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Donald G. Perrin, Executive Editor

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Table of Contents – January 2008

Editorial

"The Proof is in the Pudding!"

Elizabeth Perrin

The success of our instructional design, whatever the format – face-to-face, technology based, world-wide- web, disc delivered, computer interactive – is measured by learner performance. Of course, the student variables are probably far more complex and significant than any combination of technologies and delivery formats.

The increasing depth of research in technology-supported teaching and learning is to be commended. The Community of Inquiry 'technology log' equivalent to Mark Hopkins' ideal teaching scenario brings technology learning into a viable global learning arena.

What must be noted, however, are the widely divergent forms of "distance learning". These vary from highly successful, highly interactive transmissions from live on-campus classrooms especially designed for interactivity and connected to a number of distant receive classrooms. At the other end of the technology spectrum are "correspondence courses" delivered via DVDs or online with asynchronous interaction by web or email instead of via the postman.

When we talk about "distance learning", we need to be very clear about which end of the elephant we are describing.

Editor's Note: This excellent and compelling study contradicts some popular beliefs about the significance of instructional design and organizers to facilitate student performance. It reminds us that human beings are not lab animals, and that human needs for communication and participation are sometimes more significant than theory and practice.

Assessing the Impact of Instructional Design and Organization on Student Achievement in Online Courses

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Abstract

The Community of Inquiry Framework posits teaching, social and cognitive presence interact to create the learning experience in online environments (Anderson, Rourke, Garrison & Archer, 2001). Though a great deal of research has been conducted to empirically validate this construct, it has done so largely from the perspective of student satisfaction and perceived learning. Using a mixed methods design, this study examined the relationship between instructional design and organization (one of the components of teaching presence) and student performance. The results suggest that much more inquiry is needed in this area as triangulation of data raised serious questions related to the perceived value of instructional design elements among certain socio-economic groups of learners.

Keywords*:* online learning, teaching presence, instructional design, organization, student achievement, online courses, Hispanic students, Community College**.**

Introduction

As enrollment of online learners continues to grow at double digit rates (Allen & Seaman, 2006), it is imperative that faculty understand those elements that redefine what it means to be a teacher within this environment (Bennett & Lockyer, 2004). While the most obvious aspect of this paradigm shift is developing an understanding of related technologies (Brown, 2003; Pittinsky, 2002), it is essential that faculty understand the move from tool usage to application of such tools in a fashion that is informed by evaluation of their impact on pedagogy/andragogy (Epper & Bates, 2001; Hiltz & Goldman, 2005).

Though several models have been proposed to explain the learning process in online environments, one gaining the most attention is the Community of Inquiry Framework (CoI) (Garrison, 2007). Grounded in the constructivist school of thought, the CoI consists of three overlapping elements – teaching, social presence and cognitive presence – that coalesce to create the educational experience (Garrison, Anderson & Archer, 2000; Garrison & Archer, 2002). With a search of Google Scholar revealing more than 160 citations (Arbaugh, 2007) and confirmation through factor analysis (Arbaugh, 2007; Arbaugh & Hwang, 2006; Garrison, Cleveland-Innes & Fung, 2005), the CoI is considered as a baseline for the establishment of grounded theory in online teaching and learning dynamics.

Several studies have examined the three presences (Arbuagh & Hwang, 2006; Richardson & Swan, 2003; Shea, Li, Swan & Pickett, 2005; Swan & Shih, 2005); however, research has largely assessed each in terms of its impact on student satisfaction, with few studies assessing the impact of the presences on learning effectiveness (Wise, Chang, Duffy and del Valle, 2004). This study moves in this direction by examining the relationship between one facet of teaching presence – instructional design, organization and relationship – and learning effectiveness.

Following a review of the related literature, the institutional setting is contextualized and a description of the convergent triangulation research design is presented. Interpretation of data uses a comparative construct to explain the complexity of assessing the impact of practice on performance. Finally, conclusions and directions for further research are presented in hopes of expanding on this exploratory study.

Literature Review

To promote learner satisfaction and success in the online environment, educators must examine emerging teaching methodologies and engage in critical self-reflection of their instructional practices (Bennett & Lockyer, 2004; Conrad, 2004; Long, 2002; Merriam & Caffarella, 1999; Palloff & Pratt, 1999). Among the many considerations to foster positive outcomes for the learner is preparation and facilitation of courses in this medium. Instructors must be willing to rethink how they will guide learners to understand material and concepts that are essential for the transfer of learning (Olgren, 2000). Thus, the perspective of the instructor regarding learning via online instruction is a large factor in the success or failure of a distance learning venture. Instructor attitudes toward the online forum tend to range from enthusiasm to skepticism. Nevertheless, the online approach to teaching is here and measures for excellence in this endeavor must be cultivated for this is a continually expanding educational opportunity (Dziuban, Shea & Arbaugh, 2005; Palloff & Pratt, 2003).

Teaching Presence and the Community of Inquiry Framework

Viewed in a larger context, the performance of the aforementioned instructor-related tasks fall within the teaching presence construct of the Community of Inquiry Framework (CoI) (Anderson, Rourke, Garrison & Archer, 2001; Garrison, Anderson & Archer, 2000). Consisting of three overlapping presences (teaching, social, and cognitive) which coalesce in asynchronous learning communities, the CoI is considered a leading theoretical framework for understanding the co-construction of knowledge in online learning environments (Garrison, 2007; Garrison & Arbaugh, *2007*). For purposes of this study, teaching presence is considered the most important; however, brief synopses of social and cognitive presence are provided to allow for contextualization.

Social presence, in the context of online learning, is described as the ability to project one's self through media and establish personal and meaningful relationships. The three main factors that allow for the effective projection and establishment of social presence are effective communication, open communication and group cohesion (Richardson & Swan, 2003; Swan & Shih, 2005).

Grounded in the work of Dewey (1933), cognitive presence is defined as the exploration, construction, resolution and confirmation of understanding through collaboration and reflection (Garrison, 2007). Garrison and Archer (2003) describe this process as consisting of four phases, beginning with creating a sense of puzzlement or posing a problem that piques learners' curiosity. As a community, course participants exchange information and integrate understandings to answer the initial problem, culminating in the resolution phase were learners are able to apply the knowledge to both course and non-course related issues.

Teaching presence, the third component of the CoI, is described by Anderson and colleagues (2001) as a three-part structure consisting of: facilitation of discourse, direct instruction, and instructional design and organization. The first element, facilitation of discourse, is necessary to maintain focus and engagement in course discussions. It also allows the instructor to set the appropriate climate for academic exchanges (Anderson et al., 2001). The authors include the following as indicators of facilitation of discourse:

- identifying areas of agreement and disagreement
- seeking to reach consensus and understanding
- encouraging, acknowledging, and reinforcing student contributions
- setting the climate for learning
- drawing in participants and prompting discussion
- assessing the efficacy of the process

With respect to direct instruction, Anderson et al. (2001) describe the following indicators:

- presenting content and questions
- focusing the discussion on specific issues
- summarizing discussion
- confirming understanding
- diagnosing misperceptions
- injecting knowledge from diverse sources
- responding to technical concerns

Recent work by Shea and colleagues (2005) indicates that students may not perceive a difference between facilitation of discourse and direct instruction. In their research, factor analysis indicated that perhaps these first two elements should be collapsed into one category and termed directed facilitation.

With respect to instructional design and organization, the element most important to this study, Anderson et al. (2001) include the following indicators:

- setting curriculum
- designing methods
- establishing time parameters
- utilizing the medium effectively
- establishing netiquette

Although social and content-related interactions (social and cognitive presence respectively) are necessary to facilitate learning in online environments, Garrison and colleagues (2000) contended that by themselves they are not sufficient to ensure maximization of outcomes. Interactions need to have clearly defined parameters and be focused toward established goals and objectives, in other words, application of the tenets of teaching presence (Garrison and Arbaugh, 2007). Reinforcing this assertion are a number of studies underscoring the importance of teaching presence in online learning environments (Dixon, Kuhlhorst & Reiff, 2006; Finegold & Cooke, 2006; Garrison & Cleveland-Innes, 2005; Murphy, 2004; Swan, 2003; Richardson & Swan, 2003; Swan & Shih, 2005; Wu & Hiltz, 2004). However, the vast majority of teaching presence research has focused on the facilitation of discourse and directed instruction with little attention given to instructional design and organization. Further, a review of the available instructional design and organization literature revealed that those few studies that do exist address the relationship between this element and student satisfaction, not performance.

Instructional Design and Organization

Traditionally, instructional design has been thought of as a systematic process that addresses, desired goals and outcomes, then working backwards, strives to develop assessments, strategies and materials that will achieve these objectives (Davidson-Shivers & Rasmussen, 2006; Gagne, Wager, Golas & Keller, 2004; Morrison, Ross & Kemp, 2006; Wiggins & McTighe, 2005).

Applying this general definition to online learning and refining it to apply to the CoI, Anderson and colleagues (2001) described the design and organization element of teaching presence as the planning, design and development of those structures and processes that serve as catalysts for interaction in online courses.

Because online learning environments are low in paralinguistic cues (Liu, Bonk, Magiuka, Lee & Su, 2005) and generally lack the transparency associated with the traditional classroom (Coppola, Hiltz & Rotter, 2002), socially mediated practice (Vygotsky, 1978) can be negatively impacted. Therefore, instructors must be more explicit with respect to providing directions and establishing expectations (Anderson, Rourke, Garrison & Archer, 2001).

Method

This study utilized a convergent triangulation design to answer the following research questions:

RQ 1: Is there a relationship between student satisfaction with instructional design and organization and student performance in online courses?

RQ 2: What facets of instructional design and organization do students associate with success in online courses?

