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Exploring the Learning in Service-Learning: A Case of a Community-Based Research Project in Web-Based Systems Development

Lara Preiser-Houy
Carlos J. Navarrete
Computer Information Systems Department
California State Polytechnic University, Pomona
Pomona, CA 91768, USA
lpreiser@csupomona.edu cjnavarrete@csupomona.edu

ABSTRACT

Service-learning integrates coursed-based academic learning with community service. This form of experiential learning is becoming more prevalent in higher education as academic institutions strive to enhance student learning while providing meaningful service to the community. This study investigates the impacts of service-learning in a junior-level IS web development course on student learning outcomes. The study also explores the use of community-based research in web-based systems development. The study's context is a project to develop a web-based system for an elementary school classroom. Our findings propose an integrated, multidimensional concept of student learning that links the academic with personal and interpersonal learning outcomes. The academic dimension of student learning includes domain-specific and general academic knowledge and skills. The interpersonal dimension of student learning encompasses communication, collaboration and leadership skills, and the personal dimension consists of self-knowledge and personal efficacy. The service-learning strategy of community-based research promotes student learning and transforms the student into an *engaged* and *active* learner. Furthermore, community-based research is an effective approach to supplement the software development methods of prototyping and joint application development in a web-based systems development project. The study's findings provide a framework for structuring effective service-learning experiences in the systems development domain of an Information Systems curriculum.

Keywords: Community-Based Research, Web-Based Systems Development, Service-Learning, Information Systems Education

1. INTRODUCTION

Service-learning (S-L) is an educational strategy that combines the academic learning objectives of a course with community service. The integration of experiential learning into the higher education curriculum is on the rise. In the past decade, the post-secondary institutions have been criticized for the gap between the traditional curricular content and the need for citizens with a new set of skills and competencies (Association of American Colleges, 1991). In the effort to re-think the academic roles relative to the community needs, and to enhance student learning, many academic institutions are forging educational partnerships with community organizations and integrating service-learning into their academic programs.

Students benefit from service-learning experiences in many different ways, from enhanced academic learning to growth in cognitive and affective domains (Furco, 2002). Furthermore, community-based research (CBR), a special kind of a service-learning strategy focused on collaboration, validation of multiple sources of knowledge, and social action, not only enriches academic learning, but promotes social change in the community (Strand et al., 2003).

In the context of Information Systems (IS) education, service-learning projects enhance students' academic knowledge through the application of theory to real-world problems (Guthrie and Navarrete, 2004). Students also gain relevant experience for future professional careers as they work through the social-technical, economic, and political problems embedded in the dynamic context of community-based projects. Furthermore, the use of community-based research as a service-learning strategy has a positive impact on the community affected by the outcomes of student interventions (Preiser-Houy et al., 2005). However, in spite of the growing body of literature on service-learning impacts, there is a need for more research to delineate the discipline-specific learning outcomes and the processes that promote and facilitate these outcomes (Eyler, 2000; Giles and Eyler, 1998). There is also a need to explore the use of CBR as a service-learning strategy in the academic core of

the Information Systems curriculum (Preiser-Houy et al., 2005).

Web-based systems development projects for non-for-profit organizations are an important part of the service-learning initiatives in the Computer Information Systems Department of California State Polytechnic University, Pomona. In a three-year period, Cal Poly's CIS students developed thirty-five classroom web sites for K-6 teachers in the local elementary schools. These service-learning projects had a positive impact on students' academic learning (Guthrie and Navarrete, 2004). However, after the projects were completed, few of the elementary school teachers maintained and/or used their web sites in the classrooms. In the effort to promote student learning and to increase the impacts of the S-L projects on the community partners, we investigated the use of community-based research as a service-learning strategy in an IS core course. We also explored the use of CBR as a supplemental approach to web-based systems development.

The purpose of this study is to investigate the discipline-specific learning of a service-learning project in a junior-level IS web development course. The unique feature of the project is the use of community-based research strategy to promote student learning and to supplement the process of developing a web-based system for a real client. Our findings propose a multidimensional framework of student learning. The framework consists of academic, personal, and interpersonal learning outcomes. Furthermore, we found that the CBR strategy of service-learning not only promotes student learning, but also supplements the process of web-based systems development. The study's findings have implications for structuring effective service-learning experiences tailored to the systems development domain of Information Systems education.

2. BACKGROUND

Service-learning is an educational strategy that integrates service experience with the academic curriculum and provides students with the opportunity for reflections (Jacoby, 1996). Service-learning differs from a service-based internship in that the service activities of the S-L projects are tightly integrated with the curricular content of academic courses (Furco, 2002). Thus, students apply the knowledge gained in a course to address a curriculum-related need of the community. On the other hand, the service provided through an internship is co-curricular and is based on industry or a career need rather than on the specific objectives of an academic course.

The primary motivation for integrating service-learning into the higher education curriculum is to enhance student learning through the provision of community service (Eyler and Giles, 1999). The S-L literature documents a broad range of possible student learning outcomes, ranging from enhanced academic learning to social and cognitive development (Astin and Sax, 1998; Eyler et al., 1997). In a large national study of 1,500 college students, Eyler and Giles (1999) found that the service-learning experiences contribute to students' personal development, interpersonal development, and academic learning. The personal development outcome includes students' self-knowledge (i.e., knowing 'self' better), personal efficacy (i.e., knowing that one's skills and knowledge can make a difference), and moral development. The interpersonal development encompasses students' ability to work well with others and to take the initiatives in accomplishing project goals. Finally, academic learning includes critical thinking and broader understanding of the subject matter.

