

*Journal of*

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# **INDUSTRIAL TECHNOLOGY**

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*Volume 23, Number 2 - April 2007 through June 2007*

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*Peer-Refereed Article*

**KEYWORD SEARCH**

**Construction  
Curriculum  
Ethics  
Research  
Research Methods  
Teaching Methods**

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# Service-Learning in an Introductory Course in Construction Management

By Dr. Steven W. McCrary, Dr. Dane Peterson & Dr. Shawn Strong

## Introduction

Service-learning is a form of experiential education in which students engage in activities that address human and community needs together with structured opportunities intentionally designed to promote student learning and development (Jacoby, 1996). The popularity of service-learning in higher education has grown tremendously in recent years, presumably due to the numerous benefits associated with the instructional technique (Collier & Lawson, 1997). Some of the benefits include providing community services, improving the academic institution's public image, and perhaps most importantly, providing students with many valuable educational experiences that cannot be achieved through the traditional classroom approach to education (Ehrlich, 1996). For instance, it is generally assumed that service-learning develops a strong sense of civic responsibility among participating students, and that the experiential or hands-on learning approach enables students to achieve a more thorough and comprehensive understanding of the course material. While the effectiveness of the service-learning approach has been examined in a number of academic areas, the benefits of service-learning in many technical fields, such as construction management (CM), is largely undocumented (Kerka, 1999). The purpose of this study was to conduct a preliminary examination of the effectiveness of using a service-learning approach in an introductory CM course for enhancing students' perceived civic responsibility and comprehension of curriculum knowledge.

While service-learning is commonly employed in a number of academic areas, an examination of construction

management programs in the Associated Schools of Construction revealed that only three institutions in the United States have formally incorporated service-learning into their construction management programs (Tinker & Tramel, 2002). Although the service-learning approach is relatively new in construction management, the hands-on learning approach has been employed for centuries in construction-related fields (Senior, 1998). Presently, almost all construction management programs require some type of experiential learning in the form of co-operative education and/or internships. However, service-learning involves more than simply the hands-on learning experience that often characterizes co-operative education and internships. Service-learning engages students in activities that address the needs of a community, which is believed to foster a greater sense of civic responsibility among the participating students and facilitate personal growth and integrity (Waterman, 1997). Another advantage of service-learning is that it may be incorporated early in a student's academic career. Whereas co-operative education and internships are typically completed during the student's final year of study, a service-learning approach could presumably be incorporated into many of the standard construction management courses, including the introductory course (J. W. Martin & Haque, 2001). Exposing students to a hands-on learning approach early in their academic career is consistent with the recommendations of many construction management companies that believe experiential learning should begin after the completion of the first full academic year (Fester & Haupt, 2004).

One of the challenges to implementing service-learning into the construction management curriculum comes from the newness of its application to the technical fields (Senior, 1999). While there is substantial research literature on the most effective means of implementing service-learning in many academic areas, especially the humanities and social sciences, service-learning in construction education is relatively unexplored (Burr, 2001). In addition, for many of the academic fields in which service-learning has been successfully implemented, there is an obvious link between service-learning and the educational goals of the course. That is, student involvement in the welfare of a community is a natural extension of many of the courses offered in the humanities and social sciences. Thus, both the recipient (the community) and the provider (the students) benefit from the service-learning experience. In the case of construction management, the connection between providing community service and the course goals is not as obvious (J. W. Martin & Haque, 2001).

Despite the challenges of incorporating service-learning into the construction management program, there are several reports that document instances in which service-learning has apparently been successfully applied in construction management courses (Burr, 2001; Folkestad, Senior, & DeMiranda, 2002; J. W. Martin & Haque, 2001; Senior, 1998). However, these examples predominately represent case studies. In most instances, no attempt was made to compare the effectiveness of the service-learning approach with the more traditional methods used to teach construction management courses. The present study used the difference between a before and after measure to compare the outcomes associated with a service-learning approach to teaching an introductory CM course with a traditional lecture/laboratory approach.

