Health and Safety Practitioner Competency Development Using Experiential Learning

Desarrollo de competencias para profesionales de la salud y la seguridad utilizando el aprendizaje experiencial

Laurie Martin Southgate *
Independent Health and Safety Consultant - VIETNAM
laurie.southgate@gmail.com

ABSTRACT

During the construction of a copper mine in Kazakhstan, the contractor health and safety (H&S) team had members who lacked necessary competency in hazard recognition and intervention skills to support the projects Zero Harm philosophy. An action research method was used in this study to create, assess, and improve an intervention strategy of developing the contractor H&S team competencies using experiential learning at the worksite. A training and development program that used classroom instruction, hazard control bulletins for specific site hazards, and experiential learning activities supported by task observation checklists to aid in hazard identification in the work area was developed and implemented. The experiential learning process used a four-step cyclic process of planning for task observation in the work area, observation, engagement, and reflection. Task observation checklists were developed and became an effective tool to support hazard recognition. The average number of at-risk deficiencies identified and corrected per observation was three. Critical reflection after the task observation and engagement experience was used by the H&S practitioners to recognize what they learned, how the learning could be applied to future situations, and reflection allowed for the consideration of what knowledge and skills still required further development. This study found that the experiential learning approach implemented, supported by mentoring was effective to train health and safety practitioners in the evidence-based practice of hazard identification and risk management in their work areas.

Keywords: Experiential Learning, Competency Development, Construction Safety, Task Observations, Action Research.

RESUMEN

Durante la construcción de una mina de cobre en Kazajstán, el equipo de contratistas de salud y seguridad (H&S) tenía miembros que carecían de la competencia necesaria en el reconocimiento de peligros y las habilidades de intervención para respaldar la filosofía del proyecto Zero Harm. En este estudio se utilizó un método de investigación de acción para crear, evaluar y mejorar una estrategia de intervención para desarrollar las competencias del equipo de contratistas de H&S utilizando el aprendizaje experiencial en el lugar de trabajo. Se desarrolló e implementó un programa de capacitación y desarrollo que utilizó instrucción en el aula, boletines de control de peligros para peligros específicos del sitio y actividades de aprendizaje experiencial respaldadas por listas de verificación de tareas para ayudar en la identificación de peligros en el área de trabajo. El proceso de aprendizaje experiencial utilizó un proceso cíclico de cuatro pasos para planificar la observación de tareas en el área de trabajo, la observación, el compromiso y la reflexión. Las listas de verificación de observación de tareas se desarrollaron y se convirtieron en una herramienta efectiva para apoyar el reconocimiento de peligros. El número promedio de deficiencias de riesgo identificadas y corregidas por observación fue de tres. La reflexión crítica después de la observación de la tarea y la experiencia de participación fue utilizada por los profesionales de salud y seguridad para reconocer lo que aprendieron, cómo se podría aplicar el aprendizaje a situaciones futuras, y la reflexión permitió la consideración de qué conocimientos y habilidades requerían aún más desarrollo. Este estudio encontró que el enfoque de aprendizaje experiencial implementado, apoyado por la mentoría, fue efectivo para capacitar a los profesionales de la salud y la seguridad en la práctica basada en la evidencia de la identificación de peligros y la gestión de riesgos en sus áreas de trabajo.

Palabras clave: aprendizaje experiencial, desarrollo de competencias, seguridad en la construcción, observaciones de tareas, investigación para la acción.

* Corresponding author.

Recibido: 18/01/2019 Aceptado: 02/05/2019

1. Introduction

Construction projects are dynamic with exposure conditions and exposure groups changing as the project progresses. No two construction projects are the same. People, work processes, tasks, equipment, tools, materials, and the work environment are not consistent, and they all influence the various determinants of exposures. If a hazard from an exposure source is not anticipated or recognized then it is not discussed, not assessed, not monitored, and not managed. Health and safety professionals use their technical ability in hazard identification, risk management, leadership influence, and effective communication to gain credibility and cooperation with others to prevent occupational injury and disease (Daud, Ismail, and Omar, 2010). During the construction of a copper mine in Kazakhstan, the work scope of the project from September 2015 to January 2016 transitioned from heavy civil construction of trenching, underground piping, underground power cables, and concrete foundation work to include structural steel erection, piping and equipment installation, electrical cable tray installation, scaffold work, and heavy crane lifts.

