

# An Integrated Approach to Teach Communication Skills Using Educational Technologies

*Dr. Shannon Arnold and Suzi Taylor*

## **Abstract**

The purpose of this pre-experimental pre-test/post-test design was to identify a group of agricultural education students' knowledge and perceptions towards the use of integrated educational technologies in the classroom. The population was 17 agricultural education students enrolled in an agricultural communications course over a two-year period. A multimedia content development touch screen resource was integrated into the course as a capstone project. Pretest and posttest evaluations showed 6% to 57% changes in knowledge as a result of the digital capstone project. The most significant changes were seen in storyboarding, multimedia project development, and graphic design principles, indicating that students require additional education in these areas. The lowest percentage changes were seen in the same three competencies each year; revealing that students were most knowledgeable in interviewing, technical writing, and giving public presentations. The findings revealed that students gained the most knowledge in technology development, integration and application, rather than interpersonal skill building. This integrated course provides an example of how educators can design courses that not only increase students' communications knowledge and skills, but also gain realistic experience by creating their own multimedia content for public communication.

## **Keywords**

communication skills, educational technologies, multimedia, agricultural education students, integrated learning

## **Introduction, Literature Review, and Conceptual Framework**

Technology is changing the face of traditional and online instruction at colleges and universities (Lowerison et al., 2006). George (2000) stated, "Technology can play a vital role in helping students meet higher standards and perform at increased levels by promoting alternative, innovative approaches to teaching and learning" (p. 57). The U.S. Department of Education (2009) reported an increasing amount of evidence related to the beneficial opportunities of using technology to improve education. This meta-analysis study found that mixed instruction of using online and face-to-face elements was more effective on student achievement over face-to-face instruction alone. The report further stated that instructors must look for innovative ways to integrate digital content into courses to increase teaching effectiveness (U.S. Department of Education, 2009).

Allen and Seaman (2008) reported about 67% of colleges and universities now offer online courses and programs to fill student needs. As a result of these changes, more faculty are taking advantage of new techniques and opportunities to incorporate technology into all courses and deliver information in a new way (Ertmer, 2005). The Chronicle of Higher Education (2007) challenged

educators to utilize a variety of teaching and learning resources, especially technology, to reach a new generation of “millennial” students. Educators must engage students in an education that properly prepares them for a future career that will more than likely involve working with online and emerging technologies.

Today, 98.4% of college students now own a personal computer (Salaway, et al., 2007). Research promotes the integration of technology into agricultural college courses. Alston and Warren (2007) specifically stated the importance of using more web-enhanced instruction and technology assignments in agricultural education courses to better prepare future agricultural leaders. Rhoades, Friedel, and Irani (2008) reported that educators must continually be aware of how agricultural students adopt and use new technologies. Jones, Johnson-Yale, Millermaier, and Perez (2009) found that 94% of college students spend considerably more time online, at least one hour each day, than Internet users in the general population. Students in the study reported high rates of online social activity, use of Web 2.0 tools, and view technology as part of college life. Jones and Madden (2002) found that 68% of college students used technologies to gain research information in their academic and professional fields. Kotrlik et al. (2003) found that agricultural education teachers spend the majority of their effort on exploring and adopting the use of teaching technologies, but are not as actively involved in the integration of these technologies into the classroom. Factors of inexperience with technologies, teaching effectiveness, and anxiety tend to be barriers to this integration. However, educators must recognize this widespread use of technologies by students and discover new teaching techniques to engage them in building their professional skills using familiar media. Infusion of these new technologies into agricultural courses will not only assist current students in refining a variety of communication skills, but can also attract potential students looking for educational programs that teach current technologies (Rhoades et al., 2008). Furthermore, multimedia can create high-quality learning environments for enhanced instruction. Research suggests that using technology and multimedia tools to teach science content can enhance student learning outcomes (Roschelle et al., 2000). The key elements of “multiple media, user control over the delivery of information, and interactivity” can be used to improve the integrated learning environment (Cairncross & Mannion, 2001, p. 156).

