Power, Play and PBL in Postsecondary Learning: Leveraging Design Models, Emerging Technologies, and Game Elements to Transform Large Group Instruction

Abstract

As higher education institutions seek to improve undergraduate education, initiatives are underway to target instructional methods, reexamine curricula, and apply innovative technologies to better engage students with content. This proposal discusses the findings of an exploratory study focused on a course redesign that embedded game elements, problem-based learning methods, and 3-D communications tools in an introductory computing course. Some of these findings included an appreciation for how the technology skills gained in the course applied to the world of work, an understanding of the significant role that interpersonal communications play in learning and in career success, a sense of empowerment fostered by access to resources, and an increased willingness to play, explore, and experiment with tools, content, and design processes.

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Paper presented at the American Educational Research Association Annual Meeting, March 28, 2008, New York City, New York.

Introduction

In an effort to enhance the quality of the undergraduate experience in large introductory courses, one state in the southwestern United States has provided universities with small grants that target initiating and supporting research focused on the redesign of large enrollment post-secondary courses. Goals of the project included improving student satisfaction, as well as critical thinking and problem solving skills, objectives that often are adversely affected in large group instruction (LGI). The specific course targeted by this redesign was an introductory course in basic computer applications used in educational settings. Not only was this a large-enrollment course, the pre-existing format of the course was problematic in that it targeted overly fine-grained learning objectives that have shown little transfer from the narrow context of the course tasks themselves to the course assessments, let alone the future contexts in which students are expected to learn and work.

Given that this computer applications course emphasized skill acquisition coupled with the promising results of research in problem-based learning (PBL) (Albanese & Mitchell, 1993) and constructivist learning environments (CLEs) (Jonassen, 1999; Jonassen & Hernandez-Serrano, 2002), the course redesign leveraged elements of these design theories such as the development of learning activities around ill-structured problems, the use of stories and narrative to contextualize experience, and small group work because of their reported impact on critical thinking and problem solving skills (Meyerson & Adams, 2003; Sage, 2002; Willis, 2002; Yip & Gafarian, 2002). Moreover, a new frontier for learning technologies has been identified by theorists in the field as video games and digital simulations (Aldrich, 2003; Barab, Warren, & Ingram-Goble, 2006; Cassell & Jenkins, 2000; Jenkins, Squire, & Tan, 2003; Squire & Steinkuehler, 2005; Steinkuehler, 2004). Much of the interest in these technologies is for their ability to engage students and motivate self-directed learning. Game elements such as artificial conflict, scenarios for "winning," and system of rules governing play (Salen & Zimmerman, 2004) were also incorporated into the course redesign in order to increase student satisfaction with the course experience as well as to draw students more deeply into the coursework.

Description of Redesigned Course

Problem-based learning has shown high promise for use as a basis for developing a form of game scenario at the post-secondary level (Albanese & Mitchell, 1993; DiPasquale, Mason, & Kolkhorst, 2003; Elder & Paul, 2002; Keller, 2002; Kolodner, 2002; Willis, 2002; Zembal-Saul, Blumenfeld, & Krajcik, 2000) because this instructional model requires the presence of rules governing student and instructor interaction and roles, artificial conflict in the form of ill-structured problems, and "win scenarios" in which students have successfully or sufficiently developed a defensible solution to the problem or conflict. PBL has been correlated with a propensity for enhancing critical thinking skills (Tiwari & Lai, 2002), improving post-secondary learning experiences by providing authentic tasks (Bonk, Kirkley, Hara, & Denned, 2001), and compelling students to engage in story-driven, problem-centered tasks similar to those found in video games (Jonassen, 1999; Jonassen & Hernandez-Serrano, 2002; Warren, 2006a, 2006b). Compounded by the fact that post-secondary learners tend to be motivated by internal self-esteem, recognition, need for a better quality of life, and self-actualization rather than extrinsic rewards (Rachal, 2002; Shank, Winchell, & Myers, 2001; Terehoff, 2002), the learning activities

can be packaged in such a way that they mirror real-world tasks contextualized by the narrative overlay common in video games that has been found to motivate learners, particularly those that require additional feedback, peer support, and motivations that they may not find in more traditional classrooms.