The Client had implemented international health, safety, and environment (HSE) standards on the project using OHSAS 18001 as a framework. As the scope of work increased to include multiple work disciplines located in several different work areas, it became evident that the contractor H&S team lacked the hazard recognition and intervention skills necessary to support the projects Zero Harm philosophy. The contractor H&S team needed to be trained and coached so they could self-manage and verify that project HSE standards were being implemented in their work areas, to recognize potential hazards, and to intervene effectively.

2. Methods

Action Research

An Action Research method was used to develop and monitor the implementation of using task observations as an experiential learning strategy to improve competency and engagement of the contractor H&S Team in managing risk in their work areas. Action research can be beneficial in an industrial setting because the study is practical, and the results can be meaningful to create relevant actions for improvements (Zhang, Levenson, and Crossley, 2014). Action research is a continuous process of four steps: Plan, Act, Observe, and Reflect. Upon reflection and data analysis, the intervention plan was revised. Within this continuous cycle of action and reflection, there were opportunities identified for action research cycles that could be explored for a deeper understanding of the full value that the experiential learning intervention could offer.

Experiential Learning Activities

Experiential learning theory (Kolb and Kolb, 2005) is based a constructivist approach that learning is an ongoing process of developing knowledge and skills through experience. Completion of the entire experiential learning cycle (Fig 1.) is needed for effective learning to occur and competency to be developed (Kolb and Kolb, 2005). Competency can be defined as demonstrating the expected application of knowledge, skills, attitudes, and values to perform professional practice in a realistic or closely simulated work setting (Pedro, Chien, and Park, 2018). Competency is enhanced through a repeated process of applying theory to practice; reflecting on the experience, developing meaning, and applying new understanding to more complex situations (Austin and Rust, 2015).

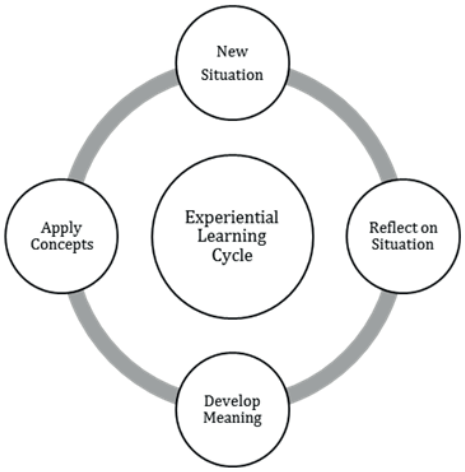

Figure 1. Kolb's Experiential Learning Cycle

Study Population and Context

A Chinese contractor employed 3200 people as part of their contract during the construction of the $2 billion USD Copper Mine located in eastern Kazakhstan. The contractor had a health and safety (H&S) team of 40 Chinese expatriates, of which 27 were work-area H&S practitioners. Only 7 of the 27 work-area based personnel had a certificate in Health, Safety, Environment from an internationally recognized body such as NEBOSH. Only 9 out of 27 had a post-secondary degree, the remaining had only completed high school. The average age was 38, with the oldest being 63 and the youngest was 27. The H&S team had an average of 14.9 years' experience in construction. Only 5 out of 27 had any experience working on a construction project using international HSE standards such as OHSAS 18001 and for 15 out of the 27 expatriates, this project was their first outside of China. The 27 work-area based H&S practitioners participated in this research study.

Training Development

A review was made of the types of incidents that had occurred on the project and the types of hazardous conditions identified during the client scheduled inspections. The project scheduled was referenced to anticipate the hazards associated with the type of work activities that would be occurring. An overall assessment was then conducted which evaluated the potential hazards from the types of tools and equipment used to perform the tasks, the quantity and types of hazardous materials, and the anticipated change in the work environment. The assessment identified nine categories of activities and HSE program elements that the contractor H&S practitioner needed hazard recognition and risk management competency. These categories were Crane Activities, Hot Work, Excavations, Working at Heights, Electricity (de-energization and isolation), Hazardous Materials, Confined Spaces, Environmental Protection, and General Activities.

A task observation checklist was developed for each hazard category. The checklist included specific items to meet the project HSE standards and the applicable HSE laws of Kazakhstan. The checklist served as a reminder of what items to look for and verify for different task hazard categories and the completed checklist would be a verification record of daily observations in the work area for each H&S practitioner.