The Kotrlik-Redmann Technology Integration Model © (Kotrlik & Redmann, 2002) was used as the conceptual framework for the study. This model was developed based on theories and research concerning the integration of technologies into teaching and learning and has four distinct and independent phases of technology integration: “Exploration, Experimentation, Adoption, and Advanced Integration”. The Exploration phase involves teachers seeking information about technologies and how to use them; the Experimentation phase focuses on teachers beginning to utilize technologies in classroom instruction; the Adoption phase reveals evident physical changes in the classroom with technology as a focal point of teaching and learning; and the Advanced Integration phase centers on instructors who seek new and unique ways to use technology to enhance teaching and learning beyond traditional activities. Additional research is needed to explore new ways for teachers to integrate technologies into the classroom setting and move through each of these phases. As research suggests (Kotrlik et al., 2002), the more confident and experienced teachers feel about using technologies, the more these technologies will be integrated into new ways of teaching and learning.

A unique multimedia resource, the BTC Studio 1080, was integrated into an agricultural communications course to educate students on how to apply these skills into a digital storytelling and educational context. The goal was not only to engage students in learning a variety of technical skills, but to provide them with the opportunity to use rich media technologies to showcase course

projects. The Studio offered a venue for students to publicize their accomplishments and share ideas through the creation of a touch-screen exhibit. Development of a research-based agricultural education module within the course allowed students to conduct research, design educational content, utilize multimedia software, integrate technologies, and build digital exhibits that were then presented to the public. Use of this integrated teaching approach inspired students to apply agricultural communication skills, including written, oral, digital media, and research, in a new way. The digital exhibits remain in Studio 1080 beyond the completion of the course.

## **Purpose and Objectives**

The purpose of this pre-experimental pre-test/post-test design one group research study was to determine changes in agricultural education students' knowledge of using integrated educational technologies in the classroom. The objectives of this study were: (1) To determine the amount of changes in agricultural education students' knowledge regarding multimedia technologies, and (2) To assess agricultural education students' perceptions of the use and application of multimedia technologies.

## **Methods**

The course in this study offered an overview of communications strategies important in the agricultural industry. Focus was placed on developing basic competencies in the areas of public relations, technical writing, qualitative research, video production, photography, storyboarding, scriptwriting, and graphic design. Various multimedia technology skills were emphasized in different assignments throughout the course and then compiled in the capstone project: a 24-screen interactive multimedia exhibit available to the public in the BTC Studio 1080 multimedia center. In groups, students used the BTC Studio 1080 software to create a research-based touch-screen exhibit that communicates agriculture, helps solve a "real-world" agricultural problem, teaches an agricultural education lesson, highlights agricultural research, or promotes an agricultural education program. The goal for students' final digital exhibits was to effectively communicate agricultural research or education for a public audience. The module was uploaded to the BTC Studio 1080 multimedia center for public viewing. Each group created a 24-screen exhibit using information from course assignments including: an interview with an expert, a video, photographs, and educational content based on primary and secondary research. The module also included the following components: a map, graphics, music/audio clip, an interactive quiz, or a slideshow of pictures.

The Montana State University Institutional Review Board approved the study protocol, deemed it exempt, and all participants provided written informed consent prior to participation in the study. To measure changes in knowledge, the study design utilized a single group pretest/posttest design of non-randomized students enrolled in an upper division, entry-level agricultural communications course over a two-year period. To assess students' perceptions of the application of multimedia technologies, a separate post-evaluation questionnaire was also completed related specifically to the capstone project assignments. Questions included training needs, program difficulties, applications of the system, required technological skills, user challenges, compatible external software and programs, communication strategies, the importance of technology, and future recommendations. All participants completed the instrument. Two separate classes participated in the research study. Groups were assessed for equivalence before the treatment based on the similar characteristics- all participants were upper level agricultural education students (Leedy & Omrod, 2010). The independent

variable was the instructional methods, while the dependent variable was the change in knowledge and perceptions towards using integrated multimedia technologies. The treatment was the capstone project assignment and there was no control group, which is a limitation to the study. It must be noted that caution must be used in drawing conclusions because there was no comparison group and there may be other confounding variables accounting for changes, such as other courses in which students were enrolled. However, the use of single group pretest/posttest designs can be supported if situational factors are taken into account and in this case, all students were exposed to the same coursework and took an identical pretest and posttest during the enrolled semester (Eckert, 2000).

