



USING ELECTRONIC RESOURCES TO TEACH COMPUTER LITERACY: STUDENTS' PERCEPTIONS AND USE

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Abstract

This paper presents results from a two-step study that examines students' reported perception and use of electronic textbook (e-book) and other electronic ancillary resources in a computer literacy course at a medium-sized, Midwestern university. The first, an exploratory study, compares results on the same measures from two groups of students: one group using a printed book with traditional supplemental materials, and another group using an e-book and its ancillary resources. Pre- and post-test achievement results are presented. In addition, a survey asked students about their study strategies and note taking habits. E-book users who responded to the survey were asked to volunteer for individual interviews, during which they raised several issues about using the electronic features. Results from the exploratory study support the cost efficiency of using e-books with no major negative effect on students' performance when compared with using a printed book. Educational implications for teaching, student learning, and training users of technology gathered in the exploratory study were adopted for the course. Results from the second, follow-up study, show differences in reported responses by gender, race, and age. Students also report their use of electronic ancillary resources in learning the content and preparing for tests.

Keywords: e-books and electronic resources; teaching computer literacy; college teaching

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Introduction

In the evolving job market of the 21st century, it is imperative that new generations of college graduates have the necessary technology-based skills to be competitive. Whether considering materials for college instruction or for on-the-job training, technology is becoming more important in the education and training of today's work force. More higher education courses and disciplines utilize technology and, consequently, require students to have computer literacy skills. For these reasons, many higher education institutions prepare students by offering computer literacy and advanced technology courses.

When instructors use technology, the two major questions related to teaching and learning focus on: 1) the type of technology used, and 2) the effect of the use of technology on the teaching and learning process. With continuing opportunities to use innovative technology in education, and new possibilities of selecting publisher-provided Web-based textbooks and resources, instructors may now choose to adopt electronic textbooks (e-books) and additional electronic resources. However, what effect do these electronic resources have on student learning and performance in a class designed to educate students about appropriate uses of technology?

In this paper, we present the results from an exploratory study (eight course sections) that compared performance results and reports from students using an e-book with students using a traditional print textbook. Based on those results, and implemented in the follow-up study when the e-book was adopted as the course text, we examine student-reported perceptions and use of the course-assigned e-book and other electronic ancillary resources in the same computer literacy course (twenty course sections) at a medium-sized, Midwestern university.

Technology and Education

Use of technology in education

Sivin-Kachala and Bialo (1993), in a synthesis based on 86 research reviews, presented the effects of use of technology in education. Their analysis posited that the use of technology in teaching demonstrated a significant positive effect on achievement. They also showed that technology had positive effects on student attitudes toward learning and on student self-concept. In

addition to effects on students, technology influenced teachers. Teachers employed more student-centered approaches to teaching when using technology, and the student-to-student and student-to-teacher interaction showed an increase when technology was used. The authors acknowledged, “It is not the technology that makes the difference but rather how teachers adapt and apply technology that makes the difference” (Sivin-Kachala & Bialo, 1993, p. 389).

One component of using technology in education relates to the use of e-books. The electronic format of a textbook substantially reduces the expenses related to paper, printing, distribution, and recycling. In addition, Negroponte (1995) draws attention to the availability of information once the information is transformed from atoms to bits; and with that, the entire spectrum of digital enhancements, such as hypertext and multimedia, become available. At the same time, the availability of e-books has an effect on the process of teaching and learning, forcing both instructors and students to alter the educational process.

“There is no doubt that e-learning has an important role to play across all business sectors. In addition to its cost-effectiveness, its main advantages are its flexibility, its convenience to users, its wide reach, its easy accessibility, its consistency and its repeatability. The objectives of e-learning are dependent on the quality of the teaching process and the effectiveness of online access” (Gunasekaran, McNeil, & Shaul, 2002, p. 51).