## **Purpose of Research**

### **Objectives**

The overall objective of this research was to conduct an exploratory investi-

gation into the use of a service-learning approach in an introductory construction management course compared to a traditional approach that includes laboratory assignments. This exploratory study compared self-reports at the beginning and end of the semester for students who completed an introductory construction management course involving a service-learning component with students who completed the course with the traditional laboratory approach.

### **Hypotheses**

Based upon the foregoing, the researchers sought to explore the following hypotheses concerning the influence of service-learning on students' acceptance of civic responsibility, improvement in low-level knowledge, and higher-order cognitive thinking skills:

1. The acceptance of civic responsibility will improve more for students in the service-learning class compared to students in the traditional class.
2. The low-level knowledge improvement will be the same for students in the service-learning class compared to students in the traditional class.
3. The higher-order cognitive thinking-skills will improve more for students in the service-learning class compared to students in the traditional class.

The outcomes investigated in this study include the students' perceived civic responsibility and self-reported comprehension of the curriculum knowledge. In the following sections, this paper provides a brief review of the research in service-learning relating to civic responsibility and comprehension of course material. The literature review is followed by a description of the methodology, results, and discussion of the study.

## **Literature Review**

### **Civic Responsibility**

Civic responsibility refers to active participation in the public life of a community in an informed, committed, and constructive manner, with a focus on the common good (Gottlieb & Robinson, 2002). Civic responsibility is

considered paramount to the success of a democracy (Morgan & Streb, 2001). Instilling students with a strong sense of civic responsibility is also advocated by a number of professional organizations in the construction field (Folkestad et al., 2002). For instance, many professional organizations such as The American Council for Construction Education, the American Institute of Constructors, and the Associated General Contractors of America, among others, view good citizenship as a desirable trait that members should possess. In addition, several construction-related professional organizations have adopted codes of ethics that promote serving the community interests.

Despite the importance of civic responsibility, numerous studies indicate that interest in civic responsibility is declining among the younger generation. Putnam's (1996) review of the literature on civic responsibility lead to the conclusion that older Americans are much more deeply engaged in civic life than individuals from more recent generations. This trend toward civic disengagement among the younger generation has become even more pronounced since 1985 (Bennett, 2000; Putnam, 2000). Compelling evidence of disengagement from many forms of civic life has been documented in numerous nationwide surveys of college freshman (Sax, 2000). As an example, one study reported that students are so highly concerned about career advancement that the students have little or no time for involvement in civic activities (Rhoads, 2003).

One means of connecting or re-connecting college students with the importance of civic involvement is through participation in service-learning courses (Gottlieb & Robinson, 2002). Service-learning offers the potential to foster civic responsibility by providing students with the opportunity to engage directly in their community and meet community needs while enhancing their course work. Involving students in community service provides an opportunity for students to recognize that both individual and

collective action can make a difference in the community. Studies in a number of academic areas have consistently found support for the supposition that involvement in community service activities helps develop a set of attitudes and behaviors that are consistent with the expectations of good citizenship (Astin & Sax, 1998; Roschelle, Turpin, & Elias, 2000). These investigations show that participation in service-learning strengthens the belief in social responsibility, develops a better understanding of social problems, and creates a heightened awareness of human difference and commonality (Gose, 1997; Jacoby, 1996). The benefits of service-learning appear to have an enduring effect, as demonstrated in a longitudinal study by Astin, Sax, and Avalos (1999) wherein participation in service-learning continues to be related to greater civic involvement nine years following graduation from college.