The population was 17 agricultural education students who were enrolled in an upper division, entry-level agricultural communications course over a two-year period (N=17, n=8 in year 1 and n=9 in year 2). The response rate was 100%. Student knowledge and perceptions were determined using a researcher developed content knowledge achievement pretest and posttest instrument based on the following competencies in Table 1. To address construct validity, the instrument was developed from a review of literature regarding integration of technologies into courses and foundational agricultural communication competencies (Akers et al., 2001). The pretest and posttest contained the same 17 questions to measure changes in knowledge; however, nine additional open-ended questions were added to the posttest to obtain student perceptions of the technologies following their use. Content and face validity of the instrument were determined by a panel of four agricultural university faculty (Ary et al., 2002). A pilot test with 10 agricultural education upper division undergraduate students not in the study was conducted and a Cronbach's alpha was calculated on the instrument and revealed a reliability coefficient of 0.72. SPSS 18 software package was used in analyzing the data. Descriptive statistics, including means, standard deviations, and percentages were calculated.

## Results/Findings

Objective 1: To determine the amount of change in agricultural education students' knowledge using multimedia technologies

A pretest and posttest evaluation instrument was given to all students regarding course competencies. Knowledge in the following areas were evaluated: agricultural education research, interviewing, news writing, photography, multimedia project development, photo editing, video production, graphic design, technical writing, public presentations, poster development and design, storyboarding, and research methods. Mean scores, standard deviations, percentages changes for each year are presented in Tables 1 and 2. All evaluation scores were based on a Likert five-point scale with 1=No Knowledge, 2=Little Knowledge, 3=Moderate Knowledge, 4=Knowledgeable, 5=Very Knowledgeable.

In year one, students' pretest scores ranged from M=1.50 to M=3.63 in all competency areas. Posttest scores ranged from M=3.50 to M=4.50. Percentage changes from pretest to posttest ranged from 6% to 57%. Highest knowledge increases were in the following areas: storyboarding (+2.0, +57%), graphic design principles (+1.62, +46%), video production (+1.50, +43%), multimedia project development (+1.62, +36%), and poster development and design (+1.50, +36%). Lowest changes in mean scores were in the following areas: public presentations (+0.87, +19%), interviewing skills (+0.62, +15%), and technical writing skills (+.25, +6%) (Table 1). In year two, students' pretest scores ranged from M=2.11 to M=3.67 in all competency areas. Posttest scores ranged from M=3.56 to M=4.22. Percentage changes from pretest to posttest ranged from 8% to 41%. Highest knowledge increases were in the following areas: press release writing (+1.45, +41%), research methods (+1.33,

Table 1  
Change in students' competencies from pre to post-test course evaluations: Year 1 (n=8)

Competency	Pre-test <i>M(SD)</i>	Post-test <i>M(SD)</i>	Change (%)
Storyboarding	1.50 (0.76)	3.50 (0.53)	57
Graphic Design	1.88 (0.84)	3.50 (0.93)	46
Video Production	2.00 (1.31)	3.50 (0.53)	43
Multimedia Project Development	2.88 (1.25)	4.50 (0.53)	36
Poster Development and Design	2.63 (1.06)	4.13 (0.64)	36
Feature Story Writing	2.88 (1.00)	4.25 (0.71)	32
Research Methods	2.63 (1.06)	3.63 (0.92)	31
Press Release Writing	2.75 (1.04)	4.00 (0.76)	31
Photography	3.13 (0.84)	4.25 (0.89)	26
Photo Editing	3.00 (1.07)	4.25 (0.46)	29
Awareness of Ag Ed Research	3.13 (0.83)	4.25 (0.71)	26
Public Presentations	3.63 (0.92)	4.50 (0.53)	19
Interviewing Skills	3.38 (0.52)	4.00 (0.53)	15
Technical Writing	3.63 (0.74)	3.88 (0.83)	6

*Note:* Likert Scale 1=No Knowledge, 2=Little Knowledge, 3=Moderate Knowledge, 4=Knowledgeable, 5=Very Knowledgeable

+39%), storyboarding (+1.34, +38%), graphic design principles (+1.45, +38%), and multimedia project development (+1.44, +34%). Lowest changes in mean scores were in public presentations (+1.10, +24%), interviewing skills (+1.0, +25%), and technical writing (+.48, +12%) (Table 2).