Especially in the early 21st century, the focus in education is on critical thinking, higher-order thinking skills, and the development of lifelong learning skills. Koehler, Mishra, and Yahya (2007) argue that technology should be used in a purposeful way in order to generate high levels of learning. The authors posit that “effective technology integration for teaching subject matter requires knowledge not just of content, technology and pedagogy, but also of their relationship to each other” (Koehler, Mishra, & Yahya, 2007, p. 746). They introduced the concept of Technological Pedagogical Content Knowledge (TPCK). The model consists of four components: *Technology (T)* encompasses standard technologies used in an educational setting, *Pedagogy (P)* includes the methods of teaching, *Content (C)* concerns the subject matter that is to be taught and learned, and *Knowledge (K)* consists of the information acquired by the student. Koehler, Mishra, and Yahya (2007) stress that the TPCK model emphasizes the relationship between content, pedagogy, and technology. Each

subject area domain has its own TPCK. The use of technology as pedagogy, or in conjunction with pedagogy, must be employed in a purposeful way in order to promote optimal learning. This idea is widely acknowledged in the literature and stressed by researchers (e.g., Lei & Zhao, 2007). Cegielski, Hazen, and Rainer (2011) suggest that we “teach them how they learn” by considering learning styles in information systems education. In addition, we must reach them where they live - and that is online!

Use of e-books

A large amount of research has been conducted on the use of e-books, especially focusing on comprehension and improvement of literacy in students who used an e-book for learning purposes. Most of the research on e-books concentrates on the benefits to student learning or changes in the instructional process. However, it is possible that students employ different learning and test taking methods when using an e-book as compared to using a traditional printed textbook. Previous research reports conflicting results, covering the entire spectrum from the efficiency of e-books in learning to the lack of, or very small, effect on student learning.

Zucker, Moody, and McKenna (2009) conducted a meta-analysis on 27 studies concerning the effect of e-books on literacy skills in the domains of comprehension and decoding for students in K-5th grade. Their results indicated that the effects of e-books on comprehension-related outcomes were small to medium in size. On the other hand, Cavanaugh (2002) stressed the advantage of e-books, especially for teaching special needs children as well as exceptional children who need more challenging and richer information than a regular print book could offer. Aside from the effects of e-books on learning, Grimshaw, Dungworth, McKnight, and Morris (2007) studied the effect of book medium presentation on students' motivation to read the e-book. Their results indicated that the type of medium did not significantly affect the children's enjoyment of the printed or electronic storybook. Their results also indicated that students obtained significantly higher comprehension scores when they only read the book, as compared to when narration was present (students were listening to narration at the same time they were supposed to read the printed text). Their research demonstrated that just because technology can offer many interesting features, the extra features were not always helpful.

Considerable data suggest that supportive digital text can help students who are experiencing difficulty in reading (Anderson-Inman & Horney, 1997; Anderson-Inman & Horney, 1998; Anderson-Inman & Horney, 1999; Anderson-Inman, Horney, Chen, & Lewin, 1994; Boone & Higgins, 1993; Boone, Higgins, Notari, & Stump, 1996; Higgins, Boone, & Lovitt, 1996; Higgins, Boone, & Lovitt, 2002; Horney & Anderson-Inman, 1995; Lei & Zhao, 2007; MacArthur & Haynes, 1995). Korat, Segal-Drori, & Klien (2009) observed the effects of e-books compared to printed books on reading comprehension. Results from their research indicate benefits of using e-books; specifically, that using e-books increased literacy levels in low socio-economic status children.

Method

The research presented in this paper was conducted in two steps taking place in a computer literacy course: one initial exploratory study (Fall 2010), and a second follow-up study (Fall 2011).

In the exploratory study, the research question targeted the effects of e-book use in the computer literacy course compared to the use of traditional printed textbooks. Specifically, we observed the effects of using an e-book on student performance and potential changes in test taking skills. In three (3) sections of the course, students used an e-book, and the teaching pedagogy incorporated expanded online materials. In five (5) other sections that used a printed textbook, similar content was covered with the goal of students acquiring the same content knowledge. The topics included were the same; however, the presentation format and detailed content was not. Based on results from the initial study, the e-book was adopted for all sections of the course beginning with the Spring 2011 semester.

The follow-up study took place during the Fall 2011 semester, when nine (9) instructors taught twenty (20) sections of the course. In this follow-up study, the research question targeted students' reported perception and their use of the course-assigned e-book and other electronic ancillary resources.