Instructional Setting

The study is based on a population of students residing in the Rio Grande Valley of south Texas and attending class at South Texas College. At this institution, students have the opportunity to complete certificate programs through the Bachelor of Applied Technology degree. The participants for the study were enrolled in online courses in a variety of subjects, ranging from developmental education through senior level class work in all areas of instruction. Course design utilizes WebCT as the learning system and synchronous or asynchronous instruction, determined by the instructor's preference. During the Fall 2005 semester, one or more sections of 75 different courses were offered.

Participants

South Texas College's Institutional Review Board approved the protocol for this study to ensure ethical treatment of all participants. The survey instrument was administered to 2,157 students enrolled in one or more online courses with no incentive for participation offered. A total of 362 participants (response rate = 16.8%) chose to complete the survey. The majority of respondents (69.3%) were between the ages of 18 and 29, with 28.2% age 18-21. Females comprised 79.9% of participants. With respect to ethnicity, 91.4% described themselves as Hispanic, 4.3% Anglo, 1.4% African American, 0.6% Native American and 2.3% as Other. In terms of previous online course experience, 65% had previously taken at least one online course. With respect to technical preparation, 51.1% of participants had completed a pre-course tutorial offered to students taking online courses and 95.4% believed that they were adequately prepared.

Design

A mixed methods approach utilizing a convergent triangulation design with both concurrent and sequential components was implemented (Cresswell & Plano-Clark, 2006). In the analysis and interpretation phase, equal weighting was given to both the quantitative and qualitative components to enrich the description of the value participants placed on instructional design and organization (Morse, 1991). Three separate sets of data were utilized in the triangulation process: end of course Likert-type items, end of course open-ended qualitative items and autoethnographic reporting (Patton, 2002).

A mixed methods research design was selected for the work and guided by a "pragmatic approach" or paradigm (Morgan, 2007). The focus was to capitalize on the strengths of both quantitative and qualitative approaches to data collection. This required following established

criteria for generating high quality quantitative and qualitative data. While criteria for judging the quality of quantitative studies are well established, there is less agreement regarding what quality criteria are applicable to qualitative research (Denzin & Lincoln, 2003; Marshall & Rossman, 1989). Jick (1979) argued that triangulation of data sources aimed at enriching understanding through multiple perspectives should be the central criteria by which mixed methods research is judged.

End of Course Survey – Quantitative Data

At the end of the semester, students were asked to complete a survey to assess satisfaction and perceived learning. The survey consisted of 48 items. Of these, 13 asked for demographic information and four were open-ended qualitative items. The remaining 31 were Likert-type items assessing student satisfaction with course design, navigation, the instructor and perceived learning, including an item that asked for self-reporting of final grades. Four of these former items were related to instructional design and organization (Appendix A) and comprise the quantitative portion of the study.

End of Course Survey – Qualitative Data

Of the four end-of-course survey items, two were used in the study:

1. Please list one thing the instructor did that helped you to succeed in this class.
2. Please list one thing the instructor did that hindered your success in this class.

Responses were analyzed following suggestions by both Strauss (1987) and Tesch (1990) using an interpretive, iterative approach with emphasis placed on drawing out thematic strands. Because of the data richness, both within and cross case analyses were utilized to more fully represent what occurred at both the individual level and as part of a group dynamic. Data were then transformed and quantified by theme within the teaching presence construct of the CoI. Thirty replies were related to personal issues, therefore not falling within the CoI Framework. These replies were coded and categorized as Other.

Autoethnographic Reporting

In accordance with suggestions offered by Patton (2002), this paper's lead author utilized a self-interview format for ongoing journaling of her perceptions of student response to instructional organization and design techniques during the semester in which data collection occurred. Though this technique is arguably subject to bias on the part of the reporter, it was deemed a valuable tool for cross-checking the interpretation of the end of course survey qualitative data.

Triangulation

After analyzing each qualitative data set in the manner described above, the end of course survey, qualitative data was crosschecked with the autoethnographic reporting to assess commonality and accuracy of independent interpretations. This process included the use of negative case analysis to explore consistency across data sources (Ryan & Bernard, 2003). Quantitative data were then analyzed using descriptive statistics and regression analysis.

The qualitative findings were then converged on the quantitative data to fully explore the implications of the statistical findings. As there was a significant difference between quantitative and qualitative data, the qualitative points were used to offer an explanation of these differences, using suggestions made by Cresswell and Plano-Clark (2006). The interpretive conclusions from triangulation analyses were then compared to what is known about the corresponding elements, instructional design and organization to develop conclusions and directions for future research.

Results

Reliability

As previously noted, the wording of the instructional organization and design subscale was revised to accommodate potential interpretability issues that may impact community college learners. Therefore, reliability of the scale was a primary concern in this study. Reliability analysis produced a Cronbach's Alpha of .91, thus alleviating concerns related to reliability.

Multiple Regression Analysis

A multiple regression analysis was applied to examine the relationship between the instructional design and organization measures and student reported performance. In the regression analysis, the criterion variable was the final grade in the course as reported by students. The predictor variables were four measures of instructional design and organization (Appendix A). No violations were found in the assumptions of normality, linearity, and homoscedasticity of residuals. Thirteen outliers were found based on the criteria of beyond ±3 standard deviations; these were removed, and 349 cases were used in the present analysis.

Presented in Table 1 are the unstandardized betas (B), standard error (SE B) and standardized betas (Beta) of the independent variables. The results of the regression model were found to not be significant, $F(4, 342) = 2.194$, $p > .05$. The multiple correlation coefficient was .177, indicating that 3.1% of total variance in student performance could be accounted for by instructional design and organization.

Table 1

Unstandardized Betas, Standard Error and Standardized Betas

	B	SE B	Beta
(Constant)	1.638*	0.615	
Class is clearly designed	0.288	0.149	0.15
Syllabus is clearly presented	-0.252	0.171	-0.11
Syllabus offers a tentative schedule	0.109	0.113	0.057
Instructors requirements clearly explained	0.093	0.17	0.044

*P < .05

Qualitative Data

Of the 362 students completing the survey, 227 chose to provide feedback relating to both their success and lack of success in the course. An additional 74 students chose to provide feedback related only to their success in the course and 29 chose to provide feedback related to their lack of success in the course.

Through an iterative, interpretive review of the qualitative data, it was possible to group all but 30 responses into one of the preconceived teaching presence categories. As only the instructional design and organization component of teaching presence was explored using quantitative analysis, the qualitative data was only divided into components for this category. All other themes that related to teaching presence were grouped under facilitation of discourse.

Presented in Tables 2 through 4, below, is the categorical prevalence of themes associated with success and lack of success. Data is segregated according to the qualitative items to which students responded.

Table 2

Categorical prevalence of themes associated with success and lack of success by those who responded to both qualitative items.

	Success	Lack of Success
Class is clearly designed	3	19
Syllabus is clearly presented	8	25
Syllabus offers a tentative schedule	11	8
Instructors requirements clearly explained	17	24
Facilitation of discourse	180	134
Other	8	17

Table 3

Categorical prevalence of themes associated with success by those who chose to respond only to this item.

	Success
Class is clearly designed	3
Syllabus is clearly presented	1
Syllabus offers a tentative schedule	14
Instructors requirements clearly explained	6
Facilitation of discourse	48
Other	2

Table 4

Categorical prevalence of themes associated with lack of success by those who chose to respond only to this item.

	Lack of Success
Class is clearly designed	5
Syllabus is clearly presented	3
Syllabus offers a tentative schedule	2
Instructors requirements clearly explained	9
Facilitation of discourse	7
Other	3

Of students who cited instructional design and organization issues contributed to their lack of success, 31% received As in the course, 39% received Bs, 24% received Cs and 6% received Ds or Fs. In contrast, of students who cited facilitation of discourse issues contributed to their lack of success, 8% received As, 43% received Bs, 45% received Cs and 4% received Ds or Fs.

Autoethnographic Reporting

Throughout the semester during which the data was collected, the researcher utilized a journal format to record personal observation of student perceptions and reactions regarding instructional organization and design techniques. Observations were recorded at least weekly and many times more often as the need arose. Based on the study of these observations, it was determined that there were three areas where students consistently required additional information which was requested either through the e-mail or the discussion tool in WebCT. The three areas were assignment dates, assignment directions, and submission guidelines.

Predominantly, student e-mail or phone calls were for clarification of assignment due dates. While these were listed in the course calendar, under Assignments in the shell's course menu, and in the course calendar, students requested confirmation of a due date or what was the due date. The response included a direct answer and a casual comment about where the information could be found. Invariably, when the next assignment was due, the same students would e-mail again asking for deadline information.

Students often contacted the instructor for specific directions for assignments. Again, this material was presented in general terms in the syllabus and in more specific terms under each assignment heading. Often, the student questions regarding assignment requirements were submitted via the discussion forum, where students were encouraged to post and answer questions. Often, the instructor would leave a question unanswered for a brief period of time to observe whether another student would offer the answer. This was a rare occurrence.

The most illuminating area noted through observation was the area of submission guidelines. This referred to the technical aspect of uploading the information to the appropriate area. For this instance, instructions were provided in the course for each assignment and general instructions were also provided by the course management system. Still, students often e-mailed, usually very near the deadline for the assignment, that they were unable to submit or did not understand how to submit the assignment. Many times, resolution required a telephone call to walk the student through the submission process step-by-step to ensure that the submission was correctly handled.

Triangulation & Discussion

Regression analysis revealed no significant relationship between instructional design and organization and student achievement in online courses. In addition to a lack of significance, the multiple correlation coefficients indicated that only 3.4% of the variance in student achievement was accounted for by the predictor variables. Though this study was exploratory in nature, it was believed that a relationship was likely to exist and would account for a larger degree of variance. Therefore, the results of the regression analysis were quite surprising as they contradicted the assumptions upon which this study was founded.

