AC 2011-275: STUDENT REFLECTION IN EXPERIENTIAL LEARNING PROJECTS

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Student Reflection in Experiential Learning Projects

Introduction

Experiential learning (EL) is university-wide approach of teaching, research, or experiential learning that combines authentic community or public service activity with academic instruction, focusing on critical, reflective thinking as well as evidence of civic responsibility and/or personal growth. Experiential learning is a broad term that encompasses a variety of teaching and learning strategies, including the following:
EL: Experiential Learning; SL: Service Learning; CBL: Community Based Learning
ABCS: Academically Based Community Service
CL: Civic Learning, CE: Civic Engagement
EE: Environmental Education
PBE: Place-Based Education
WBL & STW: Work-Based Learning, also referred to as "school-to-work" (STW)
CUP: Community University Partnerships
Apprenticeships and internships that enhance and reinforce learning
Practicum and capstone projects that connects learning with activity in the community

The emphasis in experiential learning is on student learning and applying subject matter taught in a course, reflecting on that experience, growing personally and professionally in that process and serving a community in a meaningful way. Experiential learning projects create mutually beneficial relationships between university and the extra-campus community for the purposes of education and growth among all parties. Experiential learning experiences integrate in-class knowledge and meaningful engagement within community (institutions, partners, businesses and organizations). In some cases such activities link faculty research agendas and student learning to the needs of the community, fostering long-term relationships with regional, national, and international organizations. EL transfers ideas and knowledge from university to the community and from the community to university and enriches classroom engagement by providing students with service learning activities that require application of their coursework. Service learning connects meaningful community service with academic coursework and purposeful reflection. The experience yields reciprocal benefits for all participants, a renewed sense of civic connection, and encourages critical thinking and self-examination.

The three basic components[1] of EL are illustrated in Figure 1. The "partner" in this figure refers to the community partner. In order for EL projects to be effective in achieving specific goals they must be based on sound instructional methods and design of the respective curriculum to satisfy the accreditation criteria for that educational program. Students who complete EL projects exhibit personal growth through increased self-esteem and confidence, personal responsibility, and sense of personal efficacy. They also acquire active exploration of career interests, understanding of the work environment, specific job skills, hiring advantage over others greater confidence in career choice, increased interpersonal skills, increased tolerance/support for diversity and interest in other volunteer activities in the community. Many recent longitudinal studies have assessed the effects of experiential learning on students in schools and universities. These studies report that service learning programs had a positive

impact on students. Compared to non-participants, students who participated in service exhibited higher levels of academic achievement, including the following: grades, degree aspirations, retention, contact with faculty, time devoted to academic endeavors, academic self-confidence, and self assessments of knowledge gained[2].

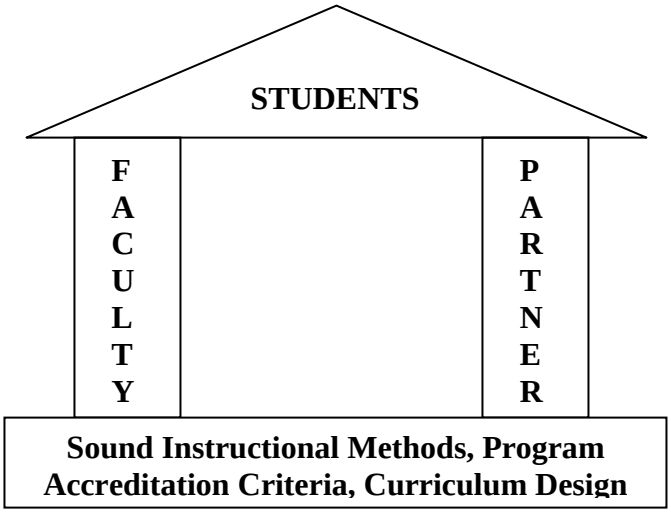

Figure 1: Basic Components of Experiential Learning

When EL is used in courses, faculty will be able to engage all learners, help students to structure and act on knowledge, facilitate critical synthesis and learning, enhance and augment learning, relate course material to real-world and practical applications, create lasting partnerships with community agencies, organizations, industries and professionals, increase professional recognition, reward or consulting work and augment and redirect professional development and research. The community partners value students' point of view, reimburse students' travel expenses, appreciate help with projects on the "back burners", and acquire access to university resources. For the university, EL projects provide opportunities to publicize its service to the community justify any financial support from the state, place students on jobs with the partners and support community in times of need.

