The Impact of Service-Learning: A Quasi-experimental Assessment of Student Performance in an Introductory Microcomputer Course

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Abstract

The purpose of this quasi-experimental study was to measure the impact of service-learning on academic achievement of students enrolled in an introductory course in agricultural applications of microcomputers. The treatment consisted of a service-learning project that engaged students in the conversion and compression of digital video clips for integration into PowerPoint shows they developed for research faculty in the College of Agriculture, Forestry, and Life Sciences at Clemson University. Student performance was measured using a pretest and posttest developed from a test bank that accompanies the course text. No significant difference was found between the treatment and control groups in the study.

Introduction/Theoretical Framework

No other experiential teaching format better represents such an array of learning theories and social development ideals better than that of service-learning. Senator John Glenn (National Commission on Service Learning, 2001) best summarized this concept, stating:

> By its very definition, civic responsibility means taking a healthy role in the life of one's community, state, and nation. That means that classroom lessons should be complemented by work outside the classroom. Service-learning does just that, tying community service to academic lessons (p. 7).

In the past 20 years, service-learning programs have found their way into primary, secondary, and higher education institutions throughout the nation. Much of this increased interest in service-learning may be due to efforts in federal funding. Two primary initiatives have fostered the growth service-learning: 1) federal legislation was passed in 1990 that created a commission to award grants for service-learning programs, and 2) the 1993 National Community Service Trust Act provided funding to states for the purpose of promoting service-learning in schools (National Commission on Service Learning, 2001). Additionally, programs such as Learn and Serve America, Higher Education (LSAHE) documented growth in service learning interest by universities through direct grants and sub-grants. The LSAHE funded approximately 100 higher education institutions and organizations with $10 million for service learning programming, and through sub-grants, approximately 500 institutions were involved (Gray, Ondaatje, & Zakaras, 1999).

As a result of the increased interest in service-learning, a plethora of research has been developed in many of the areas it affects. Service-learning provides researchers opportunities to investigate such areas as career development, personal/interpersonal development of students, social outcomes, and community relationships (Eyler, Giles, Stenson, & Gray, 2001). However, educators are often concerned about the impact of service-learning on academic achievement. Few studies exist that focus on the academic aspect of service-learning, as opposed to other studies that center on social/community oriented issues. Overall, findings from studies on academic achievement of students engaged in service-learning have mixed results. Various studies found that academic achievement of students was higher than student counterparts when involved in service learning (Balazadeh, 1996; Gelmon, Holland, & Shinnamon, 1998). Similar studies of student achievement in college courses found no significant difference between students engaged or not engaged in service-learning (Kendrick, 1996; Strage, 2000). Many of the studies on service-learning have occurred within advanced college courses.

However, integration of service-learning activities in academic core courses has not occurred as often (Antonio, Astin, & Cress, 2000; Gray, et al., 1998; Sagaria & Burrows, 1995). The use of service-learning in applying experiential applications to skill development

courses (such as computer courses) in academic core programs would seemingly be practical as well as valuable to long-term retention. In a study of college of agriculture students' self-efficacy of computer skills, Johnson, Ferguson, and Lester (2000) found that students entering as freshmen scored low on computer knowledge assessment and scored below average or average on self-efficacy assessments of specific important skills needed while in college. In analyzing their findings of students' self-efficacy, Johnson, et al. (2000) reflected on similar work by Kinzie, Delecourt and Flowers (1994). Kinzie, et al. (1994) contended that student use of computers is based on their self-efficacy, which can be based on their experiences with the media. Johnson et al. concluded that various computer experiences affect students' self-efficacy ratings, which can serve as a predictor of computer skills and knowledge.

In the study by Johnson, Ferguson, and Lester (2000) findings reflected that 69% of the students rated their self-efficacy regarding presentation graphics software as below average. This study focuses on assessing the impact of service-learning upon students engaged in presentation graphics skills development (Microsoft PowerPoint) in an introductory computer class.

Theoretical Framework

The precepts of service-learning are initially based on the works of John Dewey. Dewey's writings (1916, 1938) often paralleled present-day service-learning concepts. In relation to the development of social development aspects by service-learning, Dewey reflected that actions directed toward the welfare of others stimulate academic and social development. Dewey's (1938) words also provided a basis for the concept of experiential learning as he stated that "there is an intimate and necessary relation between the processes of actual experience and education" (pp. 19-20).

In modern times, Kolb and Fry (1975) built upon Dewey's work, developing the experiential learning model. This model specifies four major elements that occur in the learning process: concrete experience; observation and reflection; the formation of abstract concepts, and testing in new situations. Kolb and Fry argued that learning can begin at any of the four stages; however, one may assert that in service learning the concrete experience would occur at the onset.