The course

The computer literacy course in this study focuses on the interaction between information and methods of communication technology. It explores:

1) the impact that technology has on individuals and organizations; 2) the effects of current technology infrastructure; and 3) the use, duplication, and transmission of information in our world. The course links technology with communication; this combination provides consumers with access to a wealth of data and information, both locally and globally. As course performance measures, students are required to exhibit proficiency with Microsoft Office 2007/2010 software applications (Word, PowerPoint, and Excel) and demonstrate knowledge of computer technology and components that aid in their understanding of data and information.

Electronic resources

The electronic resources utilized for this course include: an *e-book* that covers concepts and issues (Emerge with Computers, version 2.0/3.0, author Ken Baldauf, from Course Technology, Cengage Learning); an *automated, proficiency-based assessment and training environment* or Skill Assessment Manager (SAM 2007/2010, from Course Technology, Cengage Learning) that covers Microsoft Office 2007/2010 applications; and an *online study tool* (StudyMate Class, from Respondus). In the marketing materials for the e-book, the publisher suggests that this e-book helps to bridge the gap between the old model of higher education (lecture halls and printed books) and the way that students live and want to learn (Cengage Learning, 2012). The *e-book* allows students to explore topics and content as they wish, rather than forcing them to follow the linear methods previously used. Unfortunately, the platform for the e-book requires launching through a course management system (e.g., Blackboard) and restricts access. While a computer/laptop with an Internet browser can easily access the e-book, e-readers, smart phones, and other devices are not able to open the e-book at this time. The use of an *automated, proficiency-based assessment and training environment* to provide training and assessment of skill-based tasks allows students to observe, review, and incorporate what they learn while receiving immediate feedback. We know that individuals use different techniques to study and assimilate information; and the *online study tool* allows students to review material with flash cards, fill-in-the-blank, crosswords, and other game-like presentation formats.

The following four sections (3.3 through 3.6) present results from the exploratory study conducted during the Fall 2010 semester, prior to course-

wide adoption of the electronic resources. Section 3.7 presents results from the follow-up study during the Fall 2011 semester.

Pre-test results from the exploratory study

Comparison of students' performance results began by administering a pre-test to students enrolled in eight (8) sections of the computer literacy course. The pre-test consisted of objective questions that cover basic computing concepts and Microsoft Office application skills. The pre-test was administered at the beginning of the semester as a non-credit exam; of the 329 students enrolled, 312 students completed this activity. Instructor 3 taught using an e-book; the other two instructors used a printed textbook. The results (see Table 1) were relatively consistent across sections and reinforced faculty assertions that students enrolled in the course did not possess knowledge of computing basics nor did they initially possess the skills needed to complete the course requirements successfully.

Table 1. Pre-test results by instructor

Instructor	Number of Sections	Number of Students per Instructor	Average Score per Instructor
Instructor 1 (print text)	3	127	49.76
Instructor 2 (print text)	2	87	49.93
Instructor 3 (e-book)	3	98	51.37
Total	8	312	50.35

Post-test results from the exploratory study

Prior to the end of the semester, the same exam, with modified question order, was administered as a post-test. As usually occurs in a freshman-level course, student attrition and inconsistent attendance reduced the number of students completing the post-test assessment (see Table 2).

Table 2. Post-test results by instructor

Instructor	Number of Sections	Number of Students per Instructor	Average Score per Instructor
Instructor 1 (print text)	3	84	67.24
Instructor 2 (print text)	2	61	65.61
Instructor 3 (e-book)	3	62	66.52
Total	13	207	66.45

As shown in Table 2, average scores for all instructors were very similar. This means that students in all sections acquired similar levels of content knowledge as measured by the post-test. A comparison of grade distributions for pre-test, post-test, and final course grades by instructor is presented in Table 3. Data listed in the table represent proportions of each respective grade from the total number of students in all sections of each individual instructor. For example, for instructor 3's students, 3.1% (3 out of the 98 students who completed the activity) earned a B on the pre-test, 8.1% (5 out of the 62 students who completed the activity) earned a B on the post-test, and 30.6% (34 out of 111 students) earned a B in the course. The "Other" category for grades includes students who remained enrolled in the course but did not complete the work to earn a grade.