A particularly effective and transformative form of service-learning is community-based research (Strand et al., 2003). While the goal of a typical service-learning project is to enhance student learning through service, the dual goals of community-based research are to enrich student learning through the provision of relevant and meaningful community service and to promote social change in the community. The three essential principles of CBR are collaboration between students and their community partners, validation of multiple sources of knowledge, and the goal of social change (Strand et al., 2003).

The collaborative nature of community-based research promotes equal participation to co-solve social problems of the community. This collaborative endeavor requires active listening, critical discussion of problems, and team-oriented implementation of the agreed-upon solutions (Couto, 2001). Community-based research also validates multiple sources of knowledge, from the experiential knowledge and viewpoints of community members, to the specialized knowledge and skills of students and university faculty (Strand et al., 2003). This reciprocal exchange of knowledge builds capacity and enhances resources of the community-based organization while engaging students in active, experientially-based learning. Furthermore, the CBR's goal of social change necessitates that students engage in critical thinking about the problems and issues facing their community and help co-develop long-term solutions for social justice.

The practitioners of community-based research posit that when students are required to "collaborate with community members, critically analyze the sources of problems, and experience their own potential for social action", they are "more likely to develop the leadership skills, political awareness, and civic literacy that represent developmentally richer form of service-learning." (Strand et al., 2003, p. 123)

Calderon (2003) also points out that the integration of community-based research into academic courses links theory with practice, transforms students into engaged, active learners, and prepares students for future roles as the agents of social change. In 1997, a group of sociology students from the Pitzer College utilized CBR to establish the Pomona Day Labor Center, a non-for profit organization that helps educate and empower day laborers in Pomona, California. The students worked side by side with the day laborers on the issues of immigration rights, technology training, and job preparation. These academic-community partnership projects required that students reflect critically on the social problems

in their local community and develop solutions with long-term implications for social justice (Calderon, 2003).

The empirical studies of service-learning in the IS courses suggest that this form of experiential education contributes positively to students' learning experiences and helps prepare students for the real world of IS work (Guthrie and Navarrete, 2004; Lazar and Lidtke, 2002; Lazar and Preece, 1999). The work of IS specialists involves social-technical processes that occur over time and require significant interaction with business clients (Newman and Robey, 1992). The quality of the IS-client interaction depends in part on the role orientation, behaviors, and skills of the IS specialists (Preiser-Houy, 1999). When IS specialists collaborate with their clients to evolve mutual expectations, trust, and influence, they develop high quality IT-client relationships, thus enhancing the chances for successful implementation of technology projects. Finally, the knowledge and skills of IS specialists have an impact on the flexibility of IT infrastructure and the contribution of technology to competitive advantage (Byrd et al., 2004).

The IT industry needs graduates with a balanced set of technical, personal and interpersonal competencies, including communication, collaboration, and conflict resolution skills (Lidtke and Stokes, 1999). In fact, the IT recruiters perceive the skills of interpersonal communication, team work, critical thinking, and personal motivation as the most important skill sets for the entry-level IS personnel (Fang et al., 2005). In a content analysis of 902 job advertisements for the systems analyst position, Lee (2005) found the recruiters looked for IS specialists that possess not only the technical skills of systems development, client/server computing and information security, but also the business and social skills, including general business knowledge and interpersonal competencies.

Service-learning experiences in business education help students develop knowledge of specific academic domain and promote greater interpersonal skills and ethical sensitivity (Zlotkowski, 1996). Service-learning projects in the Information Systems curriculum promote the acquisition of technical knowledge, project management skill, as well as interpersonal communication and social skills (Hoxmeier and Lenk, 2003).

A study of an IS service-learning project for online communities found that students enhanced their technical skills as they learned about the software tools to develop web-based resources for the community members (Lazar and Preece, 1999). In addition to acquiring technical skills, the students also learned the social aspects of working with clients. In a web design course of developing web sites for primary teachers, students demonstrated deeper understanding of the systems development process as they worked with real clients (Guthrie and Navarrete, 2004). However, one of the challenge in structuring effective service-learning projects in the IS curriculum is to ensure that once the projects are completed, the community partners adopt, maintain, and use applications built by students. The integration of community-based research into the IS courses holds the promise of facilitating the adoption and the use of the IT applications co-developed by the student-community partner dyads (Preiser-Houy et al., 2005).

3. METHODOLOGY

The purpose of this study was to investigate the student learning outcomes in a service-learning project of web-based systems development under the CBR strategy. The study also aimed to explore the use of CBR as a supplemental approach to software development methodologies for web-based systems development.

3.1 Research Questions

The research questions for the study were as follows:

- What are the student learning outcomes of a service-learning project in web-based systems development using community-based research?
- How does community-based research promote student learning outcomes?
- Can community-based research be used to supplement the software development methodologies for web-based systems development?

3.2 Research Method

We utilized a case study research method to explore the student learning outcomes and to delineate the impacts of community-based research on student learning. Case studies are best suited for research with the following characteristics: 1) is exploratory in nature (Creswell, 1994), 2) addresses a "how"-type question aimed at understanding the nature and complexity of the processes under investigation (Yin, 1994), and 3) interprets and comprehends the meaning of text and actions (Miles and Huberman, 1994). Case studies are also used to investigate intensively the complexity of the unit of analysis (Benbasat et al., 1987). Furthermore, intensive case-based research typically focuses on one or few cases and strives for detail and depth of analysis (Stoecker, 2005).

We choose the case study method because the nature of our study was exploratory. Our main goal was to investigate intensively the student learning outcomes phenomenon and to explore how it unfolded within a real-life context of a service-learning experience in web development. We also aimed to interpret and comprehend the meaning of actions that promoted student learning.