### **Curriculum Knowledge**

The assumption underlying the hands-on educational approach, including service-learning, is that students achieve a greater comprehension of academic material if they are able to put it into meaningful practice (Waterman, 1997). Service-learning projects allow students to make their own sensory observations to explore possibilities and draw their own conclusions (Hope, 1999). Thus, service-learning fits into the constructivist methodology, which asserts that learning is facilitated when students construct their own meaning from the environment. This is consistent with John Dewey's (1963) proposal that learning must be connected to the surrounding community and that all genuine education comes through the experience of learning that occurs within a meaningful context. In other words, learning entails making sense out of surroundings based upon one's own schemata.

Many studies tend to support the idea that students learn more effectively through a combination of hands-on and traditional approaches. For instance, research clearly shows that the most effective style of learning varies among

students. Empirical studies indicate that most college students can be categorized as hands-on/active learners, who learn most effectively through concrete experiences beginning in practice and ending in theory (Schroeder, 1993). The research evidence suggests very few students can be characterized as learning most effectively through the abstract reasoning and lecture forms preferred by the majority of faculty. This finding is supported by the proposition that individuals remember 10 percent of what they hear, 15 percent of what they see, 60 percent of what they do, and 80 percent of what they do with active reflection (Phillips, 1984). A hands-on learning approach is also advocated by those outside of academia. A recent survey of construction management companies indicated that the vast majority support a hands-on approach to learning and believe that some form of experiential learning should be included in construction management curriculum (Fester & Haupt, 2004). In addition, the survey reported that employers prefer to hire students who have been exposed to a combination of project and traditional course-based training.

While the hands-on learning approach has numerous advocates, the empirical evidence has not been overwhelming. Most of the research in the area of construction management is based on case studies. The majority of these case studies claim that service-learning produces a number of academic benefits; although the evidence is primarily anecdotal. For instance, a case study by Burr (2001) suggested that "progressive service-learning experiences provide students with realistic, transformative, experiences that broaden the scope of learning beyond that of traditional pedagogical practices." Burr's study concluded that service-learning projects motivate students to explore and experiment with the knowledge they already have or they are learning in the classroom. Another case study concluded that service-learning provides students with the hands-on experiences that are needed in order for students to relate what they have done in the field to what

they have learned in the class, thus producing more effective graduates (J. W. Martin & Haque, 2001).

More rigorous studies examining the superiority of the service-learning approach over traditional instruction methods have been conducted in other disciplines. The results of these have been inconsistent (Gelmon, Holland, & Shinnamon, 1998; Mabry, 1998). Most investigators have found that students who participate in service-learning have neither better grades nor more self-reported learning than students in traditional classes (Giles & Eyler, 1994; Hudson, 1996; Kendrick, 1996; Miller, 1994; Parker-Gwin & Mabry, 1998; Strage, 2004). Others studies have shown that students achieve modest positive academic benefits from service-learning (Blieszner & Artale, 2001; Markus, 1993; Sax & Astin, 1997).

There are a plethora of possible explanations for the conflicting results regarding the academic benefits of service-learning. Investigations on service-learning have varied in terms of the discipline in which the course is offered, the type of service-learning employed, and the manner in which the course is taught. Another possibility is that the conflicting results might be due to the proponents of service-learning unintentionally highlighting the favorable findings and downplaying the negative reports (Wade & Saxe, 1996). Others suggest that academic benefits can be achieved if the service-learning courses are carefully planned so that service-learning is linked to the course outcomes (Valerius & Hamilton, 2001), and students are placed in service-learning positions in which they have control over the project and make critical decisions (Morgan & Streb, 2003). Based on a review of the literature, Mabry (1998) attempted to identify the critical factors for successful service-learning. She proposed that positive results were most likely to be obtained if students spent at least 15 to 20 hours of service per semester on the project, had frequent contact with the service beneficiaries, discussed the service

experience with both instructors and site supervisors, and, perhaps most importantly, included weekly in-class reflections and ongoing summative written reflections.