However, supporting the quantitative findings were the transformed qualitative data. As open ended questions do not impose a preconceived bias on respondents' replies, it gives significant weight to alignment of this data with the quantitative findings. Of those students citing factors responsible for their success in the course, only 20.9% were related to instructional design and organization. Of those citing factors for their lack of success, 37.1% cited factors related to instructional design and organization. On the surface, this data appears to contradict the quantitative findings to some extent. However, of the students sighting instructional organization and design issues as a reason for their lack of success, 31% received A's in the course and 39% received B's. It is interpreted that a total of 70% believed they were not completely successful in mastering course content and objectives, yet performed at levels deemed excellent or good by conventional standards.

In understanding why a significant relationship was not found to exist between student achievement and instructional design and organization, the autoethongraphic reporting is informative. Despite directions for participation, due dates and course content being presented in a clear, and often redundant, manner, students frequently contacted the instructor via email or phone to seek additional information. A review of the associated course website indicated that this data was clearly available and presented in an easily interpretable fashion.

Whether students were simply not reading the online materials or wishing to make additional contact with the instructor for reasons related to the establishment of social presence remains unclear. However, the noted lack of student-to-student communication in seeking clarification suggests that establishing a relationship with the instructor at a more personal level or as an authority figure may have been a motivating force in the frequent level of contact.

The autoethongraphic data also suggests that, for these students, the relationship with the instructor was far more important in the learning process than was the relationship between students and the content. Supporting this hypothesis is the qualitative data, which revealed that 75.2% of students attributed their success in the course to directed facilitation on the part of the instructor.

Findings of this triangulation are presented in a guarded manner as participant demographics limit generalizability in two ways. First, this study consisted of community college learners who may have learning needs that differ significantly from learners in other post-secondary programs. Second, the population was overwhelming (91.4%) Hispanic, raising the prospect that ethnicity may be a confounding factor in interpreting the relationship between instructional design / organization and achievement.

Over the past decade, four-year college completion rates have been declining across all racial and ethnic groups as more students take longer to receive their Bachelors degree (Astin & Oseguera, 2005; Cabrera et al., 1993; Longerbeam et al., 2004). Compounding the problem is the tendency of prospective students from low socio-economic areas, where poorly maintained and funded public schools are the norm, to doubt their academic abilities, question the value of their scholarly contributions, and reconsider their decision to pursue a degree (Cuádraz, 1997; Gándara, 1995; Solórzano, 1998). In response, many students from this demographic elect to begin their coursework in a community college setting where the curriculum is perceived to be less rigorous and the risk of failure lower. However, the reality is that too often these institutions provide instruction grounded in cultural practices that remain alien to many attendee clusters, thereby failing to address socially derived structural inequalities (Garcia, 2003; Garcia & Gopal, 2003; Valencia & Bernal, 2000)) and therefore curb the knowledge transference function in community colleges (Ornelas & Solórzano, 2004).

For Hispanic students, the situation is even more dire. In comparison to other ethnic groups, research shows that they take longer to enroll in college and to eventually graduate (Kennen & Lopez, 2005; Swail, Cabrera, Lee and Williams, 2005). Delayed enrollment and longer time to degree completion for Hispanic students has been attributed to several factors, such as working full-time while also taking courses part or full-time, having to tend to familial responsibilities, or having to take developmental courses which may not be credited towards degree attainment (Nora, 2004). In turn, these experiences serve to amplify self-doubt and lead to a need for external reinforcement or precipitate the decision to withdraw from programs (Ponjuan, 2005).

Conclusions

The original intent of this study was to determine if a relationship existed between instructional design / organization and student performance in online courses. None of the three methods revealed a relationship between the predictor and criterion variables. However, we believe that

the study is meaningful in that it illuminated the possibility that among certain demographics little value may be placed on instructional design related elements. Rather, there is a strong indication that the students in this study were highly dependent upon interpersonal student / instructor interactions for both direction and reinforcement.

From the literature, reviewed in the triangulation and discussion section, this hypothesis appears to be consistent with the needs and expectations of both low socio-economic status students and Hispanics that enroll in community college courses. However, as both groups were inexorably intertwined in this study, more analysis is needed to determine if both demographics present the same set of needs or if the phenomenon is more tightly focused.

Likewise, future inquiry should address multiple institutions, racial groups, geographic clusters and degree levels. Ideally, a mixed methods study with a quantitative component that utilizes hierarchical linear modeling would be ideal for this purpose as various group attributes could be defined as nested data sets and regressed against the criterion variable of performance.

Regardless of the approach taken we believe that future studies are imperative. If in fact, contemporary practices related to design of online courses and subsequent pedagogical strategies are repressive to any socio-economic group, then we are creating a secondary digital divide just as the cost-driven digital divide is starting to be mitigated by market forces. As such, this issue should be viewed as one of promoting equity through technology mediated praxis.

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Editor's Note: With popularization of the Internet, many institutions abandoned television studio classrooms and interactive television for online instruction. However, television continues to be a viable method of instruction and is often preferred for visual and process oriented topics such as engineering, science, and nursing. As the internet goes broadband and facilitates multimedia and video, there is a renewed interest in learning from television. This article emphasizes the need for planning and technical support, especially for legacy systems. There needs to be clear assessment of effectiveness of the chosen ITV format by the originating institution. Recommendations listed here should be implemented.

Teaching with Instructional Television

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Abstract

College and university educators may be required to teach with distance technologies such as instructional television (ITV). As higher education focuses more on asynchronous educational mediums such as the Internet, adapting to teach with ITV may seem unnecessary. However, many schools have invested heavily in technology and support systems for ITV that is not likely to be abandoned in the near future. Teaching with ITV continues to be a challenge for educators. Teachers from a small public university who have experience in teaching with ITV were surveyed to discover strategies adopted by educators to meet these challenges. This information may help institutions offering distance education via ITV to better support their teaching faculty.

Keywords: active learning, administrative support, classroom management, communication, course management software, distance education, higher education, instructional television, student evaluation, synchronous instruction, teacher attitudes, technology, faculty workload.

Teaching with Instructional Television

Institutions of higher learning use instructional television (ITV) for educating students located at a distance from colleges or universities. TheNational Center for Education Statistics 2003 canvas of colleges and universities in the United States found that (56%) of all two and four year institutions that grant degrees offered some instruction through distance education. More than half (51%) of the institutions used instructional television in distance education.

ITV typically involves filming an instructor at one site and transmitting that instruction on television in real time to one or more additional sites. Teaching with ITV has been improved by the addition of two-way audio and interactive video and the ability to display computer graphics at both sites (Bacon & Jakovich, 2001). ITV is synchronous interactive video and, as such, preserves interactivity between students in both classrooms and the instructor even for the distance classroom (Andrews, Gosse, Gaulton, & Maddigan, 1999). Technologies such as video streaming, telephone-conferencing, and internet allowed ITV to emerge as a powerful medium for teaching distance students (Mercer, 2004).

There is a tendency to regard the future of distance learning as belonging solely to online or web classes. However, Burrow and Glass (2001) found that courses offered in ITV were sometimes preferred by students even when the same course was offered online. Dooley, Lindner, & Richards (2003) found that the visual and interactive nature of instructional television benefited students. Student satisfaction with ITV has been heavily researched and generally confirmed (Anderson & Kent, 2002).

As a consequence of the boom in distance education, faculty members are often asked to teach using delivery mechanisms such as ITV. This can be a source of considerable strain. Seay,

Rudolph & Chamberlain (2001) surveyed fifty-five instructors who taught with ITV. They found that 78.2 percent preferred to teach in a traditional classroom while 47.3 percent expressed strong opposition to teaching with ITV. Faculty who experienced difficulties teaching with ITV had problems with: technology, communication, workload, and lower student course evaluations in the ITV classroom.

Faculty members at a small public university in California who taught with ITV were surveyed regarding their experiences in teaching with ITV. The research presented in this paper is intended to give a better understanding of teaching from a distance through ITV so that distance faculty can learn from the experiences of their colleagues and be better supported by their institutions.

Literature Review

Instructors interviewed by Wheeler, Batchelder, & Hampshire (1996) found that there was considerable time involved in adapting to cameras and microphones, both for themselves and for students. Swift, Wilson, and Wayland (1997) stated that manipulating the control panel to direct the camera angles constituted a considerable distraction to the instructor's attention. Seay, Rudolph, & Chamberlain (2001) noted that ITV instructors must adapt their courses to tools such as the Elmo, an overhead camera, which limits the display material an instructor can use to the size of a letter sized sheet of paper. This makes illustrating concepts difficult because all explanation must occur in that small space. In-class technological failures of ITV equipment disrupt the flow of a class and take up needed class time (Thyer, Polk, & Gaudin, 1997).

Communication issues for ITV instructors varied. Some instructors have difficulty with the lack of non-verbal cues. As Cooke and deBettencourt (2001, p.222) noted, "in typical college classes, the professor generally relies on nonverbal means such as: eye contact, facial expressions, and body language to gauge the reactions of the participants." ITV instructors who adopt a learner-centered teaching style are challenged to elicit responsiveness from students at the distance site. Traditionally, viewing television is a passive act. "Most students have little expectation of, or experience with, television as an interactive medium" (Racine & Dillworth, 2000, p.349). Yet learner-centered teaching has been linked to academic achievement in distance education research (Dupin-Bryant, 2004).

Distance educators fear an increased workload. The National Education Association poll of distance learning faculty found that distance teaching required a greater time and work commitment from instructors than traditional courses (2000). Much of the literature recommends that the instructor periodically teach at the distance site in order to improve the experience for the distance student (Bader & Roy, 1999). Depending on the location of the sites, this can result in a considerable amount of lost time for the instructor. Beattie et al (2002) noted that an increase in class size due to multiple sites equaled an increase in teacher workload as additional time to grade and prepare course materials is required.