The "case" for our study was one service-learning project in web-based systems development. The project was undertaken in a junior-level IS course of Interactive Web Development. The duration of the course was a ten-week academic quarter. The course covered the topics of XHTML, web design, Java Script programming, prototyping, joint application development, and project management. The context of the service-learning project was the development of a web-based system for a second-grade classroom of a teacher in a local elementary school. The project's

deliverables consisted of a second-grade web site, the site's documentation manual, and a training manual for web site maintenance. The project was undertaken by an IS student who worked together with a community partner (i.e., a school teacher) to plan, develop, and implement a web-based system for the teacher's classroom. While the IS student had some programming background from previous CIS classes, neither he nor his partner had any prior experience with a full-scale web development project. Furthermore, the community partner had minimal technical proficiency and did not utilize technology in her second-grade classroom.

The unit of analysis for the study was the student's learning outcomes of a web-based systems development project. The case evidence was obtained from interviews with the student and his community partner, the review of project documentation, the observations of the project as it unfolded throughout the academic quarter, the student's background survey, and the student's reflections essays on his service-learning experience. The case analysis consisted of two stages, descriptive and interpretive, and was guided by the framework of the service-learning outcomes proposed by Eyler and Giles (1999). The first step of the analysis procedure was to reconstruct interview tapes and observation notes into detailed written accounts. The next step was to code categories for learning outcomes and to summarize the resultant categories into the conceptually-clustered matrices. The final step of the analysis procedure was to search for patterns by comparing the study's results with the patterns predicted from the literature on the service-learning outcomes.

4. CASE ANALYSIS

The service-learning project of web-based systems development consisted of four sequential, inter-related phases of planning, designing, training, and implementing the system. The objectives of the planning phase were three-fold: 1) to identify the purpose, target audience, and the value-added of the system, 2) to develop a project plan, and 3) to evaluate a software tool for web site maintenance. The goals of the design phase were to gain an in-depth understanding of the community partner's requirements for the web-based system and to design/program the system. The objective of the training phase was to commence the evolutionary training process and to gradually build the community partner's confidence in her ability to maintain the system on her own. Finally, the aim of the implementation phase was to implement the system in the partner's work setting. The implementation activities included setting up a server account, uploading the site's files to a web server, documenting the system, identifying the integration tactics to diffuse the system into the partner's work setting, and delineating the critical factors for sustaining the system over time.

4.1 Phase I – Planning the System

Table 1 summarizes the project activities and student learning outcomes of the planning phase.

PROJECT ACTIVITIES	STUDENT LEARNING OUTCOMES
▪ Identifying web site's purpose, target audience and benefits ▪ Developing a project schedule; ▪ Selecting a software tool for web site's maintenance	***Personal Development***: • Personal efficacy in learning a new software tool ***Interpersonal Development***: • Communication and collaboration skills to evolve mutual expectations and a project plan • Leadership skills in evaluating a new software tool ***Academic Learning*** • Project management skills of planning and managing the project • Software evaluation skills

Table 1. Phase I: Activities and Learning Outcomes

In planning the project, the student and the community partner evolved mutual expectations as to the purpose, the target audience, and the benefits of the web-based system. The client commented, "I saw it as a win-win project in that I could get introduced to a technology that I was completely unfamiliar with and, at the same time, create a vessel for communication with my families and students." The student-partner dyad also collaborated on the development of a project schedule with detailed tasks, deliverables, and due dates. As they worked on the schedule, the student educated his partner about the systems development process. The partner noted, "I have never worked on a project like this before, so the landscape kind of unfolded for me as I learned about the project stages and deliverables." On the other hand, the student learned that project management in a real-life context was quite complex because of the many unknowns inherent in real projects. In fact, the student had to modify the schedule several times throughout the project in response to conflicting priorities and underestimated tasks.

The experience of planning, monitoring, and modifying a real project schedule enhanced student's project management skills and provided him with a realistic view of the complexities and uncertainties of managing IT projects from inception to completion. The student reflected, "What I got out of it was scheduling my time better and organizing myself. People depended on me to finish certain tasks, and that kind of pushed me to work on time and deliver on time. I think my project management skills improved during the project."

The student also had to learn the essential features of Macromedia Contribute software to train his non-technical partner to maintain the web-based system. "Contribute is the easiest piece of software I have seen, which was quite literally made for computer novices to maintain web sites," said the student. Learning and evaluating a new software tool helped the student acquire software evaluation skills. But even more importantly, his motivation to learn and his sense of personal efficacy were enhanced as he realized that he possessed the technical knowledge to help his non-technical

partner become self-sufficient in maintaining the web-based system on her own.

4.2 Phase II –Designing the System

Table 2 summarizes the project activities and student learning outcomes of the design phase.

PROJECT ACTIVITIES	STUDENT LEARNING OUTCOMES
▪ Conducting Internet-based research ▪ Designing end-user survey ▪ Analyzing, designing, testing the web site through prototyping and JAD	***Personal Development***: • Self-knowledge of strengths and weaknesses ***Interpersonal Development***: • Interpersonal skills of communication and collaboration ***Academic Learning*** • Technical skills of web design, prototyping, and joint application development (JAD) • Critical-thinking skills of identifying alternative designs • Research skills

Table 2. Phase II: Activities and Learning Outcomes

At the onset of the project, the community partner's needs and requirements for the web site were uncertain. She commented, "I wanted to have examples of well-executed web sites for elementary classrooms, so I could go through those sites and start getting a feel for what I would want to have on my site." Consequently, the student conducted research on the Internet to learn about the existing web-based systems for elementary school classrooms. This newly acquired knowledge helped the team narrow down a list of possible alternatives for the system's layout and content. The student also helped the partner design an end-user survey to get feedback from the parents of the second-grade class on the preferred content for the web site. Consequently, the student developed some basic research skills, as he conducted the Internet research on elementary classroom web sites and helped design an end-user survey.

