Technology Integration and Teacher Training: The Effectiveness of Embedding Technology into Education Coursework

Elaine Lawrence, Ph.D.
State University of New York – College at Oneonta

Technological literacy is quickly becoming an educational standard in the classroom. Increasingly, educators are expected to model technological literacy and integrate technology into the curriculum. Teachers who exude confidence in their technological abilities are more likely to integrate technology into the classroom curriculum (Jao, 2001).

Initially, many teacher education programs require pre-service teachers to enroll in an introductory computer science course to obtain training in fundamental computer skills. Maeers (2000) asserts that a single technology course is insufficient training to generate technologically literate teachers with the confidence to integrate technology into the curriculum. For this reason many teacher education schools have been slowly altering their approaches to technology’s role within the curriculum. Teacher technology requirements that began as a detached introductory computer course have become either a separate educational technology course incorporating skills training with curriculum integration or have included adding technological aspects to educational methods courses and student teaching experiences (Brown, Appelman, Green, & Hansen, 2000).

With this change in focus the need to study the use of technology as an instructional tool is imperative because of the implicit impact on future classrooms (Kjetsaa, 2002). Future educators are expected to fully implement technology integration into the curriculum while having had only minimal exposure to computer applications via introductory computer science and methods courses that do not allow for recurring practice in using technology to augment K-12 student learning (Beyerbach, Walsh, & Vannatta, 2001).

Inclusion of classroom technology use training in methods classes has resulted in increases in pre-service teacher confidence and proficiency levels regarding integrating technology into classroom instructions and lessons and the learning environment (Halpin, 1999). Subsequent recommendations suggested the value of integrating technology training earlier within teacher education coursework (Beyerbach, Walsh, & Vannatta, 2001; Krueger, Hansen, & Smaldino, 2000; Ropp, 1999, Stuhlmann & Taylor, 1999).

The constructivist model aligns with the fundamental belief that the knowledge base is constantly fluctuating and becomes stronger through discovery methods of testing and reevaluating. Since computing technology continually changes, teachers need to develop and maintain technology skills in order to maintain relevant technology integration within their classrooms. It is recommended that education programs need to build self-efficacy and self-confidence with computing technology integration and constructivist teaching (Blocher, deMontes, Tucker, & Willis, 2000). However, without courses that immerse undergraduate students in a constructivist approach in the many uses and applications of computing technology in the classroom, many of them will continue to view computing technology as an add-on teaching tool rather than as a device that naturally complements a constructivist approach within all academic subject areas. This research sought to identify specific skills and define constructivist methods for inclusion of technology into the pre-methods education curriculum that will prepare pre-service teachers to effectively infuse computing technology into their lesson plans.

Relevance and significance

Teacher education programs are expected to facilitate the development of teachers who are computer literate and able to integrate technology into the classroom (Beyerbach, Walsh, & Vannatta, 2001). Therefore, learning to incorporate technology into classroom learning is becoming a focal point in teacher education programs. Many teacher preparation programs require pre-service teachers to complete an introductory computer science course in an attempt to produce computer literate teachers who will hopefully use technology effectively within their classrooms (Abbott & Faris, 2000). But a focus on computer applications alone fails to prepare pre-service teachers to use technology as an effective teaching tool (Gibson, 2002).
Schrum (1999) summarizes this by stating, “It is important to look carefully at how teachers learn about technology, for they are quite clearly the key to transforming teaching and learning” (p. 83). Reports indicating that less than one-fifth of our nation’s educators feel prepared to integrate technology into the classroom send a clear signal that a vital element is missing in teacher preparation programs. Efforts to include better preparations have begun for pre-service teachers within methods coursework and during student teaching, but the foundation needs to be laid earlier in the education program.

Laffey and Musser (1998) suggested that teacher education programs need to incorporate technology into the curriculum in order to motivate teacher candidates to creatively utilize technology. Pre-service teachers who experience modeling of relevant usage of technology will be more likely to implement this approach within their own classrooms. Recommendations from studies that infuse technology into education methods courses concur that technology training should begin early in the education program – into education courses taken prior to methods coursework – and continue throughout. Studies of this earlier infusion are needed in order to determine if technology integrated into pre-methods education courses have a positive impact on the attitudes and confidence levels of pre-service teachers.

Globally, technology is developing exponentially and access to information is virtually available almost anywhere at anytime. Technology has been and continues to transform education just as it does businesses and within our personal lives. If current educational systems adapt appropriate technological functions too slowly, then they will be preparing students for a world that no longer exists. Educators need to model how best to incorporate technological changes and become process instructors and purveyors of guided learning – to use technology to “teach students how to research, what to do with the information gathered, and how to use it to solve problems” (McCain & Jukes, 2001, p. 114).

Hypotheses investigated

This study measured and compared the self-efficacy and confidence levels of pre-service teachers who had participated in an introductory computer course to those who had participated in pre-methods education courses with constructivist-based technology integration approaches. It also measured and compared the self-efficacy and confidence levels of pre-service teachers who had participated in an introductory computer course and a pre-methods education course with constructivist-based technology integration approaches to those who experienced only the introductory computer course or one of the education courses with the constructivist-based technology integration approaches. Baseline data from the findings were utilized to examine the educational technology aspects of the teacher education program.