Table 3. Proportions of Grade Distributions by Instructor

% of Grades Test type	Instructor 1/print			Instructor 2/print			Instructor 3/e-book		
	Pre	Post	Final	Pre	Post	Final	Pre	Post	Final
A	0.0	2.4	14.5	0.0	0.0	26.4	0.0	0.0	9.9
B	0.0	17.9	38.2	1.1	14.8	33.3	3.1	8.1	30.6
C	2.4	27.4	27.5	6.9	23.0	12.6	2.2	37.1	25.2
D	12.6	27.4	5.3	10.3	32.8	9.2	21.4	32.3	6.3
F	85.0	25.0	8.4	81.5	29.5	2.3	73.5	22.6	9.9
Other	--	--	6.1	--	--	16.1	--	--	18.0
# of Students	127	84	131	87	61	87	98	62	111

There were no statistically significant differences in results comparing the pre-test, post-test, and final grades obtained by students using the e-book with results from students using the printed book. The proportion of students who obtained A grades in instructor 3's sections (e-book) was much lower than students taught by instructor 2 (print textbook). However, the grade distribution for instructor 3's students was comparable to instructor 1's students. Overall, the course performance of students using the e-book was comparable to that of students using the printed book. Since we did not have access to students' overall grade point averages (GPAs) by section, we cannot make any statement related to students' general knowledge level by instructor. For that reason, we can discuss only grades in the course and cannot argue that use of the e-book might have had an effect on overall grade distributions.

Survey results from the exploratory study

The analysis comparing students' performance using the e-book with those using a printed textbook showed only that use of the e-book made no difference in students' academic achievement. However, this quantitative analysis did not tell us anything about the actual experience of using an e-book. Suskie (1996) drew attention to the importance of collecting educational research data by using surveys to complement information based on quantifiable educational achievement. We designed a survey in order to gather information and better understand the effect of e-book use – not only from the point of view of students' performance (which we compared via pre-, post-test, and final course grades), but also from their experience in using the e-book and electronic ancillary resources. Data collected with a survey can be complementary to other quantitative data and better explain it, especially when we look at scores measuring school performance (e.g., Babblie, 2001; Dillman, 2000; Fowler, 2001).

In addition to pre- and post-tests, all students were asked at the end of the Fall 2010 semester to complete a survey about their experience in the course. The survey was administered to all sections taught by the three instructors. All students were presented with ten questions, and the results were compared across instructors. In addition, students using the e-book were asked to complete an additional 15 questions about their experience using the e-book and electronic ancillary resources.

Results From Survey Across All Sections

The survey gathered student responses about their class attendance, time spent on the course outside of class, time spent reading the text, textbook preference (electronic versus printed), use of lecture slides, note taking practices, exam preparation strategies, and time spent practicing skills.

Results show that the self-reported *class attendance* of students using the e-book was similar to reports from students using printed books. The students in the e-book sections also reported that they spent comparable study time *outside of class*, and a large majority of students in all sections spent between 1-2 hours on the course outside of class. When asked about their time *reading the textbook*, students using the e-book described comparable time as their counterparts using a printed book; however, 47-86% of students spent less

than one hour per week reading the textbook. Regarding their *textbook preference*, it is interesting to note that of the students with a preference, students using a printed book thought they would be better off with an e-book, while students using an e-book preferred a printed book. Perhaps, a case of “the grass is always greener ...”?

Students in all sections reported that they used *lecture slides* in the classroom during lecture and in preparation for exams. Student-reported *note taking* behavior indicated that students took notes in class and when preparing for an exam. Of special interest was the distribution of note taking behaviors revealed by students using the e-book, which showed a more uniform note taking behavior across an assortment of activities when compared with their counterparts using the printed book. When *preparing for exams*, most students across all sections read the lecture slides. Students using the e-book also had the opportunity to take Self Quizzes and practice exams using the provided online tools, which a large majority stated that they did use for exam preparation. However, when asked more specifically, students stated that they used sporadically the Self Quizzes (43%), and practice exams (61%). When asked how much time they spent *practicing the skills* required in the course, most students (49%) across all sections reported spending only 1-2 hours per week.