One of the project's challenges was the unstructured set of requirements for the web site. This challenge was addressed through the use of joint application development (JAD) and prototyping tactics to evolve the system's concept through five iterative prototypes. The JAD and prototyping sessions required critical thinking to identify alternative solutions for the system's content, graphical-user interface, and navigational strategy. Each successive prototype was developed based on the results of the Internet-based research and the partner's evolving preferences for the content and the usability of the prototypes. In the process of learning JAD and prototyping techniques, the student enhanced his academic knowledge of web-based systems development. Furthermore, the collaborative nature of the web design process necessitated that the student learn how to work with a non-technical user to evolve poorly defined requirements, thus enhancing his interpersonal skills. The student reflected, "I have not worked one-on-one with a real client before. So that really helped me to develop this aspect – to be able to understand what the client wants and to provide the solution for that."

One manifestation of the student's personal development during the design phase of the project was in learning about his strengths and weaknesses. For example, the student learned that while technical expertise was one of his strengths, it was hard for him to translate this expertise into a language that his non-technical partner could understand. The student said,"I come from a technical background and have certain things that I come to expect – like small font size on a web page or using thumbnails for images. But my client sees things differently. So, I learned that I needed to sell my ideas to her and to explain technical concepts and their rationale in a language that she could understand; and that was hard to do."

4.3 Phase III –Training the Community Partner to Maintain the System

Table 3 summarizes the project activities and student learning outcomes of the training phase.

PROJECT ACTIVITIES	STUDENT LEARNING OUTCOMES
▪ Developing a training manual for web site maintenance ▪ Developing workshops to train the partner to maintain the web site ▪ Conducting training workshops on web site maintenance	***Personal Development***: • Personal efficacy in training a non-technical community partner • Personal efficacy in empathizing with the partner ***Interpersonal Development***: • Communication and collaboration skills in training a non-technical partner ***Academic Learning*** • Technical skills of developing a training manual • Technical skills of developing a training workshop and conducting training sessions with the partner • Critical thinking skills in designing a training program for a non-technical partner

Table 3. Phase III: Activities and Learning Outcomes

At the onset of the project's training phase, the student collaborated with the community partner to develop a customized training manual to maintain the web-based system in the Macintosh environment. The student paid close attention to aligning the manual's narrative to the partner's needs and capabilities to maintain the system. The student commented, "One challenging part of the project was making the training manual. I had to learn how to make a step-by-step set of instructions with screen shots and narrative text. It took a long time to get it right." The

experience of developing a training manual helped student enhance his documentation and training skills.

The student also conducted several training sessions to teach the community partner the various aspects of web site maintenance. Training a non-technical partner on the use of a new software tool was not an easy task since it required technical knowledge and critical thinking to tackle the complex nature of the training issues. The client said, "I found it very interesting, and frustrating at times, to be trained on the use of this new technology. It is like trying to learn the Hebrew language, I suppose, it is going into a completely different paradigm... So, I was surprised how much work it was to go through training, and how difficult the training is for someone at my level of technical proficiency."

The training experience helped the student improve his communication skills and to learn the ins and outs of being a trainer. In reflecting on the training tasks, the student said, "I tried to explain concepts in the language she could understand since she was not a technical individual. Often, I would have to stop and think – 'How could I explain things more clearly, without the technical jargon?' " In observing the training sessions, it also became evident that the student developed a high degree of empathy for his partner's lack of technical proficiency. The student, thus, was eager to share his knowledge and expertise in helping the partner become more confident in her abilities to maintain the system.

4.4 Phase IV –Implementing the System

Table 4 summarizes the project activities and student learning outcomes of the implementation phase.

PROJECT ACTIVITIES	STUDENT LEARNING OUTCOMES
▪ Implementing the web site ▪ Developing documentation materials for the site ▪ Developing web site integration tactics ▪ Identifying the site's sustainability factors	***Personal Development***: • Self-knowledge of interpersonal characteristics • Personal efficacy in empathizing with the partner ***Interpersonal Development***: • Leadership skills in implementing and helping integrate the web site • Communication and collaboration skills in working with the project's key stakeholders ***Academic Learning*** • Technical skills of implementation • Technical skills of documentation • Knowledge of SDLC

Table 4. Phase IV: Activities and Learning Outcomes

Throughout the implementation phase of the project, the student took the initiative to lead the implementation efforts, thus demonstrating his leadership abilities. He engaged the client in testing the system for usability and content accuracy. He worked with the network administrator of the elementary school to upload the system's files to the school's web server. He developed documentation materials for the system. He collaborated with the partner on ways to integrate the system into the curricular activities of her class. Finally, he made recommendations to the school principal to implement a hot-line technical support for his partner and to initiate an on-going training program to help the partner sustain the system over time.

The student's proactive involvement in the implementation activities promoted the acquisition of technical skills and the academic knowledge of systems implementation. Furthermore, the student enhanced his communication and collaboration skills by working with different stakeholders of the project, including the second-grade teacher, the school principal and the network administrator.

The student also broadened his academic knowledge by learning how to develop a web-based system through all the phases of the systems development life cycle – from planning and design, to training and implementation. The student said, "I never worked on a systems development project from start to finish. In my part-time jobs, I was always the one in the backroom, at the computer...I was just a programmer." This project, on the other hand, provided the student with the context for learning the system development life cycle as it unfolded in a real-life setting. Through this active learning experience, the student gained a deeper understanding of the systems development process and complemented his knowledge of XHTML programming with the newly acquired academic knowledge of planning, web design, research, training, documentation, and implementation. The student proudly reflected that "...on this project, I was a designer, a researcher, a trainer and a technical expert. I got involved in many different tasks."