Reflection is generally considered a critical link between service and learning. Reflection describes the process of deriving meaning and knowledge from the experience and occurs before, during and after a service-learning project. Reflection, both written and verbal, should encourage students to be thoughtful about their experiences, and contemplate the meaning and linkages between their service work and class work activities (Eyler & Giles, 1999). Research shows that the quantity and quality of reflection is consistently associated with a deeper understanding, better application, and increased knowledge of the subject matter (Gottlieb & Robinson, 2002).

While the quantity and quality of reflection may account for some of the conflicting reports regarding the academic benefits of service-learning, differences in the methods of measuring academic benefits may also resolve some of the discrepancies in the empirical findings. Several measures have been employed to assess academic benefits, ranging from the grade achieved in the course to self-reported learning. However, regardless of the method used to measure academic benefits, no attempt has been made to assess the complexity of the material or the required level of reasoning. The next section briefly reviews Bloom's taxonomy of cognitive skills and discusses how the complexity of the material used to assess curriculum knowledge may account for the conflicting reports in the literature.

### **Levels of Cognitive Thinking-Skills**

A number of frameworks have been proposed for conceptualizing educational or learning objectives. The most recognized within the education community is Bloom's Taxonomy of Learning which consists of six hierarchical levels of thinking-skills (Seddon, 1978). In the cognitive domain, the

skills or levels build upon each other as the learner gains knowledge and expertise, therefore leading to complex understanding and knowledge. The six skills are knowledge, comprehension, application, analysis, synthesis, and evaluation, with the last three considered higher-order skills (Bloom, 1984). The teaching of higher order skills are considered extremely important since they are necessary for functioning in a highly technical society. This is particularly true in construction management, where higher-order thinking skills are considered essential (J. W. Martin & Haque, 2001).

Service-learning would seem to be an especially effective method for teaching higher-order thinking-skills (Gottlieb & Robinson, 2002). Folkestad et al. (2002) have provided a thorough account for how applying service-learning in a construction management course could enhance higher-order thinking skills. They pointed out that comprehension is necessary in order to solve service-learning problems, because students must develop a deeper understanding of the technical alternatives than the simple aggregation of technical facts. Service-learning problems are specifically designed to require students to apply facts in concrete real-world situations. In most cases, an analysis and synthesis is required when students break down a relatively complex problem into manageable pieces and then find a wholistic solution to these pieces. Evaluation skills are used in the reflective assessment of the problem and the applied solution, which is a central element of service-learning (Folkestad et al., 2002).

Therefore it would seem feasible that the academic benefits of service-learning may be more pronounced when the material used to assess learning requires a higher level of reasoning. That is, while traditional lecture/laboratory classes may be highly effective for lower level thinking-skills, a service-learning approach might be superior when educational benefits are assessed with problems requiring higher-order thinking-skills (Sedlak, Doheny,

Panthofer, & Anaya, 2003). Thus, prior studies reporting no academic benefit of service-learning might have involved lower level knowledge, while studies reporting positive results of service-learning may have examined a higher level of reasoning. Support for this possibility is provided by studies showing that service-learning benefits performance on essay questions but not on simple multiple-choice items (Strage, 2001).

### **Methodology**

To test the hypotheses, the researchers chose an entry-level course in construction materials and methods, which typically includes both lecture and laboratory activities. At the beginning of the semester, students self-selected one of two available sections for the course. One section was randomly selected to be the service-learning section; the other section was taught with the typical (traditional) laboratory procedures.

### **Service-learning Section**

Two projects were available for service-learning participation by students in this section. The students were able to work on either or both of the projects. One project involved the rehabilitation of an early 20th century house for Habitat for Humanities. Project management and control of the rehabilitation project came from the students' CM Club and several upper classmen in the CM program. Students were involved in the rehabilitation of both interior and exterior finishing work and some landscaping. The project superintendent, an upperclassman, organized the work crews on-site on an *ad hoc* basis. That is, as students reported on site for service, the project superintendent selected foremen and assigned student workers to the foremen's teams. The students worked alongside other volunteers and past and future recipients of Habitat for Humanities homes.