Purpose/Research Questions

The primary purpose of the study was to measure the impact of service-learning on academic achievement of students enrolled in an introductory course in agricultural applications of microcomputers. The study was organized around the following research question:

6. What differences in academic achievement, if any, were there among students that were engaged in service-learning and those not engaged in service-learning activities.

For the purpose of analysis, the research question was posed as null hypothesis.

HO_1: There was no difference in the academic performance of students who were engaged in service-learning activities and those who did not participate in service-learning activities.

Methods/Procedures

To determine the impact of service-learning on students' achievement, a non-equivalent control group quasi-experimental design was selected for this study. The Quasi-experimental design (Campbell & Stanley, 1990) allows the researcher to use intact groups with no random assignment to the treatment or the control.

The population of the study consisted of 35 undergraduate/graduate students at Clemson University enrolled in two sections of AGRIC 200, Agricultural Applications of Microcomputers during the spring semester 2002. AGRIC 200 is a freshman-level course designed to provide an overview of microcomputer hardware and software encompassing word processing, spreadsheet, database management, utility, and graphic communications in the College of Agriculture, Forestry and Life Sciences (CAFLS). Class size is set at a capacity of 19 students, 19 students were enrolled in Section 1 and 16 were enrolled in Section 2. A total of 21 students were males (60%) and 14 (40%) were females. Class ranks consisted of 19 Freshmen (54%), 11 Sophomores (31%), 3 Juniors (9%) and 1 each in the categories of Senior (3%) and graduate student (3%). Most of the students were enrolled in agricultural education 15 (43%); 8 students were in Animal and Veterinary Sciences (24%), 3 in Agricultural Mechanics and Business (9%); 2 each in Aquaculture, Fisheries and Wildlife (6%) and Crop, Soil, and Environmental Science (6%), and 1 each in Agricultural Economics (3%), Human Resource Development (3%), Horticulture (3%), and Turfgrass (3%). The class is a required course for students in many of these majors and others in CAFLS.

One pretest/posttest instrument was developed for the study. To guard against selection bias, a pretest instrument was administered to students in both sections during the first session of the semester. A posttest was administered to students on the final day of class to determine the impact of the service-learning activities used in Section 1.

Description of Treatments

As described above, students in both treatment groups were enrolled in the Spring semester of 2002 in either Section 1 or Section 2 of AGRIC 200, Clemson University's course entitled Agricultural Applications of Microcomputers 3(2,2). Students in both sections attended class once per week on a grueling schedule of 100 minutes of lecture followed immediately by 100 minutes of lab. All students used the required text for the course, Microsoft Office 2000; Introductory Concepts and Techniques (Shelly, et al., 2000) and both instructors used the same general format for instruction. Each class meeting included a PowerPoint based lecture, a quiz or exam, and lab time spent working on projects. Projects

were practical applications of concepts covered in the textbook and lectures and were completed by individuals, in pairs, or sometimes in small groups. The instructors circulated during lab time answering questions and occasionally interrupting the entire class to clarify answers to widely encountered problems. Both instructors supplemented the textbook with handouts. Web development was taught completely from handouts since this topic was not covered in the textbook we used. Topics presented in both sections included e-mail, World Wide Web, Windows 2000, computer hardware, Web development, and Microsoft Office applications: Word, Excel, Access, and PowerPoint. Both sections used Clemson's Collaborative Learning Environment (CLE) to handle information exchange and to manage grades.

Students in Section One met Monday evenings 5:15- 9:00 p.m. The instructor covered the course topics in the following order: 1) Internet, email, computer hardware and software; 2) Ethics, history of computers, and Windows 2000; 3) Microsoft Word (3 weeks of instruction); 4)PowerPoint (2 weeks of instruction); 5) Web development (2 weeks of instruction); 6) Access, and 7) Excel (2 weeks of instruction).

In addition to the lectures, quizzes, exams, and lab projects, students in Section One were required to work in groups to complete a service-learning project. This semester-long project consisted of designing and developing a professional PowerPoint presentation that gave an overview of research activities of specific research-oriented faculty in the College of Agriculture, Forestry, and Life Sciences. Students were more involved in the service-learning project over the second half of the semester. A culminating event for the students included presenting their team PowerPoint presentation to their respective faculty at a major presentation at the conclusion of the semester.

Students in Section Two met Tuesday evenings from 3:30 - 7:10 p.m. The instructor covered the course topics in the following order: 1) Internet, email, and the campus network; 2) Ethics, history of computers, hardware, and software; 3) Windows 2000; 4) Microsoft Word (3 weeks of instruction); 5) Microsoft Excel (2 weeks of instruction); 6) Microsoft Access; 7) Microsoft PowerPoint (2 weeks of instruction), and 8) Web development (2 weeks of instruction).

