Experiential Learning in Lean Manufacturing

Measuring Student Perceptions of Innovative Assignments

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Introduction

Lean manufacturing concepts are complex and difficult to teach in a traditional learning environment.

- Experiential learning methods (Kolb et al., 2001) can be developed and used to provide students with a more in-depth understanding of these concepts.
- Through these experiential teaching methods, students can understand the Lean concepts better and can apply them in both personal and professional capacities.

This study aims to present how student learning can be enhanced in the Lean Manufacturing Systems and Concepts course by developing and implementing innovative experiential learning opportunities:

- Applied waste identification assignment.
- Applied 5S assignment.
- Semester-long team project that involves practical applications of Lean Manufacturing principles at local companies.

Overview of the Innovative Assignments

Applied 5S Assignment

- **Objective:** Students improve an area within their home through the application of 5S and document their progress and results.
- Students select a location within their home, such as their desk, kitchen shelving, laundry room, or any other area in need of organization.
- Throughout the assignment, students reflect on their activities for each stage of the 5S process: Sort, Straighten, Shine, Standardize, and Sustain.
- **Graded component:** A written report documenting their activities at each step.
- **Graded based on:** Students' application of each stage of the 5S methodology, along with explanations and photo documentation at each step of the assignment.
- Students gain **valuable insights into the 5S methodology** while making **tangible improvements** to their living or working environment.
- This assignment has similarities to the "5S Your Life" assignment designed by Witt et al. (2018).

Before | After

An example of the Applied 5S Assignment: Before and After Pictures

Applied Waste Identification Assignment

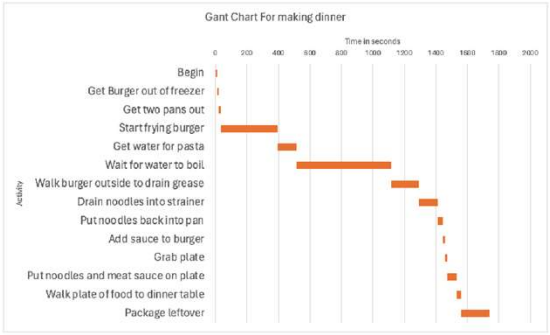
This is an innovative assignment, which is not documented in the literature.

Objective: Students identify the 7 wastes of Lean Production, which include overproduction, waiting, transportation, processing, inventory, motion, and rework, in a process they are familiar with.

3 main tasks:

1. Choose two different processes/jobs, either from their daily lives or from a process they have observed through work experience, such as doing housework/chores.
2. Break down each process into sub-activities using a Gantt chart to determine if they are value-added or non-value-added
3. Classify those sub-activities into the 7 waste categories.

Throughout this project, students learn the proper way to identify and categorize wastes, so they can work towards eliminating them. This assignment provides a unique experiential learning experience for students to learn about the 7 waste categories while actively applying course content in their personal lives.



An example of the Applied Waste Identification Assignment: Gantt Chart

Semester-long team project Assignment to solve real problems at companies

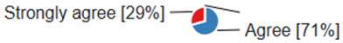
- **Objective:** Students engage in experiential learning by working in groups with a local manufacturing/service company and applying lean concepts to real-world problems.
- This project takes place over an **11-week period** and ends with a presentation to company managers at their facilities about their findings and improvement suggestions.
- Students work on a **real problem** that the **company wants to solve** using Lean methods.
- This project involves visits to the local company and documentation of activities and findings on a weekly basis. Each week covers a different topic, which also becomes an important aspect of the weekly discussion boards.
- **Goal for students:** define and address the specific Lean problem, collect relevant data, apply Lean methods, and present their findings.
- **Graded elements:** weekly discussion posts and discussion replies, the final presentation, and the project report.

Results

This study assessed the student perception of the impact of these methods on student learning using surveys (Spring 2024, Fall 2024, Spring 2025). Overall, students reported feeling more prepared to apply Lean concepts in real life and identified additional areas where these methodologies could be used to enhance processes in their lives. Specifically looking at the Applied Waste Identification Assignment, many students expressed how this assignment helped them understand the concepts, make their life more efficient and reduce waste in their daily tasks.

"How helpful was the waste identification assignment for you to understand lean concepts?"

"It helped me to understand how lean manufacturing techniques are applied in a real-life setting."



"It helped me to understand my daily processes and habits and learn more about myself."

"How helpful this Waste Identification assignment was for you to identify issues with your daily performance and improve your processes?"

Conclusion

Through this study, students were introduced to a combination of different experiential learning assignments, which led to a better understanding of lean manufacturing concepts, an opportunity to gain experience with industry professionals, and a chance to learn how to improve their lives using lean applications.

Our study is the first to incorporate multiple experiential learning opportunities with different lean concepts, including the novel waste identification assignment of which nothing similar has been introduced in lean manufacturing courses before. We found that these assignments led to students gaining a more thorough understanding of the course material and how to apply their knowledge in a professional and personal capacity.

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