Objective 2: To assess agricultural education students' perceptions of the use and application of multimedia technologies

Table 2  
Change in students' competencies from pre to post-test course evaluations: Year 2 (n=9)

Competency	Pre-test <i>M(SD)</i>	Post-test <i>M(SD)</i>	Change (%)
Press Release Writing	2.11 (1.36)	3.56 (1.41)	41
Research Methods	2.11 (0.78)	3.44 (1.01)	39
Storyboarding	2.22 (1.30)	3.56 (1.01)	38
Graphic Design	2.33 (1.41)	3.78 (0.97)	38
Multimedia Project Development	2.78 (1.10)	4.22 (1.09)	34
Feature Story Writing	2.33 (0.87)	3.44 (1.41)	32
Photography	2.89 (1.05)	4.22 (0.67)	32
Video Production	2.89 (1.17)	3.78 (0.97)	24
Poster Development and Design	2.56 (1.13)	3.67 (0.87)	30
Photo Editing	3.22 (0.97)	3.67 (0.87)	12
Technical Writing	2.78 (0.67)	3.56 (0.88)	22
Interviewing Skills	3.11 (0.60)	3.78 (1.89)	18
Awareness of Ag Ed Research	3.00 (0.60)	3.56 (1.71)	16
Public Presentations	3.67 (1.12)	4.00 (1.00)	8

The posttest contained nine additional open-ended questions specifically related to the use and application of multimedia technologies for the capstone project. Questions included training needs, program difficulties, applications of the system, required technological skills, user challenges, compatible external software and programs, communication strategies, the importance of technology, and future recommendations. Difficulties encountered were sizing photos, software restrictions, file format conversions, applying graphic design principles, multimedia software problems, convergence of media, uploading media and materials to the program database, and limitation of web templates. Students learned to work with unfamiliar software programs such as Photoshop, iMovie, iPhoto, Google Picassa, PowerPoint, a Scrapbook program, Microsoft Paint, Microsoft Works, Windows Movie Maker, and Audacity to develop competencies. Specific skills learned included photo editing, interviewing, video production, audio recording, design principles, graphics creation, summarizing and organizing information, storyboarding, file conversions, and creative ways to communicate information. The following quotes in the post-evaluation revealed the perceptions of students about the importance of multimedia technologies in agriculture.

- “In an ever growing age of technology, it is important to stay current with new technology programs,”
- “To make us more well-rounded professionals and help us communicate agriculture to the general public in various ways,”
- “This is the direction that technology is taking and it is important for us to be prepared to use it,”
- “There is a lot of agricultural information to showcase and this a good way to reach larger audiences,”
- “It is the future,”
- “We always say we want to communicate agriculture better and we have to be technology savvy to accomplish this. It enables us to reach more people and bigger audiences,”
- “Because as agriculture becomes more technologically advanced, this is a good way to understand and learn about those advancements.”

Throughout the digital exhibit development process, students reported that they learned how to use the technology tools and about the process of organizing content in a non-linear (user-driven) setting. Students presented their work on the touch-screens in a professional and well-organized manner, and their exhibits remain on permanent display for the public. As a result of integrating assignments with a capstone project, students increased communications knowledge, while also gaining realistic experience through the application of skills to a specific multimedia program.

### **Conclusions, Implications, and Recommendations**

It is thought that many of today’s students are familiar with using modern online multimedia tools for personal use. However, not all students in agricultural education have the opportunity to experiment with professional quality multimedia development software that directly incorporates these tools into coursework. Course assignments were designed to teach the students not only about technologies, but allowed them to develop their own touch-screen educational module through integration of these technologies. As a result of this course, students learned to improve technical skills and how to integrate technologies that can be used to showcase communications work.

Many college students embrace the value of multimedia and user-generated content (Cotton &

Jelenewicz, 2006), but the visual appeal and public access of Studio 1080 has escalated interest in using new educational technologies within the classroom. This course has initiated inter-disciplinary projects and sparked discussions of the significant role of technology in higher education classrooms. The type of assignment not only gives students the opportunity to contribute their own work in a high-tech creative environment, but also enables educators to include key elements of an integrated learning environment into courses (Cairncross & Mannion, 2001). Although many college students are accustomed to sharing their work through websites like YouTube and Flickr, the studio allows them to combine video, text, images and animations into richer non-linear presentations, much like those found in a museum or science center.

As reported in the posttest open-ended questions, students understand the value of learning new technologies and want to be prepared for future careers. These findings specifically reflect Alston and Warren's (2007) research of the importance of using more web-enhanced instruction and technology assignments to better prepare future agricultural leaders. Using an integrated approach to teach specific skills and then having students apply these can enhance learning outcomes as seen in the positive changes in knowledge. The most significant changes in mean knowledge scores during both years were seen in storyboarding, multimedia project development, and graphic design principles, which indicates that students need more education in these communication competencies. Many topics could teach use of storyboarding as a graphic organizer for planning purposes, including campaign development, educational proposals, web development, and instructional design. Graphic design principles and theories may also be taught to complement development of many e-learning tools, such as blogs, podcasts, and video recording software, some of the most widely used e-tools as reported by Thomas, Davis, and Moss (2008). The lowest percentage changes in mean knowledge scores were seen in the same three competencies each year revealing that students were most knowledgeable in interviewing, technical writing, and giving public presentations. Specifically, these results provide evidence that agricultural education students perceive that they are being effectively prepared with knowledge, skills, and attitudes important in multimedia development. Findings also revealed that more focus should be placed on technology development, integration and application in this course, rather than interpersonal skill building. Instructors should continually survey students in order to determine the emphasis of teaching material, assignments, and student needs.