A Task Observation and Engagement Training presentation was developed which included case studies from the project to assist the attendees in recognizing at-risk conditions and behaviors. The training was conducted in a workshop style that lasted 3 hours in a training room. The presentation included each of the nine categories of activities that observation checklists were created. The training presentation was developed in English and then translated into Chinese. A Chinese interpreter was utilized during the training workshop**.** Utilizing the project risk register created that identified over 90 specific hazards; 39 health and safety topics were developed into hazard awareness bulletins which were issued and discussed weekly to supplement the training.

Work Area Mentoring

The client H&S professionals provided one-on-one mentoring in the work areas to the contractor H&S practitioners. Coaching was provided on how to use the checklist to observe the activities that were occurring and interact with and confirm the understanding of the crew leader and workers in their responsibilities, training, and safe work procedures. The H&S practitioner were also coached in how to use the checklists to offer guidance to crew leaders on task planning and safe execution of the activities. The client H&S professionals used the mentoring interactions with the H&S practitioners to evaluate growth in competency by monitoring how task observations and engagements were being conducted, and by verifying understanding of risk management principles through discussions. The coaching of the contractor H&S practitioners occurred in their work area over a 4-week period and feedback was given on their completed task observation checklists.

Data collection

Data was collected from various sources: project inspection files and incident reports, observations of work areas and H&S practitioner interaction with others, structured and unstructured interviews, questionnaire surveys, and analysis of completed task observation checklists. To assess the effectiveness of the using the task observation checklist as an intervention, the Client monthly inspection records were compared for the 3-month period before the intervention to the 3-month period after the intervention strategy was implemented. The completed observation checklists were evaluated monthly to identify trends of hazards that were identified. A post-intervention questionnaire and interview were conducted on the use of the task observation checklist in August 2016, 4 months after implementation. The questionnaire was developed in English and then translated into Chinese. A Chinese interpreter was utilized during the completion of the questionnaire and a brief interview. All 27 H&S practitioners participated in a post-intervention questionnaire and interview on the use of the checklist 4 months after the implementation of the task observation checklist. All of those who participated in the questionnaire had received the 3-hour task observation course and completed task observations in their work area.

2. Results

Action research cycles

Action research cycles identified that the training workshop required followed-up with work area coaching. This resulted in the client assigning a mentor to each of the contractor trainees to provide up to one-hour of review, feedback, and coaching in their work areas. Another improvement identified was that the completed observation checklists needed to be reviewed by the contractor OHS area team managers to provide feedback and support to ensure corrective measures were assigned and implemented for open action items. A feedback loop to crew leaders and work area managers was needed to improve accountability and to incorporate into future task planning.

Task Observation and Engagement

After the implementation of task observation training and the observation checklist, the Client documented an average of 57 hazards each month for the period of April to June 2016, which was a 40% decrease as compared to the pre-intervention period of January to March 2016, which had an average of 93 hazards documented per month. In April 2016, the contractor completed 161 task observation checklists and 1121 at-risk deficiencies were identified in their work areas. In May 2016, 141 task observation checklists were completed, and 644 at-risk deficiencies were identified. In June 2016, 257 task observation checklists were completed, and 421 at-risk deficiencies were identified in their work areas. At-risk deficiencies included both physical hazards, non-compliance to project standards or legislation, and at-risk behavior of people.

Some deficiencies identified by the H&S practitioners were continuously repeated if the corrective measure could not be implemented by the work crew supervisor. Unresolved deficiencies were caused by a lack of resources, a lack of authority to make the correction, lack of cross-discipline coordination, or if an item needed to be purchased. The solution to this was to ensure that the area safety manager reviewed and followed up on the un-corrected deficiencies listed on the submitted observation checklists. The Client then decided to require the contractor construction manager to attend a scheduled weekly meeting with an agenda focused on HSE action items, to assign someone with the authority to rectify the deficiency.

On average, the task observation checklist took 45 minutes to document each day. Each day the H&S practitioner spent an average of 74% of their time in the work area. The average number of at-risk behaviors or conditions identified and corrected by each H&S practitioner was 3. Six of the twenty-seven H&S practitioners observed at least 5 at-risk deficiencies daily, with 8 at-risk deficiencies being the highest number reported by one individual. Through coaching, the H&S practitioner improved in making comments on the task observations, including both describing positive comments of their observations and in describing deficiencies that needed corrected and if they were corrected.