Student evaluations of instructors have a major impact on promotion and retention decisions. Negative evaluations from the ITV classroom may be more indicative of problems with the medium than with instruction. Fetzer (2000) in her comparative analysis of nursing student evaluations from a traditional and an ITV classroom where the class and instructor were the same found that the teacher received higher ratings in 12 out of 13 categories from the traditional classroom than from the ITV group. Thyer, Polk, & Gaudin (1997) in a similar study of social work students found that the traditional classroom rated the instructor higher on all counts except for course management. Beattie et al (2002) however, noted that results were similar for the traditional and distance sites in their study of special education credentialing students. They suggested that altering teaching style and incorporating interaction in order to include the ITV students resulted in more positive evaluations.

Currently, a substantial number of college instructors teach with ITV. Johnson and DeSpain (2001) surveyed Deans of Education and found that (61%) expected newly hired professors to teach with ITV while (22%) stated that faculty currently employed could not refuse to teach with ITV. Musial and Kampmueller (1996) found that the start-up cost to launch an ITV program can be more than $100,000 dollars and that ongoing maintenance charges contributed to the total cost to the institution. The demand for distance education, the need to support students who are not geographically located near a college or university, and the financial investment in equipment and support make it important for faculty to find ways to adapt to this technology and determine which ITV technologies should be implemented as more instruction/learning is supported.

Methodology

Sixty faculty members at a small public university who taught with ITV were sent surveys in Spring 2006. These faculty members teach in diverse subjects including Social Work, Education, Science, and English. They represent varying ages and experience levels in teaching and with technology. Thirty-three faculty members completed and returned the surveys for a fifty-five percent return rate. Instructors exhibited much enthusiasm in their impressions of ITV regardless of whether those impressions were positive or negative.

The survey instrument consisted of 46 questions that provided for structured and free text responses. The surveys were designed to elicit faculty attitudes toward ITV, problems faced, and strategies developed for coping with those difficulties. A variety of concerns that emerged in a review of the literature were covered including: technology, communication, workload, and student evaluations. Demographic data regarding: gender, ethnicity, subject discipline, and experience in teaching and ITV were used as variables in evaluating survey results. Survey results were inputted into Statistical Package for the Social Sciences (SPSS). The data gathered was intended to discover how the ITV teaching experience could be improved for instructors.

Results

Survey respondents included 19 female and 14 male faculty members. The median age was 49.5 years. The oldest person surveyed was 74 and the youngest was 33. The average time spent teaching at a college or university was 14.6 years with only one respondent having taught for less than one year. The average number of ITV courses taught prior to the survey was seven. The ethnic breakdown was: (78.8%) Caucasian, (6.1%) Japanese, (3%) Hispanic, and (12.1%) who preferred not to answer.

Subject disciplines represented were: science (15.2%), nursing (15.2%), education (15.1%), social work (12.1%), economics (12.1%), business (9.1%), English (6.1%), psychology (3%), criminal justice (3%), theater (3%), history (3%), general studies (3%), and art history (3%). This is broken down by department in Table 1.

Table 1

Percentage of Instructors Surveyed by Academic Department (n=33)

Departments	Percent Surveyed
Humanities	48.3
Sciences	30.4
Education	12.1
Business	9.1

All courses taught by faculty included in this survey were either at the upper division or graduate level. Of instructors surveyed, (61.5%) said that they preferred to teach in a traditional classroom.

1. Technology

Of the ITV instructors surveyed, slightly more than half (51.5%), indicated that the equipment they were using was not satisfactory for teaching. Problems mentioned specifically by instructors were: lack of equipment updating (27.3%), inability of students at the distance site to see both the teacher and lecture slides at the same time (18.2%), lack of range of movement with the microphone and camera (12.1%), that the cameras did not focus on the distance students while they were speaking (6.1%), and that all students in the distance classroom could not be seen.

ITV instructors when asked about the loss of class time due to technical difficulties such as losing sound and buzzing noises reported that this happened frequently (33.3% of the time) or occasionally (45.5% of the time) in their classrooms. It was reported that classes were cut short or classrooms needed to be changed due to problems with the technology. An instructor noted as a "distraction in class" [that] "cameras do not work with microphones" preventing students and the instructor from seeing who is speaking in the other classroom. These incidents suggest that technological difficulties have a significant impact on teaching through ITV.

When asked about technical support at the distance site, more than half (66.7%) of ITV instructors surveyed indicated that it was sufficient. Those who were dissatisfied indicated that they were bothered by: slow or erratic courier service for delivering graded papers or materials to students (9.1%), lack of resources available to students at the distance site (9.1%), and lack of technical assistance at night (6.1%). In terms of pedagogical support of active learning, instructors surveyed expressed a desire for a class aide (3%) and a better audio connection (3%) between sites.

Most instructors expressed comfort in their use of ITV technology (87.9%). More than half, (57.6%) had received training on teaching via ITV. More concern was expressed over what was available in terms of the technology than any real discomfort in using the equipment. Almost half (45.5%) of instructors, stated that they had camera and video feed needs not being met by the existing technology. Instructors who did not find the Elmo and the whiteboard sufficient for their instruction constituted a substantial percentage (27.3%). More than one instructor expressed a desire for a mobile microphone that could be worn when moving around the classroom. Technology to enhance video coverage and apply greater zooming capability can make the ITV pedagogical experience more closely resemble that of a traditional classroom.

2. Communication

I. *Active Learning*

Active learning is generally considered to be an effective method of teaching. When queried regarding whether their teaching style was traditional, active, or a mixture of traditional and active learning, more than half of instructors surveyed (54.5%) reported using a mix of the two. Only (6.1%) of instructors used active learning as their primary teaching method. Group work is used in active learning. One instructor could not hear or see what the distance class was doing so group work in the distance classroom went unmonitored. ITV was not considered a favorable medium for group projects by (42.4%) of instructors.

The traditional lecture method of teaching may look like the most practical choice for ITV given the static nature of filming. In fact, (33.3%) of instructors stated that data-driven courses were best for courses taught through ITV. An instructor wrote that she did not have the "knowledge/ skill to do small group activities and full classroom discoveries" in an ITV classroom. However,

as the literature review has shown, the synchronous nature of ITV can lend itself effectively to encouraging interaction among students. Of the instructors surveyed, (24.2%) indicated they had reduced or eliminated interactive projects in order to make the course fit better into the ITV framework. One instructor stated that she had altered her course for ITV by using "less active learning because it is much harder with the 10 second time delay."

When asked about strategies to manage group work more effectively, (18.2%) thought that course management software such as Web CT was effective for encouraging discussion between students at both sites and between students and the instructor. Overall (60.6%) of instructors teaching with ITV reported that they used tools such as Web CT to complement classroom instruction and encourage interaction.

II. *Classroom Management*

As illustrated in Table 2, (57.5%) of ITV instructors surveyed said they encountered more problem behavior from students in the distance classroom. Problem student behavior included: poor attendance, sitting in seats that were off camera, failing to press the microphone button so that students at the other site could hear, cheating on examinations, distracting behavior such as talking to other students or on cell phones, working on other projects during class time, and rudeness to students at the other campus. Many teachers (42.4%) had more problems with attendance in their distance classrooms.

Table 2

Percentage of Instructors Reporting Classroom Management Problems n=33

Distance Classroom	Yes	No
Problem Behavior	19	14
Poor Attendance	14	16

Strategies developed to address problem behavior included: asking students to turn off cell phones, emailing students privately later regarding their behavior, asking students to change their seats, learning the names of students, informing staff about issues, and using personal websites. The idea of using a seating chart was also mentioned as a solution to the problem of students sitting out of camera shot.

III. *Workload*

Two-thirds of faculty (66.6%) reported that they spent more time preparing for their ITV classes than for their traditional classes, while one-third (33.3%) indicated that the same amount of time was taken to prepare for an ITV class as compared to a traditional class. The vast majority (88.5%) of instructors made alterations to make their courses more suitable for ITV. Email and transferring materials to a course management program were mentioned as a means of improving communication. It was noted, however, that email in particular tended to be very time consuming.

Only (15.2%) of instructors were required by their departments to visit the distant site. However, almost one-third of instructors (30.3%) stated that they found visiting the distance site an effective means of encouraging communication between themselves and their distance students. One instructor was emphatic that visiting the distance sites was necessary but that the time it took was very draining since she taught a course that was broadcast through ITV at multiple sites. Another instructor wanted to visit the distance site but could not because her courses were scheduled back to back, and she taught a mixture of ITV and traditional courses.

Survey comments indicated that instructors put additional effort into including their distance students in the class. One instructor mentioned the "intense work [of] getting materials ready for Web CT." Class size is an obvious factor as with more students there is more work involved in grading and advising. Instructors may generally place caps on the number of students registered in a class. However, the number of students admitted in a course, course scheduling and workload assignment may not be decided by the instructor.

IV. *Student Evaluations*

Almost half (45.4%) of instructors reported that student evaluations of their ITV classes were noticeably worse than student evaluations of their traditional classes. The remainder either indicated that there was not a difference in student evaluations of their ITV classes (33.3%) or chose not to answer (21.3%). One instructor stated that her evaluations had been worse before she began the practice of visiting the distance site each quarter. Lower student evaluations carry a tremendous weight for instructors because retention and promotion decisions are largely based on these. A poor student response may have a profoundly negative impact on an instructor's career.

An instructor stated that she saw a correlation in her classes between technical problems at the distance site and poor evaluations from students at the distance site. This was borne out by comparing the data in SPSS. When a question regarding class interruptions due to technical failures such as loss of sound or buzzing noises was compared with poor student course evaluations for the distance site a highly moderate correlation of 0.484 was identified.

Conclusion

When asked if they preferred to teach in a traditional or ITV classroom, the overwhelming majority of faculty members surveyed, (61.5%), said that they would prefer to teach in a traditional classroom. Only two instructors stated that they would prefer to work in an ITV classroom. One teacher noted that she preferred the traditional classroom "because I am not well trained in ITV or Online."