Integrated course assignments should be made so students can use new technologies and software programs, as well as experiment with innovative multimedia development systems. Students not only learned to produce educational research-based content, but to do it in a way that encouraged critical and creative thinking due to the non-linear program structure. Students learned to incorporate various media into a non-linear module that communicated agricultural information to the public in an enticing way. This project also allowed students to capitalize on their strengths and interests in using multimedia tools within an exciting learning atmosphere.

The students' work has become part of a permanent digital exhibit available to the general public, thus contributing to the university's outreach mission. Because the students' exhibits are permanently located in a public multimedia center, their work has more reach than a traditional capstone course project. The projects have been viewed by visiting high school students during the State FFA Convention and 4-H Congress; by Chamber of Commerce groups and international delegations; and by faculty as an example of how they, too, can incorporate technology into the classroom. Studio 1080 and its student-produced digital content has become an integral component of the orientation program and campus tours for prospective students. In this regard, the students' work goes beyond their classroom learning and helps to fulfill a community outreach mission.

This study revealed one way that educational technologies can be integrated into courses, but supports the continual need for research on the adoption and use of new technologies in the classroom (Rhoades et al., 2008). Although this technology studio is available to all instructors on the campus, the agricultural communications course is one of only three courses currently using the resource. As Kotrlik et al. (2002) stated, one possible reason for this is due to the lack of confidence and experience that teachers have with integrating technologies into teaching. To improve this confidence, teachers must move through the four phases of the Kotrlik-Redmann Technology Integration Model. They must first seek to learn about technologies, utilize them, adopt them in teaching, and continually pursue new educational technologies such as Studio 1080. Therefore, more emphasis on professional development of faculty on the use of educational technologies can help them to move through these stages © (Kotrlik & Redmann, 2002) more effectively.

Although the small sample size was a limitation to the study and that many campuses do not have access to a multimedia development software package and high-tech facility such as Studio 1080, the idea of integrating new educational technologies into comprehensive course projects can significantly enhance student learning as seen in this study and reported by Roschelle et al. (2000). While students had the advantage of using a state-of-the-art museum-style software package and presentation facility, the skills learned and applied—multimedia development and non-linear presentation — can translate to any learning environment. Multimedia skills can be practiced in any classroom where students have access to still and/or video cameras and editing software, much of which is free online, and most agricultural communications programs are likely offering some level of this training. Non-linear presentation complements multimedia and is another skill set that will be valuable to students, particularly as mass communication becomes increasingly dependent on the Web and other digital platforms. The most common example of a linear presentation is a Powerpoint slide show presented by its creator and delivered, with little deviation, from start to finish. A “non-linear presentation,” conversely, allows a user—rather than the creator— to direct his or her individual experience. A Web site with hyperlinks is a great example, as are touch-screen kiosks, museum exhibits and many mobile phone applications. The communicator creates the platform but has less control over how the story is experienced; thus, the communicator must practice a different skill set, which includes storyboarding and site organization.

Non-linear presentations eliminate the inverted pyramid structure from journalism or the introduction-body-conclusion story flow; the user is now in control. A user might experience a story by starting at its end, skip pieces of information, or follow a trail to a new story. Giving the user such freedom can be a challenge for the developer, and students working in this environment learned to consider work as discrete “chunks” of information rather than a path to be followed from start to finish. The skill of non-linear presentation development has application in everything from exhibit development to Web design. Even “traditional” media are now often experienced in an online format, where hyperlinks can take a reader to another story, sidebar or media asset in the blink of an eye. Although most institutions do not have access to a Studio 1080-style software package and presentation facility, students can still learn and practice both multimedia development and non-linear presentation in several ways. They can create basic Web sites with internal and external links (with particular emphasis on site organization and user experience); they can go beyond the traditional Powerpoint slide show and use the tool’s hyperlinks feature; and they can access an array of free software tools such as Prezi, a highly visual Web-based application that allows viewers to zoom in on a topic in any order; Glogster, which allows users to create interactive graphic posters; SpeakFlow, another non-linear presentation suite of tools; or Wix, a Flash-driven Web site tool similar to the

Studio 1080 MMaPS software. Even on-line photo books now allow the creator to share a digital version with others, who can then create their own experience as they view it.

