receptive view according to which learning is mainly a process of acquiring chunks of information, while the latter perceives learning as a process of participating in various cultural practices and shared learning activities. In the participation metaphor, the focus is on the

process (i.e., on learning to learn) and not so much on the outcomes or products. According to this view, knowledge does not exist in individual minds but is a product of participation in cultural practices, and learning is embedded in multiple networks of distributed individuals engaging in a variety of social processes, including dialogue, modeling, and "legitimate peripheral participation" (Lave & Wenger, 1991). Learning occurs through sustained interaction and conversation with practitioners. Social networking practices also enable the creation of virtual communities, as well as the building of relationships and sharing of common interests and ideas within these communities. These social experiences are very often the foundation of learning.

To keep pace with the content creation processes enabled by Web 2.0 and social software tools, it appears to be necessary to go a step further and venture beyond the acquisition and participation dichotomy. Paavola and Hakkarainen (2005) propose the knowledge creation metaphor of learning, which builds on common elements of Carl Bereiter's (2002) theory of knowledge building, Ikujiro Nonaka and Hirotaka Takeuchi's (1995) model of knowledge creation, and Yrjö Engeström's (1987, 1999) theory of expansive learning. From the perspective of the knowledge creation metaphor, learning means becoming part of a community through participation, exchange of ideas, sharing, contribution of ideas, and knowledge generation. Students are both producers and consumers ("prosumers") of knowledge, ideas, and artifacts. As newcomers to a community of practice, they not only engage in "legitimate peripheral participation" (Lave & Wenger, 1991) to develop their own mastery of knowledge and skills through interaction with experts, but they also have a responsibility to play a part in the continued advancement of the community's existing body of knowledge as they progress toward full participation in the socio-cultural practices of the community (Lee, Eustace, Hay, & Fellows, 2005). The knowledge construction paradigm can be appropriately applied to learning environments where digital affordances and tools enable engagement in self-directed activities, and learners exercise agency in moving beyond mere participation in communities of inquiry to become active creators of ideas, resources, and knowledge artifacts.

These skill sets (creation, inquiry, critique, networking) are being hailed as vital in the new knowledge economy, which emphasizes creativity, entrepreneurship, and innovation, enabled by ICT tools designed to increase social connectedness and extension of personal boundaries. The metaphor of "the network" is seen by some researchers as the fundamental organizational form in today's society (Castells, 2004; Hargreaves, 2004; Rudd, Sutch, & Facer, 2006). The authors of the present article have adopted this perspective as they are making a case for a new understanding of teaching and learning that addresses its networked, collaborative, and connected dimensions: "The proper identification of our society is in terms of its specific social structure: networks powered by microelectronics and software-based information and communication technologies" (Castells, 2004, p. 222).

Learning Networks and Connectivism

Supporting the notion of a networked society is the theory of connectivism (Siemens, 2005), which stresses the importance of building networks and collaborative linkages to foster communication and dialogue. Educational research and theory have long recognized that learning processes are socially situated and networked, and ideas are generated as a result of collective intelligence, efforts, and collaboration (Scardamalia & Bereiter, 1994; Tharp & Gallimore, 1988). Siemens' theory builds on these ideas by conceiving of learning as a process that occurs within multiple overlapping environments of dynamic core elements that support the "amplification of learning, knowledge and understanding through the extension of a personal network" ("Connectivism," para. 9). Essentially, Siemens presents a view of knowledge development that is aligned with the proliferation of Web 2.0-based social software tools, and premised on the kinds of digital skills needed to function effectively in the knowledge age (see also New Media Consortium, 2005). Instead of a learning theory focused on the learning processes of the individual, connectivism situates learning within the dynamics of social interaction, connection, and collaboration. Maintaining these connections is a skill that is essential for lifelong learning in a knowledge-based, networked society. Some of the salient characteristics of this theory are the following:

- Learning and knowledge are generated by accessing a diverse blend of opinions;
- Learning is a process of making connections between specialized nodes or information sources;
- Currency (accurate, up-to-date knowledge) is the focus of all connectivist learning;
- The integration of cognition and emotions in meaning making is highly important.

The metaphor of the network can be seen to epitomize the social and economic changes of the last three decades, while the metaphor of learning as knowledge creation is a fundamental perspective that encapsulates the processes and outcomes that learners need to engage in so that they learn to operate

successfully in these networks. Both metaphors challenge us to question whether our current education system and pedagogy, based on the delivery and consumption of content and the acquisition of abstract knowledge and skills, are adequate to support the development of the competencies and digital literacies that characterize the knowledge society, with its associated learning communities and networks. In response to this question we propose a framework for revised pedagogy, *Pedagogy 2.0*, that recognizes the power of social software tools, together with the wider resources and distributed social networks that learners now have access to. Exemplars are provided later in the article (Appendix A) to demonstrate Pedagogy 2.0 in action, supported by empirical research.

Pedagogy 2.0

Pedagogy 2.0 is a framework that aims to focus on desired learning outcomes in order to exploit more fully the affordances and potential for connectivity enabled by Web 2.0 and social software tools. It is envisioned as an overarching concept for an emerging cluster of practices that advocates learner choice and self-direction as well as engagement in flexible, relevant learning tasks and strategies. Though not intended a prescriptive framework, it distills a number of guidelines characterizing effective learning environments, such as choice of resources, tasks, learning supports, and communication modalities, as follows:

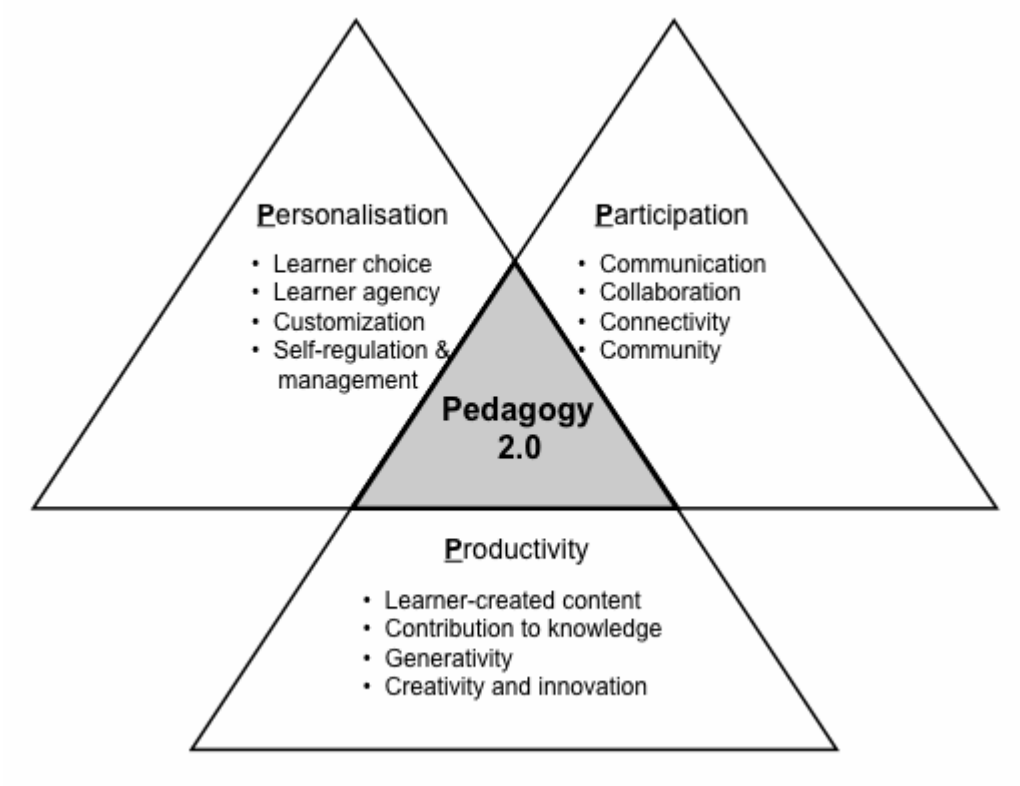
- *Content:* Should consist of micro units of content that augment thinking and cognition; may include a wide variety of learner-generated resources accruing from students creating, sharing, and revising ideas;
- *Curriculum:* Should not be fixed but dynamic, open to negotiation and learner input, consisting of "bite-sized" modules, inter-disciplinary in focus, and blending formal and informal learning;
- *Communication:* Students should be offered multiple opportunities for open, social, peer-to-peer, and multi-faceted forms of visual, verbal, and auditory communication, using multiple media types to achieve relevance, immediacy, and clarity;
- *Learning processes:* Should be situated, contextualized, reflective, integrated with thinking processes, iterative, dynamic, performance, and inquiry-based;
- *Resources:* Should include multiple informal and formal sources that are media rich, interdisciplinary, and global in reach;
- *Scaffolds:* Support for students should come from a network of peers, teachers, experts, and communities;
- *Learning tasks:* Should be authentic, personalized, experiential, and learner driven and designed, and enable the creation of content and innovative ideas by learners.

These principles represent the intersection between established instructional design principles for the creation of constructivist, student-centered learning environments (e.g., open-ended learning, authentic learning, inquiry-based learning) and emerging perspectives on cognition including connectivism (Siemens, 2005) and the knowledge creation metaphor of learning (Paavola & Hakkarainen, 2005). They are evident in and have been derived from the exemplary practices of a growing number of teachers in tertiary education who have begun to demonstrate how social software tools offer rich possibilities for students to create and share ideas, connect, and participate in broader learning communities that are not confined to the spaces in which formal teaching and learning activities take place. Some of these exemplars are illustrated later in the present article (Appendix A). Through these pedagogical strategies, learners take on active roles such as content creators, peer teachers, mentors, researchers, innovators, and entrepreneurs.

Emerging Practices: A Fresh Look at Learning Through the Lens of the Three-P's of Pedagogy 2.0

Pedagogy 2.0 also acknowledges that in a networked society, powered by a range of high-speed technologies, learners have access to ideas, resources, and communities to support their learning, are driven by personal needs and choice (personalization), and are able to develop self-regulatory skills. Pedagogies need to engage learners in the social processes of knowledge creation rather than the mere consumption of instructor-supplied information **(**productivity**)**, in addition to scaffolding linkages, dialogue, and connections in and across communities and global distributed networks **(**participation**)** for the purposes of idea sharing, inquiry, and problem solving. Although not dependent on the technology, Pedagogy 2.0 capitalizes on the core energies and affordances of Web 2.0 – a raft of tools that support user autonomy, increased levels of socialization and interactivity, access to open communities, and peer-to-peer networking – in order to move beyond instructor-centered classroom environments, prescribed curricula and content, and the "walled garden" approach of learning management systems. This is achieved by facilitating personal choice, collaboration, participation, and creative

FIGURE 1
Key Elements of Pedagogy 2.0



production. These overlapping elements are shown in Figure 1, and are discussed in detail in the subsections that follow. They represent principles that are congruent with the philosophy of the relatively new concept of Web 2.0, but, nevertheless, they are well supported by established and accepted learning concepts and theories including motivation and self-regulation (Pintrich, 1995; Pintrich & Schunk, 1996), information processing theory (Miller, 1956), multimedia learning theory (Mayer, 2001), socio-cultural learning theory (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991; Vygotsky, 1978), and experiential learning theory (Kolb, 1984; Kolb & Fry, 1975).

It is important to note that the elements depicted in Figure 1 are desired learning outcomes, while also providing principles for the design of learning activities and environments. For example, while student-generated content is a valued outcome of learning as it provides evidence of knowledge construction, the principle of active learner contribution must inform the learning task design, and provide opportunities for learners to become producers of resources as opposed to consumers of content.

Participation

More engaging, socially-based models for teaching and learning are needed to replace the traditional, "closed classroom" models, which place emphasis on the institution and instructor. A defining feature of Pedagogy 2.0 is that, alongside the increased socialization of learning and teaching, there is a focus on a less prescriptive curriculum and a greater emphasis on teacher-student partnerships in learning, with teachers as co-learners. According to Lee (2005, p. 17),

> [W]e have already managed to overcome the confines of the physical classroom, but … still remain unknowing prisoners of the instructor-centered online classroom. To move further ahead, we will need to demolish these virtual walls so as to create social learning spaces, in which learners and … [teachers] … become associates in a community of practice, participating in networks of interaction that transcend the old-fashioned constructs of institutions and organisations. (p. 17)

Now, social software tools make it easy for learners to engage deeply with their peers, instructors, other subject-matter experts, and the community at large. Through these tools, individuals can create and maintain their own collections of ideas, photos, and bookmarks online. These creations, while enabling personal expression and publication, also allow for social constructivist forms of participation by allowing comments and annotations by others, and, furthermore, by contributing to extant communities of interest by sharing resources. Therefore, not only is this element of Pedagogy 2.0 reflective of the "participation model of learning" (Sfard, 1998), as opposed to the "acquisition" model, but it also adds a further dimension to participative learning by increasing the level of socialization and collaboration with experts, community, and peer groups, and by fostering connections that are often global in reach. Jenkins (2007, p. 51) aptly summarizes the process as follows:

> Learning in a networked society involves understanding how networks work and how to deploy them for one's own ends. It involves understanding the social and cultural contexts within which different information emerges … and how to use networks to get one's own work out into the world and in front of a relevant and, with hope, appreciative public.

Personalization

Recent research attests to a growing appreciation of the importance of the learner's self-direction and control over the whole learning process (Fazey & Fazey, 2001; Narciss, Proske, & Koerndle, 2007). Evidence suggests that we can improve learning effectiveness by giving the learner control over, and responsibility for their own learning (Dron, 2007; Nesbit & Winne, 2003). This is the foundation for such approaches as problem-based and inquiry-based learning (Desharnais & Limson, 2007; Edelson, Gordin, & Pea, 1999), and is central to the grand vision of Pedagogy 2.0, where learners have the freedom to decide how to engage in personally meaningful learning.

In fact, the notion of personalization is not entirely new to educators, and it is often linked to the term "learner-centered" education, a desirable state where learners know how to choose and make decisions relating to their personal learning needs. However, despite the efforts of many constructivist teachers, the control culture of education prevails, and pre-packaged content and pre-designed syllabi continue to dominate, denying students choice and autonomy in shaping their own learning trajectories. According to Dron (2006), such approaches lead to de-motivation, boredom, and confusion. Web 2.0 and social software tools enable choice and allow learners to make decisions about how to best meet their goals and needs for connection and social interaction. Apart from choosing which resources and sites to subscribe and contribute to, which tools to use, and how and where to use them, we are witnessing a shift in the modalities of expression that are now available (Jenkins, 2007). Text alone is not always preferred mode of communication, as web-based multimedia production and distribution tools incorporating rich audio (podcasting, Skype), photo (Flickr) and video (vodcasting, YouTube, Stickam) capabilities are growing.

By harnessing digital technologies and social software tools, four key areas pivotal to the development of personalization through teaching are summarized by Green, Facer, Rudd, Dillon, and Humphreys (2006). According to these researchers, pedagogy must do the following:

- ensure that learners are capable of making informed educational decisions;
- diversify and recognize different forms of skills and knowledge;
- create diverse learning environments;
- include learner-focused forms of feedback and assessment.

How do we bring these principles into the design of tasks in higher education? The challenge for educators is to enable self-direction, knowledge building, and learner control by providing options and choice while still supplying the necessary structure and scaffolding. Also linked to the centrality of learner control is the on-going discussion around the notion of Personal Learning Environments (PLE's), defined by Siemens (2007a), as "a collection of tools, brought together under the conceptual notion of openness, interoperability, and learner control. As such, they are comprised of two elements – the tools and the conceptual notions that drive how and why we select individual parts" (para. 2). Moving on from LMS's, the PLE concept represents the latest step towards an alternative approach to e-learning. Unlike LMS's that take a course-centric view of learning, PLE's are learner-centric. The idea is to have learners exercise greater control over their own learning experience, rather than be constrained by centralized, instructor-controlled learning.

Productivity

Students are capable of creating and generating ideas, concepts, and knowledge, and it is arguable that the ultimate goal of learning in the knowledge age is to enable this form of creativity and productivity. In recent

times, the value of textbooks is being questioned (Fink, 2005; Moore, 2003) and the open source and open content movements (Beshears, 2005; Massachusetts Institute of Technology, 2007; MERLOT, 2006) are gaining increased attention and traction. Clark (2003) points towards the "Napsterization" of e-learning through peer-to-peer (P2P) file and media content sharing services. Today's students perceive little value in the rote learning of factual information, particularly given the accessibility and ease of use of search engines and web-based reference sites such as Google and Wikipedia. Educators are thus beginning to realize that instructor-supplied content has limitations, particularly if it pre-empts learner discovery and research, and active student involvement in the knowledge creation process. They are starting to see how social software tools make it easy to contribute ideas and content, placing the power of media creation and distribution into the hands of "the people formerly known as the audience" (Rosen, 2006), which includes their students.

Mirroring the massive outpouring of information and dynamic, user-generated content between peers on the Web, dubbed "personal publishing" (Downes, 2005), is the rise of student-generated content or student performance content (Boettecher, 2006). For example, in recent years the e-Portfolio (Abrami & Barrett, 2005; Love, McKean, & Gathercoal, 2002) has emerged as popular strategy for capturing and organizing student-generated content, which, in addition to completed project/assignment work or deliverables, may also incorporate evidence of the process of learning that is representative of the complexity and "messiness" of an authentic, problem-based learning experience, such as successive drafts of solutions, descriptions of mistakes made, or difficulties encountered. Student-generated content may also include synchronous and asynchronous computer-mediated communication (CMC) discourse such as chat logs and discussion board postings, reflective writing in the form of blog-based diaries, summaries, and reviews, created by students working individually or in teams. Last, but not least, it may also include "found" content, including the results of students' own wide reading, gathered from websites, journals, magazines, and news articles that are brought to, and shared with others in, the learning environment.

Current Examples of Pedagogy 2.0 in Tertiary Teaching and Learning

Appendix A contains examples of what the authors consider to epitomize Pedagogy 2.0. They have been drawn from the practices of teachers at tertiary learning institutions worldwide, and cover a range of academic disciplines, illustrating how the principles of Pedagogy 2.0 can be applied in a variety of face-to-face classroom settings as well as in fully online, supplemented, and blended e-learning environments. Importantly, it can be seen from these exemplars that with the advent of Pedagogy 2.0, we are witnessing a re-definition of the roles of both teachers and learners, with the latter assuming more active roles as contributors of course content and ideas while also demonstrating learning outcomes through performance and production of ideas.

The three P's of Pedagogy 2.0 are exhibited by the examples in Appendix A in a variety of different ways. For example, to support his course in General Psychology at the University of Connecticut, Professor David B. Miller (2006, 2007) hosts weekly informal discussions with students following each week's lectures. During these discussions, students are able to seek clarification on the course material and talk about it in greater depth, as well as to actively explore and discuss issues not covered during the lecture that are of interest and relevance to the group (participation). The discussions are recorded and made available to other members of the class as a series of podcasts for individual listening at a convenient time and place (personalization). The process of creating and participating in the discussions becomes a form of student-generated content (productivity). All students in the cohort are welcome to submit questions in advance of the discussion via email; these questions, as well as those asked by students who attend in person, are answered during the discussion.

In another example, at the University of North Carolina at Pembroke (UNCP), Dr. Kenneth Mentor's courses make use of a wiki-based encyclopedia, with the goal being for students to create and maintain encyclopedia entries on a variety of subjects related to law, criminal justice, sociology, and criminology. In previous courses, Mentor's students created web pages as class assignments. The *Online Encyclopedia of Criminal Justice* (2006) project extends those efforts in two notably powerful ways: firstly, using a wiki enables the student-generated content to be readily shared in virtual "public spaces" and to a broader audience beyond the walls of the classroom, and, secondly, the wiki's ease of use enables students to create substantial amounts of content within a short timeframe (productivity). In addition to generating and entering initial content, students also perform the roles of editing, revising, and organizing the content, which becomes part of the shared pool of resources accessible to all learners. The learning experience and activities are personalized in that students have a great deal of autonomy and choice in determining when, where and how to contribute to the collection of information on the wiki, as well as deciding which topics or entries to create, read, add to, and/or modify. Although all site content was initially written by UNCP students, the site is now available for educators to use for class

assignments, and users outside the institution are allowed to register and contribute (Sener, 2007b). In this way, Mentor's students are active participants not only in the context of the course they are studying but also in a wider, professional, academic community that extends beyond the walls of the classroom and institution in which they are based (participation).

