Experiential learning: connecting theory and practice

Clara B. Vaz[1]

[1]Research Centre in Digitalization and Intelligent Robotics (CeDRI), Instituto Politécnico de Bragança, Campus de Santa Apolónia, 5300-253 Bragança, Portugal

Abstract

This study describes an experiential activity conducted with students enrolled in the Operations Management (OM) subject from Mechanical Engineering and Electrical Engineering Bachelors. This activity was the result of the close collaboration between university and industry, in which a company was involved in the learning process at the school and the students were involved in solving some real problems at the company workplace. This collaboration was crucial to innovate the experiential learning practices.
At the university, five seminars were taught by the staff company, in the topics of the OM subject during the first five weeks of the semester. After the seminars, the students developed some projects at the company workplace during six weeks. Each project was developed by a group of students, solving a real problem of the company where it was necessary to eliminate or reduce the waste with the supervision of the lecturer and the company staff.
The students all agreed that this experiential learning activity helped them to better understand companies' real problems and how the company works, enabling to boost the most relevant skills to be better prepared to handle the challenges that they will face in the real world.

Keywords: *Experiential learning; Skills; Company; Learning-by-doing*

1. Introduction

The universities are crucial in providing students with the required knowledge to be applied in unknown and evolving real world. For this, the students need a broad range of skills which have been promoted by the the Organisation for Economic Cooperation and Development (OECD) at the scope of the project OEDC Learning Compass 2030 [1] that distinguishes three different types of skills. These include the cognitive and metacognitive skills such as critical thinking, creative thinking, learning-to-learn and self-regulation, the social and emotional skills which include empathy, self-efficacy, responsibility and collaboration and the practical and physical skills in using new information and communication technology devices.

In today's changing world, the development of these skills appears critical, in which the university–industry collaboration plays a fundamental role to prepare students for the labor market [2]. Many universities have changed their traditional learning approaches and align them better with the OECD's requirements [3]. In turn, some approaches have been implemented to promote a more experiential learning where the students use their knowledge and develop their skills to solve problems. This often takes the form of work placement or internships. Futhermore, a simulated approach could be used to simulate real world problems to provide experiential learning [4].

According to Kolb [5] definition, in experiential learning the learner is directly in contact with real world environment that is being studied, developing certain skills that are not learnt in the traditional classroom setting which typically includes lectures, presentation of case studies and examples. Experiential learning can also promote the development of the skills such as communication, teamwork, problem

solving and creativity that are required competences demanded by employers. Thus, experiential learning can fill the gap between theory and practice [6].

The experiential learning approach promotes the “learning by doing” concept introduced by John Dewey in the beginning of nineteen century, in which if the people are actively involved in tasks that they understand, they learn best [7]. Nowadays, “learning by doing” concept appears in many learning theories, being exemplified in experiential learning as active learning and service learning [7].

This paper focuses on university-industry collaboration which promoted an experiential learning to students in workplace to enrich their skills and knowledge. Due to confidentiality reasons, the name of the company must be kept anonymous. This experiential learning activity was adopted during the second semester of the academic year 2014/15 at the Polytechnic Institute of Bragança (IPB), at the Operations Management (OM) subject taught to third year students enrolled in Engineering’ Bachelors.

2. Methodology

The IPB is a Portuguese University of Applied Sciences which the main objectives include the transferability of professional skills and the integration of applied research in their professional and technological education mission in which the university–industry collaboration plays an important role. Generally, the students perform an internship in the final scholar year to develop their business/industry-oriented project. The IPB–industry collaboration has been intensified in the academic year 2014/15, as some projects were also developed by students in some subjects in the company workplace. These projects included the solving of real problems in the industrial company located in Bragança district. To accomplish these aims, some subjects from Technology and Engineering’ Bachelors had to be reorganized in terms of learning and assessment methods. This paper describes an experiential learning activity adopted in the OM subject taught to the third-year students enrolled in the Mechanical Engineering (ME) and Electrical Engineering (EE) Bachelor degrees, at the same scholar schedule.

The OM subject is organized in 4 major topics during 15 weeks and comprises two hours per lecture, twice a week. This subject includes the forecasting methods, the inventory management models, the production planning and the quality control following Heizer *et al.* [8].

As the result of the close collaboration IPB-industry, an experiential learning was adopted. Thus, the company was involved in the learning process at the school and the students were involved in solving some real problems at the company workplace. At the university, five seminars were taught by the staff company, in different topics of the OM subject, two hours a week at the scholar schedule of the subject, during the first five weeks of the semester. After that, the students developed some projects at the company workplace. Each project was developed by a group of students in the company, solving a real problem with the supervision of the lecturer and the company staff. To implement this, a lecture of two hours per week was replaced by a similar time that the students spend in the company developing the project for six weeks.

During the remaining lectures, the topics were taught through case studies presentation and examples, encouraging the students to develop their own spreadsheets to solve the OM models which were included in the individual toolkit developed by each student.
In terms of assessment method, each student was evaluated by the toolkit developed during the semester and the project developed in the company which was presented during the lectures of the last week of the semester.

