

The Learning Cycle of an International Graduate Student in Construction Job-Shadowing

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The vital role of experiential learning in undergraduate construction programs has been recognized and studied by both practitioners and academics. An initial search of the literature revealed little previous research specific to experiential learning opportunities offered to international students in graduate construction programs. This examination of the literature stimulated the idea of a case study that delved into the details of an international graduate student's six-month job-shadowing experience in 2011. The learning experience of the international student about construction practice and acculturation was analyzed with reference to Kolb's learning cycle theory. Interviews with two international students who completed paid work internships during the Summer of 2011 further confirmed the applicability of Kolb's learning cycle theory and the benefit of job-shadowing experience. This limited case study aims to stimulate the discussion and further research about experiential learning experience for international graduate student in construction education programs.

Key Words: Experiential Learning, Job-Shadowing, International, Graduate Education, Construction Education

Introduction

The vital role (Hager, 2005; Wasserman, 2008) and benefit (McCarthy & McCarthy, 2006) of experiential learning in undergraduate construction programs has long been recognized and studied by both practitioners and academics. An initial search of the literature revealed little previous research specific to the experiential learning experience of international graduate students in construction education programs. This paper is intended to stimulate discussion and further research about international students' job-shadow learning experience through a limited case study.

Though no precise statistical data about the number of international students enrolled in construction programs was identified, it is estimated to be substantial. According to the U.S. Immigration and Custom Enforcement's SEVIS database in 2009, about 258,950 foreign students studied in science and engineering (S&E) programs; 98,910 of them in Engineering, a field that includes construction engineering (Burrelli, 2010). What is more, for S&E programs, international students enrolled in graduate programs were nearly twice as numerous as foreign undergraduate students (Burrelli, 2010). Considering the relatively large number of international students in construction graduate programs, it is important to understand their learning experience.

Unlike undergraduate construction programs that require a mandatory work internship, many graduate programs encourage internships but leave the option of participation open to the students. Frequently international students graduate with little local career-related work experience. There are varied reasons to account for the limited internship experience of international graduate students in construction programs. First, compared with American students, it is harder for international students to find a paid work internship. This may be due to the language barrier, the cumbersome procedures required to recruit an international intern, and the long-term concern of the employer about international students' intention to stay in the U.S. after graduation. Furthermore, it is hard to balance a work internship with classroom and financial responsibilities tied to the student's academic work. To receive funding from a college or university, most international graduate students serve as either Teaching Assistants (TA) or Research Assistants (RA). In order to keep up the work in the classroom or research lab, the location of the internship needs to be close to campus. After several failed tries, international student usually give up

their plans for a work internship. Many professors fail to recommend a job-shadowing experience. Consequently, when the international students graduate, they usually have no significant career-related experiences other than miscellaneous jobs such as servers at restaurants on campus, graders for certain courses, or academic researchers.

Literature Review

Many have examined and advocated experiential learning for undergraduate students in construction education (Bilbo, 2007; Hager et al, 2003) for construction management programs (Souder & Gier, 2006; Wasserman, 2008), construction engineering programs (Tener, 2003), construction engineering and management programs (Riley, Horman, & Messner, 2008), and construction science curriculum (Martin & Haque, 2001; Moffat & Decker, 2000). In addition, there are also some studies about international students' experiential learning and learning styles (Ladd & Ruby, 1999; Ramburuth & McCormick, 2001), or learning approaches (Jalali, 1988). What is more, some literature studied international students' experiential learning experience in curricula of majors like business (Cheney, 2001), language (Bauder & Milman, 1990), hospitality and tourism management (Barron & Arcodia, 2002), and sociology (Mooney & Edwards, 2001). However, an initial search of the literature revealed little previous research on experiential learning for international graduate students specifically for construction management programs. This dearth of written material on the subject encouraged a case study about the job-shadowing experience of an international graduate student. Specifically, the authors tried to analyze a student's experience and learning process as it relates to an established experiential learning theory.