Problems and Challenges Facing Pedagogy 2.0

With the above having been said, the implementation of a Pedagogy 2.0 approach is not without its issues and challenges, and these cannot be ignored. For example, as Jenkins (2007) points out, Web 2.0 signifies a participatory culture in which there is greater opportunity to initiate, produce, and share one's creations; to engage in peer-to-peer learning; and to become a global citizen, capable of communicating and working in diverse contexts. These benefits, however, need to be accompanied by pedagogical interventions that equip students with the skills needed to operate in a digital culture and that use media to enrich their learning and develop essential literacy skills, while ensuring that there is a shift in "the focus of literacy from one of individual expression to community involvement" (Jenkins, 2007, p. 4).

Recent research has shown that many higher education students currently lack the competencies necessary to navigate and select relevant sources from the overabundance of information available (Windham, 2005). In the age of personal publishing and user-generated content, essential digital literacy skills are required to locate quality sources and assess them for objectivity, reliability, and currency (Katz & Macklin, 2007). Students need to develop expertise and confidence in finding, evaluating, creating, and sharing ideas, which often involves complex critical thinking skills (Jenkins, 2007; Lorenzo & Dziuban, 2006). Fortunately, many of the examples presented in Appendix A demonstrate that the adoption of appropriate strategies can lead to opportunities for higher-order thinking and meta-cognitive development (e.g., Lee, Chan, & McLoughlin, 2006; McLoughlin, Lee, & Chan, 2006; Miller, 2006, 2007; Sener, 2007b). Moreover, in fostering learning processes that encourage learner-generated content there is still a need for accountability and recognition of authoritative sources of information; however, the review, editing, and quality assurance of content can be done collaboratively and in partnership with learners, while simultaneously drawing on input from the wider community (i.e., "wisdom of crowds").

A further challenge is that educators may not be fully aware of the potential and range of social software tools and may need opportunities for professional development to reveal how Web 2.0 applications can support teaching and assessment. There may be a culture shock or skills crisis when "old world" educators are confronted with the expectation of working in unfamiliar environments and scenarios, and with tools with which they lack expertise and confidence. For these reasons, there is a need to make time for talking, awareness raising, and discussion of what pedagogic approaches and tools best target the desired learning outcomes. For the principles of Pedagogy 2.0 to come to fruition, institutional change may be needed to dissolve educational silos and to equip educators with the skills and facilities that allow them to engage learners in social networking, while encouraging them to become active partners in creating educational pathways that will prepare them for careers and lifelong learning journeys in the networked age. Looking ahead, it is unlikely that the role of technology in supporting personalized, learner-centered pedagogy will diminish. While recognition of the value that social software brings to education is growing, there is a need for ongoing evidence-based research demonstrating that the application of these tools and technologies is delivering on the promised of improved learning outcomes.

Summary and Conclusion

In summary, Web 2.0 and social software tools facilitate user-controlled, peer-to-peer knowledge creation, and network-based enquiry. The authors envision that the combination of the affordances of these technologies, coupled with a paradigm of learning focused on knowledge creation and networking, offers the potential for transformational shifts in teaching and learning practices, whereby learners can access peers, experts, the wider community, and digital media in ways that enable reflective, self-directed learning. Nevertheless, it must be recognized that technology is not of itself the sole driver of pedagogical change. Technological resources provide opportunities for a range of interactions, communicative exchanges, and sharing, but it is not possible to base an entire sequence of learning episodes solely on tools. Pedagogical frameworks, informed by learner-centered principles, and sensitive to the learning context, need to be considered. In practice, this means that before attempting to leverage the affordances of social software, teachers need to identify pedagogical outcomes (for example, drawing on the three P's in Figure 1) and ensure that technology integration is aligned to tasks and assessment (Joyes, 2005/2006; Salaberry, 2001).

Furthermore, Web 2.0 is part of a constellation of societal factors that include changing student expectations and demographics, lifelong learning, and institutional pressures for improved, innovative, and

cost-efficient modes of teaching. This implies that we must be alert to a range of factors that impact on pedagogical choice. There are already signs of optimism that existing Pedagogy 2.0 practices, by capitalizing on the three P's of personalization, participation, and productivity, will result in a learning landscape and a diverse range of educational experiences that are socially contextualized, engaging, and generative.

Early adopters of digital media opportunities involved the integration of new media modes, forms, and genres into learning activities. These have included wikis, blogs, video logs, text messaging, email, hypermedia, and more (Ganley, 2004). These representations have taken advantage of media-rich elements, interconnectivity, and social participation. Given the establishment of these new media uses, the challenge has now become the development of learners' skills and competencies in these expressive media forms and, more importantly, assisting them in becoming capable of choosing which of these media are relevant and for what contexts.

With the emergence and uptake of social networking tools comes the awareness that learning need not be confined to a single space or a single source. Multiple perspectives, resources, and environments for learning, both real and virtual, are available. It has been said that "technology has given us a communications toolkit that allows anyone to become a journalist at little cost and, in theory, with global reach. Nothing like this has ever been remotely possible before" (Gilmor, 2004, p. xii). In fact, the 2007 *Horizon Report* (New Media Consortium [NMC] & EDUCAUSE Learning Initiative [ELI], 2007) identified the Web 2.0-based areas of user-created content and social networking as two areas with a time to adoption of one year or less, with broader changes such as the emergence of new forms of scholarship and publication set to take place in the slightly longer term (i.e., over the next four to five years). However, obstacles and barriers still remain. Can teachers, whose traditional frame of reference is formality, understand how informal learning can take place through social networking and beyond the formal spaces of classrooms, libraries, and laboratories? Can we extend our classrooms to link with open communities that are sharing, revising, and creating new ideas? Can academia, with their established legacy of transmissive pedagogy, rise to the challenge and affect the kind of teaching revolution and changes that are both necessary and inevitable in the new age? The challenge is to facilitate learning, be less prescriptive, and be open to new media, tools, and strategies, while nurturing the skills of information evaluation as well as the blending, remixing, and recombination of ideas to reach creative solutions. This can be achieved by employing the social software tools, resources, and opportunities that can leverage what our students do naturally – socialize, network, and collaborate.

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APPENDIX A
Exemplars of Pedagogy 2.0

Institution/ Country	Reference(s)/ Author(s)	Learner Tasks	Manifestation of Pedagogy 2.0	Web 2.0 Technologies Used
University of Connecticut, USA	Miller (2006, 2007)	Students studying a General Psychology course participate in informal discussions about the course material following each week's lectures. These discussions are recorded and distributed to the rest of the class as part of a podcast series entitled *iCube* (Issues In Intro). The students also download and listen to two additional types of instructor-created podcasts: • *Precasts* – Short enhanced podcasts previewing material prior to each lecture; • *Postcasts* – Short post-lecture podcasts containing re-explanations of selected concepts.	The instructor hosts/facilitates and participates in the iCube discussions, as well as producing the precasts and postcasts before and after each lecture, respectively.	• Podcasting
Bentley College, USA	Frydenberg (2008)	Students in an introductory information technology class work in pairs or groups and produce vodcasts to teach topics based on the course lecture materials to their peers.	The instructor supplies the set of course topics for the students choose from. He also provides basic instruction on video recording and editing techniques, and sets up the RSS feed for sharing the vodcasts.	• Vodcasting
Charles Sturt University, Australia	Lee, Chan, and McLoughlin (2006); McLoughlin, Lee, and Chan (2006)	Second year undergraduate students take charge of producing talkback radio-style podcasts to assist first year students undertaking a unit of study that the former group previously completed. The entire podcast production process, from inception and scriptwriting through to the final recording, is driven by the student-producers, with minimal instructor intervention.	The instructor facilitates group discussions and reminds the students of their overall goals and objectives. In general, he provides minimal input but is available to offer general guidance and assistance to the students on request. During the recording of podcasts, the instructor is also occasionally brought in as a "guest" or interviewee, to offer insight into, or clarification of, the more difficult or complex issues and topics.	• Podcasting
Australian Catholic University, Australia	McLoughlin, Brady, Lee, and Russell (2007)	Pre-service teachers studying secondary teaching courses use podcasting and blogs to engage in peer mentoring with their classmates while undertaking their teaching practicum, during which they are assigned to geographically dispersed schools throughout the Australian Capital Territory. They share experiences, stories and anecdotes, as well as offering support, feedback and encouragement to one another.	The instructors set up the Web 2.0-based technology infrastructure within the university's learning management system, and outline the parameters for the activity to encourage student interaction and promote reflection on practice. They also participate in and provide input into the discussion, so that both instructors and students are producers and consumers ("prosumers") in the online community.	• Podcasting • Blogs
University of North Carolina at Pembroke, USA	Sener (2007b)	Students use a wiki to create a web-based encyclopedia containing entries on a variety of subjects related to law, criminal justice, sociology, and criminology. In addition to generating and entering initial content, students also edit, revise, and organize the content.	The instructor supplies the technology framework and assesses the students' work, providing constructive feedback about their encyclopedia entries and the content therein.	• Wikis

Institution/ Country	Reference(s)/ Author(s)	Learner Tasks	Manifestation of Pedagogy 2.0	Web 2.0 Technologies Used
Macomb Independent School District, Michigan, USA	Wenzloff (2005); Richardson (2006)	Student teachers use the social bookmarking site Furl to bookmark and tag web sites and share them with their instructor and peers.	The instructor uses the export feature of Furl to quickly and easily generate online or paper handouts of the resources he has bookmarked for the class. He also subscribes to the RSS feeds of his students' Furl sites, to examine the sites they are reading as well as the comments they have written about the sites.	• Social bookmarking • Tag-based folksonomies • RSS
Open University, United Kingdom	Kukulska-Hulme (2005)	Students attending German and Spanish summer schools use digital voice recorders and mini-camcorders to record interviews with other students and with native speakers, as well as to create audio-visual tours for sharing with their peers via the web.	The instructors supply the recording equipment and provide guidance to the students in completing the various activities, for example, by providing sample topics/questions for the student-led interviews.	• Media/file sharing
Osaka Jogakuin College, Japan	McCarty (2005a, 2006); Sener (2007a)	Students are interviewed by their instructor, perform roles, and/or present their own creations, in contribution to the instructor's bilingual podcast feed and blog targeted to those studying Japanese or English as a foreign language. The podcast episodes cover Japanese culture, history, folklore, and comparative religions as well as contemporary social issues such as the education system and the rights of minorities in Japan.	The instructor maintains the podcast feed and blog, adding his own content as well as soliciting contributions from students.	• Blogs • Podcasting
Matsuyama Shinonome College, Japan	McCarty (2005b); Sener (2007a)	As part on an intensive course on translation, students from two East Asian cultures (Chinese and Japanese) participate in a recorded discussion in which they are asked to explain five proverbs in English as well as in their native language.	The instructor provides stimulus questions to trigger thought and discussion, and oversees the operation of the recording hardware and software. He assists the students in publishing the recording as a podcast.	• Podcasting
Kansas State University, USA	Wesch (2007)	As part of their exploration of how digital technology impacts human interaction, cultural anthropology undergraduates create "digital ethnographies" of *YouTube* through a process of participant observation. Although they work closely with one another, each student in the team is ultimately responsible for their own three to five minute video ethnography of some aspect of the *YouTube* community.	The instructor provides coaching, modeling, and facilitation, while introducing the skills of research methods	• Media sharing (video – *YouTube*) • Vlogs (video blogs)

Institution/ Country	Reference(s)/ Author(s)	Learner Tasks	Manifestation of Pedagogy 2.0	Web 2.0 Technologies Used
Fashion Institute of Technology, USA	Harris (2007a, 2007b)	Students studying an art history class visit the Metropolitan Museum of Art, where they take photos of exhibits using their mobile phones, upload them to *Flickr*, and use the site's tools to tag, annotate and write descriptions and comments about the photos. They participate in a "Scavenger Hunt" in which the objective is to locate and photograph works of art that pertain to a number of vocabulary words and terms they have studied in class (to be used as tags for their uploaded photos).	The instructor organizes the field trip to the museum and provides scaffolding for the activity by establishing the technology infrastructure (Flickr group) and supplying the keywords for the Scavenger Hunt. She also evaluates the students' work as part of their mid-term assessment.	• Media sharing (photographs – *Flickr*) • Tag-based folksonomies
Mt. San Jacinto College, USA	Helms (2007); D. Helms, personal communication	Health Sciences students use the social networking site *Ning* to create Web 2.0-based web sites to teach others about the dangers associated with drug use and abuse. Working in groups, they each take on one of four roles: Web Designer, Multimedia Designer, Researcher, and Copyrighter. *Ning* allows the students to integrate various forms of multimedia by drawing on the vast resources already published on the Web, for example in image libraries and on media sharing sites such as *YouTube*, without the need to learn complex web authoring and programming techniques. The students also use the blogging and threaded discussion features of *Ning* to engage in constructive and reflective discourse about the content they have produced.	The instructor assigns each group with a specific drug to research and provides "job descriptions" for each of the four roles. He also practices a form of modeling by producing a sample *Ning* site for students to view as an example of the possibilities of the medium.	• Social networking sites (*Ning*) • Blogs • Media sharing
University of Michigan, USA	Yew, Gibson, and Teasley (2006)	Students in a database and information class use blogs and RSS as a means by which to converse, interact, and share knowledge with one another and with their instructor. The posts on their individual blogs are aggregated on a central "Class Remix" site, where they are encouraged to improve upon, change and/or integrate the group's knowledge contributions. Students tag their posts openly and in a collaboratively manner to facilitate the organization, sharing, and coordination of the group's knowledge artifacts.	The instructor teaches regular face-to-face classes and encourages students to share relevant questions, answers and observations of the material taught in the classes via the individual and class blogs.	• Blogs • RSS • Tag-based folksonomies
University of British Columbia, Canada	NMC & ELI (2007); Lamb (2007)	A masters-level course entitled *Text technologies: the changing spaces of reading and writing* uses a course blog in conjunction with RSS to aggregate and present a list of relevant Web-based resources. The feeds and resources are compiled collaboratively through the use of social bookmarking tools.	The instructor sets up the course blog and provides assistance to students on the use of the various RSS and social bookmarking tools. He also contributes resources to the collection in collaboration with his students.	• Blogs • RSS • Social bookmarking

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We Innovate: The Role of Collaboration in Exploring New Technologies

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Pre-service teachers faced an old problem with new possible solutions by working collaboratively to learn new technologies and changed the way they react to new tools. This approach required students to explore technologies independent of instructors—with peers in small groups. Instructors believe the learning activities implemented in this project to facilitate learning new technology are better aligned with professional development realities of their students' future profession. The old problem with the "inability to keep up with all the new technologies" and the new teaching strategy of "collaborative learning communities" prompted the development of the *Innovations Mini-Teach* course project. Through focus groups, an end-of-semester course effectiveness survey, and analysis of students' final products, this study showed that collaboration can be a superior method for helping pre-service students independently learn about the innovative technology tools that may be helpful to them as teachers, explore a professional development model that could support them in their future teaching careers, and most importantly see themselves as future innovators. Finally, students in focus groups indicated their class wiki, which archived each group's consequential knowledge, would continue to support them to become teacher-leaders of technology integration.

Efforts to equalize access to educational technology tools for PreK-12 classrooms in the United States have begun to pay off (Trotter, 2007). This is good news for teacher preparation programs because now, for the first time, instructors are more confident that their graduating teachers will be placed in classrooms with adequate access to technology. But now that the national average in the United States is 3.8 students to each computer (Wells, Lewis & Greene, 2006), teacher preparation programs have begun to realize a new layer of concerns. The added access and the rapid development of Web-based tools (e.g., Google Earth, social bookmarking, wikis), makes keeping up with the growing list of technology choices difficult for teacher preparation programs. To prepare for technology-infused classrooms, pre-service teachers must embrace the idea of continually availing themselves to any technologies with possibilities of "enabling students to learn subject matter more deeply and with more curiosity than without the technology" (Hughes, 2004, p. 346).

With these circumstances in mind, teacher preparation programs are challenged to (a) accommodate the current skillset of pre-service teachers who, at varying levels, are underexposed to technology tools and uses, while assuring minimal technology competencies upon exit from their courses (Albee, 2003); (b) prepare pre-service teachers to use the wide and changing range of technologies supportive to their curricular area (Flores, Knaupp, Middleton, & Staley, 2002; Hughes, 2004); and (c) instill a driving desire in pre-service students to stay updated with respect to technology and its meaningful integration in their future classrooms (Williams, Foulger, & Wetzel, 2008). Forward-thinking programs should offer technology integration content to students in a way that "fosters among the students a sense of ownership for their learning … as both protagonists and authors of knowledge-building activities rather than simply as conscripted information-processors with regard to the ideas of acknowledged experts in the field" (Ball & Wells, 2006, p. 192).

Three instructors of educational technology in a teacher education college at a large urban university in the United States were faced with this dilemma. When analyzing their current curriculum and reflecting about possible refinements, the instructors felt adding another dimension to their course would be necessary—one that would help students "carry on" with learning about and implementing educational technology after the completion of the course. This could only happen if students developed attitudes and beliefs necessary for continued exploration of, and responsiveness to, new technologies and their potential application to 21st century teaching and learning environments. Instructors hoped they could begin to support these lofty goals through one innovative course project.

Theoretical Framework

Pre-service students seldom understand that, as an integral part of their job, PreK-12 teachers in the United States are mandated by recertification requirements to participate in ongoing professional development activities. Effective professional development processes help teachers to "be pro-active, be able to anticipate situations and continuously update their knowledge to address new situations" (Pillay, 1997, p. 122). This includes the challenges associated with staying updated with new technologies, thinking creatively about potential uses

in teaching and learning processes, and adopting new pedagogical approaches where new learning tools allow.

Although opportunities for individualized professional development are increasing for in-service teachers, "there are sound educational advantages in group learning that mark this type of professional development as superior. Groups can become a powerful way of encouraging individuals to feats they could never manage on their own" (J. Rogers, 2001, p. 54). Small, self-directed groups have been known to provide (a) a more supportive environment, (b) the creation of challenges unavailable in isolated learning situations, (c) the construction of more complex cognitive structures due to the representation of a variety of experiences, and (d) a dynamic force that can lead to the creation of a community of practice as it draws its members in (A. Rogers, 2002). Through participation in common experiences, group members may not only grow to have common knowledge but will also develop a set of shared beliefs central to their work (e.g., Lave & Wenger, 1991; Wenger, 1998; Wenger, McDermott, & Snyder, 2002). This characteristic is more likely if group members participate in intensive and extensive interactions (Bar-Tal, 1990). These beliefs "provide the epistemic basis that unites group members into one entity, serve as a foundation for group formation, and form a bond for the group's continuous existence" (Bar-Tal, 2000, p.35). Yet, a sense of community does not magically happen; instead, it evolves through successful attempts whereby "interacting collaboratively, all participants' strengths can be maximized, their weaknesses can be minimized, and the result will be better for all" (Friend & Cook, 2002, p. 13). Institutions that realize and support these complexities can sustain a culture that embraces change and refuses to stagnate (Adey, 2004).

Most teacher preparation entities recognize the value of professional collaboration. Particular to the state where this research took place, two of the nine proficiencies in the professional teacher standards embed collaboration as an important teacher skill. One standard relates to the ability of special education teachers to work with other professionals and parents to create students' individualized education programs. The other pertains to the role of collaboration in supporting general education teachers to work with colleagues, parents, the community, and other agencies to help students meet the academic standards and transition from school to work or post-secondary education.

In a university setting, instructors who help students organize themselves in ways that allow the learners to do the learning may be able to support the development of collaborative abilities relevant to professional development in students' future careers. Students who participate in these types of experiences report fundamentally different environments founded on synergistic learning, with noticed shifts from being passive recipients of knowledge to feeling empowered, responsible learners who "reclaim a role in their own education" (Holmes, Tangney, FitzGibbon, Savage, & Meehan, 2001). These positive benefits are worthy of attention at the pre-service level for the attainment of course outcomes and possibly for the benefits afforded students past their final exam.

