



Seattle

122nd ASEE Annual Conference & Exposition

June 14 - 17, 2015
Seattle, WA

Making Value for Society

Paper ID #11735

The Perceived Impact of Information Technology Experiential Learning on Career Success: A Pilot Study

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Connie Justice is a Clinical Associate Professor in Computer and Information Technology (CIT) at the Purdue School of Engineering and Technology at Indiana University Purdue University Indianapolis (IUPUI) and a faculty member of the Center for Education and Research in Information Assurance and Security (CERIAS) at Purdue University. Professor Justice has over 20 years experience in the computer and systems engineering field. Professor Justice is a Certified Information Systems Security Professional, CISSP. She created the networking option and security option for CIT majors and a Network Security Certificate Program. She has also designed and modified many courses in networking and networking security. Professor Justice is noted for her creation of the Living Lab, an experiential learning environment where students gain real world experience running an IT business.

Professor Justice takes extreme pride and is a great innovator in the area of experiential learning and service. Experiential learning and service contributes to the integration of theory and application by creating an environment where the students learn by doing or apply their theory in service learning projects, practica, internships, games, and simulations. The Living Lab for CIT was created out of the need to provide a business environment for students to give them a taste of a "real" IT environment. A secondary purpose is to provide service to internal and external clients. The Living Lab has served many internal and external clients.

Professor Justice has consulted for and managed IT departments in small and medium sized businesses. Her areas of research include: experiential and service learning, information and security risk assessment, risk management, digital forensics, network security, network and systems engineering, network and systems administration, and networking and security course development.

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The Perceived Impact of Information Technology Experiential Learning on Career Success: A Pilot Study

Information Technology has become an integral component of various organizations throughout the world. In the early years, IT was seen as an isolated department; rarely understood by other employees and only utilized when a problem occurred. Today, however, IT has become the center of most every organization – supporting all departments and being involved with all facets of the organizational processes. According to Holtsnider and Jaffe ^[1], “IT departments are by default in the middle of action. Everyone is aware of the values that computerization can bring to an enterprise” (p. 603). Due to this drastic increase in the level of IT involvement, the need exists for talented, experienced individuals to fulfill rewarding IT positions. Experience is no problem for one working in IT for twenty years, but how does a college student with little or no prior IT involvement gain valuable experience? The answer to this question, faced by so many college graduates, is experiential learning.

Experiential Learning

Experiential learning is the concept of learning by experiencing and applying classroom material in a real world situation, rather than a purely theoretical setting. Justice, Fernandez, and Do ^[2] characterize experiential learning as including internships, applied projects, service learning, and several other applied learning situations. The particular variant of experiential learning implemented is dependent on the topic of study and resource availability. Chan ^[3] states, “[With experiential learning] Students are able to efficiently transform the knowledge learnt from the classroom and textbooks into their understanding” (p. 405). The key word in Chan’s statement is *transform*. Classroom subjects become more than words in a book, but rather tools that can be applied in a real world setting. These new tools will be counted as valuable experience when the student graduates and transitions into a career.

Yardley, Teunissen, and Dornan ^[4] state, “By linking new experiences to prior ones...educators can guide students to understanding their current and future workplace activities in personally meaningful ways” (p. 163). Experiential learning makes a connection between a student’s traditional classroom subject matter with related hands-on activities to be applied on the job. This process not only enriches student understanding of material, but also solves the dilemma of required employer experience. This study will work to provide a quantitative basis for this assertion.

Background of the Living Lab

The Computer & Information Technology (CIT) Living Lab (LL) course at Indiana University Purdue University Indianapolis (IUPUI) focuses on the concept of experiential learning. The mission of the LL as stated by Justice and Fernandez ^[5] is, “to serve as the beginning of an experiential pipeline in which students apply their knowledge and develop their skills in networking and security” (p. 1). The mission is carried out by placing undergraduate technology students in positions that allow them to apply their course material by working in real world IT environments – local businesses, non-profit organizations, and the university.