There have been various methods and theories with reference to experiential learning in higher education, starting from Bloom' taxonomy, Paulo Fieire's banking model of education, Carl Rogers' person-centered approach, and William Perry's work illustrating the cognitive development of students during their college years. Among the various theories about experiential learning, one of the most widely accepted models is Kolb's experiential learning theory (ELT) model (Tener, 2003), which was based on theories of Lewin, Dewey, and Piaget (Kolb, 1984). As shown in Figure 1, this model is a four-step cycle, with two dialectical modes of "Concrete Experience (CE)" and "Abstract Conceptualization (AC)" about experience grasping, plus two dialectical models of "Reflective Observation (RO)" and "Active Experimentation (AE)" about experience transformation (Kolb & Kolb, 2005: 194).

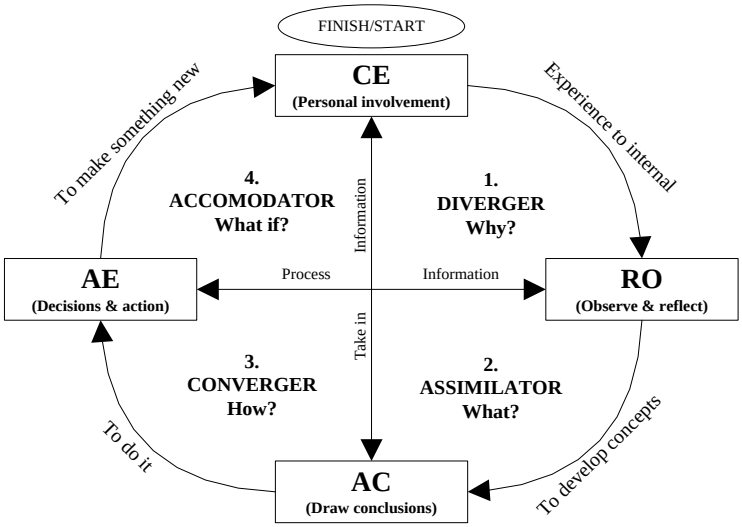

Figure 1: Modified Kolb's Learning Cycle by Tener (2003), based on Kolb (1984) and Wankat and Oreovicz (1992)

A number of researchers identified problems or difficulties faced by international students (Ramsay, Barker & Jones, 1999; Robertson et al, 2000). The concerns of the international students included: academic pressures such as language barriers and adjustment to new educational systems (Holmes, 2004); personal and emotional intensity like homesickness and absence of familiar "social support" (Poyrazli & Lopex, 2007, p. 265); socialization difficulty like

difficulty becoming "involved in campus activities" and being attached to the institution (Kaczmarek, et al, 1994, p. 26); as well as cultural issues like understanding and adjustment to culture difference (Nilsson & Anderson, 2004). International students need to learn to adjust to the differences of academy, emotion, socialization, and culture experienced in the U.S. construction industry.

Acculturation theory is a theory that can help explain international students' adjustment to the U.S. culture. As an individual-level phenomenon, acculturation has been defined as an individual's psychological and behavioral changes because of "first hand contact" of another culture (Berry, Kim, Minde, & Mok, 1987, p. 491). Sodowsky, Lai, & Plake (1991) proposed three factors about international students' acculturation to the U.S. culture, including acceptance of U.S. culture, perceived acceptance by Americans, and "language usage". Acculturation is a "culture-learning process" (Chun et al, 2003, p. 1), which can also be interpreted by Kolb's learning cycle model. However, compared with other learning experiences, acculturation is a hard and slow process. It is difficult to fulfill with a single internship experience. In the subject case, evidence of a partial learning cycle of acculturation from the three areas was noted in a six month job-shadow.

The Job-Shadowing Experience

In order to address a gap in the literature, a case study of an international student's job-shadowing experience was conducted. The subject of the case study is one author of the paper, who is an international graduate student from China in the Department of Building Construction Management (BCM) of Purdue University. She has pursued her degree without any exposure to real-world construction practice or jobsite experience in the U.S.

Based on her academic and practical background, the academic adviser, the assistant project engineer, and the student herself set up related goals for her job-shadowing. To accomplish this work experience, the following job-shadow goals were established.

