2009

Toward Developing an Experiential Learning Curriculum Model in Information Technology

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Recommended Citation

Keane, Lynn Bacon; Patten, Karen; Brookshire, Roberrt G.; Cardon, Peter W.; Gerdes, John H.; and Norris, Daniel, "Toward Developing an Experiential Learning Curriculum Model in Information Technology" (2009). *AMCIS 2009 Proceedings*. 691.

[http://aisel.aisnet.org/amcis2009/691](http://aisel.aisnet.org/amcis2009/691)
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ABSTRACT
Graduates of undergraduate Information Technology (IT) programs should have skills desired by regional businesses. Educating the next generation of IT professionals is a continuing challenge. In the IT program at a southeastern United States university, we are exploring ways to integrate real world experiences into the curriculum and allow students to develop relationships with each other as well as with local businesses. This paper describes a developing IT curriculum model which uses projects to provide experiential learning. The model is based on evolving theory in IT curriculum development, benefits of experiential learning outcomes, and the need for increasing emphasis on knowledge, skills, and attitude development. Three key areas include: a) current IT student skills at different curriculum levels; b) expected knowledge, skills, and attitudes of students; and c) type of experiential learning (or student engagement) at each curriculum level.

Keywords
Experiential learning, service learning, IT curriculum development, IT student skills

INTRODUCTION
Keeping an undergraduate curriculum in Information Technology relevant and timely is a well known challenge for faculty. Especially in the field of Information Technology (IT) or Information Systems (IS), curriculum development is an evolutionary process due to the exponential change in technology and continual shifting of workplace requirements (Hunt, 2004). Successful IT programs must work to identify the necessary balance between technical, interpersonal, and management skills for workplace settings (Smith, Hunt, Berry, and Hunt, 2004-2006; Yin and Lien, 2004-2006). In response to the demands of keeping our IT curriculum relevant, our faculty is exploring ways to infuse real world experiences into our curriculum. Our IT program requires a 300 hour IT internship and a capstone IT project management course within the senior year, which provide the students with real-world IT experience prior to graduation. Faculty members have independently implemented experiential or service learning activities into individual courses throughout the core program as ways to bring real world experiences into the class. When we witnessed students from the capstone project management course naturally turn to students in the training course to help support their computer training project at a senior living center, we realized the value of infusing these real world, service-learning activities throughout the entire curriculum. This paper explores a conceptual IT curriculum model which includes the systematic inclusion and expanded focus on experiential learning. This inclusion is based on findings from ongoing research studies in our department. The paper summarizes current experiential and service learning activities, and discusses future service learning activities which use the proposed IT curriculum model to guide the process. The following sections describe a brief literature review of curriculum development in IT, experiential learning, and service learning; a description of our IT program and the curriculum model; current service learning projects; and planned future projects.
LITERATURE REVIEW

The following literature review addresses relevant research in three areas: curriculum development for IS/IT programs; experiential learning, in general; and service learning, in particular.

The Challenge of Curriculum Development in Information Technology

Several strategies for IT educators to continuously help students and graduates succeed at becoming competent IT professionals include examination and improvement of the curriculum through professional development, scholarship, and discourse (Yin and Lien, 2004-2006) and the use of the guiding principles of professional organizations’ model curriculum. One such curriculum is the Organizational Systems Research Association (OSRA) Organizational End-user Information Systems (OEIS) model curriculum. The OEIS model curriculum, now in its third version (2004), has been revised and updated to address the needs of a new generation of learners. A basic assumption of the curriculum is the need for modularity so that components of the curriculum may be grouped or stand alone. Using modularity, university IS/IT programs can focus on their own strengths and directions (O’Connor, 2004-2006). According to O’Connor, “a dynamic model curriculum allows specialization, is learner-centered, and yet includes the breadth of the field” (p. 1-2).

While the OEIS model curriculum (2004) can serve as a guidepost, it is not a mandate. IT educators must continue the process of planning, updating and improving programs based on regional resources, personnel, and situations (Yin and Lien, 2004-2006). Yin and Lien suggest several considerations based on prior experiences with merging IT- and IS-related post-secondary programs that might supplement the OEIS model curriculum.