Educators must utilize modern technological applications and innovative teaching techniques that allow for the application of skills. There are many software programs that can assist with the integration of educational technologies which can significantly improve learning as evidenced in this study. Teaching students using the media with which they are already comfortable will improve gains in learning and stimulate interest in the subject matter. There is an increasing student demand for teachers to utilize these new technologies; therefore, educators must respond to this call and seek original ways of teaching the material and incorporating student-produced multimedia into courses.

## References

- Akers, C, Vaughn, P., & Lockaby, J. (2001). High school agricultural communications competencies: A national Delphi study. *Journal of Southern Agricultural Education*, 51(1).
- Allen, I. E. & Seaman, J. (2008). *Online nation: Five years of Growth in Online Learning*. Needham, MA: Sloan Consortium.
- Alston, A.J. & Warren, C. (2007). Technology enhanced agricultural education learning environments: An assessment of student perceptions. *Journal of Agricultural Education* 48(4): 1-10.
- Ary, D., L.C. Jacobs, & A. Razavieh. (2002). *Introduction to research in education*. Fort Worth, TX: Harcourt Brace College Publishers.
- Cairncross, S. & Mannion, M. (2001). *Interactive multimedia and learning: Realizing the benefits*. *Innovations in Education and Teaching International*, 38(2), 156-164. doi: 10.1080/14703290110035428.
- Eckert, W. A. (2000). Situational enhancement of design validity: The case of training evaluation at the World Bank Institute. *American Journal of Evaluation*, 21, 185-193
- Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development*, 53(4), 25.
- George, P. (2000). Breaking ranks. *Principal leadership*, 1(4), 56-61.
- Jones, S. & Madden, M. (2002). The internet goes to college: How students are living in the future with today's technology. Retrieved from [http://www.pewinternet.org/PPF/r/71/report\\_display.asp](http://www.pewinternet.org/PPF/r/71/report_display.asp).
- Jones, S., Johnson-Yale, C., Millermaier, S., & Perez, F. (2009). Everyday life, online: U.S. college students' use of the internet. *First Monday*, 14(10). Retrieved from <http://www.uic.edu/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/2649/2301>.

- Kotrlik, J. W., & Redmann, D. H. (2002). The Kotrlik/Redmann technology integration model. Baton Rouge, LA: Louisiana State University.
- Kotrlik, J.W., Redmann, D. H., & Douglas, B. B. (2003). Technology integration by agriscience teachers in the teaching/learning process. *Journal of Agricultural Education* 44(3): 78-90.
- Leedy, P and Ormond, J. (2010). *Practical research: Planning and design*, 9th Ed. Upper Saddle River, NJ: Pearson.
- Lowerison, G., Sclater, J., Schmid, R. F., and Abrami, P. C. (2006). Are we using technology for learning? *Journal of Educational Technology Systems*, 34(4), 401.
- Rhoades, E., Friedel, C., and Irani, T. (2008). Classroom 2.0: Student's feelings on new technology in the classroom. *NACTA Journal*, 52(4): 32-38.
- Roschelle et al. (2000). Changing how and what children learn in school with computer-based technologies. *The Future of Children*, 10(2), 76-101.
- Salaway, G., Caruso, J., and Nelson, M. (2007). The ECAR study of undergraduate students and information technology. (ECAR Report 6). Retrieved from <http://net.educause.edu/ir/library/pdf/ers0706/rs/ERS0706w.pdf>.
- The Chronicle of Higher Education. (2007). The Horizon Report 2007 Edition. Retrieved from [http://www.nmc.org/pdf/2007\\_Horizon\\_Report.pdf](http://www.nmc.org/pdf/2007_Horizon_Report.pdf).
- Thomas, J., Davis, G., and Moss, M. (2008). Efficacy of blended e-learning tools: A case study. *Journal of Applied Communications*, 92(1&2), 9-19.
- U.S. Department of Education. (2009). Evidence-based practices in online learning: A meta-analysis and review of online learning studies. Retrieved from <http://www.ed.gov/about/offices/list/opepd/ppss/reports.html#edtech>.