Instructors' concerns were generally for the students at both sites and how to effectively help them. One instructor created a PowerPoint presentation to introduce her students to the process of being on camera and speaking into a microphone. Repeated comments and needs expressed were for better and more current technology, more training in how to use the technology, better scheduling (so that teachers could visit the distance site), and more staff to provide technical, proctoring, and classroom support.

Recommendations

Teaching faculty should be supported when they are working with ITV just as they are supported in the traditional classroom. Issues such as: technology, training and collaboration to improve pedagogy and communication, workload, and lower student evaluations due to issues with the medium rather than the quality of instruction need to be addressed by any university that offers a distance education program.

Distance education administrators can take steps to improve the instructor's experience. The literature and the data presented suggest that it would be helpful to have more and better communication between the administration and the faculty. Technical issues that are on-going, disruptive to learning, and experienced by multiple teachers should be tracked and addressed by school administration. The need for ongoing funding for equipment maintenance and upgrades to distance technology should be dealt with as a necessary expense. Teaching faculty should be consulted in evaluating the need and potential efficacy of new technology.

Instruction in how to use the technology should be standardized and required for all ITV instructors. As the technology changes, there should be ongoing instruction provided to faculty to address these changes. If desired, the instructor should have the option of asking for a technical assistant to be present in the distance classroom. Centralized support should be available for faculty teaching with ITV or with other distance education technologies. Faculty should have a clear communication channel to an administrative body that can resolve issues involved with teaching via ITV.

Technology is the solution for many problems with ITV. Several instructors wanted to be able to move freely in the classroom. Classroom management software, the use of class websites, and email are all useful as tools for classroom support and foster communication between the instructor and the students. Instructors should be supported in using technology which would mitigate the problems inherent in geographical and cultural distance between traditional and off-site students.

There is a significant body of literature on how to adapt teaching to the ITV or online environment. School administrators should be responsible for making this available to instructors, sponsoring workshops on how to teach with ITV, subsidizing attendance of faculty at off-site workshops that provide instruction on teaching with ITV, and creating a mechanism for ITV instructors to communicate with each other across departments so that they can more effectively share best practices. Communication between instructors and distance students could also be fostered by supporting the instructor to visit the distance site through better scheduling of ITV courses and payment of travel expenses.

The workload of an instructor should not increase simply because he or she is teaching a distance class. The greater time factors involved with the initial start-up of a distance course should be weighed when class assignments are made. The time issues involved with communicating via email or with commuting to the distance site should be considered as part of the distance educator's workload. Courses offered via ITV should be capped at both sites so that class size does not become overwhelming. Other remedies should be considered, such as offering the support of a student assistant, offering the option of a team-taught class so that the work burden is shared between instructors, and offering release time to instructors.

Student evaluations should be written to distinguish the medium from the instructor where possible. Evaluations of distance teachers should be compared to their traditional class's evaluations before significant weight is given to them. Administrators need to be cognizant of the difficulties that are inherent in teaching over a distance. With this knowledge they can provide stronger and more comprehensive support to faculty teaching through ITV technology.

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Editor's Note: Research answers two kinds of questions. What is different? And is it statistically significant? Having found a significant difference, we then ask the question, why? From a program or instructional design point of view, what do we change to improve learning, performance, or outcomes?

An Analysis of Factors Impacting Student Satisfaction and Retention in On-Site and Hybrid Courses

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United States

Abstract

This research project examined the relationship between several specific factors and the level of satisfaction and retention achieved for students attending either traditional On-Ground or Hybrid (partial Online and partial On-site) delivery modality university courses. The research project incorporated data from 110 courses and 164 students. Results indicate that there is a statistically significant relationship between the levels of student satisfaction and student retention and the quality of the university support organizations irrespective of the modality of course delivery. Contrary to the common belief prevalent at the university being studied, the impact of an individual professor or professors on student satisfaction was shown to be comparatively neutral.

Keywords: distance education, hybrid courses, online education, student retention, student satisfaction.

Purpose

The purpose of this study was to analyze the impact of several key factors upon student satisfaction and retention and to determine if the modality of course delivery served as a differentiator.

Modalities:

On-Ground: the traditional student and faculty in the same room where students meet face-to-face each week and engage in interactive instruction as well as meeting weekly in smaller learning teams outside the university classroom to work on group projects.

Hybrid: a combination of on campus and online instruction structured for students that require flexible schedules. A student who enrolls in a hybrid course attends the first 4 hours and last 4 hours in traditional in class sessions. The rest of the classroom assignments are held on online

Methodology

Test Design

The study used a Non-Equivalent Group Design (NEGD) also known as a quasi-test design. "A quasi-experimental design is one that looks a bit like an experimental design but lacks the key ingredient -- random assignment. In the NEGD, we most often use intact groups that we think are similar as treatment and control groups. In education, we might pick two comparable classrooms or schools" (Trochim, 2006). While an attempt is made to assure that the two groups are as similar as possible it is not possible for the researcher to control the assignment to the groups on a random basis. This makes the NEGD inherently subject to internal validity threats which need to be addressed.

The primary threat is *threat of selection* which impacts internal validity and may create a selection bias in the study. This bias creates a risk that any factor other than the ones being

analyzed may have led to the observed result. There are a number of selection bias threats in a multiple group study. The most relevant are Instrumentation and Selection History.

The key to addressing these validity issues is to assure that groups are as equivalent as they can be made given the nature of the environment, and that methodology is applied in a consistent manner. Validity issues in this study were mitigated as follows:

1. Random selection of survey participants (students) was made in each group so that there was no bias as to the prior history or accomplishments of the students.
2. All students were students that were dedicated members of a given group or course modality for the duration of their program so there was no issue related to a student being a member of both sample groups.
3. The sampling of a large number of students, spread across a variety of classes in each modality and the use of a single survey instrument for all students mitigated internal validity issues.

The sample in this study consisted of undergraduate and graduate students enrolled at two campuses of a regionally accredited university. The analysis explored the relationship between specific key factors, the level of satisfaction, and retention. It also determined the differences, if any, between hybrid course students and traditional on-ground course students regarding their level of satisfaction and retention. The sample data was collected by randomly asking students to fill out a survey questionnaire pertaining to their school status. The respondents were informed of the purpose of the research, which was self-administered. In addition, they were informed that after filling out the questionnaire, they would be asked to not discuss their responses with other participants to avoid the risk of biased information. All non-specific survey questions were written so that the answers would fit appropriately into a standard five-level Likert Scale for analysis. A high score was positive and a low score was negative.

Satisfaction

To understand how well the students in this sample were pleased, their individual satisfaction level needed to be measured. The following questions were asked in the satisfaction portion of the administered survey questionnaire:

- Are the class sizes adequate?
- Are student academic advisors, financial aid advisors or other student services staff helpful and courteous?
- Are your professors knowledgeable about the class subjects?
- Are you generally satisfied with the quality of the teaching provided in the classroom?
- Is the university Website easily navigated?
- How would you rate your overall educational experience at this university?
- Would you recommend that other students pursue their education at this university?
- Do you consider the university to be helpful in networking with peers that will assist in your future professional endeavors?

Retention

Review of Literature

In regard to student satisfaction, choice seems to play an important role in how the individual student determines if they are satisfied. Whenever students were given the opportunity to select a course delivery modality, satisfaction levels were determined to be higher. A “self starter” student, who values flexibility and convenience may choose to take an online format structure,

while less "self-directed" students who value guidance and a traditional classroom's supportive environment, may choose the ground-based format (Yatrakis, 2002). Haythornthwaite (2000), found that a ground-based "boot camp" preceding online courses can help build a sense of community among distance learning students and enhance their satisfaction and learning outcomes. This is supported by Doran (2001) who found that small group collaborative activity improved outcomes in online courses. Similarly when online students collaborated via chat rooms, bulletin boards, conference calls, etc, they showed significantly higher levels of satisfaction than other groups that were allowed to work individually (Yatrakis, 2002).

According to Thompson, Falloon, and Simmons (2001), no national statistics existed (at that time) that showed the number of students who completed distance education programs and courses. However, "Anecdotal evidence and studies by individual institutions suggest that course-completion and program retention rates are generally lower for distance-education courses than in their face-to-face counterparts" (Carr, 2000, p. A39).

There is an abundance of literature on student retention for online courses, but as Yatrakis and Simon (2002) state, its main theme is comparisons between online and on-ground formats. The research on the effect of on-ground and the hybrid or mixed method of on-ground and online studies is limited because of its relatively new implementation.

The majority of researchers have found major differences in retention between the two formats of online and on-ground. Some have cited student concerns about instructional quality in online courses (Bloom 1998; Terry 2000), while others consider virtual courses an "inferior technology," particularly in the teaching of complex material (Farrington, 1999; Brown and Liedholm, 2002). Arguably the end results of online education may be similar or even better than traditional on-ground formats, which are also demonstrated by their overall course grades. One study focused on an attempt to remove instructor-bias by blind-scoring tests in a graduate-level online vs. traditional course environment. The results indicated, "...average score for the online class was 5 points (5%) higher than for the on campus class."(Fallah & Ubell, 2000). This is further supported by Gold (2004) who states that there is overwhelming evidence that instruction delivered using online technology is equivalent to conventional instruction when using student achievement as the outcome measure.

According to eLearn Magazine (n.d.), "keeping students enrolled in online courses can be a struggle. Online retention depends on factors such as how much support is provided and how the course is offered," says Steve Ehrmann, director of the Flashlight Program, the American Association for Higher Education's e-learning arm. Some colleges offer local proof that online retention lags behind brick-and-mortar retention. For example, Washington Online - Washington State's online division for community college - claims a retention rate of 70% for online students versus 85% for the state's on-ground community college students. As more schools investigate the discrepancy, they are finding ways to combat it through such strategies as better student advising, increased group work, and stronger academic and technical support (eLearn Magazine, n.d.). Studies have shown that the more time students spend interacting with classmates, the higher the satisfaction level. It has also been observed that dissatisfaction does not automatically translate into withdrawal from the program (Yatrakis, 2002).

