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Hybrid Graduate Education: Assessing Student Comfort with Technology Interventions

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Abstract: This pilot study examines a cohort of fourteen, doctoral, graduate students over the last year and one-half of their hybrid (both face-to-face and on-line) program. This study's purpose was to determine their level of comfort with the new technologies (Web 2.0 software) both before and after intended learning interventions. Several theoretical models concerning technology users' preferences, attitudes, tasks, Task-Technology Fit (TTF), and student engagement provided frameworks for a conceptual model for the eventual course design, assignments, and learning interventions (Hersey & Blanchard, 1977; Davis, 1986; Davis et al., 1989; Goodhue & Thompson, 1995; Zigurs & Buckland, 1998; Kearsley & Shneiderman, 1999). Students were assessed by an instrument both before and after this portion of their program using a summated "comfort" scale over the technology interventions used in the program. Instrument reliability of .82 was estimated using the Guttman Split-Half Method. Overall results over nine technology areas: before (M = 32.29, SD = 7.18) and after (M = 39.93, SD = 5.42) revealed more comfort over time and technology use (p <.01). At the single item technology level, greatest increases in comfort were with instant messaging (1.07, d = .88), online chat (1.07, d = .86), online discussions (1.14, d = 1.04), talking with people over the Internet (1.78, d = 1.39), and videoconferencing via the Internet (1.57, d = 1.10). Mature adult learners can embrace technology to accomplish tasks in the educational environment. Planning, course design, syllabus construction, and appropriate learning interventions are critical for program success. Once "comfort" with the technologies has been established at both the individual and group levels, task performance increases.

Keywords: Graduate, Hybrid, Education

Introduction

THIS PILOT STUDY examines a cohort of fourteen, doctoral, graduate students over the last year and one-half of their "hybrid" program. The purpose of the study is to determine their level of comfort with the new technologies both before and after intended learning interventions. Several theoretical models were synthesized, and integrated to produce the overall course design, assignments, and learning interventions. Instructors took their face-to-face teaching practices and automated those using Web 2.0 tools, both synchronously and asynchronously, producing a personal hybrid teaching model. This blending of instructional designs has the potential to appeal to a wider and diverse group of students, extends the boundaries of the traditional classroom, and provides a foundation for technology mediated instruction.

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Related Literature

Comfort

Comfort is assumed to be a holistic outcome because it designates a dynamic and multifaceted state of persons. Kolcaba (1991) defines *comfort* as a state of having basic human needs met: *ease* (as a state of calm or contentment); *relief* (the state of having a specific comfort need met); and *transcendence* (as a state in which one can rise above problems). Later she states that the outcome of comfort requires as intra-actional perspective, where interventions designed to affect one or more aspects of comfort indirectly affect the other aspects as well (Kolcaba, 1994). Her specific theory is that outstanding individual needs arise from the stimulus situation and cause negative tension. Negative tension represents an imbalance that exists when obstructing forces outweigh facilitating forces at hand. The needs for comfort in any content domain are identified, and interventions are targeted towards those specific needs moving tension in a positive direction. The person (user) perceives whether the tensions are changed by the intervention (s), the instructor judges the extent the desirable outcome of comfort has been met by assessing the student's perception of comfort objectively or subjectively. An increase in comfort indicates that an individual's negative tensions are reduced and positive tensions are engaged. Positive tensions lead to a unitary trend of constructive behaviors relating to the technology characteristics (positive attitude, perceived usefulness, and perceived ease of use), the situation, and task characteristics. The instructor facilitates the outcome of comfort because it is related to the internal/external task seeking behaviors (Kolcaba, 1994; Hersey & Blanchard, 1979; Venkatesh, Morris, Davis & Davis, 2003).

