

# Hands-On Approaches to Teaching Lean Process Design

**Sharon A. Johnson, Worcester Polytechnic Institute**

**Susan Pariseau, Merrimack College**

**Venkat Allada, Missouri University of Science and Technology**

**Terry Shehata – TimeWise Management Systems**

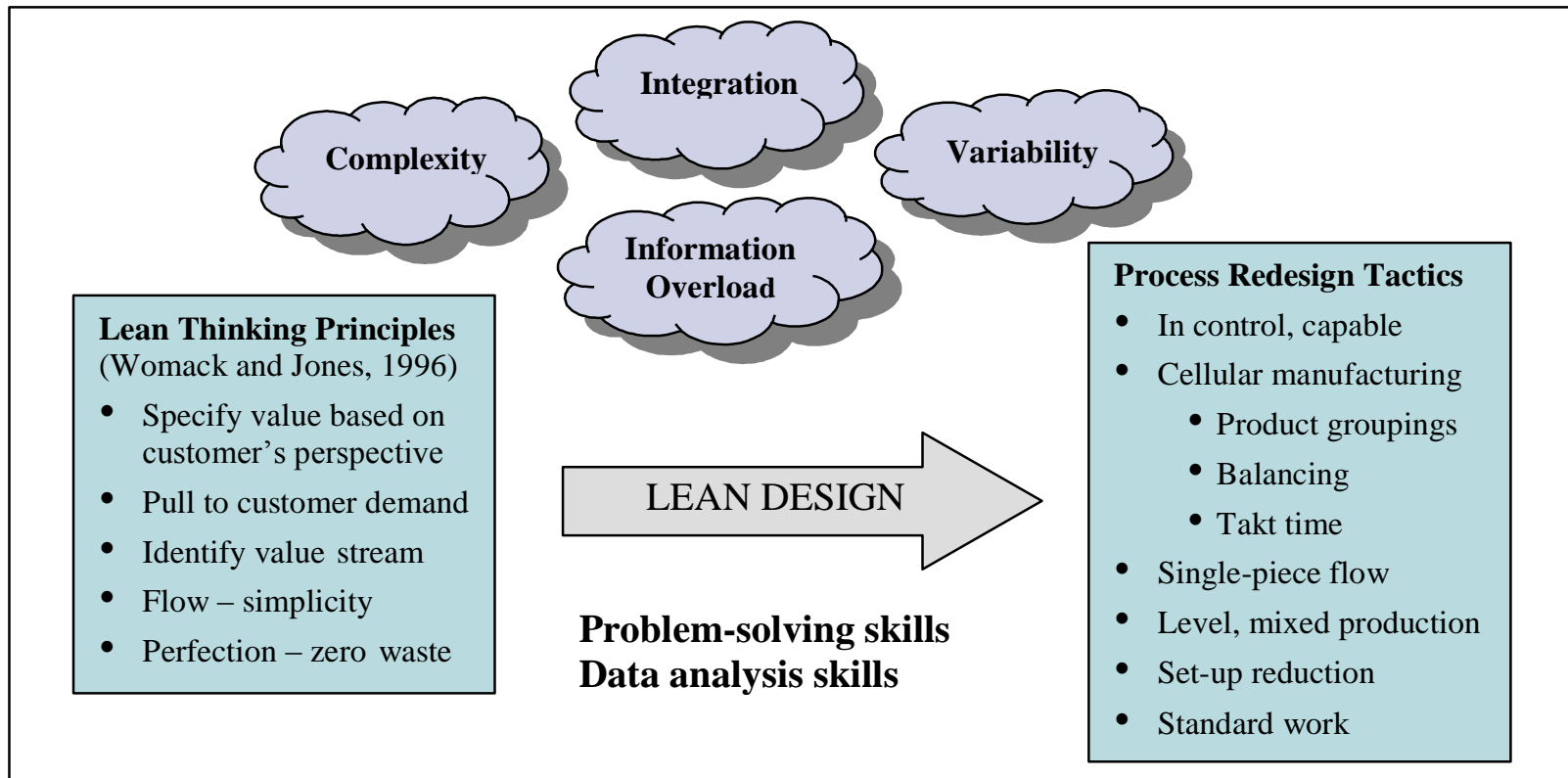
**Massachusetts MEP STEM SYMPOSIUM**

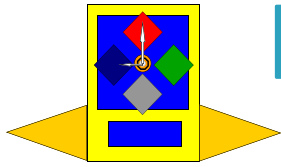
**December 3, 2008**

**Worcester, MA**

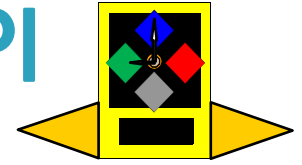
# Motivation

- Lean thinking: transformed process design
- Traditionally: piece-meal, focused on science and tactics