Data from the University of Central Florida (UCF) show that student retention in hybrid courses is better than retention in online courses and equivalent to that of on-ground courses. (Dziuban, C. D. et al, 2001). According to Robertson (2003) the College of the Mainland proposal states that hybrid classes have the potential to improve retention in both online and on-ground courses.

Participants

In order to study these factors, responses from students were collected and tabulated from a sample of 164 students who chose to enroll in courses that were available either utilizing on-ground or hybrid formats. The sample consisted of 95 female students (58%) and 69 male students (42%) with the following ethnicity breakdown: 65 African American students (40%), five Asian students (3%), 30 Caucasian/White students (18%), 61 Hispanic/Latino students (37%) and three Native Hawaiian/Pacific Islander students (2%). Out of 164 students, 95 were attending on-ground classes and 69 students were attending hybrid courses. All students within the two groups answered the questions required to measure satisfaction and retention.

One-Factor Analysis of Variance (ANOVA) and Two-Factor ANOVA without replication were used to determine whether the on-ground and the hybrid groups differed significantly in their responses to the questions based on the independent variables of satisfaction and retention.

Results

Table 1

Mean Satisfaction and Retention Scores of Hybrid and On-ground student groups:

Groups	Satisfaction	Retention	Row Means
Hybrid	**3.91**	**3.67**	**3.74**
On-Ground	**3.75**	**3.79**	**3.77**
Column Means	**3.83**	**3.73**	

From Table 1, we find that there is no difference in satisfaction and retention between the two groups. A test of hypothesis using a one-way ANOVA was conducted. Only the four factors impacting satisfaction were considered. Under this condition, the variation was either due to the treatments or it was random. The null hypothesis and the alternate hypothesis for comparing the mean levels of satisfaction were among the following four factors: classes, professors, staff and university website:

Ho: $\mu 1 = \mu 2 = \mu 3 = \mu 4$

Ha: Not all the mean satisfaction levels by category were the same.

The mean levels of satisfaction by category scores of the Hybrid and on-ground groups of students are shown in Table 2.

Table 2

Mean Satisfaction results of Hybrid and On-Ground Student groups by Category.

Groups	Classes	Professors	Staff	University Website
Hybrid	**3.99**	**4.05**	**3.46**	**4.14**
On-Ground	**3.93**	**4.07**	**3.38**	**3.92**

Table 3

Calculations for a One-Way ANOVA table by category:

ANOVA: Single Factor

SUMMARY

Category	Count	Sum	Average	Variance
Classes	2	7.92	3.96	
Professors	2	8.12	4.06	
Staff	2	6.84	3.42	
University Website	2	8.06	4.03	

ANOVA: Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Levels of Satisfaction	0.54455	3	0.181517	24.69615	0.00	6.591382
Error	0.0294	4	0.00			
Total	0.57395	7				

It can be concluded that there was a statistically significant difference in the level of satisfaction among the four factors. Additionally, the null hypothesis was tested without taking into consideration the results from the "Staff" factor (Table 4). A one-way factor ANOVA was used to test the null hypothesis.

Ho: $\mu 1=\mu 2=\mu 4$

Ha: Not all the mean satisfaction levels among the categories were the same.

Table 4

Mean Satisfaction Levels between Hybrid and On-Ground Student Groups by category excluding Administrative Staff

	Classes	Professors	University Website
Hybrid	3.99	4.05	4.14
On-Ground	3.93	4.07	3.92

Table 5

Calculations for One Way ANOVA table by category (excluding Staff).

ANOVA: Single Factor				
SUMMARY				
Groups	**Count**	**Sum**	**Average**	**Variance**
Classes	2	7.92	3.96	0.00
Professors	2	8.12	4.06	0.00
University Website	2	8.06	4.03	0.0242

ANOVA: Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Levels of Satisfaction	**0.010533333**	**2**	**0.00**	**0.60305344**	**0.602367**	**9.552094**
Error	**0.0262**	**3**	**0.00**			
Total	**0.036733333**	**5**				

We can conclude that there was no difference in the mean level of satisfaction among the three factors included in this analysis. Therefore, it was concluded that there was strong evidence that students were not satisfied with the performance of the Administrative Staff.

The variation due to the treatments (levels of satisfaction) was analyzed and all the remaining variation appears to be random. However, the analysis to this point had not set up the blocking factors so that each of the two groups of students ratings were tested along with each level of satisfaction categories. In this case, the two student groups were set as the blocking variable, and removing the effect of the student groups from the sum of squares error (SSE) changed the F ratio for the level of satisfaction variable.

The same format was used in the two-way ANOVA table as in the one-way case, except there was an additional row for the blocking variables. Table 6 shows the results using a two-way ANOVA. In this case, the focus was on the difference in levels of satisfaction by the four factors for the two delivery modalities. The two sets of hypothesis were:

1. Ho: The mean satisfaction levels by categories were the same ($\mu 1 = \mu 2 = \mu 3 = \mu 4$).

   Ha: The mean satisfaction levels by categories were not the same.

2. Ho: The means of level of satisfaction by categories of Hybrid and on-ground student groups were the same ($\mu 1 = \mu 2$).

   The means of level of satisfaction by categories of Hybrid and on-ground student groups were not the same.

Table 6

Two- Factor ANOVA results between level of satisfaction by categories and the two groups of students.

	Classes	Professors	Staff	University Website
Hybrid	**3.99**	**4.05**	**3.46**	**4.14**
On-Ground	**3.93**	**4.07**	**3.38**	**3.92**

ANOVA: Two Factor without replication

	Count	Sum	Average	Variance
Hybrid	**4**	**15.64**	**3.91**	**0.0938**
On-Ground	**4**	**15.3**	**3.825**	**0.0927**
Classes	**2**	**7.92**	**3.96**	**0.00**
Professors	**2**	**8.12**	**4.06**	**0.00**
Staff	**2**	**6.84**	**3.42**	**0.00**
University Website	**2**	**8.06**	**4.03**	**0.0242**

ANOVA: Source of Variation	SS	df	MS	F	P-value	F crit
Student Groups	0.01445	1	0.01445	2.89966555	0.18715	10.12796
Levels of Satisfaction by categories	0.54455	3	0.18151667	24.69615	0.00	9.276619
Error	0.01495	3	0.00			
Total	0.57395	7				

It was concluded that there was a difference in the satisfaction level by factor, but not a significant difference in level of satisfaction between the two modalities of course delivery.

A two-way ANOVA factor was conducted evaluating the differences between the groups of students and the mean of the level of satisfaction using only three factors (excluding Staff). The results are shown in Table 7.

Table 7

Two-Factor ANOVA results between the student groups and the level of satisfaction by categories- (excluding staff)

ANOVA: Source of Variation	SS	df	MS	F	P-value	F crit
Student Groups	0.011266667	1	0.01126667	1.50892857	0.344237	18.51282
Three Satisfaction factors	0.010533333	2	0.00	0.70535714	0.586387	19.0
Error	0.014933333	2	0.00			
Total	0.036733333	5				

The two sets of hypothesis were:

1. Ho: The mean satisfaction levels by categories were the same ($\mu 1 = \mu 2 = \mu 3$).

   Ha: The mean satisfaction levels by categories were not the same.

2. Ho: The means of level of satisfaction by categories of the Hybrid and on-ground student groups were the same ($\mu 1 = \mu 2$).

   The means of level of satisfaction by categories of the Hybrid and on-ground student groups were not the same. Therefore, it can be concluded that there was not a difference in the level of satisfaction between the three factors based upon modality of course delivery.

A test of hypothesis was conducted to determine whether the mean of the two student groups and the mean of three levels of retention differ. Table 8 shows the scores of the means of the three levels of retention by the two students groups. The null and alternate hypotheses were stated:

1. Ho: The mean retention levels were the same ($\mu 1 = \mu 2 = \mu 3$).

   Ha: The mean retention levels were not the same.

2. Ho: The mean of retention levels of the Hybrid and on-ground student groups were the same ($\mu 1 = \mu 2$).

   The mean of retention levels the Hybrid and on-ground student groups were not the same.

Table 8

Levels of retention scores by the two groups of students:

	Level One 1-3 courses completed	Level Two 4-10 courses completed	Level Three 11 or more courses completed
Hybrid	**3.78**	**3.74**	**3.54**
On-Ground	**3.77**	**3.90**	**3.77**

A two-factor ANOVA was calculated using a .05 significance level (Table 9). Based upon the sample results there is no significant difference in the three levels of retention between the two groups of students. These p-values indicate that the null hypotheses for the two groups of students and the three levels of retention should be accepted.

Two -Way ANOVA results between the two modalities of course delivery and the three levels of retention:

Table 9

ANOVA: Two-Factor without Replication

	Count	Sum	Average	Variance
Hybrid	**3**	**11.06**	**3.68666667**	**0.01653333**
On-Ground	**3**	**11.44**	**3.81333333**	**0.00**
Level One	**2**	**7.55**	**3.96**	**5E-050.00**
Level Two	**2**	**7.64**	**4.06**	**0.0128**
Level Three	**2**	**7.31**	**3.42**	**0.02645**

ANOVA: Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Group of Students	**0.024066667**	**1**	**0.02406667**	**3.15973742**	**0.217451**	**18.51282**
Levels of Retention	**0.0291**	**2**	**0.01455**	**1.91028446**	**0.343609**	**19.0**
Error	**0.015233333**	**2**	**0.00**			
Total	**0.0684**	**5**				

Conclusions

The results of this study suggest that students who choose to enroll in courses in an on-ground format have the same overall rates of satisfaction and enrollment retention as do students that enroll in hybrid courses. This finding is consistent with earlier studies and suggests that students enrolled in these course modalities by choice may possess attributes likely to make learning a satisfactory and constructive experience.