Since its inception in 2001, the LL has grown to an average of 20 students per semester covering a variety of IT subject matter relating to networking, security, web, and database. The course is structured differently than traditional college courses in that students meet from 9am to 5pm Thursdays and Fridays. Justice, Fernandez, and Do ^[2] state that the idea behind this unique schedule is to imitate a corporate IT department. Beginning students are paired with more experienced students until they're ready to transition into mentoring roles themselves. Projects for beginning students are usually internal – meaning within the computer labs/servers managed by the LL on the IUPUI campus. Once a student has compiled enough experience, he or she will be assigned an external project or internship for an outside organization ^[5]. Every week students are required to attend project status meetings and compose reflective journal entries. At the conclusion of the semester, the student provides his or her reflective documentation along with a project presentation, poster, work report, and documentation of all project work for future student reference ^[6].

According to the US Department of Labor ^[7], the recent college graduate unemployment rate is near 13.5%. This number is quite staggering given the amount of time, effort, and financial resources students put into a college education. An article in the Wall Street Journal recently stated that companies are “expecting graduates to arrive job-ready from day one” ^[8]. This is, in part, because some firms have chosen to reduce the amount of training available for such entry-level positions. Graduates simply must obtain prior experience to have a fighting chance at landing a new career. What better way for said experience to be acquired than through the LL or similar course?

Research Question

This research study will focus on examining if experiential learning in the IUPUI CIT 485 Living Lab helps IT graduates gain employment and enhance their ability to perform as an employee. CIT graduates who were involved in the Living Lab will be surveyed about how their experiential learning has or has not contributed to obtaining a position and to their ability to perform successfully. The research will ascertain a quantifiable level of benefit (if any) that experiential learning through the Living Lab provides to students.

The results will be extremely valuable to those individuals overseeing the LL, prospective students, and educational institutions considering the implementation of their own Living Lab. LL instructors will be able to use data from this study to further improve the program at IUPUI. Prospective students will be able to make an informed decision when choosing to make a commitment to the LL. Finally, educational institutions considering a LL or related experiential learning program will have research on which to base their investigation. Studies such as this are paramount in promoting experiential learning courses, as they utilize feedback from students who've transitioned into the world of work and attempt to make a connection between their LL experience and their current position.

Literature Review

One of the key ideas on which the Living Lab is based is that of andragogy, the concept of adult learning. Contrary to popular belief, adults learn differently than children (pre-adolescents and

younger). Malcolm, as cited in Merriam ^[9], states that adult learners are self-directed, internally motivated to learn, and are able to apply prior life experiences to new concepts. Children, on the other hand, usually do not have a choice in learning and are directed externally by instructors. Kolb explored this difference in learning style when analyzing Piaget's *Model of Learning and Cognitive Development*. The general idea behind Piaget's model is that as individual thought develops from infancy to adulthood, it transitions from considering the world based only on the present to a more reflective, internalized view by considering the present based on the past ^[9]. People in their daily lives make numerous decisions in both professional and personal situations. These decisions are based on rational thought processes derived from past experience. Even when adults enter the classroom, each individual brings a wealth of past experience that will ultimately be coupled with new material. Living Lab students arrive with various levels of background knowledge and, as the semester progresses, build and reflect on such knowledge in order to make more informed decisions. Kolb and Lewin define this cyclical process as consisting of four steps: Formulation of new ideas/goals based on previous experience, testing of such ideas, experiencing/implementing, and reflecting on the new experience.

Lewin, as cited by Kolb, ^[10] argues that reflection is a key component of the process. Analyzed data is to be, "fed back to the actors in the experience for use in the modification of their behavior and choice of new experiences" (p. 21). New ideas and concepts spring from reflective analysis of previous experience. This ties in quite well with the aforementioned concepts of andragogy, in terms of adults drawing on their accumulated knowledge. By the semester end, Living Lab students should have integrated this cyclical process into their professional thinking process. When a student considers a new course of action, he or she should ask, "How can I improve this process over last time?" Justice, Fernandez, and Do ^[2] define such integration as being a "life-long learner" (p. 2). Kelley, as cited by Quinn & Shurville ^[11], classifies life-long learning as a component of becoming a "knowledge learner" - one who is, "hired for their problem solving abilities, creativity, talent, and intelligence" (p. 331). Students must not only ascertain new subject-material through experiential learning, but must *learn to keep learning*. Technology and business processes of today become outdated tomorrow. Thus IT professionals who wish to remain relevant must always strive to perpetuate the learning process.