# Process Design Lab at WPI



	Course Topics	Lab Description
<b>Part I: The Big Picture</b>	Strategy and Competitiveness	<b>Lab #1: Traditional Process</b>
	Product/Process Design Mfg./Service	
<b>Part II: Value and Flow</b>	Process Analysis, Lean Principles	<b>Lab #2: DMAIC Problem-Solving</b>
	Quality Management & Capability	<b>Lab #3: Balance and Flow</b>
	Facility Layout	
<b>Part III: Zero Waste and Demand Pull</b>	Mfg Planning/Control	<b>Lab #4: Demand Pull, Perfection</b>
	Visual Control, 5S	
	Services/Capacity Management	
<b>Part IV: The Supply Chain</b>	Supply Chain Design	<b>Lab #5: Product Customization</b>
	Process Behavior, Queuing	
	Lean Implementation	



Kitting

Face Assembly

Back Assembly

Clock Assembly

Hand Assembly

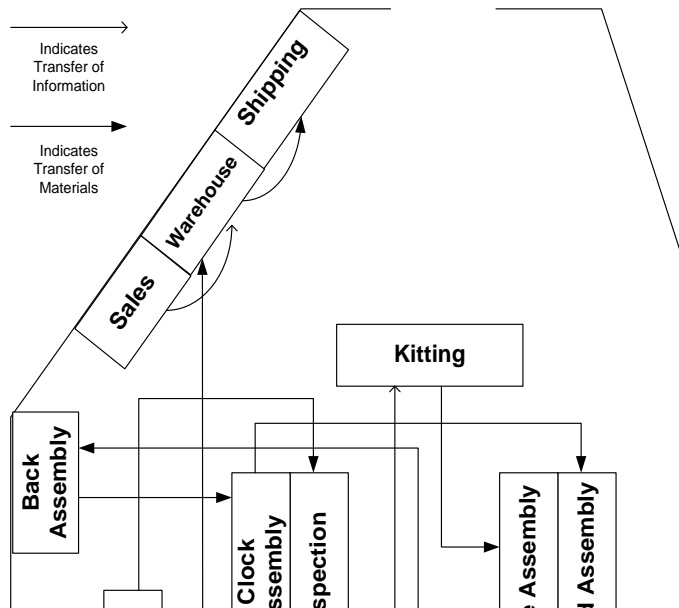
Inspection & Rework



Production Scheduler  
Material Handling  
Supervisor  
Tool Crib Attendant  
Industrial Engineers  
Warehouse Clerk  
Sales Representative  
Trucker

# Inquiry Example: Creating Flow

Initial Layout

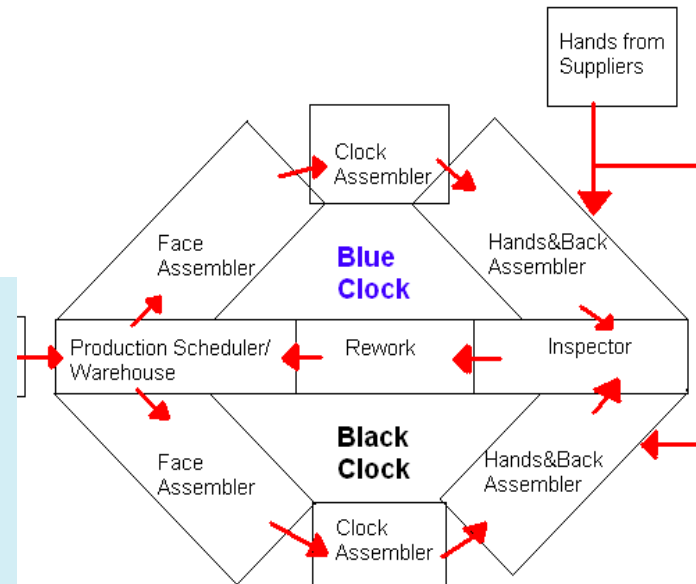


## Questions:

- Is the circular flow effective?
- Is it good to separate assembly of blue and black clocks?
- Which activities can be combined or eliminated?

