# MODIFIED UBD LESSON PLAN



**COURSE:** Discovering STEM

UNIT: Manufacturing a Product EXERCISE: Will it Sell TIME FRAME: 1 Hour

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PREPARATION: Summary of "to do's" that the teacher should understand and prepare before bringing this lesson to the classroom.

- 1. Agree ahead of time what you will do with whatever money (profit) is generated from sales. Donating to a charitable cause, like a food pantry, is a good idea.
- 2. Choose a quality assessment manager. The quality assessment manager should be student savvy. Students can be confused and aggressive when they are under pressure. Make sure the manager understands that their job is assessing, not criticizing. He or she should be careful not to tear down aspirations of success.
- 3. Negotiate the rules and regulations or predetermine them prior to the engineering phase. Most of this methodology is determined by how much time you have to dedicate to the process. Other factors include tools, materials, and production.

Teachers will need to ensure that the proper supplies are available for students to build their solutions.

#### Materials:

- Sequins metallic 800pc
- Sticks craft pk1000
- Glue elmers school 4oz
- Magnets craft 1/3" pk100
- Bead pony opaque pk/1600
- Sequins & spangles shaker
- Glue stic mini altemp pk50
- Foam wonderfoam tub

#### Tools:

- Glue gun high temp
- Scissors safety point 7"



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SAFETY: Summary of safety strategies in the lesson.

Safety is a mandated element of this activity. Supervision when using the hot glue gun is advised.

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## DESIRED RESULTS: ESTABLISHED GOALS:

Problem Solving Techniques and Applications Standards:

Teachers should use the STEM Academy Standards Correlation System available in the STEM Connections area of a unit to extract specific standards and insert these standards here.

#### TRANSFER:

Students will be able to independently use their learning to...

- Problem solve and develop a design given product specifications and manufacturing limitations
- Fabricate or brainstorm a product to sell using their knowledge of sales and distribution
- Analyze a product to see if it meets quality standards

#### MEANING:

#### **ESSENTIAL QUESTIONS**

Students will keep considering...

#### UNDERSTANDINGS

Students will understand that...

- Engineers have to constantly fix and improve products to meet current manufacturing standards and consumer demands
- Experimentation and testing often end in failure, leaving room for improvement and a better final product
- Manufacturers have to follow OSHA's (Occupational Safety and Health Administration) safety standards to reduce the risk of workers' health complications or injuries
- The CAD (Computer-Aided Design) tool creates three-dimensional models and provides more accurate details than a two-dimensional sketch
- The CAD/CAM (Computer-Aided Manufacturing) is used to process materials for production
- Companies need a quality purchasing agent to order industrial or raw materials at the best price with the best delivery time
- The type of fabrication used for a product is highly dependent on the type and amount of product needed to be manufactured
- Quality assurance tests are essential for making sure a product meets standards and specifications
- A product's packaging is highly essential to attract consumers and securely protect the merchandise
- A product may be fabricated at various manufacturers before it is ready for the purchaser

- Why do designs continue to change over the years?
- In what ways can engineers improve efficiency and keep costs down for manufactured products?
- In what situations would you want to purchase raw materials? Industrial materials?
- How do purchasing agents determine which materials to order?
- What manufacturing processes are most useful for which kinds of products?
- What are the types of production? How do you determine which type to use for a product?
- Why do we need quality-assurance tests?
- How do you design a product to sell?
- What purpose does packaging serve?
- Why might we need safety standards at a manufacturing company?
- How can we reduce the risk of injury within a company?



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#### ACQUISITION OF KNOWLEDGE AND SKILL:

Students will know...

• The seven parts of the manufacturing system and how it is organized

- Rules and regulations commonly used within a manufacturing company
- The different manufacturing processes and when they are useful
- The importance of safety in a company and common safety standards created by the OSHA
- The role computers play in manufacturing and their importance to production
- What information is needed to make a bill of materials
- The difference between raw and industrial materials and which material to order for a given product
- The different types of manufacturing processes
- CAD/CAM and how the program is useful and efficient
- The four types of production and when they are needed
- The quality-assurance test and how to apply it to a product
- The purpose of packaging
- The different kinds of distribution

- Students will be skilled at...
  - Developing ideas and working together as a team
  - Designing for manufacturability
  - Making a bill of materials
  - Compromising on a final design and create a prototype
  - Identifying manufacturing methods
  - Determining effective processes
  - Choosing appropriate materials
  - Operating equipment safely
  - Managing time and production factors
  - Sketching and drawing in order to communicate
  - Calculating material usage
  - Determining product quality in relationship to value
  - Identifying and maintaining appropriate working attitudes and behaviors
  - Measuring and evaluating time and production inputs
  - Calculating an appropriate selling price for a product
  - Making decisions concerning design elements

## 2 EVIDENCE:

#### **EVALUATIVE CRITERIA:**

- Effort/Commitment
- Self-motivated
- Followed criterion
- Appearance
- Creativity
- Time management
- Completion

#### ASSESSMENT EVIDENCE:

Performance Task(s):

#### Will it sell?

This activity teaches the different aspects of manufacturing through the eyes of a designer. Teams will design a product utilizing custom, job lot, and mass production as the process to produce a product for sale. The question is: will it sell?