Instructional design by Holmes et al. (2001) couples Vygotsky's work (1978) related to constructivism with elements of social and environmental circumstances with advances in communications technology that blur the line between instructor and student. The resulting model, known as communal constructivism, requires instructors to "build on the knowledge, skills and energy of those at the heart of schooling—the students" (Holmes et al., 2001, p. 3). In a communal constructivism environment, students and teachers work together to develop their own understandings; with great efficiency, the knowledge students generate is meant for their personal benefit and for the benefit of their instructor and other students.

Motivated by personal dissatisfaction of behaviorist, cognitivist, and constructivist ideologies of learning, Siemens takes the practice of adding technology a step further (2005b). The emerging idea, termed connectivism, calculates for the depth of understanding that occurs when learners are immersed in experiences, yet recognizes that with the amount of knowledge available in today's world, it is not possible for learners to experience everything. Because of this pressure, they are forced to learn vicariously by forming connections with others (Siemens, 2005a). Technology can allow connections to up-to-date knowledge banks. These personal networks exist through "weak ties" to new information and sometimes equate to survival:

> The starting point of connectivism is the individual. Personal knowledge is comprised of a network, which feeds into organizations and institutions, which in turn feed back into the network, and then continue to provide learning to individuals. This cycle of knowledge development (personal to network to organization) allows learners to remain current in their field through the connections they have formed. (Siemens, 2005, p. 1)

The addition of new technology tools available at the university level has made it possible to create learning environments that capitalize on augmented conversations, sophisticated communication, and collaboration; yet, existing curriculum lags in its ability

to take advantage of these possibilities (Williams et al., 2008).

With understanding of these complexities, adding innovative communications technologies to the university setting is not enough; in addition, instructors in a technology-connected environment must shift their practice to support learners in ways that prompt them to "put their learning back into the community to benefit others, which will promote an evolution of learning and teaching" (Holmes & Gardner, 2006, p. 17). Activities that rely upon peer collaboration and project-based learning, apprenticeships, and publishing of information require a great deal of flexibility and unique assessment methods (Holmes, et al., 2001) on the part of the instructor. Instructors who understand the richness of these types of environments and want to embrace the notion of impacting education on a broader scale must also shift their practice and learn how to support the necessary student functions involved.

The Situation at Hand

The first semester of their teacher preparation program students at the urban university where this study took place were required to complete an educational technology course. The course strives to prepare students to integrate technology with standard PreK-12 curriculum. A historical look shows the course has transformed over the past five years from one where students became proficient with some new technology skills and learned limited theory, to the current course, which attempts to prepare pre-service teachers to be innovative users of technology, promoters of technology integration and creative teaching techniques, and teachers who strive to continually learn about new technology tools.

Lack of Foundational Technology Skills

Although students complete a foundational technology skills course as a prerequisite to program admission, just five years ago the pre-service teacher technology course largely addressed improving technology skills, partly to expose students to the varieties of technologies they may have access to in their future school and partly to "wow" them with ideas of how technologies can be used with PreK-12 students. For example, during one class activity students were briefed on how to use a digital camera. Then, they were sent out on campus as if they were PreK-12 students to explore the functions of their camera and take a few pictures. They were then instructed on some basic functions of Adobe Photoshop™ and asked to enhance their own pictures (Wilhelm, 2005). At that time, the majority of the students had never used a digital camera, and few if any had been exposed to Photoshop™. In reality, for most students, this was the first time they had been immersed in technology to this extent. Instructors soon noticed that students were enrolling in the teacher education program with more sophisticated technology skills and were interested in learning deeper integration strategies.

Disparity between University Ideals and PreK-12 Settings

A shift in the course occurred when students became discouraged about the future role of technology in their classrooms because they were not seeing examples of technology integration in their field experiences. While some pockets of adequate access to technology were present in local PreK-12 settings, it was difficult to find classroom teachers who were available to model integration strategies presented through course content. The addition of a *Vision Video* project allowed students to stage, film, and edit a visual representation of a future technology-rich learning experience for which they could aspire. Instructors hoped pre-service teachers would hold true to their visions, and that access to PreK-12 classroom technology would increase by the time their students were ready to obtain their first jobs. Students were successful at articulating future uses of technology through the *Vision Video* project; however, their ideas for designing curriculum that integrated technology were limited.

Innovation Overload

The most dramatic change in the course content, and the focus of this study, occurred with the adoption of the *Innovations Mini-Teach* project. This new project was brought about by the surge of new Web-based tools, the increase in access to computer technology, and an increase in peripheral devices (e.g., SmartBoards, digital cameras) more readily available in local PreK-12 classrooms. The educational technology instructors now felt that, within the time limitations of a single course, it would no longer be possible to do justice to the myriad of technology integration tools and techniques. Due to these circumstances, instructors felt it might be helpful to explore ways of preparing students to become the kind of teachers who are capable of learning new technologies and devising uses to enhance specific teaching and learning needs. Instructors developed the assignment on their understanding of the capabilities of collaboration and the assumption that pre-service teachers could rely on each other to research and freely explore new

technology, become expert users, and devise valuable ways to allow technology to enhance student learning.

The topic and instructional design of this project exemplifies the type of learning instructors feel is conducive to helping pre-service teachers prepare for their future 21st century classrooms. When they become practicing teachers, they will be responsible for the development of a unique set of K-12 student behaviors that is critical to students' success in the 21st century as outlined by the *National Educational Technology Standards for Students*. These include creativity and innovation; communication and collaboration; research and information fluency; critical thinking, problem solving, and decision making; digital citizenship; and technology operations and concepts (International Society for Technology in Education, 2007). The *Innovations Mini-Teach* project aligns to the ideals presented in these standards in order for pre-service teachers to become better prepared to meet the needs of their future students.

The course-specific goal of the *Innovations Mini-Teach* project was to acquaint students with new and evolving technologies in an atmosphere where they could help each other to learn their assigned technology, better understand how technology can be integrated, and contribute to their collection of teaching ideas and materials via the class wiki. Success would be dependent upon the many facets of collaboration by small groups (2-4 students) who worked toward the following project outcomes:

- To learn one innovative technology and its possible classroom application(s)
- To learn to work together taking advantage of each others strengths
- To design and deliver instruction (of their innovative technology)
- To collect usable resources for future class assignments and possible use as a teacher
- To learn from peers about other innovative technologies and their possible classroom applications
- To use a class wiki to archive and disseminate innovation resources beyond the future of the course

Instructors anticipate innovations topics will change each semester to accommodate the skillset and teaching needs of any given student group as well as any new developments in technology tools. During the semester of this study, students of the three instructors investigated over twenty-five different innovation topics, including wikis, blogs, Smartboards, podcasting, Google Earth, and Social Bookmarking.

Instructors were cognizant about supporting student teams and provided class time for groups to create a contract delineating responsibilities and establish a timeframe for each step they foresaw. Additionally, instructors coached individuals and groups at varying degrees on an as-needed basis during and outside of class meetings. The majority of the group preparation was expected to take place outside of class time and independent of direct instructor involvement.

The culminating knowledge gained from each group was published by students in a class wiki, which was available to students after the semester's end. The project was worth 10% of students' course grade and was based on wiki content and a 15-30 minute final modeling or hands-on experience provided for classmates during an assigned class session. Ultimately, instructors hoped their students would gain long-term benefits spanning beyond the scope of the semester, including an increased interest and ability to adopt new technologies as future teachers, and an understanding that professional development that relies on collaboration might be a necessary component of their future profession (Foulger, 2005). Instructors also hoped that they could support collaborative student groups through a purposefully-created investigation where students would support each other and simultaneously learn a great deal from the inquiry process (Coghlan & Brannick, 2001).

Instructor researchers sought to investigate the process, perceptions, and outcomes of students after their experience with the *Innovations Mini-Teach* project. With the hypothesis that PreK-12 teachers who collaborate with other technology-using teachers have more potential to learn new technology and use it in ways to address student learning, instructor researchers wanted to understand how they could support the development of pre-service teachers' collaboration skills through a classroom assignment that relied on learning with and for peers (Holmes, et al., 2001). Instructors felt they needed a stronger understanding of the influences on students as they worked collaboratively to become experts, document their knowledge, and showcase to peers their assigned innovative technology and its application to 21st century classrooms. Through a focus on collaborative influences, instructors would also be able to make calculated modifications to the project so they could be more certain to support the intended long-term goal: that students would value the ability of collaboration as a superior method for ongoing refinement of their teaching, and that as future teachers they would engage in professional development experiences that would involve being connected with their peers. Specifically, three research

questions central to the elements of collaboration were investigated:

1. What value did collaboration add to the ability of students to learn new technology?
2. What obstacles inhibited students' collaboration abilities?
3. What are students' perceptions about how collaborative skills may affect use of innovations in their future teaching?

Method

Focus Groups

Focus group methodology (Krueger, 1998) was used to gather student perceptions at the end of the project. To assure focus group subjects represented differing viewpoints, students in six of the sections of the required educational technology course (n=126) taught by three separate instructors were questioned as to whether "this assignment should remain in the syllabus for next year" and to ascertain their availability to attend a focus group session meant to help their instructors improve the project for future semesters. Thirty percent the students strongly agreed, 45% agreed, 15% disagreed, and 5% strongly disagreed. Seventy-five percent of the students surveyed were available and agreed to be in the pool of students for a focus group to take place outside of class time. Next, a faculty member not associated with the study used the questionnaire responses to select student participants and form focus groups. A purposeful sampling technique known as maximum variation sampling (Patton, 2001) was used to invite students with a wide range of variation on their perception of the project. Students were then invited to a focus group discussion. The resulting four focus groups were comprised of students equally representing each of the six courses. Due to the fact that very few students strongly disagreed or disagreed with the usefulness of the assignment, compounded by some students' conflicting schedules, the percentage of students who were adverse about the project were less represented in the focus groups than in the full population.

Four focus groups were set up at different times. Each focus group had 4-8 students (total of 24 students) and was led by a faculty member familiar with the assignment but not the students' instructor of record. Two focus groups were comprised of primarily elementary education, one of secondary education, and one of early childhood majors.

The focus groups were conducted based on methods described by Krueger (1998) and served as the initial source of data for the study. Digital audio files of focus group discussions, each lasting approximately 60 minutes, were recorded and converted to text. As recommended by Krueger (1998), the group leaders posed an initial question to allow each participant to become acquainted with the topic, recollect their thoughts, and listen to their colleagues. Participants were asked to introduce themselves to the others and to explain their *Innovations Mini-Teach* experience. This was followed by a set of questions that each pre-service teacher addressed. Example questions included (a) What is your impression of the *Innovations Mini-Teach* activity?, (b) What are the important elements?, (c) How did you learn to use the innovation?, (d) Is this type of project worthwhile during the first semester in your teacher preparation program?, (e) Did you face any obstacles in preparing your project and presentation?, (f) Are there elements that could be reduced or eliminated?, and (g) What suggestions do you have? Additional follow-up questions occurred naturally to clarify answers and build on the responses.

Data Analysis

After the focus group audio files were transcribed, instructor researchers analyzed student responses using HyperRESEARCH Qualitative Analysis Tool v. 2.8 (Researchware, 2007). This process began by reading and rereading transcriptions of the focus groups. Guided by the research questions, the three faculty researchers worked together to collaboratively code one of the transcribed focus group discussions. Codes were continually revised through triangulation of other data sources and then categorized to help researchers identify emergent themes. During that process, a common set of categories and associated codes was established. Next, each researcher individually coded the remaining transcribed focus group sessions. To maximize inter-rater reliability, meetings were held in which researchers came to agreement on how each individual unit of thought would be coded. As the analysis progressed, researchers continued to revise the coding system as needed to reflect the various sources of evidence related to students' experiences. Of the final 28 codes, the 12 codes used for this study related to collaboration fell in the following categories: collaboration effectiveness, learning strategies, long-term effects, and advice.

Other Data Sources

Students' innovation projects and data from an end-of-course questionnaire administered to students were used to substantiate student focus group data and confirm the trustworthiness (Lincoln & Guba, 1985) of the results. The end-of-semester questionnaire distributed to all pre-service teachers in each section of the Technology Integration course provided feedback

regarding individual experiences during the course, and specifically inquired about the *Innovations Mini-Teach* project. This was administered electronically using a Web-based questionnaire tool (SurveyMonkey.com, 2007). Thirty-five Likert Scale questions were used to collect general feedback regarding course assignments and activities, and six open-ended questions targeted the *Innovations Mini-Teach* project: (a) What did you like most about the *Innovations Mini-Teach* project?, (b) What did you like least about the *Innovations Mini-Teach* project?, (c) Do you plan to use any of the technologies presented during the *Innovations Mini-Teach* project?, (d) Which technologies will you use?, (e) Briefly, how do you plan to use them in your classroom?

Finally, each group's wiki was examined to determine the information and resources provided by the innovation groups as well as any areas emphasized or lacking. Required elements included a description of the innovation, resources to learn to use the innovation, teacher uses/resources, and PreK-12 classroom uses/resources. (The complete set of innovations topics, focus group questions, end-of-course questionnaire, and wiki examples can be viewed at http://www.west.asu.edu/tfoulger/Innovations).

Results and Discussion

Results were constructed with primary consideration given to focus group data. Other artifacts representative of the entire student population participating in the *Innovations Mini-Teach* project were used to substantiate focus group data, including the class wikis, group presentations, and the end-of-course effectiveness survey data. Instructors are in agreement that the results reported herein hold true for the general student population.

The results section is organized following the three research questions: (1) What value did collaboration add to the ability of students to learn new technology?, (2) What obstacles inhibited students' collaboration abilities?, and (3) What are students' perceptions about how collaborative skills may affect use of innovations in their future teaching? The complex and overlapping themes represented in the data will be reported using verbatim quotes to describe the essence of the students' experiences as related to each of the three research questions. A focused discussion follows the results within each research question section.

What Value Did Collaboration Add to the Ability of Students to Learn New Technology?

Since the instructors assigned students to groups and topics, the process of creating presentations with unfamiliar peers mandated that group members quickly coalesce, coordinate efforts to research and learn the innovation, and prepare the final presentation. Students in successful groups realized that they, and/or their group members, needed to exercise certain skills that were not normally necessary for individualized work. Groups used a combination of meetings and email to complete the project.

Proactively, instructors attempted to take measures that would support group success (e.g., planning contracts). But, given that the majority of group processing needed to take place outside of class meetings, they also communicated willingness to support individual groups as needs arose. Students reported that the small groups instructors created (2-4 students) allowed group autonomy to "define the terms as far as when and how" they would interact to achieve their desired outcomes. Students reported they recognized the benefits in quickly "getting to know each other." All focus group participants reported that collaboration supported them because the project wouldn't "take that much time because of a group."

All groups completed a group contract, approved by their instructor. Students noted that some element of leadership appeared to be necessary for them to successfully delegate responsibilities, establish a timeline, attempt to equalize the workload, and in general commit to a process that would lead to a final presentation meeting their standards. This student noticed how a calendar with process checks positively affected group commitment:

> We used a time-line to schedule -- "ok you do research on this part and the other members work on the other part" so it was easy - everything was in a time-line. Every day it was like scheduled, so that's what it was like.

Instructors used a technology questionnaire to help distribute students who were technology experts among groups (available at http://southwestscreensavers.com/innovate). Because of this, group membership represented a range of general exposure to technology. About half of the groups had members who were "Pretty Good" or "A Pro" with the assigned innovation before the groups commenced. Almost all students felt that having an expert in their group supported their ability to learn about the innovation. One student noticed her technology inefficiencies, but quickly realized that the varying skillsets within her group made it possible for her to be successful:

> They had us fill out a survey type thing about what topics we know a lot about and which you don't and then they paired you up with someone that maybe knew a little more - or if you knew more then you'd be paired up with someone who knew a

> little less. I thought it was a neat idea because I learned a lot about handhelds…from the girl I was working with, so I thought that was a neat way to do it.

Another group also assigned to handhelds operated in a different manner. This group did not have a member who was a noted expert, but its members used their overall expertise to tackle learning the new technology:

> Ours was hand-helds and the PDAs and so we were able to go downstairs in the Educational Library, and we [borrowed] a whole box of the hand-held PDAs and so everyone got one and then we'd walk through little steps of what you can do, like inputting data into them and we used - we had graphing calculators too, so we brought like little websites, we just pulled them up but we didn't really use 'Google' or anything, ours was just kind of like, "ok well I know how to use a calculator" and she knew how to use a PDA, so we just kinda like collaborated on it and just used each other, so it was pretty easy - I was surprised.

Even though instructors created a situation where students felt a high sense of accountability to one another, students agreed they felt comfortable helping each other through learning their assigned technology. Even cross-group collaboration was initiated by students and occurred informally outside of class. Similarly, both instructors and students noted this effect during in-class presentations:

> Like I said, my partner and I, we knew what we were doing fairly well, but as far as like feeling like unprepared, it wasn't even a factor because everyone in the classroom was so willing and you know there to help you through it, if they knew something about it. Then they'll … raise their hand and they'll share it with you so it's kind of, as far as being prepared, I think just having something that we fooled around with, … made it a lot easier to know what you were doing while you were up there. You didn't have to worry about something not working with a website or something, so we felt fairly prepared for our presentation.

Eighty percent of the students participating in focus groups enjoyed the collaboration, appreciated the benefits it offered, and felt that working with a partner allowed for maximum success because they could wholeheartedly "try to help as much as they could" without feeling like they needed to know everything. All students understood that in some way collaboration enhanced their learning opportunities through the abundance of hands-on exploration and research with their group members, direct learning and other in-class experiences provided by other groups, and ongoing access to the class wiki where collaboration could occur even after the semester's end.

The evidence suggests that pre-service teachers valued the collaboration element of the *Innovations Mini-Teach* project. Instructors successfully established an environment conducive to this by requiring peers to learn with and for each other much like Holmes et al. propose (2001) within the communal constructivism framework. The student community was supported through instructor-created project materials and outlined processes and the availability of the instructor outside of class meetings. This "supported freedom" gave students the opportunity to practice their collaborative skills in a mandated, yet scaffolded and safe manner. Upon completion of their work, students viewed the collaboration element as a very significant factor that allowed them to (a) learn about their assigned innovation in depth, (b) gain a breadth of knowledge about the other innovations shared, and (c) delve deeper without worry of temporal or physical barriers via the ongoing collaborative capability provided by the class wiki. This accomplishment would have been impossible had students not relied on each other.

What Obstacles Inhibited Students' Collaboration Abilities?

Instructors expected difficulties with group dynamics and provided proactive measures meant to support productive group processes to the extent they could, including detailed project materials, clear expectations, the willingness to coach individuals or full groups when needed, and by presenting the first innovation to the class as a model. Yet, some students in the focus groups shared problems they encountered related to inter-group dynamics stemming from communication problems. Ten percent of the focus group students reported problems significant enough that their work was hindered or they were forced to work by themselves (e.g., partner dropped the course, major problems at home). Another ten percent had lesser problems that were handled by the students themselves such as when group members did not follow through on commitments, were not approachable, or did not consistently communicate via email. For example, frustrations arose when schedules didn't permit for convenient meetings outside of class. Although these types of issues were viewed as unavoidable and "kind of an annoyance," they were typically worked out independent of the instructor. When communication broke down over ongoing issues, as it did for two of the students in the

focus groups, group effectiveness was inhibited, but the project was still completed.

Issues external to the group such as employment responsibilities or other personal pressures and expectations caused some students to commit less time to the process of preparing for their group presentation. Students in groups with members who had limited or inconsistent involvement in the process tended to make attempts to "reach out," but they reported personal frustration over their inability to make progress toward the project's goals. Out of the numerous mini-teach group presentations, two interpersonal situations required instructor intervention. One student talked about being frustrated to the point that she claimed she "didn't know what to do" and ended up preparing for her group's presentation by herself. In the end, she remembered how she gave her partner many opportunities before she "took over the project [because she was] nervous that it wouldn't get done." Although this student felt collaboration actually hindered her, in the end she also recognized her depth of understanding of the innovation and knew her instructor "realized through the presentation that my partner didn't really know what she was talking about….and it ended up showing in our grades."