The purpose of this study was to compare the impact of embedding technology training into three pre-methods teacher education courses against the traditional approach of requiring education majors to enroll in only one introductory computer course. These education courses were prerequisites for enrollment into a methods course. The hypotheses to be investigated were:

- **Hypothesis One:** Prior to methods enrollment, education majors who experience performance-based technology integration within core education coursework will have significantly different self-efficacy levels regarding technology integration than those who rely solely on the introductory computer course for their technological base.

- **Hypothesis Two:** Prior to methods enrollment, education majors who experience performance-based technology integration within core education coursework will have significantly different confidence levels regarding technology integration than those who rely solely on the introductory computer course for their technological base.

Previous studies addressed the impact of incorporating technology into education methods coursework and student teaching experiences for specific education majors yet these did not investigate: the impact of incorporating technology into pre-methods education coursework among a heterogeneous representation of education majors, a comparison of perceived skill attained by the pre-service teachers after taking the introductory computer course and/or the pre-methods courses with technology embedded within the coursework. Jao (2001) states that the attitude of the teacher can have an impact on the view of the students and Rogers (as cited in Kjetsaa, 2002) emphasizes the idea that teacher modeling of technology uses aids in the diffusion of knowledge in the classroom. Thus, the pre-service teacher needs to develop skills in technology and modeling of technology integration. This study provides insight into the impact of integrating technology into pre-methods education coursework – utilizing the ISTE 2000 standards – on the perceived skill sets of pre-service teachers. This insight can be used to develop teacher education
curriculum as a means of producing teachers with the skills necessary to integrate technology into the K-12 classroom.

Limitations

Many colleges and universities are embedding technology integration into education methods courses and student teaching experiences. This study focused solely on integrating technology into three pre-methods courses required by every education major attending the State University of New York – College at Oneonta during the Fall 2003 semester: Issues in Education (EDUC 106), Diversity and Teaching (EDUC 201), and Philosophy and Foundations of Education (EDUC 206). Data was collected to compare self-efficacy and confidence levels of students receiving the constructivist-based technology integration treatment in selected sections of EDUC 106, EDUC 201, and EDUC 206 with those of education majors enrolled in Introduction to Computers (CSCI 100) during the Fall 2003 semester. Because students usually pre-register for these classes, the sample groups tended to be more in line with convenience sampling (Gay & Airasian, 2000).

The comparison of two different curricular approaches is typical of experimental research. This study involved comparing specific college courses (EDUC 106, 201, and 206) that integrate technology skill practice and links to pedagogy to the more traditional introductory computer course that focused on six technology skills: spreadsheet, database, web pages, computer communications, word processing, and multimedia. All participants completed the same pre-survey to establish baseline data that was compared to data collected from the post-surveys that all participants completed.

Participants who were Education majors and enrolled in CSCI 100 for Fall 2003 completed pre-surveys within the first few weeks of the semester. The data provided by Education majors enrolled in CSCI 100, but not in the six selected sections of the three education courses receiving the constructivist-based technology integration treatment, were utilized for analysis to answer Hypotheses 1 and 2. The surveys had items for each of the six skill areas as well as the perceived confidence and self-efficacy regarding technology integration. These students experienced the traditional skills approach and then completed post-surveys at the end of the semester. The statistical analysis indicated any change (increase, decrease, or no significant difference) from pre- to post-survey.

Students enrolled in the test sections of EDUC 106, 201, and 206 selected for the study also completed the same pre- and post-surveys as the CSCI 100 students. The students in each of the EDUC courses had five of the six (spreadsheet, database, web pages, computer communications, multimedia, and word processing) skill areas incorporated into their education coursework. The constructivist approach involved the participants utilizing the technology skills as a means of completing tasks that have classroom applications. They reflected upon the applications to the classroom as a means of constructing their understanding of technology skills and integration. Prior to treatment beginning these students also completed the pre-surveys. These students experienced a constructivist approach and then completed post-surveys at the end of the semester. The statistical analysis indicated any change (increase, decrease, or no significant difference). The data addressed in each of EDUC courses were compared with the CSCI 100 data for the same five areas. This indicated if there was a significant difference as specified in the hypotheses.

Summary

The quantitative and qualitative data collectively reflected positive self-efficacy and confidence levels for all the approaches tested. Participants experiencing the embedded constructivist approach, the standard introductory computer course, or those with both indicated that technology integration is possible within their future classrooms once these pre-service teachers become teachers.

The literature review indicated that technology integration should begin earlier within the college education program. It was suggested technology integration should appear prior to methods coursework. The results of this study appear to align with this premise since the most significant changes occurred within the initial college education course (EDUC 106). If the initial education course embeds technology that affords pre-service teachers successful opportunities to develop perceived self-efficacy and confidence levels of at least four on a five-point Likert scale then successive courses can focus on developing the applications of technology in the classroom so that pre-service teachers entering their methods coursework
are able to elaborate on integration possibilities beyond their knowledge of and experience with the basic levels exhibited in the interviews.

Two of the three tasks utilized in the initial education course have since been added as tasks for all sections of that course. Qualitative data appears to confirm the belief that pre-service teachers entering methods are able to develop integration activities into early lesson development. This needs to be validated via quantitative data collection.
Reference List