When considering experiential learning, some may consider it superior to the traditional, classroom-based style because of its hands-on "middle of the action" approach. While it is certainly true that students are more actively engaged, one must not dismiss traditional learning as inferior, but rather as a complementary component. Chan ^[3] confirms this relationship by stating that, "traditional and classroom-based learning are complementary to each other as the former generates theoretical knowledge... whereas the latter enables individualized experiences and skills to be developed" (p. 406). One approach does not replace the other; both are necessary for a well-rounded education. In a pretest/posttest study of the attitude of students regarding a particular course, Pugsley ^[12] concluded that students who were enrolled in a theory course implementing experiential learning rated it more favorably. In the case of the Living Lab, students take their compilation of technology coursework and translate it into practical applications – thus coupling traditional and experiential approaches.

Method

Subjects who participated in the study were CIT Living Lab graduates who completed their degree between May of 2010 and May of 2014, a population of 200 students. Of these 200 students, the School of Engineering and Technology Dean's office was able to provide the researchers a total of 66 email addresses. These email addresses, along with a post on the CIT LinkedIn page, were used to recruit study participants. Participants were informed that information collected would be kept confidential. An online questionnaire was programmed into SurveyMonkey, a survey and data collection tool. A URL to the survey was sent to the personal email addresses of those meeting the study criteria and posted to the CIT LinkedIn page. Once the response time expired, results were analyzed with SurveyMonkey and imported into SPSS. The study was fully approved by the University Institutional Review Board.

The participants were asked to respond to 13 questions with the intent of quantifying the impact the Living Lab had on their ability to obtain their position and perform on the job. In order to maintain the quantitative integrity of participant responses, questions were formatted in either in a yes/no or Likert-type format, with the exception of two open-ended questions asking for specific responses. Skip logic was used to ensure only participants who were currently employed in the Information Technology field were surveyed. The initial questions focused on employment information, asking whether or not their current position is in IT, the amount of time the individual has been employed, their salary range, and whether or not the position was held prior to the Living Lab. The remaining questions asked were a focal point of the study, as participants indicated if their Living Lab experience contributed to obtaining their current position and how often Living Lab skills are applied during the course of their job. The final questions collected demographic and educational background information, including their graduation year and concentration(s) studied.

Results

A total of 11 valid responses were recorded to the Survey Monkey questionnaire. Seven were from male graduates and four were from female. Figures 1 and 2 provide more demographics of the respondents.