Results from survey of e-book sections

In addition to the survey items asked of all students, students using the e-book were asked additional questions about accessing the e-book at home, purchase of an optional printed form of the e-book, use of an online study aid, skill practice training, and skill projects.

The majority of students using the e-book (51%) stated that they were able to *access the e-book at home* with few or no problems, while others could access it but with some difficulties (16%) or were unable to access it from home (14%). Despite their difficulties in accessing the e-book outside of the classroom, only 2% of the students stated that they purchased the *printed form* of the electronic textbook. Despite the fact that some students (22%) did not use or were unaware of the *online study aid*, most of them used it (55%), especially following lecture (21%) or in preparation for an exam (56%). Students who used the tool also stated that they had better performance on the exam because they used it (43%). Even though some students (13%) ignored the *skill practice*

training, the majority of those who used it completed a few training practice tests (52%), while others completed several (21%) or most (12%) of the practice training made available. In general, students who used the skill practice training used all its features (observe - 36%, practice - 44%, and apply - 60%). More than half of all students (53%) stated that they completed a few of the *skill projects*, and 28% stated that they completed several or most of the skill projects.

Along with structured questions, students were also asked two open ended questions. Students had mostly positive responses to the first question, “*What was good in using the e-book?*” Example responses included:

- Does not need to be carried and cannot be lost
- Is not loading the backpack
- Environmentally friendly
- Access to it any time
- Easy to search and find topics
- Interactive – resources with links and video
- More organized than the printed
- Practice with the content for quizzes, exams, and projects

Students mentioned concerns that relate mostly to Internet access in response to the second question, “*What was bad in using the e-book?*” Example responses included:

- Must have internet access
- Slow loading
- Compatibility issues with different types of computers (MAC, iPad, smartphones)
- Takes time to get used to read and use eBook
- Long hours looking at the computer screen
- Very frustrating when the internet is slow or it does not download correctly

Interview results from the exploratory study

In order to triangulate our data, all students from the three sections using the e-book were asked to volunteer for an interview conducted by the

second author (who was not a course instructor). Individual interviews were conducted with 14 volunteer students from all sections. Students' gender and race was representative for the entire sample (7 female, 7 male; 1 African American, 1 Hispanic, 11 Caucasian, 1 other; age ranging from 19 to 50; overall GPA between 2.0-4.0). Students were asked to complete a response table before the interview to gather data concerning their use of the e-book and other features of the electronic resources. The questions from the interview were based on the survey presented to students using the e-book.

Several problems raised by students in the interview related to loading and opening Emerge and SAM from home; compatibility problems for Mac users; SAM exams and projects and in-class discussions not aligning well, since they cover different types of problems; and SAM's grading system regarding spelling ("content might be good but spelling will create an 'error' in SAM"). Students mentioned that they still need to develop familiarity and become more comfortable with e-book features and with learning from a completely online textbook.

Students also praised using an e-book, stating that they did not feel a difference in performance by type of text. More than that, students stated that because they used an e-book, they developed better study skills and spent more time practicing for exams. They also felt that their computer literacy increased, and they were very happy with the e-book cost effectiveness. Other positive comments relating to e-book use were that students rated it as environmentally friendly, can be updated in a timely manner, can be downloaded onto laptops or e-book readers, and occupies less space in backpacks and on bookshelves.

In the interview, students were asked their opinion concerning the different content topics they studied in the course. The most often cited topics to be dropped were Hardware, Software, and Telecommunications. Students stated that they are not really interested in those topics and do not see the usefulness in learning about them since they would not use the information in real life. Topics to be added by the students were Mac computer use and alternative software (smart phones), Internet security and privacy, gaming, and online advertising.

Based on the results from performance analysis, and after evaluating students' responses to the survey and responses to the interview, the conclusion drawn was that the use of the e-book supports the idea of e-books' cost

efficiency with no major negative effect on student performance when compared with printed book use.