- Work Requirement for Engineering and Field Work: be familiar with engineering work requirements by shadowing assistant project engineer.
- Construction Management Knowledge: come out with ideas to improve the inefficiency of current practice by becoming familiar with the structures of the project organization and CM team, as well as responsibilities of key members of CM team; attend weekly mechanical-electrical-plumbing (MEP) coordination meetings; question team members as needed; and read related contracts documents.
- Construction Management Technology: come out with ideas to introduce new applications, process, or usage patterns of technologies by exposure to the current applications, process, and usage patterns of technologies employed in the project.
- Culture/Language: adjust to the workplace culture by observing and communicating with team members.
- Research: be familiar with traditional information communication process and come out with ideas to improve the inefficiency of current process.

The job-shadow took place at the Purdue Student Fitness and Wellness Center renovation and addition project (also named Co-Rec project) in West Lafayette, IN. The project was aimed to increase the space of the existing facility by 142,000 Gross Square Feet (GSF) with a $98 million total project budget. Construction started in May 2010 and was scheduled to finish in December 2012.

The Job-Shadowing Experience in Terms of Kolb's Learning Cycle

According to Kolb (1984), the concrete experience (CE) mode requires the individual to feel the context by immersion in the immediate situation. By attending the Mechanical Engineering Plumbing (MEP) meeting and checking meeting minutes of the Owner-Architect-Contractor (OAC) meeting, the student better understood the responsibility and information communication between the CM team and other stakeholders. As shown in Figure 2, the CM team functions as the link between the A/E entity and the prime contractors who will be building the job. The challenge to the CM functioning as this link is to smooth the communication between the A/E entities and the

contractors, run the construction operations, and assure the compliance of the construction work with the contract documents.

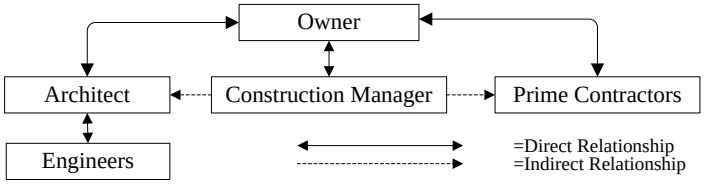

Figure 2: Organization of the Agency CM for Co-Rec Project

By being immersed in the operational environment of the CM, the student learned how information flowed within the CM team. Figure 3 was created by the student to show the structure of the CM team for the specific project. The CM team consisted of two different entities: the project management (office) team and the construction (field) team. The key members include project executive (PX), project manager (PM), project engineer (PE), and project superintendent (PS). Because the work of the PS is delegated to the field crew, in this case the two terms will be used interchangeably. The same is true for the PE and office crew. The various team members share responsibilities and communicate with each other. For example, the office crew (PE) reports to the field crew (PS) about materials supply from contractors/venders in order to get approved materials per agreement with the contract documents. The information generated by the PS is required by the PE to generate the financial report and current project status, which will be reported to both the PM for proper distribution of payments, and the PX for maintaining construction and financial risk management.