Trainee Feedback

The H&S practitioners said they give positive feedback to the work crew and supervisor most times or always when they observed work being safely executed. On a scale of 1-5 (1-never, 2-rarely, 3-sometimes, 4-most times, and 5-always) the 27 H&S practitioners were asked questions about workers and supervisors listening to safety instructions and about the safety leadership of crew leaders in their work areas. The H&S practitioners indicated that both workers (4.3) and work-crew supervisors (4.3) listen and follow "most times" the safety instructions to correct hazards and at-risk behaviors. The H&S practitioners responded that supervisors put safety first, sometimes to most times (3.8) over productivity. When asked to evaluate if they observed crew supervisors as excellent safety leaders who provided the work crews with safe work instruction, listen to workers concerns, provided correct tools and equipment to perform a job safely; the crew leaders were rated between sometimes and most time (3.7) as being excellent safety leaders. Three H&S practitioners said that in their work areas that crew supervisors never or rarely put safety as a priority.

The following are quotes from H&S practitioners regarding potential improvements to the Task Observation Checklists: "Need to modify the checklist as the project work scope changes and new hazards are introduced such as pre-commissioning activities", "Checklist should include manual material handling and body positioning", "Checklist should include tracking of corrective measures if not corrected immediately", "people should be assigned to areas and work tasks that match their skills and experience"

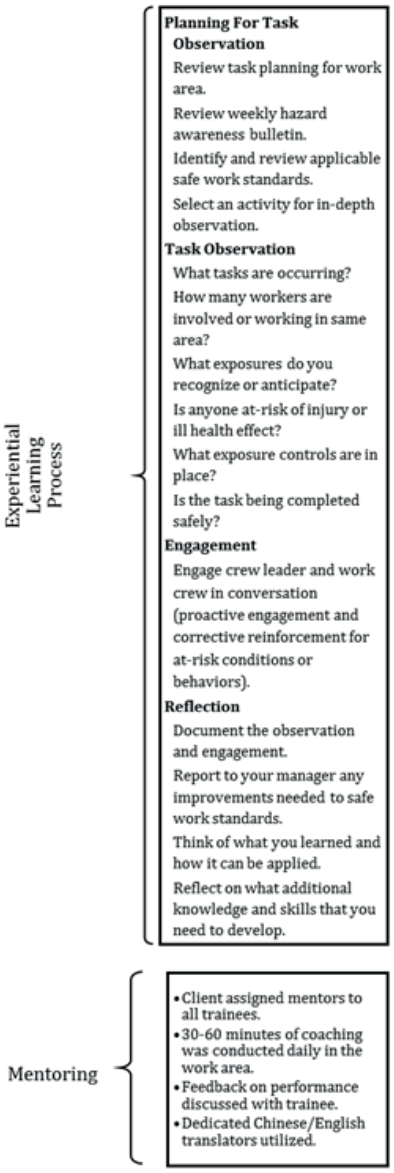

Figure 2. Experiential Learning Process and Mentoring

All (n=27) of the field H&S practitioners said they would use the same or similar task observation checklist on a future project. They also agreed that using the checklist helped them to learn to recognize hazards associated with different activities and to speak with workers or supervisors about deficiencies that needed to be corrected. The ongoing cycle of planning, observing, engaging, and reflecting created an opportunity for continuous learning and safety management systems improvement.

3. Discussion

The Action Research method used in this intervention was effective in identifying opportunities for improving consultation, communication, and generating opportunities for reflective practice in assessing different strategies for experiential learning improvement. Through the process of critical reflection on action taken, an individual can gain insight into management practices that need improving (Ronnie, 2016). This study found that the experiential learning approach implemented, supported by mentoring was effective to train health and safety practitioners in the evidence-based practice of hazard identification and risk management in their work areas. In a quantitative study of health and safety training of civil engineering students, the work site experiential learning group demonstrated significantly higher results in cognitive, affective, and psychomotor learning outcomes than a control group who attended only classroom instruction (Endroyo, Yuwono, Mardapi, and Soenarto, 2015).

Training for competency development is most effective when experiential learning activities are relevant to work-related application and supported by tutor or mentor engagement to give clarification and guidance when necessary

(Wang, Li, Pang, Liang, and Su, 2016). Negative group dynamics such as intimidation by others, power struggles, and feelings of being undervalued and disrespected can cause students to become discouraged and disengaged during experiential learning activities (Hoffman and Silverberg, 2015). It is believed that the strong presence of a client mentor in the work areas during the intervention program aided in keeping a respectful interaction between the work crews and the H&S practitioners during task observations and engagement.