1. Help students contextualize technical and interpersonal learned skills as soon as possible. Strategies for contextualizing skills include developing meaningful cooperative opportunities and requiring business internships.
2. Design curricula with both formative and summative assessments. This includes assessing students during course study, as well as after course study, and assessing for learning rather than assessment of learning (Stiggins, 2002). All types of assessment are important to complete so learning outcomes and the process of building expertise can be articulated, identified, and measured.
3. Build a community of practice through action research. Action research can encourage the participation of all community members to become inquirers and contributors, thereby building of shared experience (Argyris, Putnam, and Smith, 1985). Through active participation and reflection, new knowledge can be created by generating, collecting, processing, and interpreting information within a learning organization (Argyris, 1993; 1997).
4. Embrace a pedagogy that generates new knowledge. In preparing knowledge workers for today’s and tomorrow’s workplace, it is important to move from a know-how pedagogy to a know-why pedagogy. Technology is a tool that can empower students to be “enablers” and “catalysts” who adapt quickly to the changing workplace (Yin and Lien, 2002-2004).

Experiential Learning

As IS/IT educators implement and design their curricula, flexibility and modularity are imperative to providing learning opportunities required of digital learners. Many academic programs focus their efforts on knowledge transmission and replication, rather than providing opportunities for learning in real world contexts (Kolb and Kolb, 2005). Additionally important is providing a vehicle for students to achieve academic, professional, and personal outcomes through the interweaving of classroom theory and experiential learning projects (Smith, Hunt, Berry, and Hunt, 2004-2006) that go beyond case analyses and technical training (Kolb and Kolb, 2005). This weaving of theory and practice will help students clarify career goals, understand organizational culture, and gain workplace competencies.

Experiential learning theory is built on five propositions (Kolb, 1984).

1. Learning is best conceived as a process, not in terms of outcomes. Engaging students is a process of continuous feedback during their learning efforts. As Dewey (1897) stated, “Education must be conceived as a continuing reconstruction of experience” (p. 79).
2. Learning requires the resolution of conflicts between opposing views of the world.
3. Learning is a holistic process of adapting to the world.
4. Learning results from synergetic transaction between the person and the environment.
5. Learning is the process of creating knowledge. Experiential learning theory is constructivist in nature, whereby social knowledge is created and recreated in the personal knowledge of the learner.
In addition, several principles for curriculum development flow from the experiential philosophy (Kolb and Kolb, 2005).

1. Respect learners and their experience.
2. Begin learning with the learner’s experience of the subject matter.
3. Make space for conversational learning.
4. Make space for the development of expertise.
5. Make space for feeling and thinking.
6. Make space for learners to take charge of their own learning.

Service Learning

Service learning is an instructional strategy that has been defined as “what happens when students are afforded the opportunity to practice what they are learning in their disciplines, in community settings where their work benefits others.” (Applegate and Morreale, 1999, p. x). Real-world experiences thus, occur in a relatively safe academic environment (Wilcox and Zigurs, 2003). When educators select service learning as an instructional strategy, they hope to provide valuable services to community partners and an authentic learning process for students (Applegate and Morreale, 1999). Service learning differs from other types of experiential learning activities, such as volunteerism, community service, internships, and field education, because of its intent to benefit the provider and the recipient of the service equally (Furco, 2003). Additionally, the focus is on both the service and the learning, with service projects planned to specifically address course learning outcomes. Service learning is also considered learning by doing where both students and the community partners gain. Students gain by experiencing and then reflecting on that experience, while community partners gain because their business needs are met through the completion of meaningful and authentic work to provide business solutions. Berman (2006) highlights a key advantage of service learning in that “students learn course content, processes, and skills, strengthening their thinking skills as they develop empathy, personal ethics, and the habit of helping their communities” (p. xxi).

Service learning is further defined by the National and Community Service Act of 1990 (Waterman, 1997) as a method where:
- Students learn and develop through active participation in service experiences that meet real community needs, collaboratively coordinated with the community partner and the course professors;
- Students are provided structured time to think, talk, or write about what the student did and saw during the actual activity;
- Structured opportunities for community partnerships are integrated into students’ academic curriculum;
- Students have opportunities to use newly acquired skills and knowledge in real-life situations in their own communities; and
- Classroom teachings enhance student learning beyond the classroom, while also developing a sense of caring for others.

Successful service learning projects follow specific five elements necessary for structuring successful service learning projects (Berman, 2006):
1. Selecting the need for the service;
2. Identifying the community partner;
3. Aligning the service experience with the educational goals;
4. Managing the project; and
5. Fostering reflective student learning throughout the project.