3. Results

The experiential learning activity involved 29 students which attended the OM subject, being 14 students from ME and 15 students from EE. A few sporadic absences were verified for justified reasons. Although the subject attendance for each student was obligatory, its participation on the projects at the company was completely voluntary. More than 95% of students that attended the lectures, performed the projects in the company.

3.1 Seminars and lectures

At the university, during the first weeks of the semester, five seminars were given by the staff company, in the topics of the pull system, quality tools, logistics inbound, levelling planning and lean tools such as the Kanban, once a week in the schedule of the OM subject. These seminars focused on the different wastes that can occur in the industrial company according to the lean principles and described the tools that should be used to eliminate or reduce waste in the real problem by each group of students. The aim of these seminars was to introduce the specific areas and needs of the company to the students.

During the remaining lectures, the topics were taught through case studies presentation and examples. Concerning the collaboration IPB-industry, some of sub-topics were adjusted to consider the needs of students in solving the real problem at the company workplace. Some analytic tools to streamline the process analysis and key performance improvement indicators to assess the performance were also taught during the lectures. For each topic, some coded spreadsheets were developed by each student to support the solving of similar exercises on the same topic. These coded spreadsheets are included in the individual toolkit developed and further assessed for each student.

3.2 Projects company oriented

Each project involved a study of a real problem of the company, where it was necessary to eliminate or reduce the waste. In the first stage, each group collected data about the real problem to further analyse it. In the second stage, the students used lean and quality tools to propose an approach to eliminate/reduce the observed waste in the studied problem. The students worked in their project at the company workplace from the middle of April until the end of May, once a week. During the first week at the company, the students received training in Occupational Safety and Health at workplace.

Seven projects were developed by the students, in which two of them solve quality problems concerning customer claims and the other five try to reduce/eliminate waste in logistics inbound and in four production departments. Each project involved three and four students. In order to maximize the expected results of each project, each group was supervised by the staff company and by the lecturer of the OM subject. This learning experiential has promoted a great variety of skills such as teamworking, problem solving, analysis, communication, collaboration and critical thinking.

3.3 Assessment and students' opinion

The students all agreed that this experiential learning activity helped them to better understand companies' real problems and how the company works, and to boost their skills. Each student was assessed through its toolkit performed during the lectures that included the coded spreadsheets and the project developed in the company workplace which was presented in the final lectures. The staff`s company feedback concerning the assessment of the projects developed by the students, was considered in the project evaluation. Furthermore, the performance and retention of students were improved by this experiential learning activity which involved the close collaboration IPB-industry.

3. Conclusions

This paper describes an experiential learning activity adopted in the OM subject, in which the company was involved in the learning process at the school and the students were involved in solving some real problems at the company workplace. This close collaboration IPB-industry was crucial to innovate the experiential learning practices, contributing to fill the gap between theory and practice.

The involvement of students in this experiential learning enabled to promote the development of the skills in the real world and to better understand how the knowledge could be applied in a company. This activity also promoted deep learning since the knowledge was much better interiorized than by using the traditional learning methods. Moreover, the performance and retention of students was improved by the experiential learning activity, increasing their learning success.

Although this study provides useful insights about experiential learning for educators, universities and companies, some limitations have been identified which in turn can be further explored in the future research. Firstly, the low number of students involved in the experiential activity which was also restricted by the company. Secondly, the feedback and skills acquisition were only based on the qualitative students' opinion.

References

[1] OECD "The Future of Education and Skills: Education 2030", http://www.oecd.org/education/2030/E2030 Position Paper (05.04.2018).pdf

[2] Martínez León H.C. "Bridging theory and practice with Lean Six Sigma capstone design projects", Qual. Assur. Educ., 27, pp. 41–55, 2019

[3] Manresa A., Berbegal-Mirabent J., Gil-Domenech D. "Challenging students to develop work-based skills: A PBL experience", Sixth International Conference on Higher Education Advances. pp. 561–568, 2020

[4] Hogan M. "From Times Square to Eyre Square: Hackathons as Authentic Learning for Information Systems Students", Sixth International Conference on Higher Education Advances. pp. 301–308, 2020

[5] Kolb D.A.Experiential Learning: Experience as the Source of Learning and Development, Pearson, NJ, 2015

[6] Matsoso M.L., Benedict O.H. "Work-integrated learning: A powerful connecting tool between classroom and industry", Int. J. Educ. Econ. Dev., 11, pp. 94–112, 2020

[7] Frache G., Nistazakis H., Tombras G. "Constructing learning-by-doing pedagogical model for delivering 21st century engineering education", Adv. Sci. Technol. Eng. Syst., 3, pp. 115–124, 2018

[8] Heizer J., Render B., Munson C.Operations Management: Sustainability and Supply Chain Management, Pearson Education, Inc, 2017