Discussion with a mentor and receiving feedback was essential to confirm correct understanding, application, and usefulness. Development of health and safety practitioners can be impeded by a lack of mentoring support from experienced professionals to help them as they learn how to apply the course material in a working environment (Wells, 2014). Mentoring and discussing the completed observation checklists in the work area assisted in verifying that learning objectives were understood and could be applied. Reflecting on work-based experiences is aided when a student has a professional mentor or educational tutor to discuss learnings with or ask advice from (Wingrove and Turner, 2015).

The effectiveness of experiential learning is impacted when students feel overwhelmed due to cognitive overload, have a limited understanding of foundational knowledge, or lack a relevant opportunity to apply the theory in an authentic situation (Khalil and Elkhider, 2016). Learning objectives need to be performance-based and layered to build upon the previous knowledge, understanding, and experience. Research has shown that without the appropriate scaffolding of knowledge, students may fail to integrate the different components necessary to apply theory to practice during experiential learning activities (Susilo, van Merrienboer, Van Dalen, Claramita, and Scherpbier, 2013). Confined space entry is an example of a complex activity on the construction site that required scaffolding of various knowledge and skill (Fig. 3).

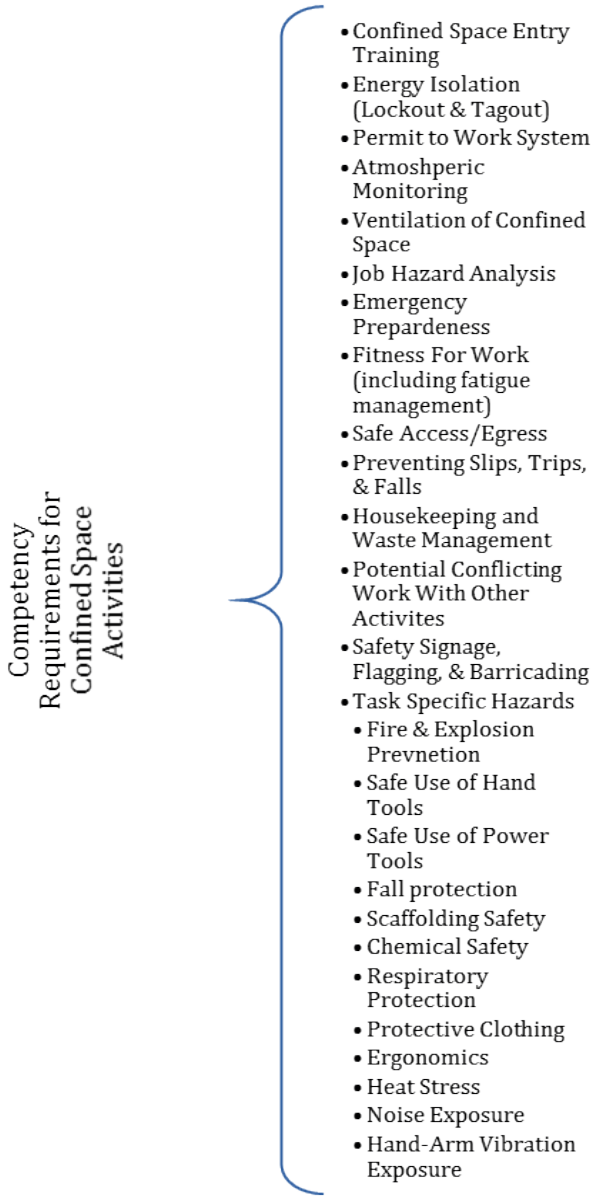

Figure 3. Competency for Confined space activities

The hazard awareness bulletins and observation checklists reminded trainees of key items to monitor during task observations. Hazard awareness bulletins need to be relevant to occurring and upcoming work activities or work environment to be utilized as applied learning aids. Checklists were not created for all types of work activities or sources of hazardous exposures. The trainees recommended that there was an opportunity to add occupational health hazards to some of the checklists that were used in this study, and in future projects, checklists for pressure testing and pre-commissioning activities which can be high risk should be created. Completing task observation checklists and field mentoring were effective in improving recognition of hazardous exposures, identifying non-compliance to project standards; providing a daily focus for consistent monitoring of work areas, and in creating opportunities for positive reinforcement of safe behavior or corrective intervention.