The second project was the historic re-construction of a one-room schoolhouse for Missouri State University as part of the University's centennial celebration. The house was built on the grounds of Greenwood Elementary/

High School for exhibit and educational purposes. Architectural drawings, created by a registered architect in Missouri, reflected an intention for an authentic early 20th century look, complete with exterior cedar siding (painted white), a cedar shake roof, and interior bead board (painted white).

The Missouri State University staff and construction management faculty shared administration of the schoolhouse project with the students. However, students were given complete freedom to determine the means and methods of construction. Day-to-day construction management was also determined by the students. Leadership for construction was provided by a carefully selected individual in the class, who was assigned the responsibility of construction methods, site management, and project superintendence. Day-to-day supervision came from pre-selected project foremen, selected for their previous construction experience and leadership ability. Each foreman oversaw the work of 3 to 5 other student workers. Many other student volunteers assisted with the completion of the project.

The course structure required each student to complete a minimum of 30 hours of project work during the semester. Project superintendent and several foremen worked beyond the minimum number of hours required. Documentation for each student's work on the projects included the use of time sheets and three journals, which were completed during weeks six, twelve, and sixteen of the semester. In addition, the course instructor held a service-learning debriefing in the classroom following the first and last journals. Students were evaluated by their immediate foreman, by the project superintendent, or by the course instructor.

### **Traditional Learning Section**

Students in the traditional learning section performed standard laboratory activities as opposed to working on the service-learning projects. This included working with concrete, performing such tasks as measuring slump, den-

sity, and moisture content. In addition, students performed concrete finishing using a 3-foot square, 4-inch thick, non-reinforced slab. The students then measured the finished slab for flatness and quality of finish. The students in the traditional learning section also built a 16-foot by 22-foot light-wood framed laboratory "mock-up." The "mock-up" was built on a raised-platform frame (setting on concrete blocks inside the CM laboratory building). The 3-room structure had conventional 8-foot walls, 5 windows, 1 exterior door, 1 interior door, a vaulted ceiling in one room, and a 3/12 pitched roof. Conventional finishes were used on all surfaces, including vinyl siding, composition shingles, and gypsum walls (inside). Students were given complete freedom to determine the methods of construction. Day-to-day supervision was provided by pre-selected project foremen, who were selected on the basis of their previous construction experience and leadership ability. Each foreman oversaw the work of three to five other student workers.

Students were required to work a minimum of 30 hours over the course of six weeks on the "mock-up." They were evaluated by their immediate foreman, by the project superintendent, or by the course instructor. No journaling of this work was required.

### **The Research Instruments**

The items on the survey relevant to the present study are presented in Appendix A. (The order of items in Appendix A does not reflect the order in which the items were presented on the survey instrument, nor were the headings included on the original survey instrument). The first three items were used to assess social responsibility or perhaps more accurately, negative attitudes regarding social responsibility. These three items were taken from the Attitude and Opinions Scale. The next 19 items in Appendix A were used to assess lower-level knowledge. These items, adapted from the Learning Gains Scale, were used to measure curriculum knowledge. The last seven items in Appendix A were used to assess higher-or-

der cognitive skills. These items were also adapted from the Learning Gains Scale.

The survey was administered during the second and last week of the semester. Initially there were 38 students in the service-learning section and 38 students in the traditional learning section; yet only 33 and 27 (respectively) students took the first survey due to late add-drop issues. To prevent contamination of survey results an additional five students were dropped from both sections. In addition, from the first to the last administration of the survey, seven students dropped from the service-learning section, eight from the traditional learning section, bringing the final possible population to 26 for the service-learning section and 25 for the traditional section. Useable data from both administrations of the survey were available for 18 students (69%) in the service-learning section and 22 students (88%) in the traditional learning section.