Finally, the student demonstrated personal development as he learned more about himself during the project. "I am an introvert trying to become an extrovert and this project helped me a lot to move closer to an extrovert... I have realized that as I move up into the professional world, I will need to become more of an extrovert, as I will have to talk to many people and deal with real clients who are very different from me. But now [after the project] I believe that instead of being just a techie, I could potentially become an IT consultant, working with people like Ms. R [the community partner]," said the student.

5. DISCUSSION

We set out to investigate the student learning outcomes in a service-learning project of web development undertaken in the context of an IS core course. We also aimed to explore the way in which community-based research promotes student learning and supplements the process of a web-based systems development. Our findings are summarized in a theoretical framework presented in Figure 1.

The findings show that the student learning outcomes include personal development, interpersonal development,

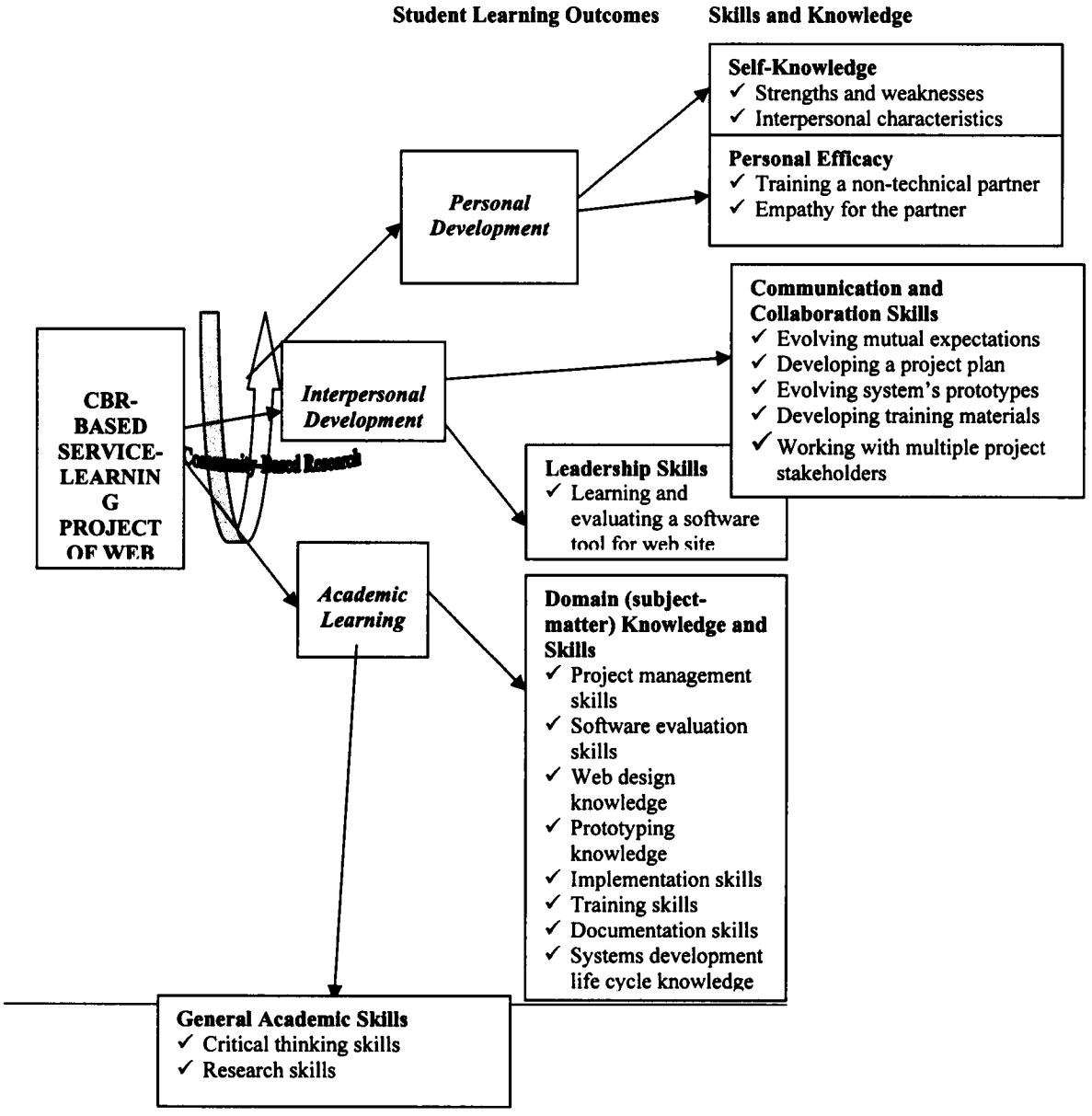

Figure 1. Theoretical Framework of Student Learning Outcomes in a CBR-based Service-Learning Project of Web Development

and academic learning. The personal development outcome is comprised of self-knowledge and personal efficacy. The interpersonal development outcome consists of communication, collaboration, and leadership skills. Finally, the student's academic learning encompasses domain-specific and general knowledge and skills. Our findings also show that community-based research can be used to supplement the process of developing web-based systems.

Learning in the context of a service-learning endeavor has a positive impact on students' personal development and growth (Eyler and Giles, 1999). The empirical literature on service-learning led us to expect that the service-learning experiences can affect students' self-knowledge and personal efficacy. While the pattern of our findings is consistent with the literature, we extend the literature by delineating the specific characteristics of student's personal development in a CBR-based service-learning project of web development. We also propose the ways in which community-based research promotes this learning outcome.