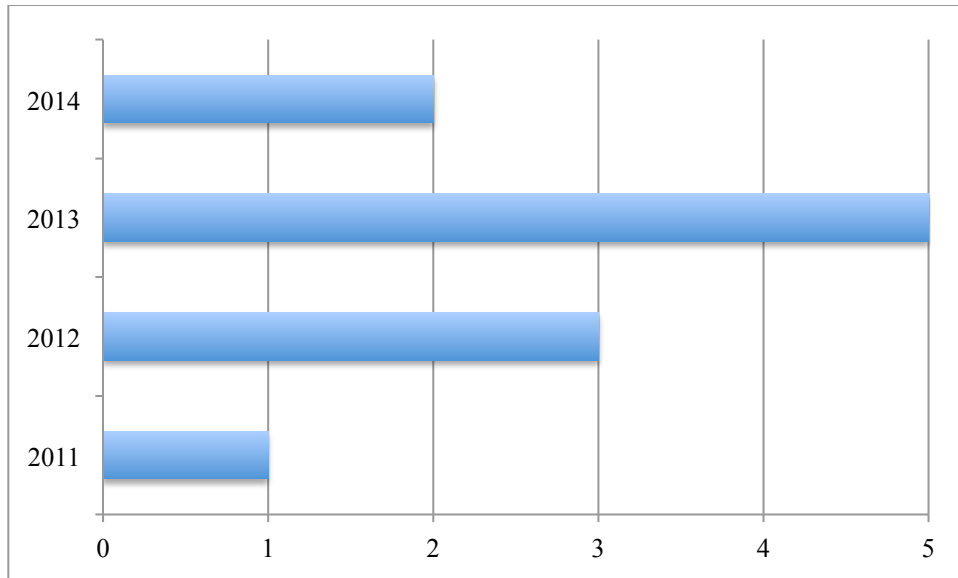


Figure 1. Year of Graduation

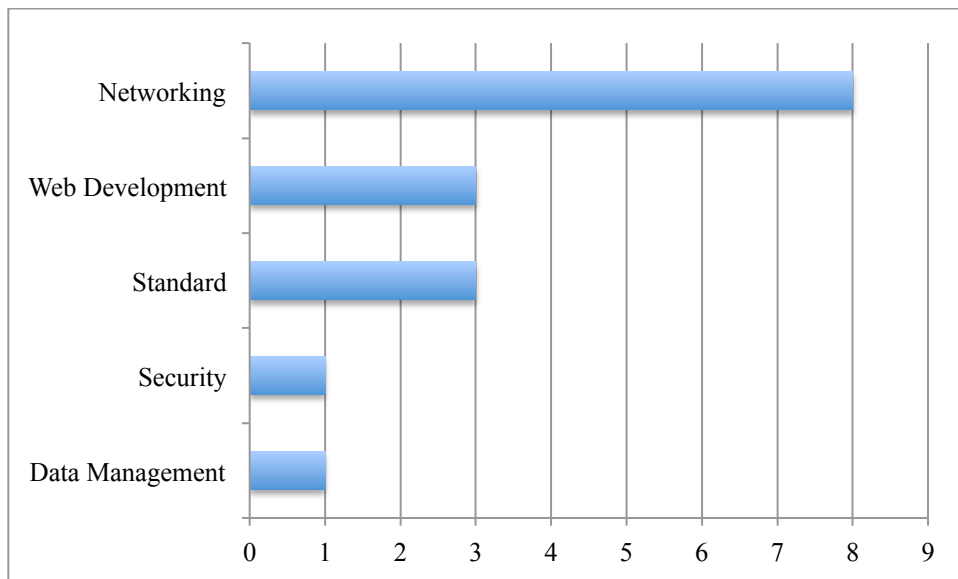


Figure 2. Concentrations (Note: Students are able to pursue multiple concentrations in the CIT program)

As the study was focused around the state of graduate employment, it was imperative to collect employment data from respondents. Three of the respondents held their current position before taking the LL; 8 did not. Figures 3 and 4 show frequency of length of employment and salary ranges of the respondents.