### ***Results***

The differences between the responses on the before condition (second week of the semester survey) and the after condition (last week of the semester survey) were computed for each student. That is, differences between the identical questions on the two administrations of the survey were computed for each student. To satisfy the assumptions of an independent groups *t*-test, the difference scores were standardized. The standardized difference scores were averaged to obtain three mean scores for each student, one for each of the three dependent measures; civic responsibility, low-level knowledge, and higher-order cognitive thinking skills. The results of three separate independent groups *t*-tests comparing the service-learning condition with the traditional learning condition are presented in Table 1.

Analysis of the results in Table 1, in terms of the stated hypotheses, reveals the following:

1. The results support the contention that service-learning enhances stu-

dents' self-reported attitudes on civic responsibility. The difference scores were significantly greater among students in the service-learning condition.

2. The results support the contention that there was no significant difference in self-reported low-level knowledge. That is, there was basically no difference between the two conditions in terms of perceived gains in low-level knowledge over the course of the semester.
3. Finally, the results regarding the higher-order cognitive thinking skills hypothesis are opposite of what was expected. The perceived gains in higher-order cognitive thinking skills were significantly greater in the traditional learning section than in the service-learning condition.

### Discussion

The results indicate that service-learning has a positive impact on students' perceived civic responsibility. This finding is consistent with a number of previous studies demonstrating that students participating in service-learning perceive a greater responsibility to assist the less fortunate and to contribute to the solution of community problems. Past investigations have consistently shown that participation in service-learning courses increases the students' awareness of community needs and social issues (Weglarz & Seybert, 2004). Students engaging in service-learning projects report a greater connection with the community and an appreciation for the contributions made by individual citizens (Eyler, Giles, & Braxton, 1997). By engaging in service-learning projects, students become aware of community needs and develop a belief they can make a difference by committing to community service now and later in life (Berkas, 1997). Service-learning also increases students' awareness and acceptance of cultural diversity and empathy for others. The positive influence of service-learning on civic responsibility is particularly important at the present time when available tax dollars and government support for social services is decreasing (Melchior, 1999). In addition, a

**Table 1. Mean Standardized Difference Scores for the Service-learning and Tradition Learning Sections for each of the Three Dependent Measures**

Skills Dependent Measure	Service Learning	Traditional Learning	t-statistic	p-value
Civic Responsibility	0.221	-0.278	2.26	0.027*
Lower-level Knowledge	0.026	-0.032	0.25	0.799
Higher-Order Cognition	-0.198	0.249	-2.02	0.047*

\* significant at the 0.05 level with 77 df.

secondary benefit of service-learning is that it provides visibility and connections for the university and the department (Bentley & Ellison, 2005).

The present study found no evidence of a difference in the perceived gains in low-level knowledge between the service-learning condition and the traditional learning condition. This result was also expected. Low-level knowledge represents basic knowledge, such as the ability to recall facts, recite information, identify, label, and recognize concepts. Some investigators believe it is necessary to focus on and teach basic skills first, since these skills must be mastered before a student can attempt more complex and demanding tasks (Johnson & Layng, 1992). It would appear that basic knowledge of facts may be easily taught in the traditional teaching formats. Thus, if basic knowledge of facts is the primary objective of a course, a traditional teaching approach is likely to be just as successful and less work for the instructor than a service-learning approach.

Higher-order cognitive thinking skills, which involve integrating ideas, evaluating information and deriving solutions, is becoming increasingly important in today's technically advanced world (Kerka, 1992). In this study, the results for higher-order cognitive thinking skills were contrary to what was anticipated. The perceived gains in higher-order cognitive thinking skills were greater for students in the traditional learning condition than in the service-learning condition. It was expected that the richness of applying one's knowledge in an actual applica-

tion would result in greater perceived knowledge at the higher cognitive levels, since these tasks would require more insight.

