Lean Manufacturing: The 5S System

Course Code: TIJ10

Broad Base Technology: Construction Technology & Manufacturing Technology

Grade Level: 9

Online Project Name: Lean Manufacturing: The 5S System

Related OVIN Sectors: Auto & Parts Manufacturing

# Introduction

Society is becoming increasingly aware of the need to minimize waste and maximize value. Lean Manufacturing is a business methodology designed to cut out chronic wastage and create an atmosphere of continuous improvement.

Proven to be highly impactful, many businesses are now expanding Lean programs throughout their organizations. We all use processes and those processes always have room for improvement. Think of NASCAR– the pit crews keep getting faster. After years of using Lean techniques they can service a car in seconds and are still finding innovative ways to be quicker. Those same techniques work in kitchens, construction sites, law offices and on movie sets. In a factory setting, sometimes it’s as simple as moving a tool bench closer to a machine to save the operator time walking back and forth. Savings from small things like moving a printer can add up over time.

Widespread knowledge of Lean would be beneficial to students as these skills are becoming more valuable – even basic Lean thinking is useful and can be applied far beyond manufacturing.

Adopting lean practices promotes:

1. Flexibility for change
2. Increasing quality and reliability
3. Minimizing waste
4. Reducing operating costs
5. Boosts productivity for staff and/or participants

# Project Outline

This project will teach students about the business methodology of Lean Manufacturing. Students will explore the various applications of Lean practices in different industries. They will learn about the 5S components of Lean and learn how this ideology works to cut out waste and work towards improved systems design. Learning via slideshow and supplementary videos, students will be asked to incorporate their learning into designing a pizza shop floor plan. Additionally, the class will be asked to brainstorm other areas of their school or community that could benefit from applying Lean practices.

By the end of this project students will…

* Be able to outline the concepts of Lean manufacturing
* Identify the 5S’ of Lean
* Think critically of their surroundings and existing systems that could be improved
* Adopt Lean practices into areas of their current and future lives

# Prior Knowledge

Students should have some basic knowledge of manufacturing processes and how items and products are made.

# Student Activities

### Activity 1 - [Lean Manufacturing Introductory Slideshow](https://docs.google.com/presentation/u/0/d/1q4pfujHmtqvd1eyppR3Su4rlomuFpczhMLGNPvHOSV4/edit)

Together as a class go through the [introductory slideshow](https://docs.google.com/presentation/u/0/d/1q4pfujHmtqvd1eyppR3Su4rlomuFpczhMLGNPvHOSV4/edit). Use this slideshow to introduce and cue discussions around manufacturing and the development of Lean Manufacturing with the aid of the slides and supplementary videos.

At the end of the slideshow, have students break into 5 groups. Assign each group one of the 5S’ (Sort, Set in Order, Shine, Standardize, and Sustain). Each group should research and define what their ‘S’ means and examples of how/where it has been incorporated in manufacturing. Each group should write their research on a poster to display around the class for the duration of this project and share/present their findings with their classmates.

**Time required**: 50-100 minutes

**Materials/equipment needed**: Projector, poster board/paper, and markers

### Activity 2 - [Lean Pizza Shop Assignment](https://docs.google.com/document/d/1azNKiB90ItbxzsWDR3xdvLP2G_jfNlfKJkoHmidPTlg/edit?usp=sharing)

Working in groups (or on their own), students will design a [pizza shop](https://docs.google.com/document/u/0/d/1azNKiB90ItbxzsWDR3xdvLP2G_jfNlfKJkoHmidPTlg/edit) that incorporates Lean practices and the 5S principles. They will be asked to consider and include a number of factors into their designs. After completing their layout they will be asked to fill in the [justification journal](https://docs.google.com/document/u/0/d/1azNKiB90ItbxzsWDR3xdvLP2G_jfNlfKJkoHmidPTlg/edit) worksheet.

**Option**: Have each group or individual share their project and reasoning to the class in a gallery-walk activity

**Time Required**: 50-120 minutes

**Materials Needed**: Project handouts printed, markers, scissors, glue sticks/tape, pencils

### Activity 3 - [Applying Lean in our Community Brainstorm](https://docs.google.com/document/d/1binK4f7cx1KhXJAhBelpurITu0UsBfoUrsxF6RoqDDc/edit?usp=sharing)

Using what you have learned about Lean manufacturing, is there anything in the school community that could be improved using the principles of Lean? Students/Groups should use the [Lean Brainstorm handout](https://docs.google.com/document/d/1binK4f7cx1KhXJAhBelpurITu0UsBfoUrsxF6RoqDDc/edit?usp=sharing) to identify inefficiencies that exist in your school/community. What are the possible solutions to improve them? How can you incorporate them to make change? Set the plan in motion and make it happen..