One student who was very frustrated with her partner's low level of commitment learned some things about herself in the process:

> As I said before, I felt like my partner …. didn't really have the desire to learn how to learn our innovation ... I was more concerned with getting it done so I felt like I took over the project … I was just nervous that it wouldn't get done if I didn't. I don't know that [collaboration benefited me] - it might've hindered me in the sense that I felt bad, 'cuz I did the whole project, but I wasn't sure if it was because of my anal-like control-freak that had to have it done ... it was like the day before until - I couldn't get a hold of [my partner] all weekend long. She was out of town. I emailed and called and nothing, so I assumed I was on my own. So I did pretty much the big chunk of the work.

When one classmate's group member withdrew from the class, the stranded student lacked the confidence to carry on alone and was brought into a new group in the middle of their process. While the new addition impacted the original collaborative working structure, the pre-existing pair adjusted to accommodate the new member. This student describes how her group accommodated this difficult situation:

> We had a third person come in kind of at the last moment, but it worked out pretty well—We decided right away how to divide: one person was gonna – I checked out the PDA and kind of played with it, as well as somebody else, so then the third person looked up information on the Internet and started on our presentation. I think we collaborated pretty well.

For some individuals who felt their technology skills were only basic and they couldn't contribute to the skill building requirement, frustration over inadequacies was apparent, especially if they felt their inadequacies "hindered their partner." This feeling was evident for one student who expressed that she perceived her partner "knew a lot." She assumed the expert partner felt that since she "already knew it [I] should go and figure it out [on my own]."

Although collaboration was poised as an important factor to student success for the *Innovations Mini-Teach* project, evidence suggests that to varying degrees struggles existed for nearly all the groups. However, change theorists who agree the adoption of new practices is greatly supported by collaboration (Bennis & Biederman, 1997; Fullan, 1994; Hall & Hord, 2006) note similar problems: that the social side of innovating can be tricky.

During the *Innovations Mini-Teach* project, faculty viewed struggles as situations that provided learning opportunities for students to develop their interpersonal skills—the same skills faculty felt could support students' professional development processes once they become teachers. By interjecting only when absolutely necessary, and in ways that did not promote a dependency on instructors, instructors were able to help students capitalize on struggles, "make problems their friends," and expand their interpersonal skills in preparation for future involvement in such professional development processes reliant upon collaboration.

What are Students' Perceptions About How Collaborative Skills May Affect Use of Innovations in their Future Teaching?

As students experienced different innovative technologies and listened to their peers illustrate the possible classroom uses for the innovative tools, they began to reflect on whether or how they would use the innovations presented in their future classrooms. The student voices that follow represent many of their peers.

> We covered [our assigned innovation] thoroughly - I think we covered every aspect of it …. I definitely see the value of the projects and definitely see how I would need to know these

> things as I go into my own classroom, but I don't believe that I entirely came away with a full, comprehensive understanding from some of the projects—from some of the presentations.

Even by the end of the semester, one student shared how she furthered her understanding of innovations assigned to other groups via her use of the class wiki; now, she sees the wiki as a place for ongoing sharing among peers with the focus of supporting future classroom use of technology:

> I've actually already been back in there and have been looking through stuff; using stuff for [another assignment]. I went back to the SmartBoard [section] and pulled up some of the lessons that they used to have the kids play around with, so I've already done that. So yeah, I think I will be continually accessing and definitely if I find something that's worth while, I'll put it up there 'cuz any help I can get is great. So I figure everybody else will feel the same way.

The class wiki will be available to students through to post graduation as students enter their profession. This being the case, students can have continual access to the information contained therein as needed for future coursework, internship purposes, or future teaching endeavors. When specifically asked if they would use the class wiki in the future, most students hadn't thought of a "never-ending course" before and didn't realize future access to the wiki was possible. Consequently, the idea of using it as a future resource hadn't occurred to them yet; however, when presented with the idea, all forum participants unanimously reported it would be beneficial and that they probably would use it.

> Most of our presenters included like a tutorial, how to use it, and different elements of how to put something, like how to put a Podcast together, how to make an iMovie, or those kind of things - so it might not have been something I grasped right at the time, but if I want to use that innovation, I can go back there and learn it step by step ... a real quick overview.

Two students specifically noted that the innovations presented by peers had already proven useful for the *Vision Video* project (through support available via the wiki about video editing and as a catalyst for ideas of tools and integration strategies) and another predicted that some wiki content could affect future teaching choices as she stated, "I know what I will use, and what maybe I won't use as much, but I know the knowledge is there if I do need it." Another student mentioned that since her group's presentation she had already added information to the wiki related to GPS systems.

Educational change experts (Senge et al., 2000) claim that team learning is a component of an innovative learning system that mandates the development of quality relationships where people learn to work together to learn new ways of teaching. Preparing pre-service teachers with skillsets that are needed for this kind of learning is a complicated task, but evidence suggests this project does indeed support students' beliefs about their plans to use innovations in their future teaching. This is likely because this learning environment mirrors the types of environments that support collaboration where a high value is placed on reflective dialogues and the development of the type of social norms where learning and inquiry permeate everything (Darling-Hammond, 1998; Fullan, 1994). Adopting technology innovations is developmental and ranges from the learning of basic operations to taking on leadership experiences (Hall, 2005). Instructors of the *Innovations Mini-Teach* project are intentionally preparing students to join school cultures as collaborative teachers, empowered problem solvers, and change agents (Darling-Hammond, Bullmaster, & Cobb, 1995).

Implications and Conclusions

Teacher educators have a lot to offer their students as they serve multiple roles including instructor, mentor, facilitator, and model. However, in this study, researchers turned the tables to ask, "What do pre-service teachers have to offer one another, and eventually, to offer their field?" The *Innovations Mini-Teach* project allowed instructors for the first time to capitalize on this power. In contrast to conventional learning approaches, the three involved instructors behaved much like a coach to choose the task and evaluation methods and provide a scaffolded environment, then to step away as they continued to challenge, encourage, give feedback, and help students through weaknesses or struggles (Holmes & Gardner, 2006).

Based on their analysis of student voices, the instructors concluded that students gained high levels of expertise with their assigned innovation and became familiar with the range of innovations covered by their classmates and archived in the class wiki. On another dimension, pre-service teachers took ownership of their own learning. The embedded technology (the class wiki) produced a situation in which the knowledge gained by one group was also owned by others. This unique instructional form was founded on communal constructivism (Holmes et al., 2001) and allowed for both depth and breadth of coverage (Collins, 1996) in a manner that did not tax the students.

Students described long-term gains as well. The reliance on collaboration created a shift for students about how they view themselves as learners. By developing a project that relied on collaborative behaviors (much like professional development processes instructors hope students will encounter in their future teaching), students were able to practice collaborative professional development mirroring effective in-service teachers. Additionally, students were empowered by an innovative social technology tool (the class wiki) that uniquely created a situation in which the course did not have a distinctive end because students could participate in ongoing learning not bound by geography or time limitations.

A possible third long-term effect will need further investigation. Instructors involved in this study wonder about the extent to which students who have participated in the *Innovations Mini-Teach* project will be viewed as technology "experts" at their future schools. If they have the ability to fruitfully collaborate with other teachers, to continue to innovate and share their understandings of technology tools, and to use innovative technologies to support student learning, they could rightfully become teacher leaders with respect to technology integration and innovative practices among their future peers.

This study investigated a superior instructional design model the researchers believe can be applied to learning groups outside the teaching field who are attempting to be more effective in the 21st century world. Learning founded on collaboration and empowered by social networking tools, such as a wiki, should be attempted across disciplines inside and outside the university domain. This model offers insight to any situation in which individual learning cannot equate to group learning and when relying on one another can create a larger knowledge base, more inter-dependency among participants, and an expanded sense of effectiveness.

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Writing in an Online Environment: Student Views of "Inked" Feedback

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Providing effective feedback on writing is a challenge in any learning environment, but it is even more problematic in fully online instruction. The lack of face-to-face interaction in web-based classes increases the need for highly transparent, prompt, and personalized feedback. Student views on the use of a semi-structured template combined with the "inking" feature of a Tablet PC for feedback on writing in an online course are reported. Survey results indicated the procedure was seen as providing clear and focused feedback with a highly personal touch. Students also reported being able to use the feedback to improve their performance on later writing assignments. Overall, this appears to be a well-received and helpful method for giving writing feedback to students in online classes.

"I always do the first line well, but I have trouble doing the others."

For many of us, reading this quote from Molière (Frame, 1967, p. 42) may lead to somewhat wry, if not outright humorous, musings as we make connections to our own writing experiences. For many college students, though, the difficulties encountered with writing offer little about which to smile. Their problems with the process often begin with the first line rather than after. As a result, improving the quality of student writing is a major focus for many instructors, and evidence of this can be seen in the ever-expanding number of Internet sites that address the issue (e.g., http://nutsandbolts.washcoll.edu & http://owl.english.purdue.edu/). Results from a descriptive study that explores providing feedback on writing for students in a fully online environment are presented. Specifically, the focus is on student views of a feedback method that combines the use of the inking feature of a Tablet PC with a semi-structured feedback template.

The Role of Feedback in Learning

Feedback has long been recognized as a key component for successful learning (e.g., Estes, 1972; Gagné, 1977, 1985; Wlodkowski, 1998). And the most effective feedback is that which is immediate and also provides explicit information on how performance can be improved (Bangert-Drowns, Kulik, Kulik, & Morgan, 1991; Bruning, Schraw, & Ronning, 1995; Schwartz & White, 2000; Winograd & Hare, 1988). This means that learners need to know not only if their work is correct, but, when it is not, they must be helped to understand the source of their mistakes and how to avoid making them in the future. Furthermore, good feedback also alerts students to the importance of taking an active role in their own learning and shows them how this can be accomplished. Feedback so designed will foster higher levels of self-regulation that, in turn, will work to decrease feelings of anxiety and helplessness and increase motivation and learning (Bandura, 1993; Bruning et al., 1995; Buttler & Winne, 1995; Mory, 2001).

But a critical, and yet often overlooked, aspect of the feedback process is what students think about the feedback they receive (Struyven, Dochy, & Janssens, 2005). Although most instructors believe they provide clear and constructive feedback, research indicates many students do not share that view (Maclellan, 2001). If feedback is to lead to improved performance, we need to engage students in the process so that we are able to understand and respond to their needs. This is of particular importance when we are talking about instruction in an online environment because the dynamics of the territory are not the same as in a traditional classroom.

Feedback in the Online Environment

The lack of face-to-face interaction in an online class makes providing feedback especially important. Online learners consistently report that the lack of direct contact makes it difficult to form satisfying interpersonal relationships with the instructor and the other students. Without this connection and sense of community, feelings of isolation take over, resulting in decreased motivation and learning (Mullen & Tallent-Runnels, 2006; Song, Singleton, Hill, & Koh, 2004; Thurmond & Wambach, 2004). Feedback from the instructor is the primary means of fostering a sense of connectedness and helping students to stay engaged and motivated to learn (Fredericksen, Pickett, Shea, Pelz, & Swan, 2000; Gilbert, Morton, & Rowley, 2007; Thurmond & Wambach, 2004; Vonderwell, 2003).

The lack of face-to-face interaction in online courses also makes giving feedback more challenging. Central to this issue is fact that the mode of communication is technology based. Students in online classes routinely comment on the impersonal nature of class communication in comparison to what occurs in the standard classroom (Gilbert et al., 2007; Mullen

& Tallent-Runnels, 2006). "It [interaction] is not like person to person interaction. It's more like computer to computer interaction." (Vonderwell, 2003, p. 83-84). Students want to have personalized communication with their instructors and they feel they do better when the feedback they receive incorporates this affective element (Mullen & Tallent-Runnels, 2006; Vonderwell, 2003).

The lack of physical presence in online instruction also requires that feedback be constructed as unambiguously as possible. In contrast to traditional instruction, the online environment does not readily allow for clarification through quick follow-up questions and there is no support from nonverbal cues (e.g., nodding or quizzical looks). When online feedback is not transparent, students often become anxious and lose motivation because they are confused about what and how well they are doing (Hara & Kling, 2001; Song et al., 2004; Thurmond & Wambach, 2004).

Time considerations also differentially affect the feedback process in the two settings due to the issue of physical presence. During traditional class sessions, questions or concerns are usually addressed immediately. In the online environment, the student often has to wait for a response. Depending on how long the delay is, it may adversely affect both student satisfaction and motivation (Haro & Kling, 2001). This point is illustrated by the following student comment: "It might take hours, maybe even a day or so before you get an answer back for the question…if you could ask it face-to-face, you might get better help" (Vonderwell, 2003, p. 84).

Approaches to Online Feedback for Writing Assignments

The development of effective writing skills is viewed as a central component of the educational process in our culture (Taylor, 2006) and most online classes are heavily oriented toward written assignments (Cavanaugh, 2005). Because of this, many instructors put a great deal of effort into providing feedback on student writing (Pengtiore, 2005; Sellani & Harrington, 2002), but it is often not well received or acted upon by students (Fritz, Morris, & Bjork, 2000; Wojtas, 1998).

Typically, feedback on written assignments in an online class takes one of three formats: a summary grade with no comments, a summary grade with general comments typed at the end of the essay—possibly with a few specific examples copied and pasted from the essay for clarification, or, an overall grade with editing and comments added into the body of the paper through the use of such tools as Microsoft Word's "track changes" or "insert comments" (Cavanaugh, 2005).

Given what we know about providing quality feedback, the "grade only" response is clearly of limited value. Although the "summary comments" method may be a better alternative, it has the potential to be ambiguous and lacks the visual impact of the traditional "pen in hand" approach that is standard when commenting on hardcopies of student papers. The track changes or insert comments features more closely resemble "pen in hand" in terms of being able to highlight problematic areas, but they are not as flexible, can be difficult for inexperienced students to use, and again lack the visual aspect of traditional notations such as drawing circles and arrows.

The potential importance of this visual element should not be ignored. Research suggests that students may have distinct learning styles—or preferences (see Felder & Brent, 2005) for "the manner in which, and the conditions under which, …[they] most efficiently and effectively perceive, process, store, and recall what they are attempting to learn" (Wehrwein, Lujan, & DiCarlo, 2006, p.153). Among the various styles suggested is a distinction in preference for receiving information in a visual (e.g., drawings and diagrams) or verbal (e.g., spoken or written words) format (Felder & Brent, 2005). Many students, including second language learners (Park, 2002), have been shown to favor visual input. Given the relatively common orientation to verbal presentations for instruction, numerous researchers have called for the inclusion of both forms whenever possible so that the needs of all learners are more likely to be addressed (Felder & Spurlin, 2005; Park, 2002; Sadler-Smith & Smith, 2004; Wehrwein, Lujan, & DiCarlo, 2006).

The Present Study

The goal of the present study was to improve our understanding of the type of feedback on writing that students in online classes find the most helpful. Given the research on effective feedback, a semi-structured template, combined with the instructor's use of the "inking" or pen feature of a Tablet PC, seemed to offer the most promise for achieving the desired outcome: sound feedback that students would both welcome and understand. The template could provide an organized and theory-based structure for the feedback and the inking could give a clear (and also visual) focus and foster the personal interaction aspect. It was expected that students would see the inking with the template as personalized and easy to understand and, thus, helpful for the development of their writing skills.

Method

Participants

The participants were 57 students (52 females, 5 males) enrolled in an undergraduate, senior seminar in

Child and Adolescent Development at a large, public university in northern California. The course was a 16-week, fully online class that was taught via WebCT.

Feedback Form

At the start of the semester, the instructor emailed students a template of the feedback form (Appendix A). They were told to use it each time they submitted one of the 6 essays they had to complete over the term. At the top of the form, students listed their writing goals for the semester and then they copied and pasted their essay into the template. The actual feedback segment of the template was based on the *Essay Marking Guide* (n.d.) and also followed the principles in Ferris (2003), Weaver (2006), and Butler and Winne (1995), including maintaining a balance between positive and critical comments, fostering student ownership and responsibility, and maintaining a balance between text-specific versus generic comments. It also had an extensive listing of "hot-linked" websites to which an individual student could be directed for help on any issues requiring additional guidance. This checklist format was chosen over a traditional rubric (i.e., a form that also included generic descriptions of various levels of performance) so that the instructor could easily and quickly insert more personalized, student specific feedback. Students submitted their essays through the drop box on the homepage of the course shell. The instructor commented on the papers and completed the feedback forms using inking on a Tablet PC and then returned them to the students via the drop box.

Tablet PC and Inking Technology

Completing the feedback was straightforward and took a relatively brief amount of time. With the inking technology, it is possible to write directly on the computer screen just as you would on a hardcopy of the paper. Moving the curser, highlighting, inserting comments, erasing, etc. is faster than with the standard computer and keyboard setup because all of those actions are carried out with a quick stroke of the "pen." Furthermore, it allows for using just an arrow or even a large question mark to convey a point in a manner not possible with standard word processing tools. (See Microsoft Corporation, 2008.)

Student Survey

At the end of the semester, students were asked to fill out an anonymous, voluntary survey of their views on the feedback process (Appendix B). The survey consisted of both Likert-scale and open-format items and was based on Ferris's (1995) principles for effective feedback on writing.

Results and Discussion

Overall, the students expressed positive views of the process. In general, they perceived the feedback as highly personalized and as helping them to focus on the problem areas of their writing. Additionally, the majority reported using the feedback to improve their performance on later assignments.

Highly Personal Feedback

Eighty-four percent of the students reported that they always or usually "thought the inking feature gave a more human aspect to the feedback." Student comments on the open-ended items reveal a similar view with the most common response (69%) to the question, "What were the positive aspects of receiving 'inked' feedback on your writing?," being that it made the grading process more human and personable than they expected in an online course:

- "It seemed more personal. As if you were taking a class that was not online."
- "Inked seemed more personal and human than receiving typed words about what I should work to improve."
- "I thought it was awesome. When entering the class, I figured we were not going to get any feedback on anything and when I checked my paper I thought WOW this is so cool. I felt like it was a way that brought us closer to the instructor."
- "It… reminds me that my paper is graded by a teacher and not a machine."

Students also stressed how this process allowed them to see that the instructor was actually reading their papers and how important this is for their course experience:

- "It was possible to see that the paper had actually been read."
- "I appreciated that the teacher took the time to personally look over my work and write her thoughts and opinions about my papers."
- "I also like that it makes me feel that a good deal of time was put into the feedback. That was important."
- "It makes you feel like someone actually took the time to read your paper because the feedback is personal and addresses specific parts of the writing."

The survey responses send a clear message. Students saw this feedback method as providing personalized contact with the instructor, and, they viewed that connection as being especially valuable in the online setting. This highlights the importance of the student-teacher relationship in online classes (Mullen &Tallent-Runnels, 2006; Vonderwell, 2003) and supports past research that the feedback process plays a critical role in promoting such connections in online courses (Gilbert et al., 2007; Thurmond & Wambach, 2004).

Students also expressed views similar to those reported in Mullen and Tallent-Runnels (2006) and Vonderwell (2003) regarding the impersonal nature of the typed communication common to online courses. And, in contrast, they praised inked feedback as helping to improve this situation by giving a more human aspect to the process and more closely approximating the personal interchanges found in traditional classrooms.

Specific and Clear Feedback

Students indicated the feedback helped them to see what their mistakes were, what they were doing well, and how to improve their skills. Eighty-six percent responded with always or usually to the statement, "Having the template and the inking comments allowed me to focus my attention on the problem areas of my writing." This same view was repeated in 44% of the open comments made about the positive aspects of inking. Some examples are

- "I was able to see what the professor had a problem with, instead of searching for it…It gave me a chance to read over a sentence to see the difference between what I wrote and what she added."
- "It was easier to understand the areas that I needed to work on and what areas I did well in."
- "It [the template] has different sections (content, style, grammar), so the students know…their strength and weakness."
- "The most positive aspect is seeing the…mistakes made. It is very similar to the corrections and feedback…on papers returned back in person. The template also gives you more detail and understanding."

Furthermore, other comments specifically highlight the contrast between this method of feedback and the more traditional approaches to online feedback in terms of helpfulness in understanding what and how to improve:

- "I really liked having the 'inked' feedback on my papers because often times when getting feedback in online classes it is in an email which is more difficult for me to follow. It was nice to be able to have the feedback right next to the portion of the paper that needed more work."
- "It was better than just receiving general comments at the end that referred to problem portions of the paper."
- "I like having comments written exactly where the problem is rather than ONLY at the end."
- "It allows for the instructor to specify distinct areas that need improvement for each individual rather than a generic response."