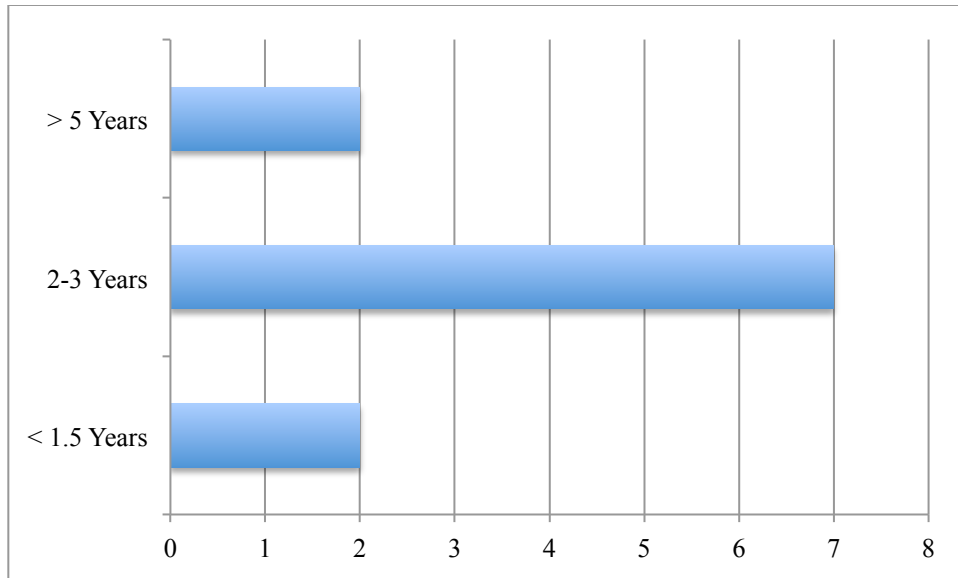


Figure 3. Length of Employment

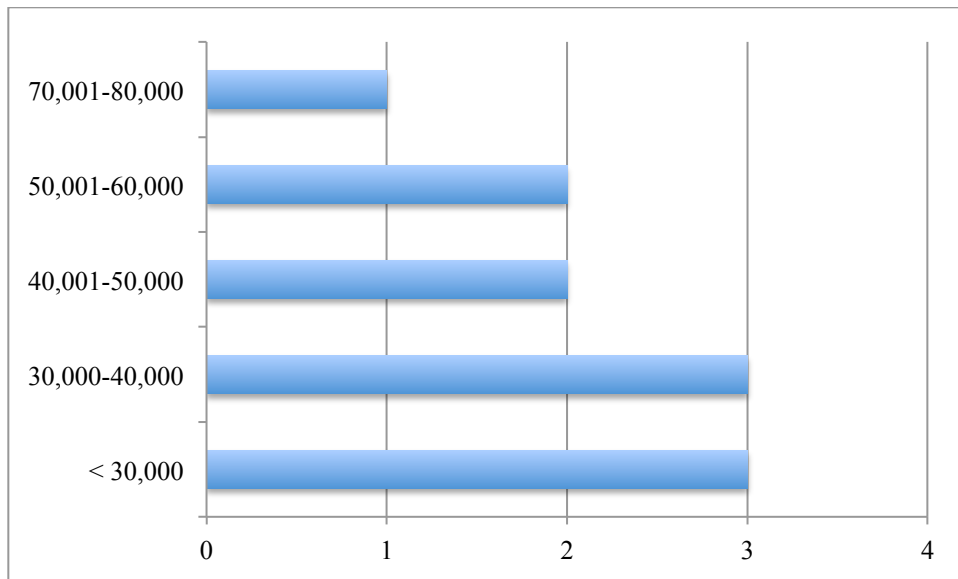


Figure 4. Salary Range (US Dollars)

It is important for the CIT program to know the Living Lab has provided direct, tangible benefit to its students. Table 1 outlines the descriptive statistics of the question asking if the Living Lab had contributed to their obtaining their current position. Responses to this question were on a Likert scale ranging from Very Insignificant (1) to Very Significant (5).

Table 1. Descriptive statistics of Living Lab contributing to obtaining current position

| | |
|--------|------|
| N | 8 |
| Mean | 3.75 |
| Median | 4.50 |
| Mode | 5.00 |

The mode suggests respondents most frequently chose “Very Significant” in response to how significant the Living Lab helped in obtaining their current position. Of the 8 responses to this question, 5 respondents (63%) indicated the Living Lab had made a significant impact or greater. 3 students skipped this question, as they already held their current position before taking the Living Lab.

Three of the questions were asked to gauge the respondent’s views of how often they may or may not apply Living Lab experience and skills on the job. The questions are presented below in an abbreviated form:

- How often do you apply Living Lab skills/experience?
- How often do you apply technical skills from the Living Lab?
- How often do you apply soft skills from the Living Lab (communication, professionalism, teamwork, etc.)?