Here are some ideas that could spark the brainstorm:

**Problem**: Bottlenecked traffic in staircases and doorways or cafeteria

**Solution**: Clearly labeled in/out doors or arrows to assist in the flow of traffic

**Problem**: Unable to find tools easily in class shop

**Solution**: Clean and obvious work stations with colour coordinated tools

**Time Required**: 50 mins - ongoing

**Materials Needed**: [Printed brainstorm handout](https://docs.google.com/document/d/1binK4f7cx1KhXJAhBelpurITu0UsBfoUrsxF6RoqDDc/edit?usp=sharing), pencils

# Planning Notes

The following are suggestions when planning to perform this project:

* Set-up projector to show slideshows and videos
* Make copies of handouts for students (have available for online classroom)
* Have materials organized: scissors, markers and glue

# Resources

### Handouts

Lean Pizza Shop Project Material ([LINK](https://docs.google.com/document/u/0/d/1azNKiB90ItbxzsWDR3xdvLP2G_jfNlfKJkoHmidPTlg/edit))

Brainstorm Applying Lean Principles into our School/Community ([LINK](https://docs.google.com/document/u/0/d/1binK4f7cx1KhXJAhBelpurITu0UsBfoUrsxF6RoqDDc/edit))

### Slideshows

Lean Manufacturing Introductory Slideshow ([LINK](https://docs.google.com/presentation/u/0/d/1q4pfujHmtqvd1eyppR3Su4rlomuFpczhMLGNPvHOSV4/edit))

### Videos

What is Manufacturing ([LINK](https://www.pbslearningmedia.org/resource/factories/what-is-manufacturing/))

History of Manufacturing ([LINK](https://www.pbslearningmedia.org/resource/43fbb7a6-bcaa-48ec-b630-215df0276c78/history-manufacturing/))

New Trends in Manufacturing (Lean Manufacturing) ([LINK](https://www.pbslearningmedia.org/resource/e7826777-f1c5-4bd6-a009-45de79cb44b7/trends-manufacturing/))

Toyota Kaizen Video ([LINK](https://www.youtube.com/watch?v=wot9DFzFRLU))

### Assessment Materials

Rubric for Lean Pizza Shop Project ([LINK](https://docs.google.com/document/u/0/d/1azNKiB90ItbxzsWDR3xdvLP2G_jfNlfKJkoHmidPTlg/edit))

Justification Journal ([LINK](https://docs.google.com/document/u/0/d/1azNKiB90ItbxzsWDR3xdvLP2G_jfNlfKJkoHmidPTlg/edit))

Brainstorm: Applying Lean into our School and Community ([LINK](https://docs.google.com/document/u/0/d/1binK4f7cx1KhXJAhBelpurITu0UsBfoUrsxF6RoqDDc/edit))

### Assessment As Learning

* Ask questions and make suggestions based on daily observation
* Assess students’ cognition about their learning
* Students monitor their own learning and ask questions as needed

### Assessment For Learning

* Provide feedback to students about their learning and how to improve
* Create differentiated teaching strategies and learning opportunities
* Identify particular learning needs of students

### Assessment of Learning

* Evaluate each pizza shop project according to the rubric
* Students will complete a justification journal to assess their understanding of Lean
* Students will draft suggestions on how to incorporate Lean in the classroom or school

# Learning Goals and Success Criteria

Learning goals and success criteria are the foundation on which students base their ability to monitor their learning and determine next steps.

### Applicable learning goals may include any of the following:

* Students will learn various applications of Lean practices
* Students will learn about the production and manufacturing of goods and services
* Students will discover the importance of efficiency and efforts for continuous improvement

### Success criteria may include any of the following:

* I will demonstrate the ability to identify inefficiencies
* I will demonstrate the ability to brainstorm for possible solutions to problems
* I will be able to explain the process of manufacturing and its evolution
* I will be able to identify the 5S’ of Lean manufacturing principles
* I will be able to design an effective pizza shop layout that incorporates Lean ideology
* I will be able to consider how to incorporate Lean principles in my classroom and community

# Overall and Specific Expectations in Support of Ontario Curriculum Grade 9 Technological Education

### Overall Expectations

A1.demonstrate an understanding of the fundamental concepts and skills required in the planning and development of a product or service, including the use of a design process and/or other problem-solving processes and techniques;

A2.demonstrate the ability to use a variety of appropriate methods to communicate ideas and solutions;

A3.evaluate products or services in relation to specifications, user requirements, and operating conditions.

### Specific Expectations

A1.1 describe a design process or other problem solving process for planning and developing products and/or services

A1.4 incorporate appropriate technological concepts (e.g.,aesthetics,control,environmental sustainability/stewardship,ergonomics,fabrication/building/creation,function,innovation,material,mechanism, power and energy,safety,structure,systems)in the design, fabrication or delivery, and evaluation of a product or service

A2.1 use a variety of appropriate methods to communicate information or ideas and concepts during the planning and production stages of a project (e.g.,production plans,scripts,flow charts, storyboards,sketches,technical drawings,recipes, client consultation reports,design briefs);

A3.2 suggest improvements to a product or service on the basis of a set of criteria relevant to that product or service (e.g.,durability,reliability, ease of use, eco-friendliness, appearance, safety, customer satisfaction).

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