These results indicate the students in this study recognized the value of and were anxious to receive clear feedback on their work (Hara & Kling, 2001; Song et al., 2004; Thurmond & Wambach, 2004). They reported that the template provided a good indication as to what the assignment requirements were and that the inking combined with the template helped them to understand both their mistakes and successes. Some students also noted that they found this process more detailed and easier to understand than other forms of online feedback - such as a summary grade, general comments, or a generic response – thus, illustrating its usefulness for providing unambiguous feedback in comparison to several of the other more commonly employed methods.

Helpful for Future Writing

Students also reported using the feedback to improve their future writing in the course. To the question, "How often did you use your instructor's suggestions when writing your next assignment?" 79% replied always or usually. And, 82% said they always or usually felt, "My instructor's feedback helped me to succeed in this class and to improve my writing."

The usefulness of the feedback for future assignments was mentioned in 60% of the open-ended comments to "list the most effective aspects of this instructor's writing feedback." The following statements illustrate this:

- "The template was helpful because after the first assignment, I knew from that what the instructor was looking for, as in how detailed our papers should be."
- "I think that having the template allowed for the students to have a guideline of what their writing should include that way the instructor

and the student are on the same page and have a mutual understanding of what the guidelines are."

- "Often you have to guess what the teachers expect and the type of writing they prefer. With the template, you don't have to guess."
- "I liked getting criteria to work on and what I should prevent writing the next time. Very helpful!"

Although one student wrote that she benefited from the instructor

- "…referring me to some of the links or websites to help me fix some areas of my writing for future assignments."

38% of the students indicated that they rarely or never consulted the websites links, even when their performance in an area was weak (survey question 11). Only 23% said they did this on a regular basis. Given that the instructor comments on the template directed students to review the websites whenever their work was weak in a particular area, it is clear that more needs to be done to help them assume a more active role in this. It may be that students need explicit instruction on how to make use of the template information--including something as seemingly obvious as the links (Butler & Winne, 1995; Goodrich Andrade, 2001).

Legibility Issues

This feedback process was popular with the students, and 34% specifically reported they saw no negative aspects to it at all, but there was one commonly reported issue—an occasional inability to read the writing. Approximately 50% of the responses to the survey item asking students to list any negative aspects of receiving inked feedback were about legibility. The comments below are typical of what students wrote:

- "Sometimes I had a hard time reading what the words said. However, this only happened on occasion."
- "Sometimes, I had trouble reading some of the comments, but [I] was able to after focusing."
- "I think using another color rather than red would be easier on the eyes."

Approximately 56% of students responded with "always" or "usually" to the statement, "When I didn't understand the instructor's comments or suggestions, I contacted her for clarification," and no students reported problems reading the feedback during the term even though email was sent encouraging anyone experiencing this issue to speak up. Given this, and that legibility was brought up only after being asked to raise negative issues, it does not appear to be a serious drawback in the eyes of the students.

Conclusion

Helping students to improve their writing skills is an important and challenging task. If we are to be successful in this effort, we need to provide students with feedback they find useful and motivating. The focus of this study was to ascertain student views on the use of a template in combination with the inking feature of a TabletPC for feedback on written assignments in an online course. The findings clearly show that the method was well received by the students and that they considered it to be highly personalized, clear, and helpful.

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APPENDIX A
Feedback Template

Student Name:
Project #:

Paste Your Semester Writing Goals Here:

Paste Your Completed Project Essay Here
[Double-Space Your Work & Use 12 Font Size]
(Note that the box will expand to fit your writing)

Instructor Feedback

A. Structure of the Essay [1 point]

For improving this section of your essay see:
http://www.calstatela.edu/centers/write_cn/e100essayorg.htm
http://www.dartmouth.edu/~writing/materials/student/ac_paper/write.shtml

1. Does the introduction present a clear statement of the issues to be covered?

2. Does the essay have a clear structure or organization in which
    a. the main points are developed logically?
    b. the relevance of the material to the theme or argument is clear?

3. Is there an effective conclusion that draws the main point/s together?

Comment on A:

B. Content [4 points]

For improving this section of your essay see:
http://www.calstatela.edu/centers/write_cn/e100devess.htm as well as your readings and **project instructions** for this seminar

4. Is there evidence of adequate reading and research?
5. Is the breadth of coverage adequate?
6. Are the issues and ideas analyzed in sufficient depth?
7. Are the arguments supported by evidence, examples, and sources?

Comment on B:

C. Analysis [3 points]

For improving this section of your essay see:
http://www.dartmouth.edu/~writing/materials/student/ac_paper/logic.shtml

8. Are the arguments logical and consistent?
9. Are the opinions based on research and fact?
10. Does the essay show evidence of original thought?

Comment on C:

D. Presentation [2 points]

11. Fluency, style, and clarity of writing
    http://www.dartmouth.edu/~writing/materials/student/ac_paper/style.shtml
    http://www.calstatela.edu/centers/write_cn/e100clarity.htm
    http://www.calstatela.edu/centers/write_cn/e100effsent.htm
    http://cctc.commnet.edu/grammar/composition/composition.htm

12. Spelling, grammar, paragraphing
    http://cctc.commnet.edu/grammar
    http://www.dartmouth.edu/~writing/materials/student/ac_paper/grammar.shtml
13. Sources: Acknowledged and properly cited?
    http://www.apastyle.org/

Comment on D:

Grade:

Additional Sources for Improving Your Writing

http///www.calstatela.edu/centers/write_cn/e100proofcheck.htm
http://www.dartmouth.edu/~writing/materials/student/ac_paper/advice.shtml
http://www.powa.org/edit/index.html

APPENDIX B
Writing Feedback Survey

Directions: Please mark the response that most closely reflects your view of the feedback that you typically received in this class. Remember that your responses are totally anonymous and your name will not be connected with your answers.

Question 1

I carefully reviewed my instructor's comments on and corrections to my writing assignments.
a. Always b. Usually c. Sometimes d. Rarely e. Never

Question 2
How often did you understand your instructor's comments and corrections?
a. Always b. Usually c. Sometimes d. Rarely e. Never

Question 3
My instructor gave me positive or encouraging comments.
a. Always b. Usually c. Sometimes d. Rarely e. Never

Question 4
When I didn't understand the instructor's comments or suggestions, I contacted her for help or clarification.
a. Always b. Usually c. Sometimes d. Rarely e. Never

Question 5
My instructor's feedback helped me to succeed in this course and to improve my writing.
a. Always b. Usually c. Sometimes d. Rarely e. Never

Question 6
How often did your instructor comment on the content of your writing?
a. Always b. Usually c. Sometimes d. Rarely e. Never

Question 7
How often did your instructor comment on the style of your writing?
a. Always b. Usually c. Sometimes d. Rarely e. Never

Question 8
How often did your instructor comment on your grammar and/or syntax?
a. Always b. Usually c. Sometimes d. Rarely e. Never

Question 9
How often did you use your instructor's suggestions when writing your next assignment?

a. Always b. Usually c. Sometimes d. Rarely e. Never

Question 10
It was clear that my instructor put care and effort into her feedback.
a. Always b. Usually c. Sometimes d. Rarely e. Never

Question 11
If my performance was weak in an area, I consulted the websites provided in the template/feedback form for additional help.
a. Always b. Usually c. Sometimes d. Rarely e. Never

Question 12
I thought the "inking" (handwritten) feature gave a more human aspect to the feedback I received.

a. Always b. Usually c. Sometimes d. Rarely e. Never

Question 13
I thought the template was a good way to receive feedback on my writing.
a. Always b. Usually c. Sometimes d. Rarely e. Never

Question 14
Having the template and the inking/handwritten comments allowed me to focus my attention on the problem areas of my writing.
a. Always b. Usually c. Sometimes d. Rarely e. Never

Question 15
In your view, what were the positive aspects of receiving "inked" (handwritten) feedback on your writing?

Question 16
In your view, what were the negative aspects of receiving "inked" (handwritten) feedback on your writing?

Question 17
Please list any ways that you think would change or improve your instructor's writing feedback to students.

Question 18
Please list the most effective aspects of this instructor's feedback.

Question 19
Please list any special issues or problems that you believe impact your writing ability.

Question 20
Is English your native language?
a. yes b. no

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Exploring Faculty Learning Communities: Building Connections among Teaching, Learning, and Technology

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Faculty learning communities (FLCs) provide their members with both information and support as they move toward utilizing digital technology tools, learn new skills, and share meaningful instructional practices. This paper emerges from the initial year of an FLC established in a large urban research university with a focus on integrating digital technology and instruction. Key aspects of an FLC are addressed, including the effectiveness of the FLC in reshaping the nature of members' engagement in the academy, the challenges and opportunities of creating an FLC, and the power of FLCs to enhance the way faculty learn about technology.

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; Levin & Arafeh, 2002; 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. Thereby, they give themselves more intellectual space for the research endeavor (Ouellett, 2004) but arguably fail to keep their teaching abreast of current understandings of what constitutes pedagogical best practice for their students.

Student Expectations

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 favors 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.

Today's students expect to find ubiquitous access to technology in the colleges to which they apply (e.g., Caruso & Salaway, 2007), and the cost of providing such penetration has been a concern for some time at both the school and college levels (e.g., Dugan, 2002; Johnstone & Poulin, 2002). Simkins (2006) and Pitler (2006) claimed that U.S. schools spend millions of

dollars each year on various forms of technology. It is understandable that the graduates of these schools expect to find the expensive infrastructure to support mobile computing devices through wireless Internet access, classroom response systems, access to multiple web-based or web-distributed software applications and learning management systems when they reach college campuses (NMC & ELI, 2007). These technologies have made "anywhere, anytime" communication and access to information a central feature of the modern learning landscape, and colleges have to be continually on the lookout for ingenious ways to pare back the cost of supporting academic technologies, while still providing other facilities that sustain their attractiveness to students (e.g., Gose, 2006).

Faculty Capacity

Against this background of financial commitment on the part of college administrations and growing expectations on the part of college students for the use of digital technology in learning and teaching, individual faculty members must contribute to making informed decisions about the role of digital technology in supporting teaching and learning in their courses. Some have suggested that digital technology has missed the mark in terms of supporting teaching and learning (Christensen, Horn, & Curtis, 2008; Cuban, 2001; Dynarski et al., 2007). At the pre-college level, for example, Becker (2001) reported findings from a 1998 national survey of more than 4,000 teachers of students from grades 4 through 12, which asked teachers to provide information "about their teaching philosophy and actual teaching practices in one specific class, [and] their access to and use of computers as a classroom teaching resource [as well as] in their own professional work" (p. 1).

Becker (2001) found that student experience with computers occurred primarily in four contexts: "separate courses in computer education, pre-occupational preparation in business and vocational education, various exploratory uses in elementary school classes, and the use of word processing software for students to present work to their teachers" (p. 2). Becker went on to comment that the more academic use of computers in the context of "acquiring information, analyzing ideas, and demonstrating and communicating content understanding" (p. 2) occurred in only a small minority of secondary school academic classes. Along the same lines, Cuban (2001) characterized digital technology as oversold and underutilized.

At the postsecondary level, Kuh, Kinzie, Buckley, Bridges, and Hayek (2006) asserted that "widespread use of effective pedagogical practices must be at the core of any agenda to promote student success" (p. 66). They focused on the role of instructional technology in "restructuring the teaching and learning environment [to shift the emphasis] from faculty teaching to student learning" (p. 66). Twigg (2005) suggested that courses redesigned to incorporate digital technology make teaching and learning a more active and learner-centered exercise. In a finding that supports the value added to learning by access to digital technology, Nelson Laird and Kuh (2005) found that first-year students who frequently used information technology for classroom-related purposes saw their courses as emphasizing higher-order thinking skills. Further, contact with the faculty was apparently enhanced by these same students' interaction online with their academic peers.

Such findings suggest that there are signs that the potential of digital technologies may be being realized in higher education, but there also has been much concern about the growth of a gap between what students expect from today's college faculty in terms of digital technology integration and the capability of the faculty to achieve such integration (Levin & Arafeh, 2002). Faculty members not only need support and training in how to use digital technology tools, they also need to be able to select those tools that are best suited to their learning goals—those that seamlessly integrate with and complement the subject matter they are teaching.

Addressing these needs involves empowering (Gordon, 2004) faculty members to share in the discussion of how technology is re-shaping the expectations for what constitutes engagement in the academy. Faculty need opportunities to engage in discussion with each other about enlightened instructional practices in the digital age and how digital technology can enhance such practices. While stand-alone workshops provide necessary introductions to the uses of specific tools and some insight into their potential, the likelihood that a stand-alone workshop will effect lasting change in behavior is minimal (Glickman, Gordon, & Ross-Gordon, 2007). The stand-alone workshop has long been a staple of professional development in education but has also long been regarded as ineffective, leading Glickman et al. to cite Wood and Thompson's reference to staff development as "the slum of American education" (p. 352). Gordon (2004) characterized much educational professional development as "well meaning, of some short-term benefit to some teachers, but ultimately unsuccessful" (p. 6). In a brief introduction, such as can typically be delivered in a stand-alone workshop, considerations of effective pedagogy and critiques of the digital tools themselves can receive only a passing glance. This leaves faculty in a position where, if they accept the digital technology at its face value, they are left to sort out the details of its instructional integration in their field outside the context of professional development.

The Faculty Learning Community

The belief that learning occurs most effectively in a community is not a new one. Notably, Dewey (1916/ 2004) placed a high value on the role of shared inquiry in education. He commented that "setting up conditions which stimulate certain visible and tangible ways of acting is the first step. Making the individual a sharer or partner in the associated activity…is the completing step" (p. 14). More recently, DuFour, DuFour, Eaker, and Many (2006) reviewed efforts since 1998 to delineate and advocate the role of professional learning communities in schools. They proposed that a learning community is focused on enhancing the learning of each student, and guided by a vision of what the organization must become to facilitate this, in particular, that the individuals in the organization must also be continually learning.

Cox (2001) discussed the concept of a faculty learning community (FLC) in the college context and defined the nature, role, and processes of successful faculty learning community programs. Findings emerging from Cox's work suggest that faculty participation in FLCs can increase interest in teaching and learning, as well as provide a supportive space for faculty to explore, evaluate, and adopt new instructional practices and tools.

FLCs can be either cohort-based or topic-based. Cohort-based FLCs tend to address the identified needs of a specific group of faculty, for example, departmental chairs or graduate students preparing to be future faculty. Topic-based FLCs tend to address shared teaching and learning needs or issues among an interdisciplinary group of faculty members (Cox, 2004). This paper explores the impact of a topic-based FLC at a large urban research university. The faculty involved explored the topic of how using technology could enhance teaching and learning.

Building the FLC

The impetus for starting the Using Technology to Enhance Teaching and Learning FLC was generated by unease concerning answers to the following questions:

1. What opportunities exist for faculty members to learn about using digital technologies in instructionally appropriate ways?
2. Where can faculty members go to participate in learning communities that explore and examine digital technologies that have potential to enhance teaching and learning?
3. How can faculty members be empowered to be knowledgeable stakeholders in determining how instructional technologies shape their work (as opposed to being shaped by those technologies)?

Beginning in the summer of 2006, faculty members from across the university were invited to apply to be part of the Using Technology to Enhance Teaching and Learning FLC. Participants were invited to consider this one-year commitment to explore using technology as an instructional tool that supports learning in the classroom, regardless of prior capability or experience. Eight faculty members were invited to join the FLC, with representatives from the Schools of Education, Nursing, and Chemistry, and from the Departments of Art Education and Art History in the School of Arts and Sciences. The advertised purpose of the FLC was to offer members the opportunity to investigate, discuss, implement, and critique the integration of digital technology into their teaching as a means of enhancing student learning. Key outcomes were identified as including (a) identifying the strengths and weaknesses of particular technology tools, (b) determining the appropriate use of technology, and (c) considering methods for assessing the impact of technology on learning outcomes.

FLC participants determined the selection of topics for seminars and workshops and set the agenda for the activities of the FLC throughout the academic year. Meeting bi-weekly for the duration of the academic year, FLC members explored a wide range of possibilities for integrating technology into teaching, including social networking tools, blogs, wikis, podcasting, web literacy, and the growth of web 2.0 tools and techniques. During the spring 2007 semester, participants built on the knowledge and insights gained during the fall semester to propose projects aimed at using digital technology to enhance student learning. Faculty projects varied across the members' fields of expertise and included exploring podcasting of lectures and course material, continuing engagement with an online learning technology, and expanding the functionality of a blog on assistive technology by adding audio and video podcasts and real simple syndication (RSS) feeds.

Facilitating the FLC

The Using Technology to Enhance Teaching and Learning FLC was facilitated by a staff member from the university's Center for Teaching Excellence, whose academic field spanned pedagogy and the integration of technology with instruction. The primary role of the facilitator was to provide training and resources to assist the FLC members in their exploration of identified topics and tools. Many sessions (particularly in fall 2006) began with focused input and explanation

from the FLC leader. Topics included podcasting (both accessing and creating), blogs, wikis, web literacy, Web 2.0, RSS feeds, social bookmarking, distributed networks, and shared/reusable resources. All sessions invariably included individual faculty reflection and sharing of the on-going exploration of discussion topics from the previous meeting and tentative classroom applications. Each meeting uncovered new layers of meaning for effectively using technology in teaching, inspired not only by the functionality of the tools but also by their perceived value to support learning.

Funding, Support, and Expectations

Each FLC member received up to $1,000 to support the integration of technology into teaching and learning in his or her field. As will be discussed later, this monetary incentive was definitely a factor at the outset of the FLC. It was a large enough sum to validate the time commitment required of faculty. Some FLC members purchased hardware and software, and others attended and presented at conferences that featured sessions on the instructional integration of technology. A portion of the funds were distributed at the beginning of the FLC, with the balance being remitted to the members' schools/departments for disbursement in full by the close of the 2006-07 academic year.

FLC members were expected to attend the bi-weekly meetings and discern ways in which the familiarity they developed with the digital technologies could be used to enhance their own pedagogical practices. While the exigencies of unscheduled demands ensured that not all FLC meetings were fully attended, absent members were kept apprised of progress by meeting minutes and resources posted online in an FLC Blackboard space. In addition, FLC members who were absent for some particular aspect of the meeting were frequently brought "up to speed" by personally contacting the facilitator before the following meeting. The expectation that the knowledge gained would impact the FLC members' pedagogical practice was also taken seriously. Time was set aside during meetings for members to "float" ideas and benefit from feedback from their colleagues. Three FLC members instituted readily identifiable innovations (for example, creating podcasts of lectures, using wikis as class collaboration tools), with others making adjustments to their practice to accommodate their new learning (for example, adding a blog to an existing website providing assistance for educators working with children with special needs).

Faculty Learning Community Reflections

FLC members were highly complimentary of their experience. A large part of the success of the FLC was the expertise of the facilitator, both in terms of the digital technologies themselves and in terms of the practical application of adult learning principles. Some of the FLC members could be described as "early adopters;" whereas others, although not neo-Luddites, were well-removed from the cutting edge use of instructional technology. The diversity of disciplines added to the richness of dialogue during the FLC meetings on the questions that arose around digital technology and pedagogical practice. In some cases, considerable time outside the meeting was needed to reposition some members on the FLC learning curve.

One of the co-authors of this paper, in commenting favorably on the format of the FLC, noted that "I have been safely conducted so far out of the box that it is difficult for me to even see that container any more!" This co-author valued the approach to learning which was employed in the FLC and felt that personal barriers to learning were respectfully demolished while respecting the participants' personal autonomy.

This co-author's comment highlighted the way in which the regular meeting schedule contributed to the continuing viability of the FLC and implied that meeting in the context of the FLC provided stimulus for change while helping sustain a belief in the value of integrating digital technology in teaching and learning. Much more time was involved in the FLC meetings than would have been consumed by just learning a digital technology application, but the comment suggested that the application to learning and teaching may not have been as effective in the absence of group support, engagement, and collaboration. This reflects a perspective held by several FLC members of the importance of establishing a safe environment for taking risks and the value of engaging in meaningful dialogue with colleagues about experimental instructional practice.