Each question was based on a 5-point Likert scale with the choices of Never (1) to Always (5). Table 2 presents responses to these questions:

Table 2. Application of Living Lab skills on the job

| Application of... | Never | Rarely | Sometimes | Often | Always |
|----------------------|-------|--------|-----------|-------|--------|
| LL Skills/Experience | 0 | 1 | 2 | 5 | 3 |
| Technical Skills | 0 | 3 | 1 | 3 | 4 |
| Soft Skills | 0 | 1 | 4 | 2 | 4 |

73% of respondents indicated they apply overall skills and experience from the Living Lab often or always while in their current position. 64% of respondents apply technical skills often or always. 55% apply soft skills often or always. Descriptive statistics for each of the three application questions are given in Table 3.

Table 3. Descriptive statistics of skills/experience application

| | Applies LL Skills/Experience | Applies Technical Skills | Applies Soft Skills |
|--------|------------------------------|--------------------------|---------------------|
| Mean | 3.91 | 3.72 | 3.82 |
| Median | 4.00 | 4.00 | 4.00 |
| Mode | 4.00 | 5.00 | 3.00 |

Descriptive data indicates respondents believe the Living Lab has made an impact on their career success. The mode values indicate respondents most frequently chose “Often” in regards to applying their Living Lab experience overall and technical experience on the job, while the mode

of the final question indicates most respondents chose “Sometimes” in regards to applying soft skills sometimes on the job.

Students were asked two open-ended questions to describe technical skills and soft skills learned from the Living Lab that they apply in their current position (if any). 8 of the respondents listed several items for both questions. Table 4 below outlines several of the common responses:

Table 4. Responses to open-ended technical and soft skills questions

| Technical Skills | Soft Skills |
|------------------------|-------------------------|
| Network administration | Effective communication |
| Troubleshooting | Goal setting |
| Virtualization | Leadership |
| Cisco technologies | Teamwork |
| Database programming | Time management |
| Web development | Documentation |

As can be seen above, students were able to not only indicate they apply Living Lab skills, but also name which skills they use on the job. All of the items mentioned (along with many more) are conveyed to students throughout the process of the Living Lab.

The final question asked respondents whether or not they would recommend the Living Lab to prospective CIT students. Of the total of 11 responses, all stated they would recommend the Living Lab. This affirms the positive impact and worthwhileness the Living Lab program has to CIT students. Despite the significant commitment, those who’ve completed the course know it is worth the time and effort.

Conclusion

The purpose of this research study was to find a quantitative connection between taking the Living Lab as a CIT student with obtaining an IT position and being successful in one’s IT career as a result. Prior studies of the Living Lab primarily focused on qualitative research. “Success” was quantified by use of Likert-type questions with weighted responses. Questions focused on how significant the Living Lab contributed to obtaining a position and the two types of skill sets taught to Living Lab students - technical skills and “soft” non-technical skills. Descriptive statistics of research data appear to indicate a positive connection between the Living Lab and “Job Success”, as the majority of responses indicated the LL was a contributing factor to obtaining a job.

The Living Lab conveys continuous improvement as one of its core values. As such, further research is always necessary to validate the program and allow for changes when needed. The demographic data along with the Likert question data can be coupled to promote further studies. Such examples may include finding a correlation between gender and IT career salary, application of Living Lab skills and salary, or the number of years since graduation and salary.

Aside from the self-selection bias, which exists because participants were not randomly selected,

the primary limitation of the study at this point in time is a low number of survey responses, which prevented the use of more advanced statistical analysis techniques. Only 17% of the individuals contacted via email responded. Furthermore, the Dean's Office only had 66 of the possible 200 email addresses of graduates meeting the student criteria. More than likely, the Dean's Office may not have all of the updated email addresses for former students on file. Subsequent distributions of the survey may more heavily use social media such as LinkedIn and Facebook to attempt to reach more respondents. As this was a pilot study, the data collected on skills and application of experience can be used to formulate more specific questions for the next survey. With more response data, one can attempt to answer the question of the Living Lab and job success.

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