Given the complications and expense of designing immersive game worlds that include both the narrative plot and the requisite scaffolds to facilitate learning, alternative media that leverage these elements are desired. One such alternative is to embed game activities that reveal enabling information and resources in a variety of media, distributed across the internet rather than a fully integrated, stand-alone product. This approach maximizes resources, such as MySpace, web logs, podcasts, YouTube, and the three-dimensional digital environment of *Second Life* that students use as part of their daily lives. As such, it creates an open system of resource distribution that more authentically mirrors the context to which learners will transfer the skills and knowledge gained in the learning activities.

Course Tasks and Tools

To address the problems with the existing course design outlined above, this course was redesigned around a top-level narrative that presented a series of six ill-structured problems posed by fictional clients who "hired" student design teams to create specific products. These elements relate to Jonassen and Hernandez-Serrano's (2002) idea of using stories to support student solutions to ill-structured problems by providing them with scaffolds to aid their understanding, feedback embedded within the system, and resources for helping overcome difficulties with learning tasks. Such contextual elements have also been found to be motivating in other settings (Squire & Steinkuehler, 2005; Tuzun, 2004; Warren, 2006a).

In this course redesign, student "Design Teams" solved these ill-structured problems using the computer applications targeted in the course, as well as a series of additional tools including the open-source course management system, Moodle; a course web site with links to resources, directions, podcasts, web logs, and general syllabus; and a space in the three-dimensional digital world *Second Life* to be used as a compliment to e-mail and discussion boards. Each of these tools was expected to provide learners with exposure to a large number of computer applications, resources, and experiences that form the basis of their overarching learning experiences. Further, students kept web logs and responded to weekly metacognitive reflection prompts as a means of encouraging them to think about their learning experiences.

Game Elements

Beyond the top-level narrative provided by the fictional clients, a series of game elements related to an underlying mystery were also provided to students. *The Door* alternate reality game (ARG) was designed as a second narrative tier. While the first, problem-based tier engaged students with fictional clients, these clients also had alternate personas, hidden beneath their client identities, and all of them were embroiled in an underlying conflict with each other as well as the unsuspecting student players. This underlying 2nd tier of the narrative was more game-like in nature as it involved mysterious happenings, artificial conflict, and "win" conditions that rewarded players with additional information and resources for completing first tier, PBL tasks. This 2-tiered design was intended to leverage the affordances of authentic contexts for situating problem-based tasks while concurrently engaging student interest in the more fantastic, other-worldly narratives that typify entertainment products, be they television shows, films, or video games.

Research Methods

This study used a qualitative, grounded-theory approach to identify emergent themes regarding learner experiences with the problem-based learning and the alternate reality game contexts (Gall, Borg, & Gall, 1996); the rationale for employing these methods follows Denzin and Lincoln's (2003) prescription for a method that "seeks answers to questions that stress how (sic) social experience is created and given meaning" (p. 13). This method tends to look at qualities, characteristics, and attitudes inherent in a system. The primary methods of data collection used for the study were semi-structured interviews conducted at the end of the pilot semester to generate a summative review of the interactions, benefits, and detriments stemming from the implementation of this redesign.

Research setting

Given the extended amount of time requisite to realize the full benefits of PBL and constructivist methods (Airasian & Walsh, 1997; Albanese & Mitchell, 1993; Matthews, 2003), the course redesign was piloted over a 16-week semester at a university in the southwestern United States. The course included six, face-to-face classroom meetings over the course of the semester, blended with online activities in the Moodle course management system, web logs, web sites, and the digital environment *Second Life*. Student teams were encouraged to explore other communications media as best fit their team dynamics. Participants in the pilot course had no prior knowledge of the instructional method prior to enrolling other than an awareness that the course blended face-to-face class meetings with online instruction.

Interview Sample

The participant sample used for summative interviews was drawn using purposeful sampling. From a class of 23 students, four students were selected because they represented varying demographics and experiences of the students as self-reported in web log responses and as reported to the researchers by the instructor. Student histories and past experiences with technology prior to the intervention were highly variable. For example, two of the students were adults who had worked after high school graduation and then returned to college while the other two students entered college directly out of high school. Also, two of the students had some computer experience while the other two had virtually none.

Transcription of digitally recorded interviews was conducted separately by the two interviewers in the interests of accuracy and completeness. Each transcript was typed verbatim from interview recordings and used for coding and analysis. Analysis of interview data followed methods suggested by Denzin and Lincoln (2003) and Boyatzis (1998). The researchers then jointly built consensus as the codes were consolidated into categories and the categories were analyzed to identify themes (Boyatzis, 1998). The primary researcher, who also taught the course, observed the entire process and served to triangulate the data. This triangulation included member checks against student self-reports contained in web logs to determine the perceived accuracy of the themes, use of independent researchers with independent participants to draw codes, and the use of quantitative data to further corroborate qualitative findings.