The university experience has generally met student's expectations. In respect to facilities, university web site and class size the survey shows that the physical environment was adequate.

The student academic counselors, student services and general administrative / support staff were found to be an area of concern.

Faculty were shown to be a factor that generally met student expectations in a satisfactory manner. Follow up discussions to further explore this point with a number of the survey respondents indicated that they tend to view the relationship with a faculty member as a passing situation which may either please or displease them. Since they will be moving on to a new course with a different professor in a few weeks it was the ongoing aspects of the university environment that were more important to overall student satisfaction and retention. Further work is needed to expand on these findings.

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Editor's Note: Teacher training is greatly facilitated by the opportunity to view master teachers in real classrooms. Whether live or through media, observing and discussing ways to use instructional technologies, complemented by hands-on experience, is important for effective use of these technologies for teaching and learning.

Facilitating Development of Student Teachers' Positive Beliefs about Educational Technologies through Electronic Modeling, Reflection and Technology Experience

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Abstract

An important task in teacher education programs is to help student teachers develop strong and positive convictions about the effectiveness of instructional technology so that they can use it to provide meaningful learning experiences for their students. Modeling, reflection and personal experience are suggested as effective strategies in affecting student teachers' beliefs about the value of technology. In this study, two educational technology courses were restructured to employ these strategies. Results revealed that student teachers' beliefs about technology did not significantly change after taking the courses in one-semester period. However, the student teachers' perceived effects of technology experience and electronic modeling significantly strengthened existing beliefs. Working on technology projects and observing electronic teacher models using technology were perceived by student teachers to positively influence their beliefs about technology.

Keywords: beliefs, technology, learning, teaching, strategies, electronic modeling, reflection, observation, projects, experiences.

Theoretical Background

Teachers' beliefs have been considered an important factor that would affect teachers' practice in class (Fang, 1996). According to Means (1994), "the primary motivation for teachers to use technology in their classrooms is the belief that the technology will support superior forms of learning" (p. 4). In other words, beliefs about technology play an important role in teachers' decision-making regarding using technology in their teaching practice. Thus, to help student teachers become technology-using teachers in their future classrooms, it is important to help them develop strong and positive beliefs about technology. In current literature, some strategies have been suggested to be effective in building or modifying teachers' beliefs, such as modeling, reflection and experiences. When applied to technology use, however, empirical evidence is needed to help us understand the effectiveness of these strategies on specific student teacher' beliefs about technology. To establish a clear understanding, it is necessary to be specific when speaking of teachers' beliefs. In this study, student teachers' beliefs about technology refer to their beliefs about the benefits that technology can bring to teaching and learning.

Modeling

When discussing the formation of beliefs, Fishbein and Ajzen (1975) pointed out that "On the basis of direct observation or information received from outside sources or by way of various inference processes, a person learns or forms a number of beliefs about an object" (p. 14). According to social cognitive theory learning, acquirement of beliefs can occur by observing others (Schunk, 2000). In the aspect of technology use, Ertmer (2005) suggested that observing teacher models using technology would help to promote changes of teachers' beliefs. In teacher

education programs, modeling approach can present how technology is used in "real-world" classroom, which provides teacher education students with concrete examples of technology-integration (Kay, 2006). However, it is not easy for teacher education students to access suitable K-12 model classrooms due to transportation issues and availability of suitable models. Researchers tried to find alternative ways to allow teacher education students to observe exemplary technology-using teachers without leaving campus. This included videoconferencing with technology-rich K-12 classrooms (Vannatta & Beyerback, 2000) and electronic models (Albion & Gibson, 2000; Ertmer, et al., 2003). For example, in a study conducted with 69 students who observed teacher models presented on a CD-ROM, Ertmer et al. (2003) found that student participants showed significant increases in their perceived ideas about technology integration and their self-efficacy regarding technology integration.

Reflection

The opportunity for reflection on pre-service experience is one factor that helps to shape a teacher's beliefs (Fang, 1996). Richardson (1996) commented that "reflection on action may lead to changes in and/or additions to beliefs" (p. 104). Reflection activities facilitate the development of prospective teachers' beliefs about teaching and learning (Dana, McLaughlin & Freeman, 1998). In a study conducted with two groups of student teachers in a seminar on teaching self-directed learning in primary schools, Tillema (2000) found that reflection after the practice could have effect on student teachers' beliefs. When discussing teachers' beliefs about technology, Ertmer (2005) suggested that the formation of teachers' beliefs about technology may not be different from that of other beliefs. Reflection was a helpful strategy to develop teachers' vision on how to use technology in teaching (Ertmer, 1999) and teachers' beliefs about technology integration in teaching and learning (Ertmer, Addison, Lane, Ross & Woods, 1999). Therefore, it is reasonable to hypothesize that engaging student teachers in reflection activities related to technology use could support development of their positive beliefs about effectiveness of technology in supporting student learning.

Technology Experience

Technology-training and technology-based activities helped to increase pre-service teachers' self-efficacy in using technology (Gado, Ferguson & Hooft, 2006; Waston, 2006). In addition to the impact on teachers' self-efficacy beliefs, technology experience could affect teachers' pedagogical beliefs (Woodrow, Mayer-Smith & Pedretti, 1996). In relating teachers' personal experiences with their beliefs, Ertmer (2005) suggested that teachers' experiences would facilitate change in their "beliefs about teaching and learning, in general, and beliefs about technology, specifically" (p. 32). Thus, it is expected that teachers' experiences in technology use would promote change in their specific beliefs about technology. In a study conducted with two groups of middle and high school teachers, Gningue (2003) found that teachers reported a change in their beliefs about the effectiveness in using technology in the classrooms after sustained training that allowed them to participate in active learning with computer technology. According to findings in current literature, it is hypothesized that introducing student teachers the use of technology and engaging them in technology activities would facilitate the development of their positive beliefs about technology.

Research Questions

To facilitate the development of student teachers' beliefs about technology based on what has been reported in current literature, two graduate educational technology courses were restructured to employ electronic modeling, reflection and technology-experience strategies. This study intended to examine how student teachers' beliefs about technology developed through taking

courses, and how student teachers' perceptions changed on using these strategies in relation to the development of their beliefs. The following research questions were examined:

1. Do student teachers' beliefs about technology change after taking the educational technology courses?
2. What is the relationship between student teachers' beliefs about technology and what are the perceived effects of electronic modeling, reflection and technology experience on their beliefs about technology?

Methods

Participants and Site

The participants in this study consisted of 26 student teachers who enrolled in two graduate educational technology courses in a northern university. Of the 26 participants, 14 enrolled in the course for elementary education majors and 12 enrolled in the course for secondary education majors. Twenty-two (22) were female participants, 4 were male. Prior to the semester, 14 had completed some credits in the graduate program of education.

Two 3-credit introductory level courses were chosen that focused on educational application of computer technology. In both courses, participants learned the *same* technology knowledge and skills and had *same* types of learning activities. Each class met 2.5 hours each week throughout the semester. Each of the two courses employed electronic modeling, reflection and technology experience strategies.

In both courses, participants watched videos on CD-ROM or online. The videos showed how teacher models used technology with their students in real classrooms. In addition to video clips of real classroom activities, teacher models talked about their thoughts and reasons for using technology and how they perceived the effect of technology on students' learning. After watching each video clip, participants reflected on what they had observed in the video in relation to their own experiences and responded to a set of guiding questions provided by the instructor. Guided reflection was conducted after each reading assignment. Besides observing teacher models using technology and conducting reflective inquiry throughout the semester, participants gained personal experience with computer technology. They received training on how to use computer technology and software as tools to facilitate teaching and learning by working on five technology projects. All of the projects allowed student teachers to apply technology to support instructional activities in their selected content areas.

Data Collection

Data was collected from online surveys. A pre-survey was administered at the very beginning of the semester to examine the participants' pre-existing beliefs about technology. Post-survey was administered at the end of the semester to examine their beliefs after taking the educational technology courses. It also measured perceived effects of electronic modeling, reflection and technology projects on their beliefs about technology.

In pre-survey and post-survey, the participants' beliefs were measured by 10 five-point Likert scale items (1 strongly disagree to 5 strongly agree). To determine association among the 10 items, two factors were identified and an exploratory factor analysis was conducted. The researcher labeled the two factors as: benefits in teaching (5 items), and benefits in learning (5 items). An internal consistency reliability analysis revealed that the Cronbach coefficient alpha for the two factors were 0.88 and 0.87, respectively.

In post-survey, three five-point Likert scale items from 1 (strongly disagree) to 5 (strongly agree) were included to measure perceived effects of the strategies. These questions asked participants

to rate their perceptions of effects that observing electronic models, reflection and technology projects had on their beliefs. At the end of the survey, two open-ended questions asked the participants to describe how their beliefs about technology were influenced through taking the technology courses.

Data Analysis

Descriptive data from pre-survey and post-survey were calculated in terms of means and standard deviations of each beliefs variable and the participants' perceptions. MANOVA (multivariate analysis of variance) tests were conducted to examine whether demographic information made difference in the participants' beliefs about technology prior to taking the educational technology courses. The effect size of the multivariate η^2 was reported.

When examining the change of the student teachers' beliefs, paired t-tests were conducted to examine whether there was a significant change in the participants' beliefs from pre-survey to post-survey. An effect size *d* was also calculated.

When exploring the relationship between the student teachers' beliefs about technology and their perceived effects of electronic modeling, reflection and technology projects, sequential multiple regression analyses were conducted. In regression analyses, the participants' post-survey beliefs scores were regressed as functions of their perceptions scores to examine of which strategy that the participants' perceived effect significantly predicted their beliefs. To control the influence of participants' pre-existing beliefs, their beliefs scores on the pre-survey were used as covariates in regression analyses. The significance level was set at .05 in all statistical analyses.