## Next Step?

- **Prescriptive:** Set up redesigned process & layout before lab, students experience benefits
- **Open-ended:** Students develop designs as HW, present them, and decide on a new process & layout



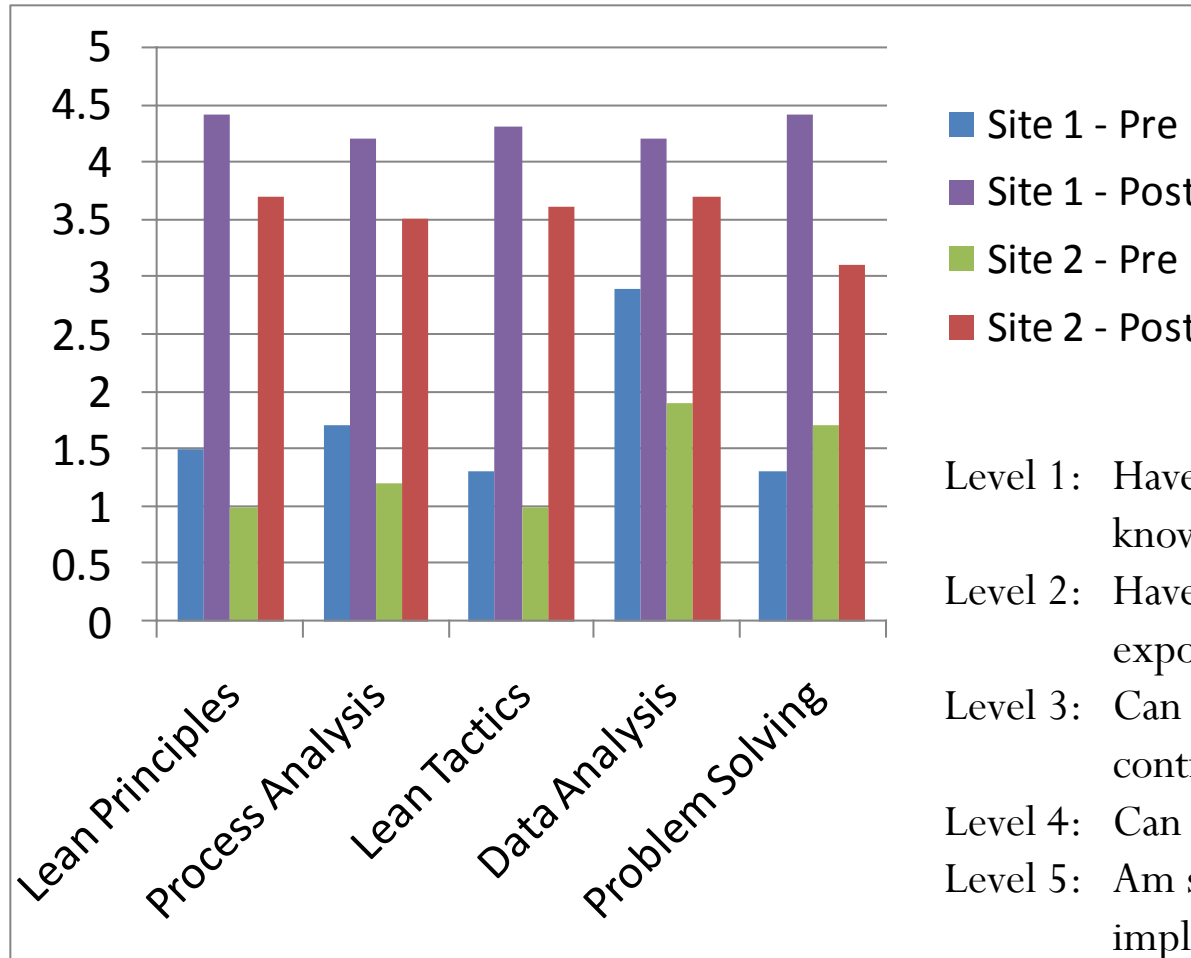
# Project Goals



- Create new learning materials by developing **15 Lean Process Design Case Studies** anchored to Time Wise™
  - Different scenarios, solutions
  - Examples:
    - Healthcare, product design, green processes
    - Kanban, risk
- Develop faculty expertise: workshops/follow-up support
- Implement educational innovation by testing the materials at diverse sites (currently 19 colleges/universities)
- Assess learning and evaluate innovations

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# Proficiency



- Level 1: Have no exposure to or knowledge of
  - Level 2: Have experienced or been exposed to
  - Level 3: Can participate in and contribute to
  - Level 4: Can understand and explain
  - Level 5: Am skilled in the practice or implementation of
- (Crawley et al., 2007; Murman et al., 2005)

# Styro Video

	Average # of Lean Principles Identified	Average # of Examples of Waste	Average # of Changes Proposed
Simulation	2.2	6	4.8
Lecture	2.1	6	3.2

Waste, flow

Pull, perfection

Balance capacity  
 Pull system  
 Change layout  
 Reduce setup  
 Modify steps  
 Preventative maintenance  
 Point of use storage

# Conclusions/Questions

- Students and faculty are enthusiastic!  
Learning improvements
- Questions:
  - What curriculum should be developed at the secondary level to encourage students to think about engineering *processes*, not just products?
  - What aspects of lean should be emphasized in the case studies that are being developed?
  - How can training and teaching methodologies be improved to encourage students at all levels to think critically about lean techniques, so they can apply them in a variety of ways?