Although service learning is considered a practical way to combine academic content and theory to the reality of life outside the classroom (Speck, 2001), empirical evidence on the impact of service learning is mixed or non-existent. While faculty and administrators are interested in the relationship between service learning and academic learning outcomes, Giles and Eyler (1998) pointed out that there is little evidence that service learning enhances or furthers academic learning outcomes. On the other hand, there is evidence that service learning does enhance students’ sense of civic responsibility, life skill development, academic development and that it impacts students’ skills, values, attitudes, and ways they think about social issues (Eyler, Giles, and Braxton, 1997). Other researchers report on the beneficial effects of service learning (Henson and Sutliff, 1998; Rhoads, 1998; Rice and Brown, 1998). More research to determine best practices for integrating service learning and experiential learning activities into the undergraduate curriculum is needed.
Because the service learning experience is based on real, personal relationships where students are doing real work that can make a difference in people’s lives, Eyler and Giles (1999) reported that students feel that doing real work is a powerful experience. The students describe that service learning projects provide a much richer learning experience when engaged in real world experiences. As a result, students say they learn more because they are more curious and more effectively engaged in the problems of the community and they remember more because they can use the knowledge and skills more readily.

Another critical component of successful service learning is reflection (Mintz and Hesser, 1996). Reflection leads to a greater understanding of how new knowledge and skills can be applied in the real world when students reflect on the connections among their service learning activities, course content, and theoretical perspectives (Eyler and Giles, 1999). Berman (2006) points out that opportunities for reflection allow students to revisit the service learning experiences, fit the various pieces of the project together, and identify areas for personal change and growth. Authentic situations, caring about others, and important work generate questions for students to think about (Eyler and Giles, 1999). Reflective writing can help to generate these questions and bring them back into the classroom. Therefore, it is important to integrate reflection opportunities into the course activities.

THE CORE AND PROFESSIONAL IT PROGRAM

Students in the program under study receive in-depth education in information technologies (IT) in five major areas. These areas include computer networking, database systems, web design and development, corporate training and development, and end-user support. All IT majors also complete a capstone project management course that incorporates knowledge from all five core areas to demonstrate and maximize their learning experience. In the capstone course, student teams work with a real business or non-profit organizations who become service learning community partners. They work to solve actual business needs or system issues of that organization by designing and implementing the needed information technology systems or technologies. The IT program stresses technology-based decision making and information management skills in dynamic business environments.

The IT Curriculum

Figure 1 illustrates the IT curriculum, which conceptually starts with the Business foundation courses at the bottom of the figure, progressing up through the Core area course and finishing with the Professional courses. The Business foundation courses consist of computer applications, programming, business communication, business law, accounting, management, and human resources before beginning the core IT courses. In the Core area, students first take an introduction to technology support and training management before moving into one of the five skill areas, which include technology support, web-based support, networking, database management, and training. The arrows in Figure 1 illustrate the sequence of courses in each of the skill areas. For example, after completing the introductory course, students can continue with database management, web-based support, networking, technology support, and training courses.

Once students complete the core IT curriculum, they begin the Professional Division courses, which include the advanced courses in each of the skill areas, a professional development course, two project management courses, and an internship. The second project management course is the capstone course, in which student project teams address real client needs in any of the five skill areas.

Experiential community-based experiences for students were planned into the Professional Division courses through the capstone project management course and the internship. In addition to the capstone course, several IT faculty members independently incorporated service-learning and experiential activities within several of the IT Core courses. As students moved from the Core courses into the Professional Division, they start applying the skills they acquired through participating in service learning activities. IT Faculty members have observed the developmental nature of the skills students were applying and using in these activities.
Expected Knowledge, Skills, and Attitudes of Students