Expanding further on the impact of the interactive aspect of learning in the FLC, another co-author reflected that "this experience [has added] depth to my understanding of the socially constructed nature of learning and the co-construction of meaning. We [were] participants engaged in redefining the art and practice of teaching."

This co-author reflected on the value added to the discussion as a result of the diversity of academic disciplines represented in the FLC. For this participant, the dialogic context of the FLC was supportive of her already established epistemological beliefs, and she spoke with enthusiasm about the significance of the experience.

A third co-author commented that, for her, the digital technologies that the FLC investigated had great potential for impacting not only "how courses are taught on the university campus but [also] the ways that humans interact." From her perspective as someone

nearing retirement, she saw the potential for digital technologies in enabling the current senior population to stay engaged with life even as increasing age limits both "physical dexterity and mobility." Even more importantly, this faculty member arrived at a crucial realization about herself and her students: "One of the first things I learned in our FLC was that everyone is technologically illiterate in one way or another. Even my students who may be proficient at text-messaging, or downloading files from iTunes and other web sites may not be proficient at understanding how to evaluate the quality of their sources or how to be critical consumers of Internet content." For many seasoned faculty members, the assumption that today's students are technologically savvy often serves as a barrier to risk taking and exploration of new educational uses of technology. Shifting this perspective may be an important step for faculty members who are at the early stages of exploring how they will adopt and use technology in their teaching. Participation in the FLC crucially supported the development of perspectives that encouraged risk taking, increased confidence, and resulted in a strengthening of self-efficacy related to teaching with technology.

The third co-author's response above dovetails nicely with the following final co-author's response in that it focused on the role of digital technologies in empowering those who can be given access to them. This final reflection combines with the preceding one in highlighting many of the overarching themes addressed over the course of the approximately twenty meetings of the FLC throughout 2006-07. Some of these themes involved the relevance of social networking tools to the lives of present-day students and the educational promise of tools like blogs and wikis in the hands of innovative and skilled educators. For example, this co-author is heavily engaged with a grant project and commented that she had "experienced much success with [a blog] that provides a quick and simple interface for keeping our educators apprised of new developments in the field." That blog has become a major communication tool for her grant project, and she indicated that "a recent review of our web statistics indicated we had over 50,000 hits to this information portal," indicating that the blog has achieved a high level of credibility in her field.

Next Steps and Future Directions

Evidence of Effectiveness

The reflections recorded above attest to the value placed by the members of the FLC on their experience. No formal assessment of the impact on teaching and learning was envisaged or conducted. As mentioned above, three of the eight FLC members made readily identifiable enhancements to their teaching repertoire. One FLC member has documented his experience for publication (Reardon, 2008). At the end of the 2006-07 academic year, the majority of the FLC members opted to extend their involvement through the 2007-08 academic year to collaborate in conducting a university-wide survey of the expectations of undergraduates concerning digital technology integration in their courses and the ability of the faculty to implement such integration. All of these are evidence of the effectiveness of the FLC as "the completing step" (Dewey, 1916/2004, p. 14) of shared inquiry.

Replicability

Some of the continuing members of the FLC recently spent time reflecting together to identify key aspects of the success of this venture. The most obvious factor they identified was the sponsorship of the FLC by the Center for Teaching Excellence. By maintaining and appropriately resourcing the Center for Teaching Excellence, the university continues to send a strong message to the academic community about the value of high quality teaching and learning. Another key factor they identified was the effective leadership of a non-judgmental expert in the field. Without the "safety net" of ready access to such expertise, the incentive for FLC members to try something different would have been significantly lessened.

In addition, the time commitment itself was a factor in the success of this venture. William (2007) discussed the role of teacher learning communities in developing skill in using formative assessment and commented on the key role of regular meeting times. In William's case, the suggestion was to meet for at least 75 minutes on a monthly basis. Contrary to William's suggestion that "meetings every two to three weeks are too frequent" (p. 39), the FLC members suggested that the commitment to meeting for two hours every two weeks was a significant factor in the success of this venture. Without overstating this point, such a time commitment made it individually unacceptable for there to be no outcomes.

As mentioned earlier, the remuneration offered to FLC participants was also a significant factor. For some, the ability to purchase hardware and software to facilitate those individuals to follow through with their ideas was strong incentive for innovation. Other FLC members took advantage of the remuneration to travel to conferences to present papers and to learn more about effective implementations of educational technology, with consequent renewed determination to make a difference to their practice.

Looking at the initial year of the FLC in retrospect, is was clear to the continuing FLC members that they had been engaged with an adult learning model which

closely approximated what Spear and Mocker (1984) referred to as an organizing circumstance. While the FLC structure did not invoke self-directed learning in a strict sense, there was no compulsion for members to pursue any one line of investigation, and the topics discussed by the leader were presented as a smorgasbord of ideas from which the participants could take as they pleased. Hence, the projects with which individuals engaged derived their structure and direction from the resources which the FLC environment provided. This emergent insight into the success of the FLC is the focus of the members' reflection in this second year.

Ultimately, it is important to note that peer interaction and discussion about the role of technology in education, critiques of specific tools, and sharing the success and failure with implementation in the classroom were central to the learning of the FLC members. As the members wrestled with using technology and resultant changes in their instructional practice, their participation in the group took on increased importance. We believe that engagement with technology in a supportive collegial environment over an extended period of time has equipped us for the meaningful and deliberate use of technology tools to support teaching and learning. We encourage the broad range IT stakeholders, as they share their expectations for use of technology in teaching, to take into account the experiences of this FLC as future plans are made to support university faculty in this endeavor.

Impact on the University

Although the experience of being a member of the FLC on Using Technology to Enhance Teaching and Learning was sufficiently positive that the majority of the members returned for a second year, the influence of the FLC in terms of university policy could be compared to a ripple on the surface of the academic pond. Certainly, there are now more satisfactory answers to the three questions that provided initial impetus for the FLC. There is now a structure in place whereby faculty members can learn about using digital technologies in instructionally appropriate ways by participating in a learning community that supports the exploration of digital technologies and their integration into teaching and learning.

In addition, the commitment among the FLC members to collaborate in conducting a university-wide survey of the expectations of undergraduates concerning digital technology integration in their courses and the ability of the faculty to implement such integration (mentioned above) opened up a conversation about "how faculty members can be empowered to be knowledgeable stakeholders in determining how instructional technologies shape their work" (stimulus question #3). In the technology survey, freshmen, undergraduates with significant university experience, and all teaching faculty were invited to respond to a series of questions designed to elicit their views on the role of digital technology in teaching and learning. This survey generated some unexpectedly vigorous responses, and the FLC will continue to explore the implications of the survey.

Finally, in the summer of 2007, the ripple reached the edge of the pond when the university announced the creation of three new FLCs under the auspices of the Center for Teaching Excellence (Developing Engaged Online Learners, Problem-Based Learning, and Fostering Adjunct Faculty Success). By broadening its support for the FLC concept, the university is giving tangible evidence of its continued commitment to promoting the professional development of faculty and the enhancement of teaching and learning.

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Presence Pedagogy: Teaching and Learning in a 3D Virtual Immersive World

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As the use of 3D immersive virtual worlds in higher education expands, it is important to examine which pedagogical approaches are most likely to bring about success. AET Zone, a 3D immersive virtual world in use for more than seven years, is one embodiment of pedagogical innovation that capitalizes on what virtual worlds have to offer to social aspects of teaching and learning. The authors have characterized this approach as *Presence Pedagogy* (P2), a way of teaching and learning that is grounded in social constructivist theory. In it, the concepts of presence, building a true community of practice, and constructing an online environment which fosters collaboration for reflective learning are paramount. Unlike learning communities that might emerge from a particular course taught under more traditional circumstances, students engaged in a P2 learning environment become members of a broader community of practice in which everyone in the community is a potential instructor, peer, expert, and novice—all of whom learn with and from one another.

Students enrolled in ITC 5220, Computers in Educational Settings, are meeting in AET Zone to work on a group project. There, they find not only the communications tools to collaborate effectively but the content resources to assist in their endeavor. After a while, they run into a real stumbling block: a question that can only be answered by their instructor. Without this guidance, they really cannot move forward. They look around, but their instructor, Amy, is not online at the moment. Fortunately, they see DR – not their own teacher, but one they have met and spoken with in the past, one who has taught this same course many times. He joins their conference, and within minutes they are back on track and moving forward.

Meanwhile, a pair of students enrolled in LIB 5020, Information Sources and Services, is posted nearby at a virtual reference desk in front of a virtual library. An avatar of a student enrolled in the Higher Education program approaches the library science students and is greeted by one of them. The higher education student is looking for information about university accountability and subsequently is escorted by one of the reference librarian avatars into the virtual stacks to locate resources on this topic.

These are typical examples of the teaching and learning that takes place in AET Zone, a 3D immersive virtual world learning environment used by faculty members and students in the Department of Leadership and Educational Studies in the Reich College of Education at Appalachian State University. Students work and interact with others present in the world, often across the traditional boundaries of class, course, or program area. Students respond to feedback and advice offered by faculty and peers present in the world when they are. Students are not limited only to their own course instructors, but instead are free to interact with and learn from instructors and peers from other courses and across multiple program areas. Students utilize tools and resources ever present in the world in the context of authentic, hands-on activities, and projects. The multiple manifestations of presence enabled by this combination of content, context, and activity are the critical attributes for engagement among students in a social constructivist learning environment. Embedded within an immersive virtual world, they combine to create a new approach to teaching and learning that, in many ways, is significantly different from those on which educators traditionally rely and those which students typically expect.

Problems and Challenges

Postsecondary enrollments are rising, and, in response, most colleges and universities offer some form of distance education, which utilizes the Internet and uses asynchronous tools as the primary mode of instruction. However, the most widely available tools offer little support for the formation of web-based learning communities or different kinds of teaching and learning. Making sure we offer our distance-based students at Appalachian State an online environment that is analogous to the face-to-face environment of traditional students in ways consistent with our social constructivist philosophy is important to us and continues to guide our efforts to develop our online spaces the right way. Jonassen (2006) argues that technologies should be used to keep students active, constructive, collaborative, intentional, complex, contextual, conversational, and reflective. It is our goal to ensure that technologies are effectively utilized to create such learning experiences for our students.

Our typical student is a K-12 educator working full-time and attending graduate school part-time. Most live and teach within a 150 miles of the university.

FIGURE 1
Students in ITC 5220 Have a Group Discussion in AET Zone

Most required courses are offered to cohorts of students who meet face-to-face in designated locations near their homes and/or their workplaces. Nearly all of our course content is online, and most interaction between students and faculty occurs online. We do hold regular face-to-face meetings; however, as cohorts gain confidence and experience online, face-to-face meetings become less frequent. A handful of courses are entirely online.

As we developed our online courses, we were challenged to look past the tools, models, and methods of today and to consider what our program could become. Traditional tools for distance education make it difficult to support the social side of learning. They do not account well for social presence, serendipitous interaction, and informal learning as well as virtual worlds (Sanders et al., 2007). Guided by these principles of social constructivism, we developed AET Zone—our 3-D virtual world for learning. Descriptions of a 3D web-based learning environment (Appalachian Educational Technology Zone or AETZone) have been noted in other research (Bronack, Riedl, & Tashner, 2006; Riedl, Bronack, & Tashner, 2006; Tashner, Bronack, & Riedl, 2005).

A Social Context for Learning

The faculty within Appalachian State University's Reich College of Education have developed a Conceptual Framework (Reich College of Education [RCOE], 2005) based upon social constructivism (Vygotsky, 1978) that guides teaching and learning within AET Zone. The following concepts serve as the foundation for this framework:

- Learning occurs through participation in a Community of Practice;
- Knowledge is socially constructed and learning is social in nature in a Community of Practice;
- Learners proceed through stages of development from Novice to Expert under the guidance of more experienced and knowledgeable mentors and among like-minded peers in the Community of Practice;
- An identifiable knowledge base that is both general in nature and also specific to specialties emerges from focused activity within the Community of Practice;
- All professional educators develop a set of Dispositions reflecting attitudes, beliefs, and values common to the Community of Practice.

The design and development of AET Zone is guided by these principles. As a result, the virtual environment serves as a powerful space through which effective learning communities may be formed and nurtured. Gilman et al. (2008) describe the literature as divided on the actual meaning of learning communities. Others use the term “community of practice” which seems to indicate communities of similar practitioners who are currently exploring various aspects of their practice together. Wenger (1998) states that communities of practice are joint enterprises that are understood and continually renegotiated by its members, where mutual engagement binds members together into a social entity and the shared repertoire of communal resources (routines, sensibilities, artifacts,

vocabulary, styles, etc.) that members have developed over time. Wenger (2006) also states that communities of practice develop around things that matter to people and that, as a result, their practices reflect the members' own understanding of what is important. Tools are offered in support of the kind of problem solving that happens when information occurs in activity. Prompts and activities offer all learners the ability to participate in projects, discussions, and other activities at different levels of complexity as they develop and gain more experience. Finally, learners have multiple opportunities throughout AET Zone to turn interactions into artifacts and ways of knowing into expertise (Sanders et al., 2007).

Recently emerging research and the emergence of 3D web-based environments for teaching and learning is suggesting the importance of the sense of presence and co-presence in the development and evolution of online communities (Schroeder et al., 2001). Students are aware of the presence of their instructors and colleagues when logged into the world; indeed, through the use of avatars, each can "see" the other. Students can approach other students and, using both audio and text, may talk to one another not only about course assignments but also about life, work, or the latest news. These planned and serendipitous interactions are key as students move from novice to expert, not only in their own content domains but in terms of being able to work collaboratively with other professionals. Their beliefs about teaching and learning are challenged, refined, and shaped by the process of learning together in an authentic social world of dialogue and discovery (Sanders & McKeown, 2007).

When considering learning as a social act, one must understand "social" in the broadest sense. From an etymological standpoint, social shares its root with words that mean "united," "allied," and "to follow." Social learning is about more than just having other people around; at its heart, social learning is about associated or allied intent to make oneself more in union with an "other" of which one is aware. Social constructivism, then, connotes the process through which we participate in a communion of associated intent toward a shared sense of understanding, a shared framework, or shared construct. An integral component of our emerging pedagogical model is the provision of a persistent social space to facilitate and to encourage serendipitous interactions between and among students, faculty, and others as they engage in collaborative, purposeful activity.

Presence Pedagogy

During the past seven years, the number of faculty members teaching in AET Zone has increased from one to six. As these numbers have grown, a dialogue has emerged about the design of the virtual space and what teaching and learning looks like in this space. Over time, this conversation has assisted us in recognizing patterns, strategies, and techniques we all tend to use in our teaching that differ from what we did in our face-to-face classrooms or in other web-mediated environments. We call this new model *Presence Pedagogy* or the *P2 Model*. Students and faculty share in the expectation that, at any given time, others will be present in the virtual world. The perpetual presence of others is a critical attribute of P2 learning environments. While these others may not be enrolled formally within the same courses—or even the same program areas—there is an expectation and understanding among all participants that all faculty instructors are my instructors and that all students in the world are my peers. Unlike the learning communities that often emerge via more traditional pedagogies, students engaged in a P2 learning environment are not limited to those within a particular section, class, course, or program. Rather, each becomes a member of a broader community of practice in which everyone in the P2 virtual community is a potential instructor, peer, expert, or novice who learns with and from one another.

The following sections describe the attributes of Presence Pedagogy and detail differences between Presence Pedagogy and pedagogies traditionally used in either face-to-face or web-mediated environments (i.e., WebCT, Moodle).

Core Principles of Presence Pedagogy

Pedagogy, historically defined, is the process by which one "leads a child." Some consider pedagogy to be the methods by which teachers manage an instructional environment (Banilower, Boyd, Pasley, & Weiss, 2006). We maintain a broader sense of pedagogy and consider it to be the set of skills, abilities, and dispositions one employs when helping others learn. This skill set often manifests itself as a collection of strategies, techniques, and styles for doing so.

How one puts to practice the defining principles of one's pedagogy is guided by beliefs about how educators and learners

- ask questions and correct misperceptions;
- stimulate background knowledge and expertise;
- capitalize on the presence of others;
- facilitate interactions and encourage community;
- support distributed cognition;
- share tools and resources;
- encourage exploration and discovery;
- delineate context and goals to act upon;

- foster reflective practice; and
- utilize technology to achieve and disseminate results.

Below, we will describe in detail how our implementation of Presence Pedagogy within a virtual world environment informs our decisions regarding each of these factors.

Asking Questions and Correcting Misperceptions

In traditional approaches to higher education, questions often are limited to clarification and frequently are reserved for times and places outside of formal instruction (i.e., after lectures). In many ways, however, questions are the key to implementing effectively a Presence Pedagogy approach. Indeed, the types of questions both students and instructors ask directly influences the levels and types of answers each receives, regardless of whether those questions are student- or instructor-initiated (Meyer, 2004). Garrison, Anderson, and Archer (2001) suggest that the effective understanding and use of questioning strategies (e.g., triggering, exploring, etc.) not only relate to the types of responses but also lead to improved support for "cognitive presence": the process by which meaning is created and confirmed through discourse across a community of learners.

Employing the P2 Model within an immersive virtual environment encourages instructors and students to employ an iterative process of cueing and questioning—rather than telling and commanding—to drive student learning. By asking questions, instructors guide and facilitate rather than limit and direct. Shifting from telling to asking not only empowers learners, but it also enhances instructors' abilities to evince, clarify, interpret, and challenge students' ever-changing base of knowledge (Toledo, 2006).

Virtual worlds provide opportunities to create spaces that support cognitive presence through the use of visuals and persistent spaces. These spaces provide a platform for both peers and experts to serve as catalysts for explicit, intentional learning. For example, one space popular among AET Zone participants is the So What? Saloon. A sign by the door notes the space's purpose: serving inquiring spirits. The So What? Saloon is modeled after an Old West watering hole: wooden chairs and tables are scattered about, a player piano is nestled by the door, and mugs and bottles sit atop a bar flanked by spittoons. As visitors mouse over each bottle, an important question in teaching with computers is revealed. Why should we have computers in educational settings? Should computers be the objects of study in K-12 schools? How do we know if our use of computers is enhancing student learning? Clicking on any of the bottles reveals a form through which students are encouraged to submit their own thoughts on each question. The player piano links to a database where ruminations from current and former participants are linked to each question. The visual of the saloon suggests that the space is a place for questioning, pondering, and conversation. The interactive database allows students to contextualize their own answers and to reflect on the thoughts and questions of their colleagues and peers.

Stimulating Background Knowledge and Expertise

For many, formal learning means suspending life lessons in favor of theory-laden, codified knowledge offered by an expert other, often resulting in an experience that is divorced from the real world in which the learner operates. Experience suggests that many learners struggle to integrate expert knowledge into their own ways of thinking, and few within formal learning environments perceive value in, or opportunities for, sharing their own knowledge in productive, useful ways. What often results is an environment that is disconnected from the real-world settings in which many learners already function, yet, for which, they are being challenged to prepare.

There is no single source of knowledge that is de facto better than others. Bruner (1997) suggests that what individuals know is surpassed by the knowledge that is gained via discussions within groups, and even this is eclipsed by the knowledge stored within the culture that exists among active communities. A core pedagogical premise within the P2 Model is the importance of fostering intentional learning behaviors (Scardamalia & Bereiter, 1996) by making the knowledge available within the learning environment germane to the real lives of learners. To do this, it is important to provide spaces and activities that allow all participants to share personal and professional experiences and to encourage that each recognize the background knowledge and expertise that results as meaningful, useful, and important.

Engaging all participants in knowledge-sharing, regardless of course, cohort, program, or department, is a key element of the Presence Pedagogy approach. Doing so surrounds learners with a rich base of knowledge from which to draw. One value of this base is the diverse and varied nature of the sources. Another is the validity attributed by learners to personal and professional knowledge vetted through a formal environment. Finally, allowing learners to share what they already know – and encouraging them to do so in a public, yet safe, way – helps instructors and others identify the cognitive hooks on which to hang new, formalized knowledge.