5.1 Learning Outcome: *Personal Development*

The IT industry needs graduates with a balanced set of technical, interpersonal, and personal skills (Lidtke and Stokes, 1999). In fact, the IT recruiters perceive personal motivation to learn and grow professionally as one of the

important traits for successful IS applicants (Fang et al., 2005).

Our findings demonstrate that the IS student displayed personal development and growth as he worked on a service-learning project to develop a web-based system for an elementary school teacher. The student gained a deeper insight about himself during the project. For example, he learned that one of his weaknesses was in translating his technical expertise into the language that his non-technical partner could understand. He also learned that while he was predisposed to be an introvert, he wanted to acquire some behavior characteristics of an extrovert to enhance his effectiveness as a provided of the IT-related services.

Another manifestation of the student's personal development was a change in his personal efficacy as he learned that his skills and technical competences were critical to achieving project goals. In the process of evaluating a new software tool and developing a training workshop for a non-technical partner, the student became a facilitator of the partner's learning, thus increasing his own sense of personal competence, motivation to learn, and the feeling that his knowledge and skills can have a positive impact on the outcome of the project.

Literature on community-based research reports that CBR can produce a variety of positive attitudinal outcomes. When students experience their own potential for social change, and engage in reciprocal exchange of knowledge, they enhance their leadership competencies and develop civic literacy skills in preparation for active citizenship (Strand et al., 2003). Furthermore, CBR promotes active listening, and critical analysis of problems and alternative solutions (Couto, 2001).

The results of our study show that CBR, through its principles of collaboration and validation of multiple sources of knowledge, promoted the personal development of the IS student. The process of community-based research brought the student and his partner together to interact in a meaningful way, to listen and to learn from one another, other, to empathize with each other, and to enhance each other's knowledge and skills. The self-knowledge and personal efficacy demonstrated by the IS student is likely to be of value to him as he commences his professional career in the IT field.

5.2 Learning Outcome: *Interpersonal Development*

Interpersonal development, including communication, collaboration, and conflict resolution skills are very important for IS graduates (Fang et al., 2005; Lee, 2005; Lidtke and Stokes, 1999). Service-learning literature suggests that the S-L experiences in higher education have a positive impact on students' interpersonal development and growth (Eyler et al., 1997; Eyler and Giles, 1999; Lazar and Preece, 1999). Our findings are consistent with the literature. We found that during the service-learning project in web development the IS student exhibited interpersonal development, including communication, collaboration and leadership skills.

The dynamic nature of web development tasks and conditions of learning are different in a real-life setting than they are in a more static learning environment of a classroom. The real-life tasks of project management, web design, training, and implementation are complex and uncertain. These tasks do not have carefully worded problem statements and scripted solutions. The field setting in which these tasks were performed during the S-L web development project necessitated creative solutions to problems and a high degree of collaboration between the IS student and the community partner.

During the planning phase, the student learned how to listen to and how to communicate with his partner to evolve mutual expectations on project goals and benefits. He also learned how to share responsibility, authority, and accountability with his partner to fulfill the project goals. During the design phase, the student learned how to explain technical concepts in a way that his non-technical partner could understand, so she would make informed decisions about the system's navigational strategy, the types of links to include on the pages, and the alternatives for integrating multimedia components into the web pages. During the training phase, the student involved the partner in the development of training materials, thus further enhancing his ability to explain the technical concepts of maintenance into the language that his non-technical partner could understand. The student also learned how to assimilate different points of view and how to work with people who are different from him in their background and experience.

Community-based research promotes collaboration and reciprocity of knowledge exchange (Strand et al., 2003). It also requires that the partners evolve mutual expectations on project goals and develop partnerships based on trust and respect. Collaboration, reciprocity and mutual understanding are very important in the context of the IS service provision. Kwon and Zmund (1987) point out that successful projects require high quality interactions between the designers and their clients. Walton (1989) suggests that client's commitment to the project and client's mastery of the system are important factors in effective IT implementations.

We found that structuring the service-learning project in web development as a collaborative partnership through CBR not only improved the efficiency of the team's working relationship and secured the partner's commitment to the project, but provided a real-world context for the student to develop collaboration, communication, and leadership skills. For example, the student learned how to bridge an IT-client culture gap and how to translate the unstructured requirements for the system into the social-technical solutions that enhanced the partner's capacity and directly addressed her needs. "Working with J. [the student] on this project helped me re-establish my educational philosophy and discover the ways that technology can be beneficial to me and my students." The experience of working with a real client on the social-technical solutions to integrate technology into the client's work setting helped prepare the IS student for the real world of IT work.

Our findings on the positive impacts of the CBR-based service-learning experiences are very encouraging for the future of IS education. The S-L experiences in conjunction with community-based research secure professional characteristics highly regarded in the IS literature. For example, IT recruiters perceive interpersonal skills of communication, critical thinking, and personal motivation to be amongst the most important skills considered for recruiting decisions (Fang et al., 2005). Other researchers point out that the interpersonal skills of IS specialists are as important as their technical skills (Lee, 2005). There is also the empirical evidence that the interpersonal competencies of IS specialists have an impact on the flexibility of the organizational IT infrastructure and the contribution of technology to competitive advantage (Byrd et al., 2004).

5.3 Learning Outcome: *Academic Learning*

IS recruiters look for IS graduates with core academic skills in programming, systems analysis, web development, client/server computing, and information security (Lee, 2005). They also value critical thinking skills and the ability to analyze, evaluate, and generate creative IT solutions to business problems (Fang, 2005).