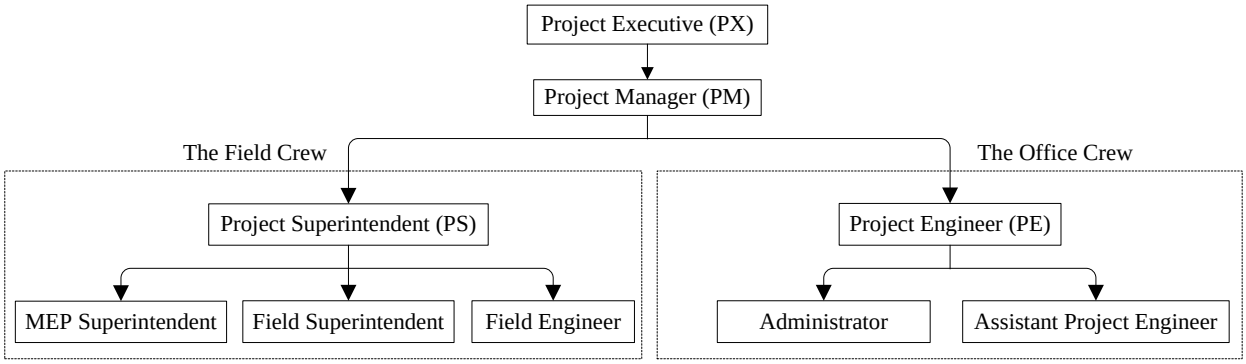

Figure 3: The Construction Management Team for Co-Rec Project

In addition, by observing and working with other team members, the student formed impressions about the types of daily interaction that took place between team members. For example, the assistant engineer may check with the administrator about the processing of RFI both formally or informally. The team members may also joke about hot topics while completing their work.

Reflective observation (RO) requires an impartial reflection of a learning situation. By becoming immersed in the project context, the student demonstrated RO from both professional and emotional perspectives. After the initial exposure to the change management process, the student demonstrated RO from a professional perspective by identifying that a flaw existed in the process or that something needed to be improved. For each change during the construction project there was a tedious procedure to clarify the problem, confirm the change, and finally update documents and communicate the change. It was error-prone and time-consuming throughout the process. For example, mistakes can happen during the change update in related documents and drawings because of misunderstanding or miscommunication. In addition, some documents may not be updated on time or left as they were. What is more, every time there was a change, all parties were notified, even those unaffected. The unnecessary information further slowed down the efficiency in managing information. Finally, even if the project team can stay on top of changes; the source of the problem is not resolved. The unresolved problem often includes a lack of error

reduction, rigid building design, and the slow response of the project team (Eastman, Teicholz, Sacks, & Liston, 2011).

At the beginning of the job-shadowing, the student did experience frustration and depression because of language barriers, contextual puzzles, culture shock, and emotion isolation. For example, when joining the Mechanical Engineering Plumbing (MEP) meeting, it was hard for the student to catch up with the meeting progress because of language barriers and unfamiliarity with the professional terms. Besides the language barriers, the lack of cultural and contextual knowledge also stopped the student from being involved in the daily conversation and interaction among team members. For example, when the American colleagues were discussing sports or joking with each other, it was hard for the student to really understand the point of the conversation. What is more, the unfamiliarity and professional relationship made the student feel isolated from the other team members at the beginning of her job shadowing experience. All this factors worked together to induce the student's frustration when the student immersed herself in the immediate project environment. From an emotional perspective, the student demonstrated RO by expressing the willingness to take charge of the learning process to overcome the psychological intensity that resulted from this initial contact with the initial situation.

Active conceptualization (AC) calls for rational thinking to create an alternative means to integrate observation with theories or concepts. From a professional perspective, by observing the change management process, the student conceived of possible procedures incorporating Building Information Modeling (BIM) for reducing changes and increasing design flexibility as well as communication efficiency. For example, the parametric attributes of BIM can accommodate and facilitate changes to the design, provide update information to only affected parties, and the BIM-based clash detection tools can identify qualified and structured clashes. Having identified the culture difference and language barriers, the student tried to think of several possible ways to improve acculturation by watching how everyone else interacted with each other, learning and understanding American culture, communicating with American colleagues whenever possible, and asking questions when confused.

Active experimentation (AE) stresses action in testing concepts and alternatives. The student demonstrated AE by trying to run automatic clash detection by implementing BIM Navisworks® on the project. However, the contract did not require the use of a BIM system, and the architect and engineer in this project used Autodesk Revit® only for their own interest. At the request of the student, the project executive got the consolidated model from the architect. Although the consolidated model offered a 3D view of the building, it limited the access to the parametric attributes of each building object and application of clash detection. With the limited resource, the student created the walkthrough of the first floor from the consolidated model and showed it in the MEP coordination meeting. The prime contractors in the meeting did express some interest and expressed an anticipation of better communication through similar models. What is more, two months after the walkthrough presentation, the plumbing contractor utilized Navisworks® to conduct clash detection for their system. This further consolidated the student's belief that improvement in work quality and information communication can be improved through BIM system.
In overcoming the emotional distress she initially felt when starting the job-shadow, the student took action to interact with project members by observation, participation, and openness. During this process her colleagues gradually better understood her difficulty and anxiety. Each of the team members began to casually ask about her progress and difficulty. The field engineer even volunteered to invite the student when he was going to walk about the jobsite and answered the student's questions and puzzles patiently and slowly. The student also began to understand others better and felt connected to them. For example, the assistant project engineer even shared her personal anxieties with her. She also discovered that the superintendent, who was used to CM-at-Risk, was not comfortable with the working relationship with the contractors under Agency CM in this project and was trying to learn more about it. The student even received a T-shirt from a subcontractor as an expression of their appreciation of support from the CM team in ensuring the safety of their work. The acculturation was a long and slow process. Even as the student felt more connected and comfortable with the situation, she still had difficulty in language, culture shock, and institutional attachment.