Based on results from this exploratory study and feedback from students in the e-book sections, the e-book was adopted as the course text in Spring 2011. The teaching methods adopted were similar to the ones used by the instructor teaching with the e-book during the Fall 2010 semester. Additional materials were developed and posted through Blackboard to help students be successful with the e-book, including general instructions for using the e-book plus suggestions to help students improve their study skills - layout of pages, tips for navigation and searching, links for Self Quizzes, how to highlight text, and how to make notes. The training during the first week of classes and additional “how-to” postings were designed to improve students’ learning and test-taking skills using the e-book and electronic ancillary resources (i.e., Self Quizzes, PowerPoint, SAM, and StudyMate).

Results from the follow-up study

The follow-up study took place during the Fall 2011 semester, this being the second full semester of complete adoption of the e-book as the course text. There were nine (9) instructors (5 adjunct and 4 full-time faculty/FT) teaching the course with a total of 831 students enrolled in twenty (20) sections (see Table 4 below).

Table 4. Results by instructor in Fall 2011

Instructor	1	2	3	4	5	6	7	8	9	Total
Type	Adjunct	Adjunct	Adjunct	FT	FT	Adjunct	Adjunct	FT	FT	
# Sections	3	1	1	4	2	1	1	4	3	20
# Enrolled	103	35	92	175	89	42	23	163	109	831
#Completed	86	18	13	117	67	19	13	95	64	492
*Female	47	10	3	64	28	12	7	58	40	276
*Male	43	8	13	55	39	7	6	39	23	223
*African American	25	6	0	29	14	1	3	13	15	106
*Caucasian	52	10	9	79	47	15	9	80	40	341
*Other	7	1	3	8	5	3	1	2	7	37

Table 4. Results by instructor in Fall 2011 - *continued*

Instructor	1	2	3	4	5	6	7	8	9	Total
Type	Adjunct	Adjunct	Adjunct	FT	FT	Adjunct	Adjunct	FT	FT	
Percentage Course Grade Distribution for Students Completing the Survey by instructor										
A	51	28	15	32	46	16	23	28	22	
B	30	39	54	39	28	47	8	31	33	
C	12	28	8	20	15	16	62	23	31	
D	5	6	0	8	9	16	8	16	14	
F	2	0	23	2	1	5	0	2	0	
Post-Test Percentage Score Results for Students Completing the Survey by instructor										
Average		54.6		53.8	60.6	53.7	55.5		60.5	
Mode		60		48	64	62	42		74	
Maximum		78		86	82	66	76		84	
Minimum		28		22	36	22	38		32	

Note: * These numbers represent only those who reported their gender and race

At the end of the Fall 2011 semester, students were asked to voluntarily complete a survey to report on their experience and opinions on the use of the e-book and electronic ancillary resources. It is important to note that at this university, using an e-book in all sections of this course is a ground-breaking event for two reasons. First, this course is the first experience of e-book use with this large enrollment of students. While it is very possible that students may have used e-readers to read books, it is likely that their experience with e-books in lieu of printed textbooks is rather limited. Second, this campus uses a textbook rental system for the majority of undergraduate courses. This required negotiating a site license with e-book access only through the course management system (i.e., Blackboard) for enrolled students. An additional benefit of this site license is automatic upgrades as new editions of the e-book are released.

SurveyMonkey was used as the platform for the survey. Instructors offered their students extra credit for completing the survey, and for that purpose, the last question asked for their name and their instructor's name. There were 520 responses to the survey. Of those responses, twenty (20) students did not supply their name and did not receive credit. In addition, eight (8) identified students completed duplicate surveys; those responses were eliminated from the results. For data analysis purposes, only those students who did not have missing data were included.

Among students who reported their demographic data were 276 females and 223 males. The reported race distribution was: 106 African American, 341 Caucasian, and all other reported race categories (Asian, Hispanic, Native American, Native Alaskan/Islander, or Other), which we grouped under “Other” because their numbers were minimal (see Table 4). Based on ANOVA analysis, the results show that students enrolled with the nine instructors were homogenous; and we did not find statistically significant differences among the sections based on self-reported overall GPA. Similarly, there was no difference in course grade and post-test scores when comparing results from the group of full-time versus adjunct instructors. However, there was a statistically significant difference in course grades by instructor ($F=3,451$; $df= 8, 483$; $p<.001$). Specifically, students in sections taught by instructor 1 (adjunct, teaching three sections) had statistically significant higher grades than students in sections taught by instructors 3, 4, 6, 7, 8, and 9. Also, statistically significant higher course grades were found for students taught by instructor 5 (full-time, teaching two sections), as compared to instructors 3, 6, 8, and 9. Regarding post-test scores, there was a statistically significant difference ($F=3.586$; $df= 5, 248$; $p<.004$) between students’ scores taught by different instructors. Students taught by instructor 4 (full-time, teaching four sections), received statistically significant higher scores than students taught by instructors 7 and 9. The correlation between course grade was statistically significant with both post-test results ($r=.230$) and with overall GPA ($r=.448$).