Results

Initial coding of interview transcripts identified several common threads among students' experiences with the course materials, interactions with the instructor and other students, and problem-based context of the redesign. These initial codes were folded into broader categories as detailed in Table 1.

Table 1: Codes applied to interview data and emergent categories identified from coding

Codes	Categories
Course experience Prior knowledge Prior classroom experience Prior experience with technology	Overall Experience
Learning style preferences Teaching style preferences Self-reflection	Personal Preferences
Communication Participation Strategies/processes Significance of teamwork	Teamwork
Usefulness of technology skills Authenticity of PBL context Relevance of tasks	Knowledge Transfer
Role/responses of instructor Responsibility of learner Access to resources Sense of resourcefulness	Empowerment
Fear/unease about the game Cognitive conflict Willingness to explore	Playfulness

Six predominant categories emerged from analysis of the various codes.

- *Overall experience* – This category included interview codes wherein interviewees commented on experiences with the course, recollected prior experiences in courses with similar content, discussed prior knowledge of course content, and described their experiences with technology.

- *Personal Preferences* – This pattern consolidates the instances in which the students interviewed revealed how they prefer to learn and to be taught. They also reflected on how they learned when the teaching methods employed in the course did not align with their preferences.

- *Teamwork* – This category merges codes related to interviewees' recounting issues with working in teams, such as uneven participation from team members and difficulties with communicating at a distance. They also expressed an understanding of the importance of interpersonal communication, its significance to the "real world" of work, and ways they

dealt with team issues in the course.

- *Knowledge Transfer* – Students acknowledged that the technology skills learned in the course would be significant assets to their future in the world of work and attributed that recognition to the problem-based context of the tasks they performed in the course. Codes related to that acknowledgement are accounted for by this category.

- *Empowerment* – Participants spoke very favorably about the responsiveness of the instructor who guided them to resources but did not give them the answers. This placed the responsibility for learning on the students who then engaged with the resources provided and began searching for others, actions, which led to a recognition of their own resourcefulness and a sense of power over their learning.

- *Playfulness* – Interviewees indicated that they initially feared engaging with the game/play elements in the course, but that by the of the semester they wished they had gotten more involved with the game tier of the course design throughout the duration. Even those who did not play the game at all expressed a willingness to explore new technologies and a newfound confidence in experimenting with different tools or ideas. References to initial cognitive conflict, overcoming it, and a willingness to try new things comprise this category.

Analysis of these categories revealed obvious relationships between *Empowerment* and *Playfulness*; as students' confidence in their own resourcefulness increased, they were more comfortable experimenting with new technologies and ideas. Consequently, these two categories were suggested a theme related to and thus labeled *Power & Play*. Because various comments in the *Teamwork* and *Knowledge Transfer* categories conveyed that both the content of the course and the problem-based context played a substantial role in student understanding of the learning objectives and their significance beyond the scope of the course, these categories were merged into the theme, *Relevance & Authenticity*. However, the categories of *Overall Experience* and *Personal Preferences* presented some complication to the analysis. On the one hand, they suggested a distinct theme when paired by themselves. On the other, many of the comments about experiences prior to and during the course, as well as the self-reflective revelations about individual preferences further informed the conclusions to be drawn from the other themes: *Power & Play* and *Relevance & Authenticity*. More specifically, *Overall Experience* informs the role of meaningful context, which is directly related to *Relevance & Authenticity.* Student comments about *Personal Preferences* for methods of learning and instruction had direct links to the *Power & Play* theme. These relationships are illustrated in Figure 1.