EL resources available online[1] provide detailed assistance for incorporating service learning projects into curricula. The general steps are listed below.

Part I (Steps 1-5): Preparation
Step 1: Service-Learning Contemplation & Research
Step 2: Identify Community Needs & Projects
Step 3: Designate Goals and Outcomes of Each Project
Step 4: Choose a Course Model
Step 5: Construct Course Syllabus
Part II (Steps 6-8): Action
Step 6: First Week of Class -Assign Students to Projects
Step 7: Provide Orientation and Training
Step 8: Supervise Students
Part III (Steps 9-11): Assessment
Step 9: Reflection – Team & Individual
Step 10: Celebrate
Step 11: Assess and Evaluate the Course

This paper focuses on Step 9 which enhances experiential learning and student growth via a formal reflection process which must be structured, with objectives, critical thinking, sharing and learning. It may be done throughout the project or before, during, and after completion of project. It may be conducted in the classroom, at the worksite or at the final celebration or presentation. It may involve students, teachers, sponsoring agencies, and recipients of project deliverables. Reflection assists in connecting and crystallizing real world service learning experiences.

Reflection

John Dewey[3], the early 20th century progressive educator, published, supported and promoted reflection in education and ethics as a perpetual process by which meanings of actions can be discovered and sustained by individuals and groups. He considered reflection to be a systematic, rigorous, disciplined way of thinking with its roots in scientific inquiry. He advocated learning from experience and reflection for personal and intellectual growth of oneself and others. Experiential learning projects sponsored by industry are characterized by multiple goals that have economic, social, societal, global and environmental dimensions or constraints. Such conflicting dimensions or constraints defined by individuals and groups in these projects generate the need for reflection. John Dewey[4] considered reflection to occur in six phases: An experience; Interpretation of the experience; Problems and questions that arise out of the experience; Learning; Generalizing learning via hypotheses; Experimenting or testing the selected hypotheses.

David Schon[5,6] recognized that professionals focus primarily on achieving specific tasks and do not think critically before, during, or after completing activities. He recognized that professionals exercise short-term reflection-in-action which allows them to evaluate alternatives and decide on optimal course of action while accomplishing tasks. He called upon professionals to engage in reflection-on-action which is retrospective thinking about an experience after an activity or during an interruption. Such reflective thinking, individually and collectively by the team, will allow participants to understand professional practice and learn from their experience. Janet Eyler, et al[7]. and Julie Reed et al[8]. provided practical manuals on reflection to assist educators in facilitating student reflection activities in EL courses and projects. This paper utilizes reflection map and classification provided by Janet Eyler, et al[7].

Reflection is a component of most learning theory models, especially, Kolb's[9,10] four-stage cyclical theory of experiential learning. Kolb translated John Dewey's reflecting thinking process to learning styles. Kolb's model is a holistic perspective that combines experience, perception and reflection, cognition, and behavior. This model is represented in the Figure 2. EL projects benefit students with different learning styles. They serve "assimilators" who learn better when presented with sound logical theories to consider, "convergers" who learn better when provided with practical applications of concepts and theories, "accommodators" who learn better when provided with "hands-on" experiences, and "divergers" who learn better when allowed to observe and collect a wide range of information. The four stages in the above diagram correspond to these four learning styles. Individual and group reflections in experiential learning projects allow students with varying learning styles to interpret project activities in order to consolidate interrelated mental schema.

