



Creative Construction Conference 2015 (CCC2015)

Teaching Lean Construction: Pontifical Catholic University of Peru Training Course in Lean Project & Construction Management

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Abstract

This paper describes the teaching strategies of the Lean Project & Construction Management Training Course, organized by the Civil Engineering Program of the Pontifical Catholic University of Peru, School of Science and Engineering, with the intention of inspiring other scholars and/or practitioners. It explains the Training Course objectives and content, as well as the principles, tools, techniques and practices of Lean Construction philosophy among others; it also includes the incorporation of management system tools and techniques that complement them. This paper also describes the lectures, workshops, and simulations made, as well as the feedback obtained from students' collaborative work routines, among others. The success of the Training Course is reflected in the opportunities for improvement identified between editing and publishing, made possible through the feedback collected from participants.

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1. Introduction

In 2012, the School of Science and Engineering of the Pontifical Catholic University of Peru designed and offered a Lean Project & Construction Management Training Course for the Civil Engineering Undergraduate Program. The design was based on the following premises:

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- Course duration of 42 hours, divided into 14 sessions of 3 hours each, including a break; 36 students.
- The course included workshops and simulation games to be developed during the sessions; the purpose of these activities was to improve the understanding of the Lean principles. One of the objectives was to use low-cost resources so the activities could be easily replicated by the attendees. Therefore, we only used paper, post-its, and stickers, in addition to multimedia equipment, for the workshops and simulation games. To date, 6 editions of this course have been offered; and a total of 202 students have received training. According to the surveys, the effectiveness of all activities was higher than 83%, which demonstrates the success of the activity.

2. Workshops, Simulation Games and Lean Construction Principles

This training course provides an understanding of Lean Construction Principles and methods through lectures, workshops, simulations, and discussion periods. Topics covered in the course include: Lean Principles, Lean Construction Principles, Lean Project Delivery System (LPDS), Target Value Design (TVD), Integrated Project Delivery (IPD), Last Planner System (LPS), Master Scheduling, Line of Balance, Pull Planning, Make Work Ready Planning (Look Ahead Planning), Weekly Work Planning, Production Control, Design and Optimization of Construction Operations, and Learning Loops and Project of Training Course. Table 1 shows the workshops and simulations programmed in key sessions:

	ACTIVITY	TITLE
1	Workshop 1 (WS1)	Alignment of Purposes: Owners' Needs and Values vs. Users' Needs and Values
2	Simulation Game 1 (SG1)	Reducing batch sizes and one piece flow
3	Workshop 2 (WS2)	Chunking and designing the production system for flow
4	Simulation Game 2 (SG1)	Complexity of the design and construction
5	Workshop 3 (WS3)	Pull Planning session using Line of Balance
6	Workshop 4 (WS4)	Balance flow improvement with conversion improvement: Balance Chart
7	Project of Training Course (P)	Collaborative Work in Last Planner System

Table 1: Workshops (WS), Simulation Games (SG) and Project of Training Course (P)

We intend to provide an understanding of Lean Construction Principles and methods through lectures, workshops, simulations, and discussion periods. We considered the principles for flow process design and improvement developed by Koskela [1], and the relevant lean construction principles developed by Sacks et al. [2], according to the following tables:

	PRINCIPLES FOR FLOW PROCESS DESIGN AND IMPROVEMENT	WS1	SG1	WS2	SG2	WS3	WS4	P	L
1	Reduce the share of non value-adding activities	X	X	X	X	X	X	X	X
2	Increase output value through systematic consideration of customer requirements	X			X	X		X	X
3	Reduce variability		X	X		X	X	X	X
4	Reduce the cycle time		X	X	X	X		X	X
5	Simplify by minimizing the number of steps and parts		X	X		X	X	X	X
6	Increase output flexibility	X	X		X	X		X	X
7	Increase process transparency	X	X	X	X	X	X	X	X
8	Focus control on the complete process		X	X	X	X		X	X
9	Build continuous improvement into the process	X	X	X	X	X	X	X	X
10	Balance flow improvement with conversion improvement		X	X	X	X	X	X	X
11	Benchmark		X		X		X	X	X

Table 2: Principles for flow process design and improvement in workshops (WS), simulation games (SG), Project of Training Course (P) and Lectures (L)

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