Service-learning literature documents positive impacts of the S-L experience on students' academic learning (Eyler and Giles, 1999; Astin and Sax, 1998; Eyler et al., 1997). The service-learning practitioners view learning as something that is actively constructed by the learners. From this perspective, effective assimilation of academic material means being able to see its relevance to new problem-solving contexts and to apply what is learned within the contextual specifics of a given situation. While the literature suggests that service-learning participation has a positive impact on academic learning, there is a paucity of research on the specific types of discipline-based learning in the academic core of the Information Systems curriculum. Our findings on the academic impacts of the CBR-based service-learning experiences are consistent with the literature, yet they further extend prior research by delineating specific categories of the IS-related academic learning.

Our findings demonstrate that academic learning in a service-learning project of an IS web development course consists of two categories of learning – the *domain* and *general* learning. The *domain* category includes the knowledge of web design, prototyping, joint application development, and systems development life cycle. It also includes the skills of project management, software evaluation, training, documentation and implementation. The *general* learning category includes critical thinking and research skills.

During the planning phase of the project, the IS student learned how to plan and monitor the project's activities through all stages of the development life cycle, thus developing the project management competencies. This experience provided him with a realistic view of the complexities and uncertainties inherent in planning and estimating a real IT project. The student also learned how to evaluate a new software tool and how to match the software features with the needs and the capabilities of a non-technical client. This experience provided the student with the software evaluation skills.

During the design phase, the student learned how to evolve the system's concept through iterative prototypes. Through the contextualized learning of prototyping the alternative designs for the system and by leveraging the community partner's knowledge of elementary school education, the student acquired a deeper understand of web development principles and the concepts of web usability. Furthermore, the student demonstrated critical thinking as he considered different solutions to the problem of developing a maintainable, yet a content-rich system for his partner. Finally, he acquired basic research skills by participating in the design of end-user surveys and by researching the web-based systems of other elementary schools.

During the training phase, the student learned how to develop a training manual and how to teach his partner to maintain the web-based system using the Contribute software. This experience provided the context for the acquisition of training skills. The student also demonstrated critical thinking as he struggled with the complexity of the training tasks which were constrained by the limited technical proficiency of his partner. Another manifestation of the student's academic learning was in the acquisition of the implementation skills as he worked with different stakeholders of the project to implement the web-based system in the partner's work setting. Finally, the contextualized application of project planning, web design, prototyping, JAD, training, documentation and implementation tasks, broadened the student's academic knowledge of the systems development life cycle.

The use of CBR as a teaching strategy in academic courses helps link theory with practice, integrates learning with action, and transforms students into engaged and active learners (Calderon, 2003). We found that the use of CBR in a web development course promoted the integration of experiential and intellectual learning strategies. It engaged the student in an active construction of academic knowledge as he critically analyzed the unstructured problems ranging from web design to user training. Furthermore, CBR empowered the student to generate the alternative solutions to the problems of web development through research and through the reciprocal exchange of experiential and specialized knowledge. Thus, in the process of solving the socio-technical problems of web development, the student enhanced his domain and general academic learning.

5.4. Community-Base Research and Web-Based Systems Development

Table 5 presents the impacts of utilizing the CBR strategy of service-learning as a supplemental approach to software development methods of prototyping and joint application development. The table column titled "Student as an Analyst" illustrates all of the traditional activities carried out during a typical web-based systems development project. The column titled "Student as a Researcher" shows the supplemental activities which are typically not associated with traditional software development methodologies.

During the JAD-planning phase, the IS student worked with the partner to map high-level requirements for the system. The requirement artifacts included project scope, system's goals, objectives and benefits, a list of the prioritized capabilities of the system, and a preliminary schedule for the project. The objectives of the JAD-design phase were to elicit more detailed requirements for the system, to design the system's interface, and to revise the project schedule.

STUDENT AS AN ANALYST	STUDENT AS A RESEARCHER
Planning: ▪ Maps high-level requirements ▪ Develops project scope and objectives ▪ Anticipates system's benefits ▪ Estimates project schedule and cost	**Planning:** ▪ Aligns project goals with the community partner's needs and the organizational strategy of the partner's school ▪ Pre-assesses the partner's IT skills ▪ Researches and evaluates software for system maintenance ▪ Aligns software features with the technical capabilities of the partner ▪ Trains the partner to set usability requirements
Design: ▪ Elicits requirements ▪ Co-develops a technically-feasible design blueprint ▪ Programs the system through prototyping	**Design:** ▪ Researches web applications to support K-6 education ▪ Surveys other end-users (i.e., second-grade parents) to identify system's requirements ▪ Evaluates requirements adoption and forecasts their impact on the key stakeholders of the system
Training: ▪ Designs and test the training materials in line with the characteristics the maintenance software ▪ Develops system documentation	**Training:** ▪ Re-assesses the required IT skill of the partner ▪ Designs training materials and aligns them with the technical competencies, the unique needs, and preferences of the partner
Implementation: ▪ Installs the system in coordination with the school's IT personnel	**Implementation:** ▪ Works with the partner to co-develop a set of integration tactics for system's use ▪ Identifies critical success factors for using and sustaining the system over time

Table 5. CBR and Systems Development

During the JAD-design session, the student and his partner combined their respective knowledge bases and expertise to co-develop a technically-feasible design blueprint that met the essential business needs of the partner. The requirements gathered through the JAD sessions were then committed to code through a series of iterative prototypes that evolved the system's concepts into a fully functional web-based system for a second-grade classroom.