Students in section two were required to work in groups to produce a PowerPoint presentation covering some aspect of South Carolina Agriculture in addition to the lectures, quizzes, exams, and lab projects. This presentation was delivered to the instructor and class peers on the day of the final exam. Students were involved in this project over the last third of the semester with much of the work being finalized in the last week.

Instrumentation

A pretest and posttest instrument was used to collect data for the study. The pretest and posttest were identical and consisted of 50 multiple-choice questions, 41 of which were derived from the course-text ancillary test bank, plus 9 questions developed by the instructors. The questions had been used to evaluate student knowledge in previous semesters. The topics evaluated by the questions included Microsoft Windows 2000, Word,

Excel, Access, Web design, and PowerPoint. The PowerPoint section of the instrument consisted of eight questions and the remaining 42 were equally distributed between the other topics mentioned. Seven of the PowerPoint questions originated from the test bank and one was developed by an instructor of the course. A post-hoc reliability analysis of the posttest revealed an alpha level of .71.

The pretest and posttest were administered during the first and final session of the course, respectively. Attrition occurred as two students in Section One did not take the posttest. Data of the students that missed the posttest were deleted from the database.

Analysis of Data

The research hypothesis was analyzed using analysis of covariance (ANCOVA). The ANCOVA was deemed appropriate for the study at it measures covariance between the pretest and posttest between the control and treatment class sections. An alpha level of .05 was established a priori for the ANCOVA. The researchers realize that a small *N* and a low number of variables in the study may present limitations to the findings. Due to the nature of the course, student enrollment is kept to a minimal number.

Results/Findings

Tables 1 and 2 represent the findings from an analysis of covariance. Knowledge test scores of students involved in service-learning activities and those not involved increased during the semester. The mean cumulative score by students on the PowerPoint section of the computer knowledge exam who participated in the control (class project) was 4.12, whereas the mean cumulative score of students that participated in the treatment (service-learning) was 4.35 (Table 1). Posttest mean scores were not adjusted in the analysis process. The posttest score for the control group was 5.87 and the mean score for the treatment group was 6.82.

The null hypothesis was developed to determine if there was a difference in student achievement on the PowerPoint section of the pretest/posttest knowledge assessment. Although a higher value in the mean score of the treatment group was detected, results of the ANCOVA (Table 2) showed no statistically significant difference between the mean scores. Therefore, the null hypothesis stating that there was no difference in the academic performance of students who were engaged in service-learning activities and those who did not participate in service-learning activities was not rejected.

Table 1.
Pretest and Posttest Means of Students' Scores on Knowledge Assessment of PowerPoint

Group	Pretest Mean	Posttest Mean	
		Adjusted	Unadjusted
Control (*N* = 16)	4.12	5.87	5.87
Treatment (*N* = 17)	4.35	6.82	6.82

Table 2.
Analysis of Covariance of Students' Scores on PowerPoint Knowledge Assessment

Source	*df*	*MS*	*F*	*p*
Intercept	1	105.81	47.93	.000
Covariate (Pretest)	1	7.34	3.324	.078
Error	30	2.20		

Conclusions/Recommendations/Implications

Conclusions

Students who participated in service-learning activities in AGRIC 200 did not achieve any higher PowerPoint scores than those participating in a traditional class PowerPoint group project. These findings are similar to those from other studies on service learning that found no significant difference in learning (Kendrick, 1996; Strage, 2000).

Recommendations

Although caution must be taken when considering time commitments required by service-learning, the researchers recommend that future courses in AGRIC 200 should consider integrating service-learning activities. As noted by the researchers previously, many variables (including sample size and number of variables) may have impacted the outcomes of the study.

Recommendations for Future Research

More research is needed to explain the effectiveness of service-learning activities in introductory computer classes. Based on the nature of this study, the results cannot be generalized to other populations or subject matter. Such studies could include an analysis of the social concepts traditionally studied with courses that integrate service-learning.

Additional studies for future studies should investigate possible relationships between commitments of time required in service learning to students' achievement. Similarly, student perceptions toward service-learning in computer courses should be considered.

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Levels of student performance for each outcome is often described and assessed with the use of rubrics. It is important to determine how the data will be collected and who will be responsible for data collection. Results are always reported in aggregate format to protect the confidentiality of the students assessed. Step 3: Analyze the results of the outcomes assessed. It is important to analyze and report the results of the assessments in a meaningful way. A small subgroup of the DAC would ideally be responsible for this function. The assessment division of the FCTL would support the efforts