Lesson Planning Template **Teacher: DeSIRE**

📆Date:	Topic: Energy Systems - History of Manufacturing	Time Required: 30 minutes

🎯**Learning Target/Objectives:**

- I can explain how many food, pharmaceutical, and energy system technology products are made through the process of manufacturing.
- I can explain through research the history of manufacturing and develop your skills using technology.
- I can think critically about the importance of the manufacturing process.

📜**Vocabulary:**

- Advanced Manufacturing
- Assembly Line
- Bill of Materials
- Corrective Action Request
- Computer-Aided Manufacturing
- Cycle Time
- Downtime
- Discrete Manufacturing
- Energy Systems
- Good Manufacturing Practices
- Human-Machine Interface
- Industry 4.0
- Machine Monitoring
- Manufacturing
- Manufacturing USA
- Make-To-Order
- Mean Time Between Failures
- Mean Time to Repair
- Original Equipment Manufacturer
- Performance %
- Programmable Logic Controller
- Quality %
- Six Sigma
- Standard Operating Procedure
- Time To Market
- Quality Management System

Color Legend:
Red = Essential
Blue = Enrichment
Purple = In Depth

❓**Guiding Questions:**

- What is manufacturing?
- How were items created in the past vs the present?
- What are some products that are manufactured?
- What were some of the major developments made in manufacturing?
- Provide some examples of the technology that has been created that benefits/is used in manufacturing
- How has manufacturing developed over time?
- How were products produced in the past (when modern technology was not available)?
- How is robotics used in manufacturing?

📚**Lesson Design Details:**
Activity 1: Introduce the lesson by watching manufacturing videos and discussing the guiding questions

Activity 2: Have students work either individually or in groups to research the guiding questions

Activity 3: Students will gather information about manufacturing

Activity 4: Create a discussion board (either on the smartboard or on a piece of poster paper) with the information students gathered

Activity 5: Create a timeline of how manufacturing has developed

Activity 6: Culminating Activity

Activity 7: Students will update their digital journals with relevant answers, questions, conclusions and next steps.

📝**Materials/Resources:**
- Digital Journal (Google Slides RECOMMENDED):

📋**Closing (Check for Understanding):**
- Discussion Review - students will share
  - Answers to Guiding Questions
  - Any surprises they experienced

Subject	Middle School Standards (NC)
Science	6.P.3.1 Explain how to measure mass, length, and volume of different materials.
	7.P.2.1 Explain how the movement of molecules can be affected by factors such as temperature, pressure, and volume. Discussing how manipulating heat (e.g., smelting, forging) or pressure changed materials in manufacturing.
	8.P.1.2 Explain how the law of conservation of energy applies to the transformation of energy from one form to another. Analyzing how energy was transformed (e.g., water falling to turn a mill, wood burning to create heat) in various manufacturing stages.
	8.E.2.2 Explain the use and consequences of multiple energy sources and their impacts on the environment. Examining the historical shift from renewable (wood, water, wind) to non-renewable (coal) energy sources and their environmental consequences in early industrialization.
Mathematics	6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. Calculating production rates, resource consumption per unit, or labor efficiency in historical contexts (e.g., how many widgets per hour).
	7.RP.A.2 Recognize and represent proportional relationships between quantities. Analyzing proportional scaling in manufacturing (e.g., doubling input materials doubles output), or cost analysis over time.

	8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Graphing historical production data, energy usage, or workforce size to visualize trends and changes in manufacturing output and inputs.
Computer Science	6.AP.1.1 Develop an algorithm to complete a task. Deconstructing multi-step manufacturing processes (e.g., how to build a simple tool) into sequential instructions or 'algorithms'.
	7.IC.1.1 Understand the positive and negative impact of computing technologies on society, culture, and the economy. Discussing the precursors to computing impacts: how early technological innovations (e.g., the power loom, steam engine) profoundly impacted society, labor, and the economy, setting the stage for later analysis of digital technologies.
	8.DA.1.1 Collect, organize, and summarize data from a variety of sources. Considering how early manufacturers might have tracked resources, inventory, or production output, even without digital tools, and the importance of this 'data'.

ITEEA STEL (Standards for Technology and Engineering Literacy) for Middle School

STEL Standard (Grades 6-8)	Benchmark (Grades 6-8)	Supporting Description Relevant to DeSIRELesson01A
Standard 2: Core Concepts of Technology and Engineering	STEL-2M. Differentiate between inputs, processes, outputs, and feedback in technological systems.	This is highly relevant to analyzing assembly lines, which the lesson introduces, distinguishing between human and robotic assembly, production, and resources needed.
	STEL-2R. Compare how different technologies involve different sets of processes.	This relates to distinguishing between manufacturing operations in food, pharmaceutical, and energy systems, which are the core industries studied in DeSIRE.
Standard 4: Impacts of Technology	STEL-4K. Examine the ways that technology can have both positive and negative effects at the same time.	This supports the Computer Science standard 7.IC.1.1 (Understand the positive and negative impact of computing technologies on society) by addressing technology impacts generally.
Standard 5: Influence of Society on Technological Development	STEL-5F. Analyze how an invention or innovation was influenced by its historical context.	This is critical for the "History of Manufacturing" focus. This analysis helps students understand how early technological innovations, like the power loom or steam engine, profoundly impacted society, labor, and the economy.

Standard 6: History of Technology	STEL-6C. Compare various technologies and how they have contributed to human progress.	This directly addresses the learning objective to research the history of manufacturing.
	STEL-6D. Engage in a research and development process to simulate how inventions and innovations have evolved through systematic tests and refinements.	This relates to the research and critical thinking goals of the lesson concerning manufacturing evolution.
Standard 7: Design in Technology and Engineering Education	STEL-7Q. Apply the technology and engineering design process.	The Engineering Design Process is explicitly listed as a focus topic for 6th Grade in the DeSIRE curriculum.
Standard 8: Applying, Maintaining, and Assessing Technological Products and Systems	STEL-8K. Design methods to gather data about technological systems.	This supports the 8th-grade objective (8.DA.1.1) regarding collecting data and highlights its importance in technological systems like those found in advanced manufacturing.

ISTE Standards (Student Standards 1.1–1.7)

Content Area Standard	ISTE Standard	Supporting Description Relevant to DeSIRELesson01A
1.3 Knowledge Constructor	1.3.a.	Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits. (Relevant to researching the "History of Manufacturing".)
	1.3.d.	Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions. (Relevant to explaining how products are made and thinking critically about the manufacturing process.)
1.5 Computational Thinker	1.5.a.	Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions. (Relevant to applying algorithmic thinking to manufacturing processes, supporting 6.AP.1.1).

	1.5.b.	Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making. (Relevant to collecting and summarizing data, supporting 8.DA.1.1).
	1.5.d.	Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. (Relevant to understanding manufacturing processes and automation concepts.)
1.7 Global Collaborator	1.7.c.	Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal. (Relevant to team-based learning activities integral to DeSIRE's PBL approach.)