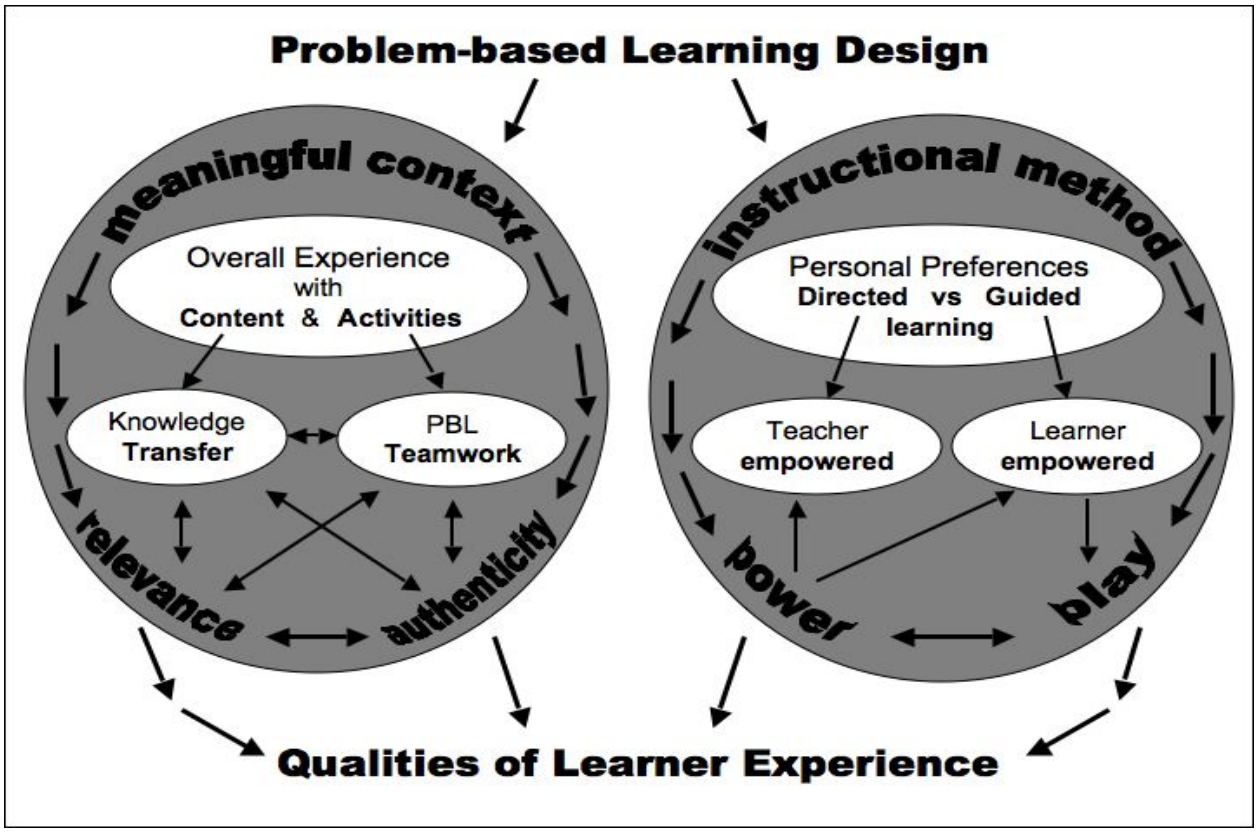

Figure 1. Relationships between PBL design and qualities of learner experience

Further analysis of the data and these two themes revealed four findings worthy of note to the qualitative experience of learners in a PBL-driven design and this specific course.

Findings

When the categories were folded into broader themes, the interview data revealed four principle findings:

1. An appreciation for how the technology skills gained in the course applied to the world of work and would impact their future.
2. An understanding of the significant role that interpersonal communications play in learning and in career success.
3. A sense of empowerment fostered first by access to resources and later by development of the knowledge and skills to become resourceful
4. An increased willingness to play, explore, and experiment with tools, content, and processes that points to potential lifelong learning.

Of these findings, two were related to the *relevance* and *authenticity* of the PBL context and activities. The other two findings resulted from the instructional methods that led to learner *empowerment* and willingness to engage in *play*.

Content in context -> relevance of knowledge and skills

Since the primary applications, Microsoft Office Suite, that formed the core of the course are already pervasively used in K-12 education, many of the students in the course already had experience using them. However, despite this prior experience, a common theme that emerged from the interviews was the realization amongst students of how important these technologies would be to their success in the world of work—a realization that did not seem to occur to them in their prior experiences with these technologies. As one student expressed it, prior learning experiences were neither challenging nor meaningful, "Because my teacher said, 'Well, do a professional edit in Word.' And I'm like, 'Why?'" This student goes on to explain that the context, completing tasks for fictional clients, provided both the challenge and relevance: "like I said, the way he [the instructor] did it where you have a client and tasks, it . . . just made you really excited to work." This immersive context also made students aware of how important technology would be to their future work. As another interviewee expressed it, "I was pretty efficient working with, you know, computers and things . . . but until I took this class, honestly, I didn't realize how much you use technology on a day to day."