Technology Acceptance Model

Consequently, adult users of technologies demonstrate the need for comfort when working with new technologies. For a given task, empirical observations of adults using new technologies reveal some negative emotions present: fear, fear of failure, lack of confidence, discomfort, anxiety, and frustration… which in some cases block task accomplishment. Therefore "comfort" with the technology, the task at hand, perceived technology usefulness, and ease of use are important constructs for the user when taken holistically. According to the Technology Acceptance Model (TAM) the easier the technology is to use, the more useful it is perceived to be, the more positive one's attitude and intention to use the technology (Davis, 1986; Davis et al., 1989). TAM is informed by Fishbein's and Ajzen's reasoned action model (1975) which states that intent to produce a behavior depends upon two basic factors: attitude toward the behavior and subjective norms. Over a ten year period (1989 to 1999), Lederer, Maupin, Sena, and Zhuang (2000) reviewed over 15 published studies using the TAM on perceived ease of use, perceived usefulness, attitude towards use, and usage of information technology. Results of these studies support the use of the TAM as an explanatory or predictive model of the usage of *different technologies*. King's and He's (2006) meta-analysis of 88 published studies on the TAM confirm that the model can be used in a wide variety of contexts and that perceived usefulness affects ease of use and intent to use the technology. Some of the types of technologies that were examined were word processing, telemedicine, electronic mail, the Internet, personal computing, and university computer centers and laboratories. From these results and meta-analyses, the TAM is robust in various

contexts and settings using different technologies. Therefore, it was decided to retained attitude towards the technology, perceived usefulness, and ease of use from the TAM.

To foster an innovative pedagogical delivery, the curriculum, assignments, instruction, and syllabi also built upon Engagement Theory which states that learning activities should: (1) occur in a group context (e.g. collaborative teams); (2) are project based; and (3) have an outside focus (authentic) (Kearsley & Shneiderman, 1999). The theory goes on to state that students are intrinsically motivated due to the meaningful nature of the learning environment and activities through interaction with others on worthwhile tasks.

Method

Nine areas of technology interventions using Web 2.0 software tools were developed from the literature, and were assessed by asking student participants their level of "comfort" on each area. Participants were asked "Before" and "After" the technology interventions to self-assess their expertise with technology. This "Before" assessment serves a baseline of self-reported technology expertise. These technology interventions informed assignments, collaboration, instruction, discussions, projects, and case analysis.

The overall hypothesis: There were no significance differences between before and after "comfort" assessments with respect to nine technology areas.

The participants were adult learners (N = 14) enrolled in a doctoral (Ed.D.) educational leadership program over the last year and one-half of the program. Statistical power was targeted at .80 using $\alpha = .05$ and $\beta = .20$ and the fixed sample size of 14 (Cohen, 1977). A simple instrument was developed from this literature by faculty over nine items which represented Web 2.0 software applications and their relevant comfort with each. Reliability of .82 was estimated using the Guttman Split-Half Method for the "before" and "after" sections of the instrument. Also, since this was a hybrid delivery (60% face-to-face and 40% online), there was an adequate time period between "Before" and "After" for a change (especially in behaviors) to take place (Kirkpatrick, 1994).

Procedure

Over a year and one-half, course syllabi and instruction were intentionally manipulated to stimulate student use of Web 2.0 software to accomplish course objectives, tasks, and outcomes. Four principal software tools were selected: Skype™, Wordpress ™, Yugma ™, and Pageout ™. Skype ™ mediated text (chats), video-conferencing, audio conferencing, (synchronously) and moving documents. Wordpress (free version) is a Blog site that allowed for thematic posts on course topics or planned responses to cases and/or discussion questions. Yugma™ worked with Skype ™ in that it allowed screen sharing with the instructor with up to 20 students (free version). Note: A simple digital tablet (Genius ™, approximately $50.00) attached to the USB port of faculty's personal computers, allowed for drawings and comments on anything their shared with their students. This mimics the use of a blackboard in a traditional classroom meeting face-to-face. Lastly, Pageout™ is a course management tool provided by McGraw-Hill™ Publishing Company (free if you use their textbooks). Pageout™ provided for course management and recorded keeping, and Web-links as well as an asynchronous discussion forum for each course. Three professors were involved in the online interventions; all have earned doctorates, all received three, two-hour training sessions