Students will develop and design the final product as well as figure out how to set up the management, labor, and design aspects that affect the resulting outcome of the product. There will be unknown circumstances imposed on the teams that will challenge their ability to produce the product, but the ultimate challenge will be the team's ability to problem solve and see the outcome of selling the product throughout the process.

Other Evidence:

Thoughtful, clear, thorough

Self-assessment



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### LEARNING PLAN: Summary of Key Learning Events and Instruction

**Summary:** Develop and design a refrigerator magnet that will be produced utilizing a specific method of manufacturing. The goal is to effectively produce and sell the largest percentage of products as it relates to the materials supplied. The method of determining this percentage will be decided by a Quality Assessment Manager (principal, local business dignitary, parent, etc.). That person will evaluate the quality of the end result product and determine if it is fit for sale. If it meets the specifications (negotiated by the class prior to the manufacturing run), then each team will try to sell their products throughout the school within a designated period of time (20 minutes for example).

#### 1. Introduce

a. Summarize the activity and explain what the students will be doing. Have students listen and read along as you go over the problem and directions on the design brief.

#### 2. Brainstorm

- a. Students should individually brainstorm and write down ideas in Step 1.
- b. Determine the rules and regulations with the class for the entire company to follow. Some constraints might include: cost, available resources, available skills, available time, safety considerations, size limits, aesthetics (be pretty), manufacturing quality, and able to be sold. These rules and laws can be predetermined, but there is a great deal of learning accomplished when they are negotiated. Discuss the constraints as a whole class and have students write down any additional constraints on their Design Brief in Step 2.
- c. Divide the class into teams. Pick a manufacturing style for each team (random, draw, etc.) and hand out materials.
- d. Each team or group will need to discuss, sketch, think tank, and exercise creativity. Students will take turns talking about their ideas in Step 1 and write or sketch group ideas in Step 3. Try to focus the activity by managing it with a specific amount of time. The pressure of being pushed will include more engagement from all of the team members. The goal of developing ideas is to get to the final solution.
- e. Have each team compromise on a final design and construct a prototype with a final drawing. After discussing possible solutions, have the students decide on a solution and draw the final plan in Step 4. It might be necessary to make a prototype or model (this will utilize some of the materials) for information. This information will help the team set up the manufacturing system. There may be jigs and fixtures that need to be constructed. A final drawing needs to be constructed before final production can begin.

#### 3. Construct

a. Students will set up the process run. Students will discuss and make a plan, draw the pictures, and simulate making the product. Warn them not to waste materials since they only get so much to work with. Have them work out the kinks, shorten distances, and improve efficiency, regardless of the system. They will run several trials and document data. Students will reflect on their data and discuss how to make modifications prior to starting production.

#### 4. Test

- a. Students will run the production lines. They will take notes and make observations about how well the solution works.
  - O What might you do better the next time?
  - O What worked well?
- b. Students will prepare their products to be presented to the Quality Assurance Manager (teachers, parents, assistants, etc.).
- c. Students will sell the product. Students will develop good marketing strategies so that the teams do a nice job selling the product. Give the students a time constraint to sell as many products to other students or teachers outside of the class as they can.

#### 5. Communicate Results

a. Debrief with the class and allow for feedback. Have the students write a half page self-reflection based on the questions in Step 6.

## **Progress Monitoring:**

Teacher should observe students and provide on-going feedback during the activity. While introducing the unit, the teacher will pause and ask for questions to make sure everyone understands.

Students will complete self-assessment and brainstorm how they could improve their skills in the future. At the end of the unit, there will be a quiz to measure their overall understanding. During the activity, students will experience failure and success at different times than others. Make sure every student understands failure is okay, and it is a normal part of designing and product.



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DIFFERENTIATION: Summary of Key Differentiation Techniques

Please use this space to insert your differentiation techniques. Depending on the needs of students, various techniques might be needed in a classroom, therefore use the information below and experts in the area needed to design your plan for differentiation.

The ASCD Study Guide for Integrating Differentiated Instruction and Understating by Design: Connecting Content and Kids. by Carol Ann Tomlinson, Jay McTighe

Integrating Differentiated Instruction and Understating by Design: Connecting Content and Kids. by Carol Ann Tomlinson, Jay McTighe ISBN-13: 978-1416602842 ISBN-10: 1416602844

Differentiating Reading Instruction by Laura Robb. ISBN13: 9780545022989

A Teacher's Guide to Differentiating Instruction
The Center for Comprehensive School Reform and Improvement



CAREER CONNECTIONS: Summary of Career Opportunities Associated with this Lesson

Please use this space to insert careers that might be connected to this lesson. This section will need continuous updating as new careers and emerging technologies change the opportunities available in the workforce.

Good sources for career connections:

Occupational Outlook Handbook <a href="http://www.bls.gov/ooh">http://www.bls.gov/ooh</a>

The National Career Clusters® Framework http://www.careertech.org/career-clusters



KEYWORDS: Please Insert Keywords from this Lesson with their Definitions

Please use this space to insert keywords and their definitions Use resources like dictionary.com to find definitions to your keywords