Bloom’s taxonomy of educational objectives, recently updated (Krathwohl, 2002), serves as a useful tool for classifying the expected knowledge of our IT students. The first column of the KSAs (Knowledge, Skills and Attitudes) section of the curriculum model (see Figure 2) labels the category of the cognitive domain addressed by IT course sequence. The learning objectives of the Business Foundation and the Introductory IT course best match up with the categories of Remembering and Applying. As students progress through the IT Core courses, learning objectives address Applying and Analyzing cognitive areas. As students progress into the upper-level, Professional Division courses, learning outcomes of these courses best address the Evaluating and Creating cognitive areas. As the second column in Figure 2 illustrates, skill areas overlap throughout the curriculum. Technical skills are addressed in the earlier courses, while Leadership and Social skills are addressed later in the curriculum. The skill areas identified in our IT curriculum model are consistent with other IT curriculum models. One comparable model is the MTC Model for Training Knowledge Workers in a Digital Economy (Smith, Hunt, Berry, and Hunt, 2004-2006), proposed to supplement the OEIS Model Curriculum (Hunt, 2004). The MTC model synthesizes managerial, technical, and communication skills that can prepare students for the changing business landscape (Smith, Hunt, Berry, and Hunt, 2004-2006). Congruent with Social skill development, we strive to foster professional, respectful, enthusiastic, and ethical graduates, as indicated in the third column of the KSAs section of Figure 2.
After identifying desired KSAs of our IT students, it is important to understand how they are developed through the program’s experiential and service learning components. The next section identifies the levels of student engagement mapped to the IT curriculum. One of the service learning projects that faculty members evaluated as part of the action research study was a joint project between the capstone project management course and the corporate training course. Through formative and summative assessment of this joint project, we observed various levels of student engagement within the projects. Students in the capstone course naturally managed and led the project. Given the knowledge and skills that students in the training course had acquired, these students were much more comfortable supporting, rather than leading the project. Therefore, the following levels of student engagement emerged as a specific focus at each level:

- At the ‘initial’ level, students first ‘observe’ or are ‘exposed’ to service learning activities.
- At the ‘expanded’ level, students ‘participate’ in service learning projects.
- At the ‘integrated’ level, various projects are integrated throughout the curriculum and students ‘lead’ the projects.

The Learning Outcomes column of this section, as identified in Figure 3, used Bloom’s taxonomy (Krathwohl, 2002) to map the expected learning outcomes of students at each level of student engagement.
ONGOING EVALUATION AND TESTING OF THE EXPERIENTIAL IT CURRICULUM

Based on the success of the spring 2008 coordinated service learning project, initiated by the students themselves, the community partner changed how it perceived its needs and requested an ongoing training program throughout the year rather than a five-week training. Our community partner’s long term goal for training is to build its senior residents’ knowledge and capacity so that they could eventually take online courses. Unfortunately, our traditional semester course structure did not allow us to satisfy our community partner’s long-term needs. Therefore, starting in the summer and fall 2008 semesters, we began an action research project to explore alternative service learning approaches that would better address these needs and expand on the experience of this coordinated approach. Our capstone and training students continue to lead and participate in the joint service learning project each semester. To evaluate this process, we collected baseline student knowledge and skills data for the summer and fall 2008 courses. During the spring 2009 semester, we added the introductory course to the ongoing experiential learning outcomes action study. In the future, we plan to capture the beginning IT students’ baseline data concerning their knowledge, skills, and attitudes in the traditional introductory course without a service learning element. Then, during the fall 2009 semester, we will add an initial observation service learning activity within the IT introductory course to expose the beginning IT students to training and development of information technology. We see this as the next step in the integration of service learning throughout the IT curriculum, which is our overall goal.

Our research plan is to continue to analyze the data and compare it to the different relationships within the integrated IT curriculum as shown in Figure 3 (Krathwohl, 2002). As a result of early analysis of the research, we have identified:

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Figure 3: Levels of Student Engagement Mapped to Knowledge, Skills, and Attitudes and the IT Curriculum
• The strengths of joint student participation where the capstone project management students are leading the project activities, while the training students are developing and delivering the actual PC training for the seniors in the community center.

• Students retain the lessons learned from the planning and implementation of the project, as well as the solving of ongoing issues during the semester’s project.

• Students who had early exposure to the training activities in the training development and delivery course were more aware of the specific needs of the client, and were more flexible when they addressed the senior participants’ training needs as part of the advanced class during fall 2008.

CONCLUSION
We expect to report on the preliminary results of the ongoing action research study for the first two semesters of the joint student service learning projects at the AMCIS 2009 conference. We expect that we will be able to identify alternative and innovative service learning approaches that may meet specific community partner’s needs for ongoing IT support from our IT students. We plan to continue to expand the experiences from this coordinated approach through the addition of the first introductory IT class into our integrated program. Finally, we also expect to begin to identify and document the evolution of knowledge, skills, and attitudes of our IT students as they progress through the curriculum. Eventually, we expect that we will be able to show the evolution of service learning outcomes from the introductory course through the training sequence of courses to the capstone project management course.

REFERENCES