There are at least a couple of possible explanations that could account for why students in the traditional learning condition perceived they had acquired better higher-order thinking skills over the course of the semester than students in the service-learning condition. First, as several investigators have noted, it is important that the assigned service-learning tasks be commensurate with the abilities of the students. For instance, a recommendation suggested by P.T. Martin and Coles (2000) is to "match the task to the capabilities of the students—freshman students should tackle freshman projects." (p. 46). Therefore, service-learning activities should not be more difficult than the students can handle. This means it is extremely important to clarify the expectations and scope of the students' work and the instructor must be certain that the expectations of the service-learning supervisors are consistent with the course (P. T. Martin & Coles, 2000). Many researchers have noted the difficulty of finding service-learning projects that are appropriate in terms of matching the content of the course and matching the ability of the student (Senior, 1999). In the present study, several students commented that some of the service-learning activities were beyond their ability to accomplish and that on-site supervision did little to bolster their abilities. Such experiences could likely account for a lack of confidence in higher-order cognitive thinking skills among the students in the service-learning condition.

A second difficulty related to the timing of the service-learning projects, which do not always conveniently correspond with the academic term (Anderson & Sungur, 1999). It is unusual for the beginning and finishing of community service-learning projects to coincide with the starting and ending of a service-learning course. In many cases, community organizations have needs and deadlines that simply will not fit neatly into an academic calendar. Perhaps an even more important obstacle in the present study was scheduling times when students were available to participate in the service-learning project so that they could take advantage of participating in specific meaningful and educational opportunities. Students in this study noted that on several occasions when they reported for the service-learning project, the scheduled activities did not provide any educational experiences. Instead, students were often assigned to perform tasks that they perceived as tedious and mundane or beyond their ability (as mentioned in the previous paragraph).

Failure to demonstrate academic benefits for the service-learning condition in the present study may also be due to the fact that in a construction management course, the traditional learning procedure includes an experiential laboratory learning experience. In the case of construction management, the learning objectives of laboratory activities can be very "realistic," in spite of being relegated to a laboratory setting. This would be consistent with the notion that all types of experiential learning are valid. Laboratory learning also has some advantages over service-learning projects. For instance, the instructor has more control over the projects so that scheduled activities can be meaningful and at the appropriate level for the students. Another advantage is the laboratory setting allows students the opportunity to experiment and make mistakes without the costly consequences associated with failure in "real-life" situations.

Although students in the service-learning condition did not show as much

gain in perceived higher-order cognitive thinking skills as students in the traditional learning approach, this could be viewed as a positive result. For example, one service-learning study observed negative results in that students participating in the service-learning project perceived less ability to make an impact through volunteerism (Miller, 1997). In Miller's (1997) study, participating in the service-learning project was associated with less perceived power to make a difference in the world. The results were interpreted positively as an instance in which service-learning changed students' unrealistic impressions regarding the ease of changing social structures and provided them with a more realistic view of the rigid nature of the world.

A similar interpretation could be applied in the present study. Students in the traditional learning condition may have acquired an unrealistic view of their higher-order cognitive thinking skills by being provided with carefully selected tasks that were specifically designed to maximize their chances of succeeding. Thus, the students in the traditional learning section may have developed an unrealistic sense of confidence in their ability. Conversely, students in the service-learning condition may have acquired a more reasonable view of their ability by being confronted with actual problems in which the solutions were often very complex. In short, their perceptions of higher cognitive abilities may be more realistic and appropriate (after the service activities) than those students completing the traditional laboratory learning activities.

### Conclusion

In summary, the results provide support for the use of service-learning as a means of increasing construction management students' perceptions of their civic responsibility. In an age when ethical values are often perceived to be lacking, the teaching of civic responsibility in construction management courses may be highly beneficial. There would appear to be no advantages of using a service-learning approach

to teach basic knowledge. It seems that knowledge at the lower cognitive levels could be taught effectively with procedures that require traditional resources versus those resources needed to teach service-learning. In the present study, the service-learning approach was not as effective as the traditional approach for increasing the perceived gains in higher cognitive skills. To be effective, instructors must carefully choose service-learning projects in which they will have enough control over the project to ensure that the service-learning activities will coincide with the objectives of the course and fit the intended difficulty level of the course. This may mean that it will be more challenging to implement service-learning in construction management courses than in other academic disciplines, such as the social sciences and the humanities.