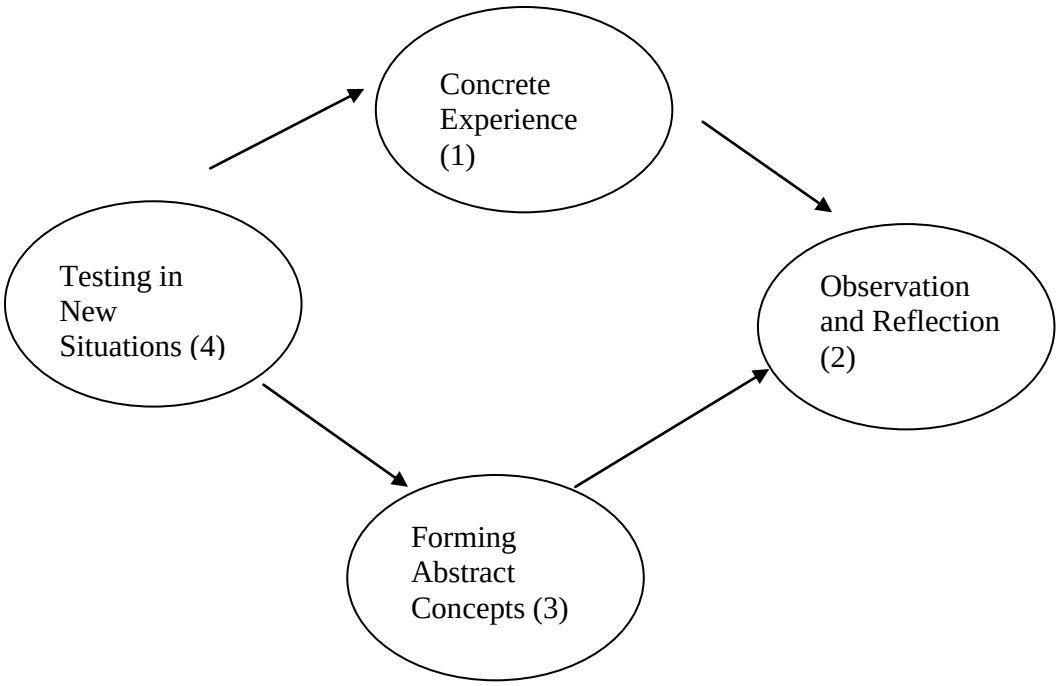

Figure 2: Kolb's Experiential Learning Cycle

Janet Eyler et al[7]. defined the four attributes of reflection to be Continuous (happens before, during, and after EL project or course); Connected (relates to project activities and course content); Challenging (follows scientific method of inquiry and facilitates learning); Contextualized (guide students in learning to reflect in meaningful ways on experience). The reflection map suggested by Janet Eyler et al[7]. is modified and shown in Table 1 for the EL projects supervised by the author at UW-Platteville.

Continuous→ **Connected↓**	**Before** **EL Project**	**During** **EL Project**	**After** **EL Project**
Individual	Letter of Commitment Assigned Reading	Weekly Meetings with Instructor. Mid-term Evaluation	Final Evaluation Individual Reflection Oral Interview
Team	Project Charter Work Breakdown Task Allocation	Record of Communication with Community Partner Assigned Reading	Final Project Report. Photo Collage Reflection by Team
With Community Partner	Project Timeline Project Contract Action Plan.	E-mails to and from Partner and Instructor	Presentation to community group Assessment by Community Partner

Table 1: Reflection Map and Activities

A wide spectrum of reflection activities[7,8,11,12] is available to educators and these activities may be classified using matrices as shown in Table 2.

Mode→ **Context↓**	**Read**	**Write**	**Present/Tell**	**Do**
Knowledge	Directed Readings of Trade Journals, Current Books, Case Studies, Professional Journals and Position Papers.	Key Phrase Journal, Double-entry Journal, Critical Incident Journal, Three Part Journal, Directed Writing, Newsletter, School/Industry Publications, Electronic Blogs, Meeting Notes, Papers, Manuals, etc.	Class Presentation, Presentation to Community Partner, Poster Presentation to Community. Inform Other Students Regional Conferences	Research, Implement Design Group Discussion Work at Sponsor Worksite Speak at Events Organize Events Create Posters and Collages Interviews Suggest Future Policy/Action
Comprehension				
Application				
Analysis				
Synthesis				
Evaluation				

Table 2: Reflection Activity Matrix

UW-Platteville created Pioneer Academic Center for Community Engagement[13] (PACCE) to provide support to EL projects in curricula. In fall 2008, with the approval of the Board of Regents, the university implemented the differential tuition plan which generated additional funds by charging $100 per student per year. This plan is scheduled to be reviewed after four years and it now supports a first-year experience program, counseling services, career services staff and PACCE. PACCE funds EL projects and one of the requirements for funding is written reflection and a formal poster presentation by students.