The observation checklists provided a daily focus for evaluating work areas and created opportunities for prompt intervention and positive reinforcement of safely executed work. Enhancement of learning has been reported to occur when the repeated practice of reflecting, recalling theory and applying to practice requires the development of a written summary or pictorial (Blunt and Karpicke, 2014). The quantity of time and quality of critical reflection during experiential learning has been reported to influence deeper understanding of course material and competency development of professional skills, applied theoretical understanding, and in the alignment of values with professional expectations (Stupans, March, and Own, 2013).

4. Conclusion

Professional competency is enhanced by reflecting on the resulting action and outcomes of an experience, to identify what was effective, what changes should be made, and how the knowledge learned can be generalized. The ongoing cycle of planning, observing, engaging, and reflecting provides an opportunity for continuous learning and safety management systems improvement. If the opportunity to observe or participate in a work situation to gain experience is not permitted by an organization or workgroup, then experiential learning will be inhibited.

Construction work environments are an opportunity for experiential learning. Health and safety practitioners need to develop knowledge and skills to anticipate, recognize, and effectively mitigate risk from hazardous exposures in the workplace to prevent occupational injury and illnesses. Experiential learning theory can be applied to train health and safety practitioners in the application of theoretical concepts in the workplace to gain knowledge and develop competency in the evidence-based practice of risk management.

BIBLIOGRAPHIC REFERENCES

Austin & Rust (2015). Developing an experiential learning program: Milestones and challenges. International Journal of Teaching and Learning in Higher Education, 27(1), 143-153. Retrieved from http://www.isetl.org/ijtlhe/pdf/IJTLHE1904.pdf

Blunt & Karpicke (2014). Learning with retrieval-based concept mapping. Journal of Educational Psychology, 106(3), 849-858. doi: 10.1037/a0035934

Daud , Ismail & Omar Z (2010). Exploring competencies. Professional Safety, 55(10), 39-47.

Endroyo, Yuwono, Mardapi, & Soenarto (2015). Model of learning/training of occupational safety & health (OSH) based on industry in the construction industry. *Procedia Engineering*, 125, 83-88. doi: 10.1016/j.proeng.2015.11.013

Hoffman & Silverberg (2015). Training the next generation of global health advocates through experiential education: A mixed-methods case study evaluation. *Canadian Journal of Public Health*, 106(6), e442–e449. doi: 10.17269/CJPH.106.5099

Khalil & Elkhider (2016). Applying learning theories and instructional design models for effective Instruction. Advances in Physiology Education, 40, 147-156. doi:10.1152/advan.00138.2015.

Kolb & Kolb (2005). Learning styles and learning spaces: enhancing experiential learning in higher education. Academy of Management Learning & Education,4(2),193-212. doi:10.5465/AMLE.2005.17268566

Pedro, Chien, &Park (2018). Towards a competency-based vision for construction safety education. IOP Conference Series: Earth and Environmental Science, 143 (1). doi :10.1088/1755-1315/143/1/012051

Ronnie L (2016). Reflection as a strategy to improve management practice: Insights from management education. Acta Commercii, 16(1), 1-7. doi:10.4102/ac.v16i1.392

Stupans, March G & Owen (2013). Enhancing learning in clinical placements: Reflective practice, self-assessment, rubrics and scaffolding. Assessment & Evaluation in Higher Education, 38(5), 507-519. doi: 10.1080/02602938.2012.658017

Susilo & Others (2013). From lecture to learning tasks: Use of the 4C/ID model in a communication skills course in a continuing professional education context. The Journal of Continuing Education in Nursing, 44(6), 278-284. doi:10.3928/00220124-20130501-78

Wang & Others (2016). Developing an integrated framework of problem-based learning and coaching psychology for medical education: a participatory research. BMC Medical Education, 162. doi:10.1186/s12909-015-0516-x

Wells, Jw. Jr. (2014, December). The evolution of OSH curricula: four decades of advancing the safety profession. Professional Safety, 24-26

Wingrove and Turner (2015). Where there is a WIL there is a way: Using a critical reflective approach to enhance work readiness. Asia-Pacific Journal of Cooperative Education, 16(3), 211-222. Retrieved from https://eric.ed.gov/?id=EJ1113550

Zhang, Levenson & Crossley (2014). Move your research from the ivy tower to the board room: a primer on action research for academics, consultants, and business executives. Human Resource Management, 54 (1), 151-174. doi: 10.1002/hrm.21616