Data analysis of survey responses shows that students are using all of the electronic resources, including the e-book. However, the usage of the e-book seems to be minimal per week (see Table 5 below). The most used electronic resources are SAM, StudyMate, and PowerPoint lecture slides. SAM is used not only by the most students, but also for the most hours per week. This is due to 11 weekly skill assignments during the 16 week semester. The results concerning usage of electronic materials is supported also by the students’ reported preferences for the materials (see “Most preferred” row of Table 5). The most preferred electronic resources are SAM and StudyMate, followed equally by PowerPoint lecture slides and Self Quizzes. The least preferred is the e-book.

Table 5. Percentage of students by use of resource, amount of time spent, and preference

% students	e-book	Self Quizzes	PowerPoint	SAM	StudyMate
Using resource	59.6	60.5	79.3	96.3	65.3
Less 1 h/week	52.4	54.3	39.4	15.8	47.5
1-2 h/week	39.0	35.9	45.5	56.2	37.7
3 or more h/week	8.6	9.8	15.2	28.0	14.7
Most preferred	6.9	15.3	15.6	32.0	31.1

Reports from students indicate that the e-book is mostly used only before tests (21.7%), which is similar to the use of Self Quizzes (37.4%). The PowerPoint lecture slides are mostly used during class (57.1%) and show a spike in use also before tests (17.2%). Students state that SAM is used to learn content in general (49.8%) and mostly used after class (58.2%). StudyMate, a resource to help prepare for tests (65.5%), is used before tests (42.9%) and also after class (16.2%).

When comparing total electronic resource usage hours per week by gender and race, females spend significantly more hours studying per week than males ($t=3.33$, $p<.001$) and African American students study significantly more hours per week ($t=2.20$, $p<.029$) compared to their Caucasian counterparts (see Table 6 below). When comparing responses by age, older students spend more time using SAM ($F=8.02$; $df=3$, 503; $p<.001$), even though students of all ages spend an average of only 1-2 hours per week studying for the course. This information, corroborated by the type of electronic resource used and the purpose for its use, brings us to the conclusion that most of the students spend a minimum of 1-2 hours studying per week by using SAM and StudyMate electronic resources. There are no statistically significant differences in results by type of instructor (Adjunct vs. Full-time/FT).

The open-ended questions of the survey concerning each of the electronic resources were first categorized as either problems or comments. Then for each category, all responses were tallied by similar problems and similar comments.

Concerning the e-book, an equal number of students found access to the e-book “glitchy” or difficult (62 students) or did not have any problems at all accessing the book (61 students). Twenty-eight (28) students reported that they

could not open the e-book, 25 did not use or did not like the e-book, and 12 prefer a print version of the book.

Only six (6) students reported that the Self Quizzes would not load, and 27 students did not use this feature at all. However, 47 students found the Self Quizzes useful or effective or reported that they loved that resource.

With the PowerPoint lecture slides, only six (6) students found the feature “glitchy” or difficult to use. Sixty-five (65) students found the PowerPoint slides useful, helpful, or effective.