Student Reflections

From 1985 through 2010, the author had supervised about 250 EL projects in the industrial engineering program at UW – Platteville. During 2008 to 2010 a total of 72 students participated in 12 EL projects sponsored by local industries. In addition to student oral and poster presentations to the project sponsor and university community, different student reflection activities summarized in this paper were used each semester during these four years and are summarized below:

“ It was a good feeling to know that Frito Lay trusted UW-Platteville students enough to let them develop a change plan that will hopefully allow them to gain control of their spare parts room inventory and save money by not ordering more parts than needed.” - Ryan Steuck

"I also got the chance to work with a team on a real-world project. This is important because I had to combine my engineering skills along with good communication skills to complete this project on time while still doing professional quality work… The Frito Lay project that my team and I did this semester was a great experience that will helped me develop professional engineering skills and knowledge. I was able to learn about inventory control, layouts, and spare parts rooms in general." – Joe Lange

" It showed me that I need to be ready for unexpected events. I had no knowledge of power plant operations coming into this project, so that is something that I needed to research at the beginning of the project. The defection of group members was also something to learn from. That was something that was unexpected, but I couldn't let the group be affected too much by it." – Ryan Dow

"We did a good job acquiring the information that we needed to, even though it was difficult to obtain it from the clients. Communication between the group and clients could have been better." - Ran Dow and Travis Glaser

" The majority of skills that I improved throughout the project were soft skills such as organization, communication, and delegation. The experience that I gained from this project will influence my career by making me more aware of "scope creep" and personnel relations. These were two unexpected issues that arose and made the project more tricky than intended." - Mario Millonzi

" Also, having the ability to work for a real company instead of just learning from a textbook was very beneficial. I knew very little about the food manufacturing business before this project, but the knowledge I gained will be very valuable in my future because my only other experience was with my Quality Engineering project at NuPak, Inc." - Mike McManus

" I learned very important skills on how to work in a team and how to talk, email, and communicate with people on a professional level. Communication needs to be done effectively because without good communication skills you will never get the results you are looking for. I also realize that although they may be my superiors, suggesting different ideas is not necessarily a bad thing. So I should never be afraid to offer a suggestion or recommendation. Overall this was a very good experience, because I now feel more confident in my engineering skills. I also appreciate the opportunity I had to develop my professional skills." - Kaitlyn Jones

" In all honesty, this project taught me more about what I want to do after graduation then any class that I have taken at the university." - Dan Allen

" This will help me work with people in industry and work with team members. It will also help me understand different data points and how to interpret them. We also learned a lot about the machines in this project and being able to learn how to ask the right questions to really understand how a machine that I am unfamiliar with works. …. Finally, being able to do a hands-on project like this with a company outside of our academic setting was useful. We talk about having to have people skills and the ability to work with other members of the workforce in class, but with this project, we practiced this in the field."- Danny Tisdale

“ This project experience allowed me to work directly with a professional client and analyze a problem within a company. I was able to apply concepts that I have learned in classes to develop a solution to the issue. This experience will influence my future career by helping me understand how to approach a problem and talk with individuals to solve it.” - Acacia Myers

“ My experience as the team leader was very valuable because I am certain I will be in this position again in the future. Being in this role helped me identify some areas of improvement, so that when I am a leader of a project again I can be more effective.” - Basia Borzecki

“ This project was the most related experience that I have been involved with. It allowed me to feel the pressures as well as the frustration. Having to deal with that now will just prepare me better in a real job.” – Joshua Kalsow

“ I have improved many skills over the course of this project. I have improved my team communication skills as well as my professional communication skills. I also have improved my problem solving skills. This experience has also furthered my confidence in my work which will influence my future career.” - Pauline McCarty

“ I have learned that not all companies have up to date software, and I would have to deal with this challenge and make the best of what is available. I also learned different levels of acceptance when it comes to communicating ideas to a group of people. Some ideas the group generated for solutions were accepted well, while others were turned down without even the chance for a trial run… During this project I enhanced my knowledge and also gained new skills. I never worked in a food packing industry before, so this was a great new experience to learn about a common industry that I may one day work in. I had previous experience creating work instructions, but this was only in the classroom setting. Having this experience in Boscobel allowed me to take the classroom experience and apply it to a real world application. I expanded on my communication skills by speaking with workers at the factory and working with my team on the project. I feel I also grew somewhat as a leader.” – Colin Beay