While the use of prototyping and JAD methods to develop IT systems is important, these methods may not be sufficient to secure the client's commitment to the project and to ensure the client's mastery and use of the system over time, as evident from the failure of our past service-learning projects to develop thirty-five web-based systems for elementary school teachers. On the other hand, the web-based system, which is the object of this study, has been actively used by the second-grade teacher, her students, student families, and the teacher's colleagues for over a year and a half since the system was implemented. This positive outcome is the result of supplementing the software development methods of prototyping and JAD with the community-based research approach to the collaborative development of a second-grade web site.

Our findings are aligned with Vidgen's (2002) methodology for developing web-based systems. Vidgen points out that web development differs from traditional IT projects. In traditional IT projects, developers identify user requirements using work studies, the use of the systems is often mandatory in the organization, and the users are trained as part of this mandatory use of the system. On the other hand, in web development, developers are change agents, user needs cannot be understood through work studies, the use of web-based systems is often not mandatory, and the users may not attend training sessions to learn how to use the system. Our findings suggest that the use of community-based research as a supplemental approach to web-based systems development not only promoted student's learning, but secured the community partner's commitment to the project, facilitated the partner's mastery of the system, and provided the foundation for the long-term sustainability and use of the second-grade web site over time.

6. CONCLUSION

The findings of this exploratory study propose an integrated, multidimensional framework of student learning in the context of a service-learning project in an IS web development course. This integrated learning outcome includes multiple dimensions of student's development and growth, linking the academic with personal and interpersonal learning.

Through the CBR's empowering principles of collaboration, equality, reciprocity and social change, the IS student in our study was transformed into an engaged and active learner as he connected his academic work to the needs of his local community and, in the process of doing so, promoted his own personal, interpersonal and academic development and growth. The multidimensional learning outcome demonstrated in this study will be of great benefit to the IS student as he enrolls in the subsequent senior-level IS courses, and as he, upon graduating from the university, works with real clients on the provision of the IT products and services.

The real work of IT professionals is complex and multidimensional. The business clients and the IT managers expect their IT personnel to enact not only the technical expert roles, but the roles of collaborators, facilitators, and leaders. Thus, the education of the IS students needs to go beyond the acquisition of technical skills and knowledge and to include learning of personal as well as the interpersonal nature. The integrated aspect of the IS learning demonstrated in this study will be of value to the IS graduates as they commence their professional work in the dynamic, complex IT environments characterized by the ever-changing technology, the increased emphasis on the soft skills, and the expectations that they possess the interpersonal ability to develop effective, credible, and trustworthy relationships with their business clients.

Our findings also point to the great potential of CBR as a supplemental method to traditional software development methodologies. We found that collaborative research between the student (the developer) and his community partner (the client) secures the client's commitment to the project and promotes the future use of a web-based system. Specifically, the CBR approach emphasized the need the following: 1) to pre-assess client's technical proficiency, 2) to align the features of the Contribute software with the unique needs and technical capabilities of the client, 3) to collaborate in researching the alternatives for the system's content and user interface, 4) to develop a comprehensive, targeted program to train the client to maintain the web-based system, and 5) to determine the integration tactics for diffusing the system into the organizational infrastructure of the client's work context.

One limitation of this exploratory, theory-building study is in the use of a single case to explore the CBR-enabled learning outcomes in an IS course. While the single-case studies are not unusual in intensive research (Stoecker, 2005), and they are often used as pilot studies for future multi-case research (Rowley, 2002), we recommend that future studies test the proposed framework of the CBR-enabled learning outcomes on a larger sample of IS students to strengthen the theoretical generalizability of this study's findings. Another avenue for future research is to assess the differences in the learning outcomes of IS students taught under the CBR-based service-learning versus traditional pedagogies. There is also a need to develop a holistic model of the CBR-enabled impacts on students, their community partners, and the university faculty. Finally, the theoretical framework proposed in this study should be tested and extended to the teaching-learning contexts of other academic disciplines.

The practical significance of our study is in highlighting the potential of a service-learning experience and community-based research in transforming students into the *engaged* and *active* learners. The findings are also important for the IS educators who teach students to develop web-based applications for professional organizations, including small businesses and non-for-profit entities. Finally, the study's findings provide a framework for structuring effective service-learning experiences in the systems development domain of the Information Systems curriculum.

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AUTHOR BIOGRAPHIES

Lara Preiser-Houy is a professor in the Compute Information Systems Department at the College of Business Administration, California State Polytechnic University, Pomona. She holds a Ph.D. in MIS from the Claremont Graduate University and a professional designation of a Certified Data Processor (CDP) from the Institute for Certification of Computer Professionals (ICCP). Professor Preiser-Houy has over ten years of industry experience, including technology consulting in a primary education sector. She has served as an Assistant Chair of the CIS Department and as the CBA's Executive Coordinator of the Russian-American Business Management Program (RABMP). Professor Preiser-Houy teaches in the areas of systems analysis, database design, web development, and MBA seminars. Her research interests include service-learning impacts of academic-community partnerships, IT-client working relationships, development and implementation of knowledge management systems, and the individual and organizational impacts of web-based technologies in primary education.

Carlos J. Navarrete is a professor in the Computer Information Systems Department at the College of Business Administration of the California State Polytechnic University, Pomona. He holds a B. Sc. from Instituto Politecnico Nacional, Mexico, and a Ph. D. in Management Information Systems from the Claremont Graduate University. Before joining California State Polytechnic University in 2001, Professor Navarrete worked for Universidad Iberoamericana, Mexico, where he was Chair of the Information Systems Department. His research interest is the use of Information Technology to support individual, group, and organizational productivity. Professor Navarrete has received several awards through his academic career. He was a Fulbright scholar from 1991 to 1994.

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