Virtual worlds provide unique opportunities for designing spaces and activities conducive to activating

background knowledge and expertise in useful ways. In AET Zone, students are encouraged to share what they know throughout the world. In the Case Study Conference Center, for example, participants are immersed in case studies drawn from real life and are offered a five-component process to guide their analysis. The process utilizes guiding questions and other prompts to engage students in identifying issues, viewing diverse perspectives, recalling various types of knowledge, proposing reasonable courses of action, and contemplating the positive and negative consequences one might expect to occur (Bronack & McNergney, 1999). Case analyses developed by the students are embedded within the virtual world and provide points for discussion and guidance for others as each develops his or her own analysis.

Capitalizing on the Presence of Others

Presence Pedagogy advances a peer-based approach to teaching and learning. The model promotes a flattened approach toward instruction that removes the preset hierarchy of expertise that is common across most educational models and replaces it with one in which all members of a learning community share in the responsibility for encouraging, challenging, and supporting one another. This is not to say that the P2 Model is completely egalitarian. There is an awareness and acceptance that the hierarchy and structure that expertise brings does exist within the community and that this expertise should be recognized and shared. Often, instructors possess this expertise. Many times, students possess unique knowledge as well. The P2 Model is an attempt to guide the structure of a learning environment in which all can benefit from the expertise regardless of who offers it. Presence Pedagogy encourages the support of a hierarchy of influence that is dependent upon knowledge available at any given time rather than one based on an a priori construct of power or prestige.

The P2 Model promotes a similar approach to supporting students. In virtual worlds, the presence of expertise available at the time is known immediately to all who are online and engaged. In AET Zone, we have adopted a naming convention that helps participants quickly recognize who are instructors and who are peers. Embedded avatars, called "greeter bots," announce the name and cohort of each participant the moment he or she enters the world. In this way, students immediately are made aware of the presence of those with expert knowledge and of more- and less-experienced peers. Each AET Zone instructor shares the responsibility of supporting students of all courses and all programs, not just those students enrolled in his or her respective courses. All students know this and are encouraged to interact with and ask questions of any instructor or expert in the virtual world, not just those to whom they have been assigned by the traditional university system. Recent survey results from Instructional Technology students suggest that participants respond well to this approach and, indeed, see themselves as part of a learning community rather than of a traditional hierarchical educational system. This survey included 121 current and former students in the instructional technology program and was administered in spring of 2007.

These results make evident the strong sense of community felt by a great majority of students participating in AET Zone. One student wrote, “I can confidently say that I feel I am a part of an effective and supportive learning community BECAUSE of the IT program. The conversations and collaboration between me and others in the program has grown, even after I graduated.”

Serendipitous interactions are a core asset of effective Presence Pedagogy environments. However, it is best for instructors and designers not to leave such interactions entirely to chance. Creating an environment that effectively capitalizes on the presence of others requires careful planning and thought and is fostered by well-designed spaces. For example, in AET Zone, all students – regardless of course, program, department, or year – always begin each session in the Commons. The Commons is a portion of the AET Zone virtual world that houses the Information Gardens (ASU’s virtual library), the Training Shoppe, the Discussion Depot, and other academic and not-so- academic spaces (e.g., the Break Game House and the Chit Chats Coffee

Table 1
As a Student in the Instructional Technology Program, I feel that I am Part of an Effective and Supportive Learning Community

	Percentage
Strongly Agree	71.9%
Agree	21.5%
Disagree	2.5%
Strongly Disagree	4.1%

Table 2
The Instructional Technology Program Promotes Continuous, Collaborative and Active Learning

	Percentage
Strongly Agree	81.8%
Agree	11.6%
Disagree	.8%
Strongly Disagree	5%

House). Designing a virtual world that places all participants in shared spaces fosters a social churn that, in turn, encourages serendipitous interactions among all participants.

Facilitating Interactions and Encouraging Community

Learning is not a singular event. Learning does not occur in isolation. Instead, learning happens in concert with others through mediated interaction. AET Zone is designed to encourage interaction and collaboration among students and faculty from multiple disciplines, across numerous courses, and at various points of development. Learning in this community is both reciprocal and recursive in nature. Novices prompt growth in so-called experts and vice versa. Likewise, the shared knowledge base that emerges from this process is not unilateral. Rather, what is already known shapes what is accepted as knowable, and the process by which learners apply new knowledge to existing questions supports and facilitates further knowing and learning.

Multiple spaces and tools embedded in these spaces offer support for interaction and community formation. The Chit Chats coffee house, the Discussion Depot, the Break Time Game House, Wiki World, and other similarly named spaces in AET Zone's Commons provide such spaces and tools to foster interactions between and among students and faculty members.

Communication and collaboration tools, while necessary, are not sufficient to encourage and promote community among learners. Presence Pedagogy requires that these mediated interactions be ongoing and intentional to build into the world an expectation that students will interact when logged into the world and that these interactions, whether planned or serendipitous, are an integral part of the students' coursework. Liu, Magjuka, Bonk, and Lee (2007) showed positive relationships between feelings of belonging to the community and social presence in the online courses. Sense of belonging to a social community was also positively linked to instructor presence and facilitation. Another study of online course work by Lee, Carter-Wells, Glaeser, Ivers, and Street (2006) shows that students cite community-centered approaches to learning and establishment of a constructivist learning environment as essential for building community during the course experience.

Supporting Distributed Cognition

Distributed learning has three major attributes: (a) learning communities containing people with varying backgrounds and levels of expertise, (b) technology which supports communication and productivity within the community, and (c) engagement in authentic activity (Winn, 2002). Virtual environments like AET Zone lend themselves readily to the facilitation of distributed cognition utilizing these three factors. If the act is distributed, then the process must be as well. The answer to "where does learning occur" cannot be simply stated as "in your head." Learning is a shared act - and both the process (cognition) and the artifact (knowledge) of that act must reside in more than one place, as well. Like a conversation - or a dance - learning is something we do concurrently with an "other." Sometimes that other is a physical, tangible, measurable one. Often it is simply a mediated one, whether mediated in our own head using the tools of language or perhaps mediated in bits, bytes, signs, symbols, or other media. This is where the concept of distributed cognition shows itself most clearly. In Vygotskian terms, distributed cognition is most evident in the Zone of Proximal Development (ZPD): that place where we can think and know beyond ourselves, via mediated interactions with others using tools, techniques, and technologies that are both familiar to us and also invisible.

One could argue that occasionally we can learn "by ourselves," assuming we think of the absence of a present other as being "alone." However, as soon as we as learners became aware of language, signs, symbols, and gestures, we became forever embedded in communion with the artifacts and intents of others. Even if when alone, one uses social speech inside his/her own head and interacts with artifacts of others' experiences with the intent of using the residue of those experiences as a way of shaping their own. The learner then shares their own experience back onto those cues, which, in turn, either solidify or reshape them.

Virtual environments such as AET Zone help educators create situations in which learners' performance is an outcome of emergent collaborative learning social networks (Cho, Gay, Davidson, & Ingraffea, 2007). The 3D context builds on learners' real-world knowledge by providing a visual metaphor, or visual narrative, of the course content. This provides a place for learning which is both familiar and engaging (Dickey, 2005). AET Zone by itself is nothing more than a virtual space. However, as a space it serves as a forum for students to form networks and communities through which learning occurs. Tools for communication and collaboration are dispersed throughout the virtual world. Cafés and coffee shops exist to provide text and audio conferencing tools for small and large groups of students; discussion boards, blogs, and wikis are posted allowing asynchronous access to conversations around issues related to course topics; and, virtual newsstands exist to provide up-to-date access to relevant RSS feeds, blogs, wikis, online journals, and other resources that might be relevant to students in all program areas.

Sharing Tools and Resources

Presence Pedagogy seeks to exploit the power of continuous, collaborative, and active learning that occurs when participants are made aware of each other and encouraged to share in the communal process of growth and development that results. An overview from a recent conference on building learning communities states that such communities:

> foster peer-to-peer collaboration, communication, interaction, resource sharing, negotiation and social construction of meaning, and expressions of support of encouragement among students. A blended or online learning community must have its own meeting or gathering space, as well as a defined set of members' roles and norms for resolving disputes. (Academic Impressions, 2006)

Simply situating more- and less-expert peers in a shared space does not, in and of itself, prompt sharing and learning. Only through mediated activity does this dynamic occur. Our virtual world is a generative environment that is modified continually, changing based on what both instructors and learners construct and contribute within it. Participants constantly add new reports, multimedia, and communication technologies to the 3D environment to create a living curriculum for student use. As new tools and resources are contributed, the interactions between those who are immersed in the world and the socially-constructed artifacts that result feed back into a common knowledge base. This base is the core of a shared understanding that, in part, defines the community of practice.

Participants in the Community of Practice that emerges not only are diverse in interests and professional assignments, but also fall along multiple points of the novice-to-expert continuum. Together, participants move forward in increasing their own knowledge and understanding, utilizing tools for communication and collaboration inherent in the 3D virtual environment such as voice- and audio-chats, common work areas, malleable artifacts, and persistent social spaces. Instructors engage students with relevant experiences through assignments and projects that encourage work that will be useful immediately in students' professional lives. The conversations and products that result involve real-world experience, and sharing them among and across participants provides a cognitive base for activity throughout each program and each cohort of students.

Providing and Delineating Context and Goals to Act Upon

Context comes from the metaphors, from the assignments, from the embedded assumptions that are both explicit and implicit within an environment. It also comes from the personal experiences and ways of knowing that individual students bring with them into an environment and that shape each student's interpretations of the prompts, signs, and gestures experienced within. The same occurs with academic goals. Both students and instructors enter each learning interaction with preset goals for learning. Each may draw from similar sources—for example, professional standards, observed and inferred needs, or explicit and implicit expectations—but drawing from similar sources does not guarantee a shared understanding of which are important to act upon. The Community of Practice provides the forum for this negotiation of goals to occur.

Participation and contribution within a community of practice both powers and shapes the learning among all members, not just novices. As such, experts are not the only—or even, perhaps, the most significant—catalysts within the learning environment. Instructors certainly are value-added members and have a core identity that affords them a "heavier push" when each wants to guide students in a particular direction. However, the Community of Practice exists beyond us, and, if we run counter to it too much, then even we become marginalized. Therefore, we acknowledge the expertise that all

members bring to the community and together identify those goals that satisfy both groups.

Encouraging Exploration and Discovery

Notions of exploration and discovery are key elements of constructivist teaching and learning; members of a Community of Practice explore, process, and build knowledge together. The design of AET Zone is such that spaces and tasks are not linear: students approach elements in the environment in ways which make sense to them.

Presence Pedagogy assumes that the environment in which presence is sustained is one that is rich with resources available to learners. These resources are both perpetual and evolving in that any resources added remain available in AET Zone for as long as it is useful and that the environment facilitates students' ability to contribute new resources to the world. Such an environment becomes one that not only supports exploration and discovery—in that there are resources embedded throughout the virtual world for students to actually explore and discover — but also in terms of encouraging exploration and discovery—in that students want to take time to explore and discover what is available. Visual cues in the world such as store fronts, staircases, gardens, and pathways facilitate the organization of and accessibility to tools and resources available to learners in the world. These cues serve as visual metaphors, which provide systems of navigation and structure to the location and organization of in-world tools and resources.

This notion of exploration and discovery goes beyond the simple storage and retrieval of resources available in the world. Rather, a more substantive value in exploration and discovery in the world involves students' engagement in activities that promote exploration and utilization of shared in-world tools, resources, and knowledge base.

Encouraging Reflective Practice

In the most effective learning environments, students move from simply gathering facts to explicitly learning when each is engaged actively in a community of practice that has a pedagogical overlay and that requires students to not only perform but also to reflect upon the meaning of results and the validity of processes. The difference between acquisition and learning is related to the level of attention, intention, and agency put forth by both the novice(s) and the expert(s) involved. Perhaps the key differentiator is the level of agency promoted or allowed by the learner. In more natural settings, the agency lies primarily with the learner: the novice must figure out what he or she is supposed to do to participate fully and to contribute. In more formal ones, those rules of engagement are codified and imposed upon the novice.

Utilizing Technology to Achieve and Disseminate Results

The technology used for AET Zone at the present time consists of an ActiveWorlds server (www.activeworlds.com), a course management system developed in-house called LESOnline, a threaded discussion board, blogs, a Voice over IP utility called Talking Communities (www.talkingcommunities.com), and a wiki hosted by the University. These pieces have come together over time as programmatic needs for improved communication have become evident.

An important note when considering these types of technology tools versus more traditional online course delivery systems (i.e., WebCT), is that the design of AET Zone is such that communication and collaboration, rather than content delivery, are the key goals. Lock (2002) identifies the four cornerstones of a learning community as collaboration, communication, interaction, and participation. The avatars, the synchronous and asynchronous communications devices, the presence of instructors and other students each work together to facilitate the creation of a true Community of Practice.

Conclusion

The P2 Model serves as the catalyst for social constructivist learning in a virtual world. While some learning can take place in and through a viable community of practice, our experience suggests the P2 pedagogy prompts a churn that encourages purposeful interactions, goal oriented projects, and collaborative processes, which result in an intentional learning environment.

There is, of course, the ability to sense of presence of others, and of one's co-presence among them, in a face-to-face classroom setting. However, this ability generally is limited to the dates and times during which a particular class is scheduled to meet. Presence and co-presence may exist during the days and times when class is in session but rarely are explicit in the hours and days between. While there may be a chance that students pass one another in the hallway or on campus, or that a group may choose to meet at the student union to discuss a class project, these meetings are not incorporated into the formal structure of the course. More specifically, neither students nor faculty randomly wander into a physical classroom during the week between classes, in the early morning hours, or in the middle of the night with

Table 3
Tenets of Presence Pedagogy

P2 Principle	P2 Practice	P2 Place
Ask questions and correct misconceptions	• Interactions with faculty and students • Both peers and "experts" serve as catalysts to promote explicit learning	• Glass Classroom • So What? Saloon • Discussion depot
Stimulate background knowledge and expertise	• Activities that require sharing of personal and professional experiences • Recognition of background knowledge and expertise • Acknowledgement of and engagement in a Community of Practice • Cross-course, cross-cohort, cross-program, and cross department interactions	• Information Gardens • Case Study Conference Center • Various interactive databases
Capitalize on the presence of others	• Activities that promote cross -cohort, -program, and –department interaction • Naming convention to identify student cohort, program, and nationality • Shared faculty responsibility of supporting students across programs	• The Commons • Individual Course spaces • Greeter bots throughout AET Zone • VoIP for small group chats • Blogs, wikis, discussion boards
Facilitate interactions and encourage community	• Team teaching • Naming convention to identify faculty and staff • Interdisciplinary lesson/unit planning • Activities to capitalize on notion of Distributed Cognition • Interdisciplinary Community of Practice • Text and voice tools for interaction	• Chit Chats • Break Time Game House • Discussion depot
Support distributed cognition	• Multiple manifestations of Presence • Creation of open space in which students and faculty of various backgrounds and levels of expertise can interact. • Expertise shared by students and faculty	• Café Cosi che Cosa • Discussion Depot • Spectacles • Blogs, wikis • Small group tasks and projects
Share tools and resources	• Students and faculty identification of relevant tools and resources • Availability of tools and resources in shared space open to all students	• General Store • Databases • Code Cove
Encourage exploration and discovery	• Engagement in authentic activity • Creation of open, resource rich environment • Activities that promote exploration of shared tools and knowledge base	• S-Mart • Hypermazes • Training Shoppe
Delineate context and goals	• Authentic, action-oriented projects and assignments that have personal meaning and relevance for the students • Visual cues to facilitate organization of and accessibility to tools and resources • Use of avatars and metaphors	• Seekers Corral • Student Services Center • Web Design Hypervator • Main Street AETZ
Foster reflective practice	• Periodic assignments requiring ongoing, guided reflection • The "So What?" question • Frequent public presentations	• Forest of Intentions • Discussion Depot • Blog Bar and Grill
Utilize technology to achieve and disseminate results	• Activities that require utilization of in-world tools and resources • Persistent presence of a living curriculum • Multiple presentations across programs, cohorts, courses, and sections	• LESOnline • Wikiworld • Showcase Showdown

the expectation that there is a chance one may encounter the other. As a result, instructors rarely rely on chance meetings as an integral part of one's pedagogical approach to the course.

Virtual worlds support a different approach, as chance meetings serve as the catalyst for learning by providing opportunities for just in time interactions between smaller groups of students and instructors. Rather than limiting the learner to a set time and to a set place, the typical restraints to learning are cast off to allow learning to take place at any time two or more are in the presence of one another and while present in any location in AET Zone.

Learning is then student powered, navigated by the instructor, just as a ship captain navigates a ship. Those who have sailed a ship know that this metaphor is more complex than it at first seems; for when navigating a ship, one must wonder who is steering whom? The ship reacts to the captain steering, but the captain is simultaneously reacting to the ship, the wind, the currents, etc. Neither the ship nor the captain is totally in control: a captain reacts to cues from the ship, the ship reacts to subtle adjustments made by the captain, and so on. It is a feedback loop that results in both getting from Point A to Point B, albeit via a negotiated route. This metaphor helps to explain how we view our model of Presence Pedagogy. In much the same way that a captain reacts to cues from the ship, and vice versa, we believe that teaching is an ongoing, ever-adjusting reaction to the students we serve. Through our interactions with these students, which are made possible through multiple manifestations of presence described above, deep learning can take place in both the individual student and in the community of which she or he is a member.

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Facilitating Engaged Learning in the Interaction Age Taking a Pedagogically-Disciplined Approach to Innovation with Emergent Technologies

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The purposes of this paper are to explore emerging technologies, engaged learning, and features and students of the Interaction Age and to identify connections across these three realms for future research and practice. We begin by highlighting those elements of the Interaction Age that suggest a shift in the affordances and applications of digital content. The Interaction Age, as an extension of the Information Age, distinguishes digital content as not just content accessed by students but as content around which they engage and construct knowledge in a social manner. Second, we review technologies emerging on college campuses as well as categorize and compare newer technologies including mobile learning, Augmented Reality, Virtual Reality, and ubiquitous learning. These technologies are among those at the leading edge of innovation and hold promise for educational application. However, in light of the Interaction Age, we argue that these technologies must contribute to student learning, and in particular, student *engagement* in learning. Thus, we present the outcomes of a literature review regarding engagement and engaged learning. Finally, we explore prominent connections between emerging technologies, engaged learning, and students and devices of the Interaction Age, offering examples of these linkages to stimulate future research and practice.

The application of a variety of technologies for learning and teaching is influenced by two significant forces: the realm of technological innovation (especially, today, in regard to hardware and software) and the realm of learning theory. In consideration of the technological trajectory, learning has evolved from textbooks to television to computers, and now to mobile digital devices, in a relatively short time. In respect to the theoretical trajectory, expansions in ontological and epistemological thought have provoked a broadening of learning paradigms (e.g., behaviorism, cognitivism, and constructivism) suggesting moves toward more self-directed, contextualized, and engaged learning environments and approaches. Developments in ways of knowing and ways of learning have evolved against a backdrop of society's evolution from an Industrial and Information Age to an Interaction Age.

Often, the technology force and the learning force develop along two separate trajectories in the less socially complex confines of "the lab" or "the mind." Yet, experience reveals, that they must be woven closely in practice. That is, whenever new technologies are introduced, researchers attempt to apply those technologies for educational purposes, often hoping to demonstrate, through empirical evidence, a better quality of education to result. Instructional personnel (teachers, instructional designers, etc.), mindful of the real-world needs of learners and constraints faced in the learning context, strive to apply sound learning theories and instructional design approaches to integrate new technologies as they arrive on the scene with increasing rapidity, abundance, and complexity. An ongoing challenge and opportunity for educational researchers and practitioners is to apply new technologies as a means toward improved learning rather than as an end in and of itself; that is, to take a pedagogically-disciplined approach to teaching and learning innovation.

In this paper, we, as instructional designers engaged in preparing today's learning environments and experiences, take a present-day look at aligning the two trajectories of technology and theory. Specifically, we inquire into emerging technologies which may support more engaged learning for students in today's Interaction Age. The specific questions under consideration are as follows:

- What do the characteristics of the Interaction Age and its students suggest for future educational practice?
- What technologies are emerging as potentially useful learning technologies?
- What factors impact engaged learning?
- To better support engaged learning, what aspects and attributes of emerging technologies might educational researchers and practitioners focus on?