“ The project showed me how communication between everyone in the facility, from floor workers to upper management, is important to meet demand. Throughout the project we got to deal with different levels of personnel throughout the facility. This was very important to gain this experience, because as an industrial engineer I will be dealing with multiple levels throughout a facility. Also, I got to see firsthand how teamwork can ease the difficulty in a large project. Teamwork is a very important aspect of industrial engineering... Working on this project really helped to relate to material that I have learned in the classrooms over the past few years. It was finally nice to get the chance to see what engineers actually get the chance to do in a facility.” - Peter Jecklin

“ This was a great project because we got to do improve something many of us are part of, but may not realize it. We were also able to apply classroom techniques in industry.”- Dan Hruby

“ The project was very rewarding due to the fact that we got to actually develop something that we would if were working in the real world. It is hard to recreate this setting in the classroom.

Not having participated in an internship or co-op yet, any outside experience dealing with Industrial Engineering that I can get is very beneficial. I look forward to sharing this experience with future potential employers during my quest to find a job after graduation, and I feel like it was a very important experience to have." - Ryan Dow

"This was the first project that I have worked on without the close supervision of a teacher or experienced engineer. So this project really pushed me to be more professional in everything that I did for this project. Without the experienced guidance of a teacher or supervisor to help me through difficulties and answer my questions this project pushed me to work through difficulties and to figure out the answer to my questions by myself. This project helped me to become more of an independent worker and it taught me to be precise with the question that I do ask." - Travis Glaser

" I am a foreign student, hence I came here to learn from zero the way the Industrial Engineers communicate with each other, all the concept they use, and the point of view they use toward to work in a company and make improvements. In conclusion, I learned a lot about IE concepts, teamwork, how a real company works, giving presentations, and mostly, how the American culture works." - Luis Peralta-Cervantes

" During the course of the semester I participated in many activities that were completely new experiences to me. Working in a food processing and distributing center was a new concept as I had never experienced this type of business and atmosphere before. Learning the processes was very valuable because this allowed me to see a completely different type of manufacturing process than I had ever worked with." - Mark Dreikosen

"This experience will help me in the future to be more comfortable working in diverse manufacturing environments. One key take away from this project is the ability to identify wasteful procedure in a process. In our case the process was indirect material flow, and we were able to identify multiple areas for improvement. Overall this semester was a great learning experience, I enjoyed being able to experience what I did, and the information that I have taken from this project are going to be priceless in the future." - Andrew Woodman

"I have gained more experience with working on real-life projects which will help me in my career. I have also been given the opportunity to apply numerous concepts I have learned throughout my four years of college to a situation I may encounter in my future work experiences. Also working in a team with four individuals has taught me a lot about teamwork skills, prioritization, and organization." - Brittany Beinborn

" I believe we have exceeded the expectations and have delivered a quality product. I am proud of our team's accomplishments." - Jenna Walsh

" During this experience, I was able to gain knowledge on emergency planning in various industries. This knowledge can be used for many tasks outside of this project." - Justin Goodrich

" *Reflection Before Experience:* Before starting the process, I knew that there was going to be a lot of work involved and would require me to put forth the most effort to effectively complete

the project. It required developing knowledge of the client and their needs and wants. It is also required developing knowledge of how my group members worked and what to expect of them. Both of those experiences helped me to understand the importance of asking questions and thoroughly listening to what each is saying.
Reflection During the Experience: The guidance from our teacher was more than helpful. He assisted us along the way and helped keep us on track during the entire process. The process also allowed me to develop competency in data collection, which was one of the goals of the project. There were also issues dealing with communication that had to be dealt with along the way; it was a good lesson to learn about making sure everyone understands what is required.
Reflection After the Experience: This experience helped me see the importance of service learning. Everyone benefitted from the experience including the client who was able to receive a solution for a problem they were facing, and us, the students, to learn how to deal with a "real life" project and problem. The experience has given me an experience and opportunity to apply knowledge I've attained at school." - Samantha Klapatauskas