on the online tools. There were scheduled asynchronous "check-ins" by students and instructors on Wednesdays. Synchronous, two-hour sessions were the normal class time schedule. For the synchronous portion, students were given the option to come to face-to-face class, or work from home or office. By using a Smart classroom, students could progressively use laptops in class, then fully remote…to ease into the technology. Cases, study groups, and application problems applied Engagement Theory, Skype™, and Yugma™. Since "comfort" with technology was thought of as a holistic, multifaceted concept, a summated scale was used and single items were also assessed over a five-point comfort scale (Kolcaba, 1994; R. Lillie, personal communication, August 20, 2009)

Results

Overall summated results over nine technology areas were: "Before" ($M = 32.29$, $SD = 7.18$) and "After" ($M = 39.93$, $SD = 5.42$). When checking for normality for the two variables, the "After" variable departed from normality, so the Wilcon Signed Rank test was used instead of a t-test between the two variables. The Monte Carlo method estimated the exact p-value's reference set (Mehta & Patel, 2000) for the two variables data ($p < .01$) and the 99% CI [.0000, .0004]. Therefore the overall hypothesis is rejected; there are significance differences between the group "Before" and "After."

Actual sample power estimates ranged from .58 to .94 over the nine items. Table 1 summarizes the means and standard deviations of *C omfort* over the nine technology areas. Using computers, Using the Internet, and Using Email showed negligible changes before and after the technology interventions. With the given sample size, means, and standard deviations, effect sizes were calculated. At the single item technology level, greatest increases in comfort (mean value increases, ES) were with: *instant messaging* (1.07, $d = .88$), *online chat* (1.07, $d = .86$), *working with online course materials* (.96, $d = .68$) *online discussions* (1.14, $d = 1.04$), *talking with people over the Internet* (1.78, $d = 1.39$), and *videoconferencing via the Internet* (1.57, $d = 1.10$).

This sample showed no difference in Email use ($M = 5.0$). However, the variance of Comfort was lower, Instant Messaging ($SD = .842$) and Online Chat ($SD = .994$) "After" technology interventions. There was also a decrease in student variance After technology interventions with online discussions (from $SD = 1.311$ to $SD = .842$) and working with online course materials ($SD = 1.092$ to $SD = .633$).

Table 1: Before and After Means and Standard Deviations of Comfort with Technology

	Before (n = 14)	**After (n = 14)**
Technology Intervention	**M (SD)**	**M (SD)**
Using Computers	4.79 (.426)	4.86 (.363)
Using the Internet	4.93 (.267)	5.00 (.000)
Instant Messaging	3.29 (1.490)	4.36 (.842)
Online Chat	3.21 (1.477)	4.29 (.994)
Using Email	5.00 (.000)	5.00 (.000)

Working with Online Course Materials	3.50 (1.092)	4.36 (.633)
Participating in Online Discussion	3.21 (1.311)	4.36 (.842)
Talking with People over the Internet	2.29 (1.490)	4.07 (1.207)
Video Conferencing via Internet	2.07 (1.385)	3.64 (1.447)
Note. Legend for Comfort Scale: 1 = Very Uncomfortable; 2 = Somewhat Uncomfortable; 3 = Comfortable; 4 = Somewhat Comfortable; and 5 = Very Comfortable		

Discussion

The overall model of hybrid instruction using Web 2.0 tools shows promise with adult learners and positive comfort changes with technology interventions occur over time. Over the nine technology areas measured, there was an overall 35% increase in *C omfort* over a year and one-half. When examining the specific technologies for greatest effect sizes over time *online discussions* (*d* = 1.04), *talking with people over the Internet* (*d* = 1.39), and *videoconferencing via the Internet* (*d* = 1.10) stand out. This is probably due to the ease of use of the main technologies, Skype™ and Pageout™ consistent with the TAM (Davis & Davis, 2003). Selection and use of the Web 2.0 software tools fostered: positive attitudes, perceived usefulness of the software, and perceived ease of use all consistent with TAM. The instructors facilitated the outcome of "comfort" with software technologies because it was related to the internal/external task seeking behaviors (what they had to accomplish in the courses, e.g., assignments, projects, cases, etc.) which is also supported (Kolcaba, 1994; Hersey & Blanchard, 1979; Venkatesh, Morris,). Working with online course materials and participating in online discussions were very task specific and displayed very positive growth changes over time.