Tasks in teams -> authentic application to future work

In addition to the recognition that newfound technology skills transferred to the world of work, students also recognized the significance of developing interpersonal communications and teamwork. Most of the students had negative experiences or frustrations with team dynamics, but they realized how important the opportunity to develop strategies for overcoming these frustrations was to their growth. One student noted that his team had several issues during the semester and stated early in the interview that, "when I have to rely on someone else for a grade and I know they are not doing what they are supposed to be doing, it bugs me." However, later in the interview, the same student noted the importance of learning to work in a team environment and the benefits of teamwork. Specifically, he felt that "having other people's ideas" and "knowledge" rather than "just my own" are important factors to success. In fact, he stated, "I prefer group study over individual study." This duality, frustration yet appreciation for group work, was common among all interviewees. As another student expressed it, "There is going to be that one person in the room of 20 people that you just don't like. . . But, when it comes to the professional world, if you can't get over that, you aren't going to make it." The interviewee added that teamwork skills would be vital to his future, reflecting that "some people are just better at computers than others or you may be better at writing than others or whatever. You gotta collaborate and work together somehow."

Guided instruction -> learner empowerment

More significant yet was the sense of empowerment students acquired from their experiences. While several students were impressed with the responsiveness of the instructor, "many expressed an initial frustration that he didn't always give them finite directions or concrete answers, but rather encouraged them to consult the fictional clients for whom they were completing their tasks, their teammates, and the resources provided to work out solutions to the ill-structured problems. As one student expressed it, "Well, the frustration a lot of times was that there wasn't a lot of… I like knowing exactly what is wanted. And he was trying to introduce us to clients not telling us everything . . ." This redirection, while frustrating, compelled students to make use of various learning resources beside the instructor. Several students asserted that this increased their own resourcefulness and sense of power over their learning. One student stated that "finding things on the Internet is easier … when you know how to look for them." He

lamented not having physical resources from the class, but then concluded that now "I know how I can find it on the Internet…, so if I can't figure something out, I'm sure I can figure out how to find it, so I guess I can get directions and do it." Another interviewee indicated that this empowerment turned out to be the best part of the class: "the information was out there and he gave us the tools to figure that out. So, that was the best part of the class was that if you couldn't get a hold of him, he'd given you the tools to figure it out anyways."

Sense of power -> willingness to play

When asked about whether or not they had played or enjoyed the ARG, many confessed that they initially were too scared to play it, a fear that stemmed from their inexperience with the various technologies that comprised the game. However, by the end of the semester, they noted that they regretted not having engaged further with the play elements. By this time, students stated that they had overcome their fear of new technologies and were intrigued by the mystery that the game presented, as well as the rewards that the game provided. One interview indicated, "I think just playing the game would have given me that much more knowledge of the computer. And it might have helped out with maybe some of the tasks." Another student reported that "if getting into the game had been part of your grade, I would have learned more. I would have made myself. I may have been tearing out my hair but . . . This was my first semester back in college in 12 years." This student added later that after becoming more familiar with the technology tools used throughout the course, she thought that playing the game "would have been fun." Yet another student indicated a willingness to play with different tools as a result of the course. Explaining that he "had never actually done anything like that [create a web page] before," he expressed some amazement that "it was pretty easy to figure out" after he just "messed around with it a little bit." These reflections point to some growth in student willingness to explore, their increasing sense of empowerment, and the desire to seek additional opportunities for meaning-making — characteristics that are often associated with lifelong learners.

Conclusion

Qualitative data collected from this pilot study indicates that the redesign is meeting the overarching institutional goals as well as those of the department and the learners. While students have expressed some frustration with mitigating the lack of finite direction from the instructor and the pitfalls of team dynamics, their increased knowledge, skills, and resourcefulness belie the overall satisfaction that they experienced in this course redesign. Overall, we feel that this form of learning from game structure combined with social constructivist learning methodology is a strong first step towards developing innovative curricula at the post-secondary level that encourage student interdependence, problem-solving skills, self-efficacy, and self-awareness as learners that can contribute to future instructional designs that seek to address similar problems.

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