" Before this project, I had a very general, textbook knowledge of projects out in the real world. We had done some small projects, some with sponsors before, but none were whole semester projects. During this project, I learned a lot more about working with vendors and working for a company. I learned more about team work and communication in a group. I also learned much about data collection, which will be a help to me in the future. Finally, I learned about writing a technical report and presenting on technical information. This project was able to tie in all that I have learned over the past couple years." - Jesse Waldecker

" Before the experience I had little to no knowledge of how a sensor interacted with a data collector, and then how the data collector interacted with some type of software to produce data. During the experience I learned how these systems worked together and I also learned how to control them to get them to work for the intended application. After the experience I feel I have gained knowledge that I can take into industry with me. Technology is an important part of our society and this experience has given me an advantage for the future." -Matt Lundberg

" I have a much deeper respect for safety and reducing workplace injuries after working on this project. By doing so we help the company's bottom line, but most importantly we are making the employee's work environment safer. We owe this to the employee because they come to work every day for us and we need to ensure that they can do their job free from injuries." - Casey Hauer

"Planning involves active communication with all people involved in the project. There must especially be active communication with the company contact to perform planning so tasks can be completed." - Dan Rutten

" Job safety analyses are required for any type of work setting, so the knowledge I gained in this project can be used anywhere. The ability to work with others in my opinion is the most important skill an engineer can have, so sharpening this skill during our project is going to be useful anywhere as well." – Brad Menning

“ I learned that it is best to start with engineering controls when trying to eliminate hazards. It is important to look at the design with an open mind, and try to think “outside the box” when coming up with solutions.” - Sara Michels

“ This project helped our group improve communication skills. Communication was a key step in the success of this project.” - Brittany DuCharme, Justin Melcher, Wyatt Parsons, William Walchak

“ Planning can be difficult and trying, but very necessary. It is what pushes the project forward, and keeps it going in a timely manner. Communicating, scheduling, and working with community sponsors is some good knowledge to take away from this project, as well as dealing with different personalities in group dynamics.” - Erik Anderson, Jacob Riniker, Troy Diestelmeier, David Hoadley

“ Planning and time management was a big step in the process of completing this project. Planning real life projects in your personal life also follows the same logic and can make daily life less stressful and more organized.” - John Vandygriff, Justin Melcher, Nate Dowse, Paul Wochinski

“ Before this project, I had no knowledge of quality engineering or the food packaging process. After completing this project, I now have a thorough understanding of all of these topics. Completing this project gave me an opportunity to take what I was learning in class and apply it to the real world. This project gave me further experience as a team member and leader, which prepared me for my profession. Working in industry on such a critical process made me feel like my work was more important than just the grade I would receive for doing it.”- Erin McCafferty

“ It was also beneficial in the fact that it included a lot of group work, improvising, and being able to be flexible to get work done even when everyone in the group was not available. It allowed us as students to gain experience and to use skills that will be very beneficial to us all later on in our careers.” - Justin Davidson

“ Working with industry in this project was a great experience. I learned a lot about interacting with employees on the floor to gain a better understanding of the processes and how individual employees affect them. It was great to be a part of a critical project to the company.” – Aaron Miller

“ This project has helped me understand more of the overall picture of engineering. Engineers are people that solve problems, and sometimes the problems we solve may not directly relate to something that we learned in class but we’re given the skills to do them through what we’ve learned in these classes. Now that this project has been completed I know a lot more about how companies operate and how they employ engineers. This project helped me become more professional with how I communicate with a client. I had to correspond a lot with our client being the team leader and so I developed those communication skills through this activity. Also I learned about the value of coming prepared to any meeting. At times I was not fully prepared for what I was doing and it ended up really hurting me as I tried to complete my work.” - Wade Jackson

" There is a large gap between learning in the classroom and doing in the workplace. This gap takes time to overcome and can be difficult to deal with while also getting acclimated at a new job so anytime you can narrow that gap before making the jump into the workplace is extremely valuable." - Brian Nelson

" This PACCE project has helped me to prepare for my future as a quality engineer." - Ben Terpening

"It was very important to for us to have the opportunity to participate in a project like this to further our education." - Paul Wochinski

Conclusions

International exchange students valued primarily soft skills they acquired in the EL projects. Traditional and non-traditional students valued both soft and hard skills they gained from these projects, but emphasized the refinement of soft skills. The formal assessment of the course by the institution revealed that all students, without any exception, appreciated their experience from the EL projects.

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