However, due to the nature of hybrid education (both face-to-face and on-line) "controls" for the overall model are difficult to create. These graduate students were full-time working professionals… all over twenty-five years old, pursing their doctoral degree either in higher education or elementary-secondary education. The learning interventions' foundations were designed around solid adult learning theory (Kolb, 1984; Knowles et al., 1984) and assignments and tasks forced the students to use the appropriate Web 2.0 technologies. The students used their professional experience and new course content knowledge to analyze case studies using Skype™, self-creating peer to peer study groups using voice, video and chat software. They also used the software for immediate, concrete solutions to many secondary problems as well, taking solutions and/or advice… applying it to their own situations.

One by-product of the model is continuous graduate student advising using Skype™. Once the student is recognized as one of your contacts you have an on-going chat (audit) record with that student (in case they leave you a message when you are not on-line). And, small non-intrusive pop-ups appear to tell you who has left you messages since your last log-on. You can also send attachments and other electronic media. Of course you can have

one-to-one or one-to-many audio conversations with your students as well. Video is available as well, but you may have some difficulty with band width if you increase the number of video users at the same time. We found that audio (voice) and being able to view what was on the professor's desktop (Yugma™) met our needs well. Many Blackberries ™ and Smartphones ™ are Skype™ compatible allowing you further continued communication. Skype™ with the Yugma™ application (both free versions) allowing for desktop sharing which emerged as the basic structure for the model.

Students found the principal software products to be easy to use and useful for the given task(s) at hand (Hersey & Blanchard, 1977; Davis, 1986; Zigurs & Buckland, 1998). Many of our online sessions revolved around PowerPoint ™ presentations. *Use of the digital pen on the PowerPoint slides with audio discussion worked exceedingly well.* Notes generated by the group discussions could be saved and distributed to all the participants at a later date. Since they were in an educational leadership program, the relationships established through study groups and peer to peer on-line conversations seemed to support the Hersey-Blanchard Model of Situational Leadership (1977) however now using an automated processes (Web 2.0 tools).

Conclusions

Some training should be available to students and faculty. The application software used here was easy to use, and the students found it useful for the tasks at hand. Web-sites provided the only technical support other than individual instructors helping students with specific problems. You might also expect adult populations (over 25 years of age) will need more training time than students less than 25 years of age. If a pretest is used prior to a learning experience, the results might help you to determine how much time and resources you need to invest in your training. This overall model could be replicated with Web 2.0 tools aforementioned. There are some limitations to the software, e.g., Yugma™ (free version presently allows up to 20 users) and sometimes there are connection problems. With a balance of synchronous and asynchronous software tools you create a balanced learning experience. Some of our group brought lap-tops or net books into the face-to-face sessions and logged-on to the software during the class. As they gained more confidence and comfort with the technologies in class they (one by one) would go on their own remotely from their office or home. This easing into the software and technology built their confidence.

Regional accreditation bureaus set standards for distance education programs and a "hybrid program" is not technically a distance education program, but has some of its components. The question of "how much should be face-to-face and how much online" is greatly depended upon purpose of the program and the regional accreditation standards. The sample ($N = 14$) was certainly a limitation to the study, however adults over the age of twenty-five have the ability to use Web 2.0 software tools to facilitate their learning. Consequently, generalizing these results might only be appropriate using the principal of *proximal similarity* i.e., similar participants, times, settings, places, and events (Trochim, 2009).

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Dr. Sivula is a former Director of Academic Computing and is a Certified Data Educator. In the early 1990s he served as a quantitative researcher and data analyst for the Public Education Fund study of the Providence (RI) Public Schools, which produced the Providence

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