Table 6. Percent of students reporting hours of study per week by gender, race, and age

		# students	less than 1 hour	1-2 hours	3-4 hours	4 hours or more
Gender	Female	286	8.8	46.0	35.4	9.8
	Male	230	14.8	51.3	29.6	4.3
Race	African American	108	11.1	43.5	34.3	11.1
	Caucasian	353	12.5	49.7	32.7	5.1
Age	18-19	311	10.9	46.6	36.0	6.4
	20-21	121	15.8	51.7	25.0	7.5
	22 and above	81	7.4	49.4	34.6	8.6

Just as the survey data showed that SAM was the resource most used and liked by the students, it was no surprise that those open-ended questions provided the most feedback. Problems mentioned by students included: not having all methods or all shortcuts recognized (23 students); being “glitchy” or freezing (19 students); grading too slow (14 students); making grading errors (15 students); some difficulties in understanding, loading, and using the resource (15 students); and that SAM did not work on Macintosh computers (12 students). However, 88 students mentioned that SAM was a very useful electronic resource; and they all liked it and found it effective, creative, interesting, or fun. Only 17 students mentioned that SAM was demanding, frustrating, annoying, or that they did not like it.

The last feature, StudyMate, seemed to work rather well (145 students did not have any problems), with a minimal number of students reporting slow loading (2) or freezing (3). Despite its great popularity among students, 30 students mentioned that they did not like it or did not use StudyMate at all. Ten (10) students reported that StudyMate quiz questions were not similar to the test questions.

Discussions

We stress in this paper the importance of “walking the walk.” If we teach about technology, it is logical - and important - to integrate technology into our teaching practices. Following the TPCK model (Koehler, Mishra, & Yahya, 2007), when students learn about technology, the preferred pedagogical methods should also involve technology. In the exploratory study, we introduced content knowledge using an e-book and used technology to teach productivity application skills. Results from that study showed that students using an e-book demonstrated a level of course content knowledge similar to that of students using a printed textbook. In addition to learning the content, e-book users also developed skills related to using the e-book and other e-learning methods that accompany the e-book package.

However, we note that e-book users are not necessarily familiar with all the learning methods pertaining to use of an e-book. By utilizing the Self Quizzes and online study tools, students can develop better learning skills, while at the same time improving their technology use skills. The follow-up study finds that e-book users can benefit from brief, informal training about ways to use the e-book and its accompanying learning opportunities. These findings agree with those of Eno (2010), that,

“... students needed training in the installation and use of digital textbooks. Findings also indicated the need for further research into what students understand about using digital textbooks. Recommendations are for the college to institute training sessions to teach students how to use the digital textbooks” (Eno, 2010, p. ii).

The advantage of using e-books is also reflected in more cost-effective education. Printed textbooks are more expensive than e-books, as well as a burden to acquire before and dispose of after a course has been completed. E-books are cheaper; do not require storage before, during or after use; allow for continuous updating of content and organic learning techniques; and may offer additional learning and testing opportunities. This cost effectiveness could be of great interest in organizations where employers target training that produces better marginal benefits. In a world where “green” products, living, and education are desired, the use of e-books - with equal performance effectiveness as a printed textbook – can be welcomed. We believe that the use of e-books is not only more cost effective but, given better Internet connections

and familiarity with e-books, education and learning can move online even when meetings take place in the classroom or the boardroom.

Today, education goes beyond the classroom and beyond college into the work force. Colleges teach technology skills to their students, and businesses offer technology training to their employees. However, more research on technology is conducted within colleges, providing information and new ideas to shape on-the-job training practices. Since technology skills are important in today's work environment, colleges and employers offer similar instruction. Considering the advantages of using e-books, including lower cost and a smaller carbon footprint, we hope that our results will provide important information to employers who offer technology-training courses.

Conclusions

Results from this study show that student performance did not differ between using a traditional printed textbook and using an e-book with additional electronic resources. For this reason the e-book was adopted in all sections of the course. We also realized that students need training to use all the features of the e-book. It was evident that students need to develop learning skills that pertain to the use of e-books and electronic resources. We developed and used as course material a study guide to help students be successful with the e-book, including layout of pages, navigation, searching, Self Quizzes, highlighting text, and making notes. The study guide helped students become more comfortable with using an e-book and jump-started their study skills while utilizing other electronic resources. Reports from students present the need and interest not only to receive instruction on the content of the e-book, but also their use. Technology is as helpful as the user knows how to take advantage of it and is comfortable in handling all the features.

By combining technology and good pedagogical methods, students can learn essential content more effectively, develop a better knowledge base, and expand their learning skills by using and working with technology.

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