Participants' responses to the open-ended questions in the post-survey helped to explain change of their beliefs and the relationship between their beliefs and perceived effects of those strategies. Responses to open-ended questions that reflected identical or similar ideas were combined into one category. The number and percentage of participants who had specific perceptions were summarized.

Results

Descriptive statistics of the participants' beliefs scores on pre-survey and post-survey are presented in Table 1.

Table 1

Descriptive Statistics of Participants' Beliefs (N = 26)

		Beliefs about benefits in teaching	Beliefs about benefits in learning
Pre-survey	M	3.85	4.23
	SD	0.76	0.6
Post-survey	M	3.95	4.33
	SD	0.6	0.5

MANOVA tests showed that the participants' pre-survey scores on beliefs were not significantly different based on majors ($p = .87$, $\eta 2 = 0.03$) or the number of credits completed prior to the semester ($p = .94$, $\eta 2 = 0.19$). This indicated that the participant demographics did not make any difference in their beliefs about technology prior to taking the courses. Participant perception scores on post-survey are presented in Table 2.

Table 2

Descriptive Statistics of Participants' Perceptions (N = 26)

	Electronic modeling	Reflection	Projects
M	3.88	3.54	4.08
SD	0.4	0.76	0.56

Change of Student Teachers' Beliefs

Paired t-tests revealed that the participants' beliefs about technology related to benefits in learning did not change from pre-survey to post-survey ($t[25] = 0.95$, $p = .35$, $d = .19$). Also, participants' scores on beliefs related to benefits in teaching did not change ($t[25] = 0.79$, $p = .44$, $d = .15$).

Analysis of the participants' responses to open-ended question regarding changes of beliefs revealed that 46% ($n = 12$) of the participants thought their beliefs were changed. They realized that technology could help teaching in many ways and facilitate exploration and discovery learning. Of 26 participants, 38% ($n = 10$) commented that their beliefs did not change much. Four out of 26 participants (15%) stated that their beliefs about technology were positively reinforced but did not change.

Relationship between Student Teachers' Beliefs about Technology and Perceived Effects of Strategies

When examining participants' beliefs about technology related to benefits in teaching, regression analyses revealed that the participants' perceived effects of technology projects ($p = .002$) and electronic modeling ($p = .05$) were statistically significant in predicting their beliefs (Table 3). As the significant predictors, participants' perceived effect of technology projects explained 9% of the variance in their post-survey beliefs scores ($sr^2 = .09$), their perceived effect of observing electronic models explained 5% of the variance ($sr^2 = .05$). It was not surprising that as the covariate, the participants' beliefs score on pre-survey was the strongest predictor of their beliefs score on post-survey ($p < .0001$).

Table 3

Regression Analyses about Beliefs Related to Benefits in Teaching

Variable	*B*	R^2	*F*	*p*	β	sr^2
Step 1						
Teaching benefits beliefs on pre-survey	0.57	.52	23.50	<.0001*	.62	.34
Step 2						
Perceptions on projects	0.46	.70	12.37	.002*	.34	.09
Step 3						
Perceptions on observing models	0.35	.75	4.35	.05*	.25	.05
Step 4						
Perceptions on reflection	0.04	.75	0.18	.68		

Note. B=raw regression coefficient; β=standardized regression coefficient; sr^2=squared semi-partial correlation.
*p<.05

Table 4 presents the results of regression analyses of participants' beliefs related to benefits in learning. The results showed that the participants' perceived effect of technology projects was the significant predictor of their beliefs score on post-survey ($p = .0005$). It explained 29% ($sr^2 = .29$) of the variance in their beliefs. As the covariate, the participants' beliefs score on pre-survey, again, was a significant predictor of their beliefs score on post-survey ($p = .005$).

Table 4

Regression Analyses about Beliefs Related to Benefits in Learning

Variable	B	R^2	F	p	β	sr^2
Step 1 Learning benefits beliefs on pre-survey	0.46	.29	9.82	.005*	.33	.10
Step 2 Perceptions on projects	0.52	.58	16.25	.0005*	.58	.29
Step 3 Perceptions on reflection	0.04	.59	0.12	.73		
Step 4 Perceptions on observing models	0.02	.59	0.01	.91		

Note. *B*=raw regression coefficient; β=standardized regression coefficient; sr^2=squared semi-partial correlation.
*p<.05

In response to the question regarding the influence of the courses, 81% (n = 21) of participants specified that working on technology projects had an effect on their beliefs about technology use in teaching and learning and 62% (n = 16) commented that observing the electronic models using technology had an effect on their beliefs. Only 23% (n = 6) of the participants mentioned reflection activity in their responses.

Discussion and Implications

According to Richardson (2003), "It has been assumed for some time that changing beliefs of teacher candidates is difficult, although not impossible" (p. 11). In this study, student teachers' beliefs about technology were not significantly changed by taking educational technology courses that employed strategies of electronic modeling, reflection and technology experience. The lack of significant results in this study indicated the difficulty in changing beliefs. However, compared to the number of the participants (n = 10) who thought their beliefs did not change throughout the semester, more participants perceived that taking these courses had influenced their beliefs. Such influence either brought changes to their beliefs (n = 12) or strengthened their beliefs about technology (n = 4).

Participants' perceived effects of technology projects and electronic modeling on their beliefs significantly predicted their beliefs scores on post-survey. This indicated that working on technology projects and observing electronic models were perceived to have contributed to the development of the participants' beliefs about technology. In addition, technology projects and electronic modeling were the two activities that the majority of the participants mentioned in comments on how their beliefs were influenced by taking the educational technology courses.

Technology Experience

In this study, participants received technology training on the use of computer technology and worked on five technology projects. For each project, they needed to develop technology-integrated instructional products that they could use with their students, such as an instructional presentation and a technology lesson plan. While working on the projects, the participants were encouraged and guided to think about how technology could benefit teaching and learning and how to make it part of the curriculum. Participants felt they gained insights into how technology could be used to enhance teaching and learning through working on these projects. Examples of the participants' comments are: "By doing the projects I feel that I have been given a new perspective on technology use in the classroom and I have learned more about how to use it," "the projects helped me realize all the things that technology could do and be useful in the classroom.

There were many different things that I learned through the projects that I did not know before." One participant specified that "this course has affected my beliefs about technology and learning in that I am more able to make connections between the two. The technology projects especially helped me to see this."

To facilitate development of student teachers' beliefs about technology, it is necessary to engage them in hands-on experiences with technology. Such experiences should not only teach them about technology but stimulate them to ponder over why technology is necessary and how to use technology to truly facilitate teaching and learning. In this study, participants perceived that working on technology projects influenced and contributed to development of their beliefs about technology. The technology experience made them more aware of what teachers could do with technology in classrooms to make teaching and learning more meaningful and effective.

Modeling

According to social cognitive theory, models who are similar to the observers that perform particular tasks well will motivate observers to perform the same tasks if the outcome of the behaviors were valued (Schunk, 2000). In this study, participants watched the videos that demonstrated how teacher models used technology with their students in class activities. Observing the teacher models using technology influenced participants' beliefs. One participant stated that "Watching the videos of exemplary teachers using technology in their classrooms has affected my beliefs about technology use in teaching and learning. I have been able to observe great teachers using technology in ways that I would like to use technology in my own classrooms." Another participant wrote, "watching the videos gave me some great ideas of how to incorporate technology into my teaching. The videos also reminded me of certain management strategies that I need to take a closer look at before using the technology in my teaching."

The results suggested that modeling strategy could facilitate the development of student teachers' beliefs about technology. If live models were not easy to access, electronic models would be effective alternative. Student teachers need to witness how technology is implemented in real classrooms. Observing teacher models using technology in classrooms gives student teachers an opportunity to see and examine how technology can facilitate teaching and learning. This will help them develop strong and positive beliefs about the benefits of technology. As one participant commented, "I liked seeing the videos because it gave me an opportunity to actually see technology being used in the classroom and how students responded to the teachers. This affected my beliefs because now I see how the students like the technology and how useful it really is."

Reflection

The student teacher participants did not perceive that reflection influenced their beliefs. This may be due to the lack of communication that allowed the participants to share ideas and discuss beliefs in class. Risko et al. (2002) suggested that reflection in the form of personal writing could help student teachers examine and modify previously held beliefs; however, writing as the only reflection activity may not be effective; reflection through social interaction with peers and instructors can influence student teachers' understanding of other perspectives and inspire them to have more in-depth thoughts. In this study, the participants' reflection activities were completed mainly through writing. In-class, discussions about their thoughts and reflections took place occasionally instead of regularly due to time limits. This may have resulted in insufficient dialogues among participants related to personal beliefs about technology, which in turn influenced their understanding and adoption of different perspectives. Participants did not think their beliefs were influenced through reflection.

In teacher education programs, to facilitate the development of student teachers' beliefs through reflective practice, it may be necessary to provide student teachers an environment that allows

them to communicate their thoughts and discuss their beliefs with the informed others. If there was not enough time in class, teacher educators could try other communication channels, such as online discussion forum, to engage student teachers in reflective thinking about beliefs through online communication.

Conclusion

To help student teachers develop strong and positive beliefs about technology is an important task in teacher education programs. This study intended to provide empirical evidence to support development of student teachers' positive beliefs about effectiveness of technology through electronic modeling, reflection and technology experience. Statistically significant changes in student teachers' beliefs did not take place during this one-semester study in educational technology courses. However, the student teachers perceived that meaningful technology experience and observing teacher models using technology contributed to the development of their beliefs about technology. Reflection in the form of personal writing was not perceived to have an effect on the student teachers' beliefs. In teacher education programs, teacher educators should engage student teachers in reflective activities and encourage interpersonal dialogues about personal beliefs. Hopefully, the findings in this study will further our understanding of strategies for facilitating development of student-teachers' beliefs about technology and suggest good practice for teacher educators.

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