Current and Future Students in the Interaction Age

According to Milne (2007), our society is extending from the Information Age into the Interaction Age. In

Age, the role of digital content is broadened as something around which people engage and interact. In

Table 1, we provide a summary of Milne's analysis regarding the shift from Information Age to Interaction Age in terms of networks, devices, interfaces, and user focus.

To summarize briefly, "digital networks have evolved from carrying data in a purely transactional sense to facilitating social interaction" (Milne, 2007, p. 14). Rather than just deliver a document to an individual's inbox, sender and receiver might use a network to conference real-time about that document. Second, students in the Information Age typically have at least one portable computing device such as a mobile phone, laptop, or even handheld gaming device. In the Interaction Age, we witness an extension of these individually-owned devices through augmented work and play spaces that enable individuals to plug in portable devices to share and engage with one another, say through a large screen interface, upon entering the environment. Third, the ever-increasing focus on Web technologies is moving today's learners from a graphical user interface (GUI) to tangible interfaces that allow for a greater range of interaction modalities. Interactive smart boards, gesture-based gaming, digital pens, or even Han's (2006) cutting edge multi-touch interfaces all allow for greater flexibility and fidelity in terms of supporting the human response. Fourth, increasingly more jobs require human engagement in group settings rather than individual performance. Many learning environments have already begun to reflect this shift by embedding more group or team work. Emergent technologies, too, are beginning to break new ground toward true multi-user interfaces; although retrofitted or adapted single-user interfaces still seem to predominate. The shift from an Information Age to an Interaction Age underlies the importance of understanding learning and learning environments as increasingly social and contextualized (Moore, Fowler, & Watson, 2007).In such a changing age, today's students are already different from students of the past in terms of how they have grown up with and use technologies (McGee & Diaz, 2007). Prensky (2001a) is one to argue the uniqueness of who he terms today's "digital native" students. As Prensky (2001b) puts it,

> Our children today are being socialized in a way that is vastly different…over 10,000 hours of videogames, over 200,000 emails and instant messages sent and received; over 10,000 hours talking on digital cell phones; over 20,000 hours watching TV, over 500,000 commercials seen – all before the kids leave college. And, maybe, at the very most, 5,000 hours of book reading. (p. 1)

A series of empirical studies sponsored by the Pew Internet and American Life Project (Jones & Madden, 2002; Lenhart, Madden, & Hitlin, 2005; Levin & Arafeh, 2002) support the notion of today's students as digital natives.

In similar fashion, Oblinger (2006) points out several characteristics of today's university students to consider in designing new learning spaces for them including: a penchant for highly active and participatory experiences both face-to-face and digitally and often at the same time; technological adeptness and ubiquity, using mobile phones, digital cameras, MP3 players, and wireless Internet to browse, download, and message; and multiple priorities, including school, work, sports, volunteer activities, that make time a precious commodity. In fact, Oblinger makes a case for the diverse and open spaces in which and through which today's students move through life as an impetus for changing spaces in classrooms and on campuses. Moore, Fowler, and Watson (2007) concur but also speak to such innovative spaces as still rare and isolated.

Finally, evidence suggests that thinking patterns, in addition to behavioral patterns, are changing with today's students in part, at least, to their native environment of ubiquitous digital technologies and considerable levels, since birth, of interaction within it. Prensky (2001b) points to evidence that today's digital native students think about and process information fundamentally differently from their predecessors - thinking in parallel and linear patterns and reading visual images as one might read text.

TABLE 1
Shift from Information Age to Interaction Age

	Information Age ⟶	Interaction Age
Networks	Transport data	Provide for social interaction
Devices	Portable devices	Augmented environments
Interfaces	Graphic interface	Tangible interface
User focus	Individual work	Group work

Note. Summarized from Milne (2007).

It is the case that individuals born since the early 1980s have grown up in a digital age. However, as Bennett, Maton, and Kervin (2008) argue, it is short-sighted to assume that all digital native students are technologically sophisticated or even technologically inclined. We agree that applying digital native as a global generalization is problematic and that individual learners remain as complex and varied and they have always proved to be. At the very least, digital natives of the Interaction Age offer an opportunity for teachers and instructional designers who prepare and facilitate learning experiences and environments to reconsider how to teach and design instruction that complements their lived experience as engaged and social digital consumers from a young age. Changes in instructional designs and teaching practices must not be based solely on an influx of digital native students but rather on empirical evidence that integrates sound pedagogy with identified learner traits.

Emerging Technologies

Once thing to count on is that today's technologies will continue to evolve as new ones continue to emerge. According to recent editions of *The Horizon Report*, a publication produced through a collaboration between the New Media Consortium (NMC) and the EDUCAUSE Learning Initiative (ELI) (2006, 2007, 2008), emerging technologies to watch and consider in regards to the learning frontier in higher education include those listed in Table 2.

In each report year, six top technologies were identified and categorized in terms of expected widespread presence on university campuses according to three timeframes- one year or less, two to three years, and four to five years. As explained by the 2008 report authors (NMC & ELI, 2008):

> The two technologies placed on the first adoption horizon, grassroots video and collaboration webs, are already in use on many campuses. Examples of these are not difficult to find. Applications of mobile broadband and data mashups, both on the mid-term horizon, are evident in organizations at the leading edge of technology adoption, and are beginning to appear at many institutions. Educational uses of the two topics on the far-term horizon, collective intelligence and social operating systems, are understandably rarer; however, there are examples in the world of commerce, industry and entertainment that hint at coming use in academia within four to five years. (p. 3)

Beyond the fact that *The Horizon Report* documents newer technologies that already show some degree of application in higher education research, learning, and creative practice, it is interesting and noteworthy that the identified emerging technologies are largely consistent with social trending from an information focus to an interaction focus and behavioral changes from passive to active and engaged learners. Such trending is reflected by a recent review by McGee and Diaz (2007) of the collaborative and communicative functions of many Web 2.0 technologies, including blogs, IM-type tools, wikis, and social bookmarking.

Although the technologies ranked in recent *Horizon Reports* (NMC & ELI, 2006, 2007, 2008) vary somewhat in name and foci, an extended review of the literature reveals several categories of emergent technologies to consider for teaching and learning, including the following: Mobile Learning (m-learning), Augmented Reality (AR), Virtual Reality (VR), and Ubiquitous Learning (u-learning). It is challenging to define these categories clearly and distinctly for a number of reasons. Researchers sometimes use the terms differently or, may even combine them. Winters (2006) pointed out that communities may define mobile learning based on their own specific set of experiences and backgrounds. For example, cases can be categorized and studied as mobile learning with AR technology or ubiquitous learning mainly using mobile devices. Challenges aside, we attempt to define these four categories and highlight those characteristics that may serve to engage learners in interesting and effective ways.

When considered as a subset of e-learning, m-learning can be defined as learning that takes place via wireless, portable devices such as mobile phones, personal digital assistants, and laptop computers (Brown, 2005; O'Malley, Vavoula, Glew, Taylor, Sharples, & Lefrere, 2003). Klopfer and colleagues (Klopfer & Squire, 2008; Klopfer, Squire, & Jenkins, 2002) identify five affordances of such m-learning devices that may support learning: portability, social interactivity, connectivity, context sensitivity, and individuality. Perhaps less apparent than the first three, context sensitivity concerns the ability to gather data unique to the current circumstance (location, time, etc.) and individuality relates to flexibility for each individual to follow a self-directed, custom learning path. Handheld data collection devices, such as handheld water testing meters or GPS/GIS receivers, are popular examples in science of context sensitive mobile technologies that can be applied for learning purposes.

TABLE 2
Technologies to Watch on University Campuses

Years to University Campus Widespread Adoption	*The Horizon Report*, 2006 Edition	*The Horizon Report*, 2007 Edition	*The Horizon Report*, 2008 Edition
One or Less	• social computing • personal broadcasting (e.g., podcasting, video blogging)	• user-created content (blogs, wikis, etc.) • social networking	• grassroots video • collaboration webs
Two to Three	• mobile phones receiving educational content • educational gaming	• mobile phones with broadening functionality (e.g., GIS, video) • virtual worlds	• mobile broadband • data mashups
Four to Five	• augmented reality and enhanced visualization (e.g., 3D representations of data) • context-aware environments and devices responding to voice, motion, etc.	• new scholarship and emerging publication forms • massively multiplayer educational gaming	• collective intelligence • social operating systems

Note. Summarized and compiled from *The Horizon Report* (NMC & ELI, 2006, 2007, 2008).

The next two emergent technology categories, augmented reality (AR) and virtual reality (VR), can be conceived of as sitting along a continuum that ranges by the degree of reality present in the experiential system (Milgram & Kishino, 1994). On one end of the continuum is the real environment, followed by AR, then VR, and lastly on the other end, the fully virtual environment. Such a continuum is useful in suggesting the many shades of gray in mixed reality systems, each being somewhat more or less real.

Augmented Reality is described commonly as blending computer-generated virtual objects/ environments with real objects/environments, often to enhance or annotate what can be discerned by the human user. Azuma (1997) offers further definition by characterizing AR as bringing together the real and the virtual, allowing for interactivity in real time, and manifesting in three dimensions (3-D). Within the context of environmental design education, Blalock and Carringer (2006) identify five AR system affordances supportive of human inquiry: rapid and accurate object identification (especially in stripped down environments), invisible feature identification and exploration; the layering of multiple information sources; readily apparent object relationships; and easy manipulation of perspectives. Whether designing a new landscape or practicing a surgical procedure, these AR affordances not only offer alternatives to real experiences but even offer opportunities to expand on what is possible in a real-world learning environment.

Virtual reality can be distinguished from AR in that an individual is immersed in a completely synthetic environment (Milgram & Kishino, 1994) where natural laws (e.g., gravity, time, etc.) likely do not apply. Second Life (2007) is an example of a Web-based VR world growing in popularity and grabbing the attention of researchers interested in its educational potential. In such a VR setting, individuals can assume varied roles and manipulate variables to explore impact (Chen & Hung, 2004). Many VR environments pose well- to ill-structured problems or challenges (e.g., through simulation or gaming scenarios) that present the opportunity to experiment with solutions (de Jong & van Joolingen, 1998) in potentially less costly ways than in a real environment. Such problems can be readily situated in single or multiple subject domains such as science and math (Brill, 2007; Hung & Chen, 2006). The lack of real-world constraints can pose potential challenges in terms of acquiring and transferring high fidelity knowledge and skills in the real world. What can be accomplished in a VR environment may not be relevant, useful, or even desirable in a real context.

The final category of emerging technologies is ubiquitous learning or u-learning. U-learning is an extension of ubiquitous computing (UC) which is characterized as the availability of many computers in the physical world that are, essentially, invisible to the individuals using them (Weiser & Brown, 1996). As Weiser and Brown put it, UC is characterized by

> lots of computers sharing each of us…the hundreds we may access in the course of a few minutes of Internet browsing…[those] imbedded in walls, chairs, clothing, light switches, cars - in everything…Fundamentally, the connection of things in the world with computation. (para. 9)

UC affords "calm technology" that extends our reach in our lived world without disrupting our center. It is digital technology going eventually the way of the

pen; once an emergent technology itself that has been, for some time now, ubiquitous and supportive without being distracting or disruptive. At the leading edge of digital technological innovation, we know the least regarding educational applications of ubiquitous computing. Yet, reflecting on much older and more mature technologies (once again, the pen), ubiquity, ready-to-handedness, and embeddedness in context (Dourish, 2001, 2004; van't Hooft, Swan, Cook, & Lin, 2007) are traits that certainly have potential to support all human activity, including learning, in a manner that is situated in lived experience.

Looking across m-learning, AR, VR, and u-learning and their unique affordances, all four categories seem to offer learners, whether as individuals or as members of a group, the opportunity to develop new knowledge and skills by exploring issues/problems within richly complex, high fidelity contexts.

Engaged Learning

Although emergent digital technologies such as virtual reality tend to grab our attention, educators and researchers must balance the inclination to jump on board with cutting-edge technologies with the discipline of sound pedagogical theory; that is, what is known and continues to be discovered regarding how humans learn and improve their performance. Engagement is a theoretical construct evident in the literature as an essential condition of meaningful learning. Certainly, emergent technologies such as those just described may offer opportunities for students of the Interaction Age to experience heightened and sustained engagement in learning. First, engagement must be considered more closely.

The concept of engaged learning has roots in well-established and researched learning constructs such as interest (Dewey, 1913), effort (Brophy, Rashid, Rohrkemper, & Goldberger, 1983; Meece & Blumenfeld, 1998), motivation (Pintrich & De Groot, 1990; Skinner & Belmont, 1993), and time on task (Berliner, 1990; Lentz, 1998). Bulger, Mayer, & Almeroth (2006) characterized engaged learning as having high levels of active learner participation designed into the plan for learning. In the edited book *Engaged Learning with Emerging Technologies*, Hung, Tan, and Koh (2006) described active learning as learners taking responsibility for their own learning during which they are "actively developing thinking/learning strategies and constantly formulating new ideas and refining them through their conversational exchanges with others" (p. 30). In this same book, Jonassen and Strobel (2006) asserted that active learners "interact with their environment and manipulate the objects in that environment, observing the effects of their interventions and constructing their own interpretations of the phenomena and the results of the manipulation and sharing those interpretations with others" (p. 1). Already, these descriptions suggest connections back to previously identified traits of the Interaction Age and emergent technologies.

In their study of engaged learning design, Bulger, Mayer, and Almeroth (2006) demonstrated that an intentionally engaged learning design resulted in higher levels of learner attention and on-task behavior. Taking a closer look, one can ascertain that their engaged learning design included: a real-world task and environment presented via simulation, directed interactive activities, collaborative group work, an in-class deliverable, a facilitative teacher, role-modeling, and a requirement to reference and integrate resources from beyond the boundaries of the classroom; components certainly illustrative of the aforementioned descriptions of active learning and active learning environments.

A number of scholarly groups have articulated indicators of engaged learning. We discuss three here for comparison and synthesis. Jones, Valdez, Nowakowski, & Rasmussen (1994) provided a set of eight indicators of engaged learning related to vision, tasks, assessment, instructional model, learning context, grouping, teacher roles, and student roles. First, teachers and students share a vision for engaged learning in which students take responsibility for learning, feel motivated to learn and energized by learning, and are strategic in their learning. In engaged learning, tasks are authentic, challenging, and multidisciplinary and assessments are based in authentic performance, ongoing, numerous, varied, and equitable. Assessment data are used by students and teachers to evaluate and advance learning in an iterative manner. The model and context for learning is characterized by interactive modes of instruction with an emphasis on the co-construction of knowledge. Students explore collaboratively in heterogeneous and flexible groupings with the teacher serving as an informed guide and facilitator. Students shift among varied roles including inquirer, teacher, apprentice, and producer. Jones et al. based their refined and expanded work on the seven indicators identified by Means and her colleagues (1993) which were grounded in observations of successful teaching/learning practice. Unique to their framework are the addition of the shared vision for engaged learning as well as significantly expanded conceptions of assessment, teacher roles, and student roles.

Hung, Tan, and Koh (2006) offered an engaged learning framework emphasizing problem and process which, they argue, are both necessary for authentic learning. The framework includes six indicators: ill-structured, multidisciplinary problems; student ownership of learning goals, inquiry processes and strategies (such as problem deconstruction); student collaboration with shared, flexible roles and accountability; self-monitoring and evaluation of the learning process; the use of teachers and experts to provide tools, techniques, and support; and real-world tools that allow for open communication and sharing among students, teachers, and experts. The work of Hung and colleagues is derived from a rather robust review of contemporary ideas in learning spanning constructivism, situated cognition, authenticity in learning, self-regulated learning, and problem-based learning. Notably, the indicator of student collaboration and accountability is supported empirically (Abrami, Lou, Chambers, Poulsen, & Spence, 2000).

A third and rather different view into engaged learning comes in the work of Wang and Kang (2006) who have grouped indicators of engagement into three domains: the cognitive, the emotional, and the social. In the cognitive domain, engaged learning is hallmarked by knowledge construction and emergence as well as student ownership and self-regulation. In the emotional domain, engaged learning is indicated by learners who feel curious yet secure and confident. In the social realm, there are indicators of information/resource-sharing and group cohesion and acceptance within the context of collaboration. Each of these domains and related indicators are considered in light of both learning and assessment for learning. This third literature-based framework offers a readily consumable guide to important elements in the high engagement teaching/learning environment. However, as Wang and Kang point out, it must be researched.

Three themes are quite evident across the three frameworks for engaged learning. Student responsibility for and ownership of learning is clearly manifest in a variety of ways including setting learning goals, co-constructing and representing knowledge, assuming varied roles and tasks, and participating in self-monitoring and assessment. Second, flexible collaboration in groups is also emphasized. Third, the use of varied and relevant human and non-human resources (teacher, expert, tools, processes, techniques, etc.) to support learning is consistent across frameworks.

Frameworks for engaged learning, such as those discussed here, offer means for understanding, designing for, and evaluating engagement in learning. They may also shed light on how to integrate emergent digital technologies that resonate with today's digital native students in informed and pedagogically sound ways.

Linking Emerging Technologies and Engaged Learning

In this paper, we have explored traits and students of the Interaction Age, emerging digital technologies, and the concept of engagement in learning. Each one of these three areas, in itself, is a challenging area to comprehend fully with a great deal of landscape to cover. Yet, each of these areas offers only one piece of the puzzle when designing for meaningful learning. The opportunity lies in understanding more clearly, through both conceptual and empirical work, the intersection of these three areas for improved teaching and learning. Our position, and one shared by other education professionals (McGee & Diaz, 2007; Moore et al., 2007), is that sound teaching and learning approaches should remain at the forefront of such a scholarly agenda. Further, we perceive engagement in learning as a pedagogical opportunity area for inquiry. If engaged learning is the goal and certain indicators appear to support enhanced engagement, the question becomes: What are the digital technologies that best facilitate engaged learning and speak to the digital native student? Moore, Fowler, and Watson (2007) point out that the design and study of such pedagogically-grounded, integrative research is challenging in that it does not quite have the lure of emergent technology research and is time- and labor-intensive, requiring significant resources toward instructional design. Further, it requires an inquiry approach that is systemic in nature. Challenges aside for a moment.

Table 3 offers several examples of the types of connections that could be further explored and researched across these individual landscapes. For example, given that the literature reveals student ownership as a common indicator of engaged learning and given that mobile learning devices can provide for individuality through unique scaffolding, this category of technologies may be an appropriate choice for a learning environment aimed at enhancing individual ownership in learning. Mobile devices certainly align with the digital native learner's way of being in the world, even if these devices have only been used to-date to achieve personal goals (e.g., using an iPod™ and Nike™ smart sneakers to support an exercise regimen). The critical aspect of such a strategy is that the mobile device is not simply dropped into the learning environment or dropped in the hands of its user as has

TABLE 3
Connecting Engaged Learning with Emergent Technologies and the Digital Native

Common Indicator of Engaged Learning	Emerging Digital Technologies Supporting Engagement Indicator	Alignment with the Digital Native Student
Ownership of and responsibility for learning goals	Mobile learning devices with unique, individual scaffolding designed for and built in	Capitalizes on their early access to and frequent use of mobile devices to achieve personal goals
Interactive, collaborative, and generative approach to learning within the context of solving authentic problems	Virtual worlds and game-based learning designed as realistic learning spaces which enable learners to manipulate a variety of variables	Connects with their pervasive habits to interact and stay in touch via digital means (e.g., mobile phone, Web spaces, email, etc.)
Facilitative role of experts, teachers, and "expert" resources	Mobile device or pervasive learning space where expert learning content is designed for and embedded	Speaks to their use of widely available digital information resources to move through the world and achieve personal goals

been done, for example, with recent laptop requirement initiatives. Rather, individual scaffolding (such as electronic goal setting, monitoring, reporting, and adjustment) must be designed intentionally into the device and, more largely, into the learning.

Table 3 presents only three examples which connect engaged learning with emergent technologies and the digital native learner. There are many more potential applications to explore across K-12, higher education, and even informal learning environments. Work to identify and research more of these types of connections continues. Developmental research, a model for research that investigates the design, development, and implementation of specific learning interventions (Richey, Klein, & Nelson, 2004), may be a particularly useful method for empirical studies. Notably, the underlying principle of this work must be that research with emerging technologies be conducted in a disciplined manner, grounded in sound pedagogical theory that is designed for in the learning experience.

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