### Acknowledgements

This study was made possible by the Citizenship and Service-Learning (CASL) office at Missouri State University, Springfield, Missouri. The researchers wish to express their sincere appreciation for the support of that office and their interest in providing service-learning opportunities for students and faculty, with special thanks given to Ms. Elizabeth Carmichael Burton - Associate Director for CASL for her support.

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**Appendix A**  
**continued on next page**

# Appendix A

## 1. Social Responsibility.

The following items refer to your feelings about service-learning activities. Please select the number that best expresses your feelings at this time.

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
1. I believe that helping a person in need is something people should do only for friends or relatives.	1	2	3	4	5
2. I believe it is up to the "experts" to solve problems in my community.	1	2	3	4	5
3. I believe that you should nearly always be paid for helping others.	1	2	3	4	5

## Low Level Knowledge

As a result of your work in this class, how well do you think that you now understand each of the following?

	Not at all	A little	Somewhat	A lot	A great deal
1. Describe sizes of windows and doors in a light wood frame building.	1	2	3	4	5
2. Awareness of construction materials.	1	2	3	4	5
3. List and explain the sequence for finishing the interior of a light wood frame building.	1	2	3	4	5
4. Describe material used for roofing a low-slope roof.	1	2	3	4	5
5. Recall construction terminology.	1	2	3	4	5
6. Describe the siding process for a light wood frame building.	1	2	3	4	5
7. List and describe the pros and cons of exposing mechanical and electrical apparatus.	1	2	3	4	5
8. List and describe the sequence of interior finishing operations for a large building	1	2	3	4	5
9. List and describe the various types of interior walls and their functions.	1	2	3	4	5
10. Draw a typical roof detail.	1	2	3	4	5
11. State a brief history of the use of glass and glassmaking.	1	2	3	4	5
12. Explain the functions of cladding.	1	2	3	4	5
13. Describe "The Rainscreen Principle" to someone.	1	2	3	4	5

To what extent did you make gains in your ability to apply any of the following as a result of what you did in this class?

	Not at all	A little	Somewhat	A lot	A great deal
14. Install the windows or doors in a light wood frame building.	1	2	3	4	5
15. Purchase the appropriate material for roofing a low-slope roof.	1	2	3	4	5
16. Select the siding for a light wood frame building.	1	2	3	4	5
17. Glaze a large light.	1	2	3	4	5

How much has this class increased or strengthened your ability or skills in each of the following?

	Not at all	A little	Somewhat	A lot	A great deal
18. Using construction concepts to evaluate materials options.	1	2	3	4	5
19. Attaining a higher awareness of needs and problem found in typical communities.	1	2	3	4	5

#### High-Order Cognitive Skills

How much has this class increased or strengthened your ability or skills in each of the following?

	Not at all	A little	Somewhat	A lot	A great deal
1. Understanding how ideas in this class relate to those in other classes.	1	2	3	4	5
2. Understanding the relevance of this field to real world issues.	1	2	3	4	5
3. Ability to think through a problem or argument.	1	2	3	4	5
4. Feeling comfortable with complex ideas.	1	2	3	4	5
5. Using construction concepts to evaluate materials options.	1	2	3	4	5

How much has this class increased or strengthened your ability or skills in each of the following?

	Not at all	A little	Somewhat	A lot	A great deal
6. Solve problems.	1	2	3	4	5

How much has this class increased or strengthened your ability or skills in each of the following?

	Not at all	A little	Somewhat	A lot	A great deal
7. Work effectively with others.	1	2	3	4	5