Benefits of Job-Shadowing by International Students

Integrating job-shadowing into graduate construction education programs for international students can provide several specific benefits. As shown in the case here, the student's experience demonstrated many of the knowledge development, culture adjustment, language improvement, research opportunity, and industry relation benefits of job-

shadowing. The depth of understanding and knowledge gained through job shadowing is of real value, and may not be otherwise attainable. In addition, the benefits of job-shadowing reached beyond the individual student. For practitioners, exposure to their projects may provide an opportunity for recruitment of future graduate students. What is more, the participating graduate students may also provide expert assistance to the projects or organizations. In the case here, the graduate student offered a report describing the benefits of BIM from the perspective of the owner at the project executive's request.

It is suggested that construction management programs may attract more international students if they can improve the learning experience of their current international students by facilitating job-shadow experiences. The quality of the programs may also be influenced positively if their international students develop better learning potential through a superior understanding of project dynamics and effective communication as a result of job-shadow experiences.

Confirmatory Interviews with Two International Graduate Students

In order to confirm common issues in the experiential learning experience of international graduate students in construction management programs, separate interviews with two international BCM graduate students who completed a paid work internship during the summer 2011 were conducted.

The specific tasks and roles of the two students were different because of different project contexts and requirements, but both students demonstrated some evidence of Kolb's learning cycle. For example the first student, an Indian graduate student, was responsible for office documentation such as the tracking of change orders in a spreadsheet, filing, and preparing a monthly report for a federal renovation project. He found that the design of the standardized form typically used for meeting minutes was not well organized and was hard for people to get the key points from. In addition, drawing updates were not kept current. It caused project members to use drawings or documents that had not been updated or to waste time looking for specific documents. He thought that highlighting key points, organizing the information according to the importance, and keeping a log for updates might be helpful. He ultimately took action to redesign some of the standardized forms, but because of time limitations he could not redesign all of them.

Besides the learning cycle they had experienced, both international students expressed explicitly the difficulty in understanding and being involved in both professional discussion and daily conversation because of language barriers, culture difference, and the lack of contextual knowledge. In particular, they both complained that they did not really have time to become immersed enough in the project to really understand the information delivery process, details of the buildings, or to build a network with the project members. This is in contrast to the case study presented here where the student conducted the job-shadowing continuously throughout a six month period while keeping up with her academic and research work. She had more time to understand and learn about the project and the people. The extended length of time for the job-shadow is the key here, especially for the time-consuming acculturation and relationship building process.

Conclusion

By offering case specific evidence this paper advocates further discussion and research about the need for experiential learning experiences for international student in construction programs. The experiential learning that can be experienced through job-shadowing was illustrated by detailing the experiences of one of the authors and contrasting this experience with established theories on acculturation and Kolb's learning cycle. Interpretation of the job shadowing experience in terms of Kolb's learning cycle helps give meaning to the abstract concepts and provides a concrete reference for later research to test ideas exemplified in this case study.

Although the details of a single case are not adequate to generalize to all graduate construction programs, the feedback from two additional international students who participated in shorter paid work internships, further confirmed that there are some common learning processes and issues in an international students' experiential

learning experience. Further research is needed to provide best practices for job-shadowing experiences that provide the most beneficial experiential learning outcomes for graduate students in construction management programs.

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