

Lesson Plan

Course Title: Manufacturing Systems

Session Title: Creating a Plan or Drawing

Performance Objective:

Students will create a sketch/drawing of a picture frame.

Specific Objectives:

Create a drawing of a product to be manufactured.

Design a pictorial sketch of the product.

Preparation

TEKS Correlations:

Manufacturing Systems

123.43(2)(A)

...Apply manufacturing technology to individual or community problems;

123.43(3)(A)

...Describe the design processes and techniques used in manufacturing;

123.43(6)(B)

...Describe the manufacturing processes;

123.43(9)(A)

...Develop a plan for completing a manufacturing technology project;

123.43(9)(B)

...Participate in the organization and operation of a real or simulated manufacturing project;

123.43(13)(A)

... Develop, or improve, a product by following a problem-solving strategy;

123.43(13)(B)

...Apply critical-thinking strategies to the analysis and evaluation of proposed technological solutions;

123.43(13)(C)

...Apply decision-making techniques to the selection of manufacturing technology;

123.43(15)(A)

...Use written, verbal, and visual communication techniques consistent with industry standards;

123.43(15)(B)

...Use mathematics concepts in manufacturing technology;

123.43(15)(D)

...Use the appropriate units of measure;

123.43(18)(B)

...Use teamwork to solve problems;

123.43(18)(C)

...Distinguish between the roles of team leaders and team members;

123.43(18)(G)

...Use time management techniques to develop and maintain work schedules and meet deadlines; and

123.43(18)(H)

...Complete his/her work according to established criteria.

Interdisciplinary Correlations:

English:

110.xx(6)(A) – Vocabulary Development

...Expand vocabulary through...listening and discussing...

110.xx(6)(B) – Vocabulary Development

...Rely on context to determine meanings of words...

Mathematics

111.36

M.2A

...Interpret information from various graphs, including line graphs, bar graphs, circle graphs, histograms, scatter plots, line plots, stem and leaf plots, and box and whisker plots to draw conclusions from the data.

Integrated Physics and Chemistry

112.42

2B

...Collect data and make measurements with precision.

Teacher Preparation:

References:

Komacek, Lawson and Horton. Manufacturing Technology (Delmar: 1990).

Instructional Aids:

1. Creating a plan or drawing PowerPoint
2. Creating a plan or drawing Rubric
3. Picture of assembly box
4. Picture of candle holder
5. Picture of finished box

Materials Needed:

1. Graph paper (with ¼" squares) 9 x 24 inches (you can cut 18 x 24 inch paper to this size or tape 2 pieces of paper together).
2. Pencil
3. Tape measure or ruler
4. Product drawing examples
5. Completed 5 x 7 acrylic photo frame

Equipment Needed:

1. Infocus projection
2. Computer with PowerPoint software

Learner Preparation:

Vocabulary

Reverse engineering – Drawing a plan from the actual product.

Dimensions or measurements – Measurements on drawings are called dimensions.

Orthographic drawing - A means of representing a three-dimensional (3D) object in two dimensions (2D).

Pictorial drawing - A view of an object (actual or imagined) as it would be seen by an observer who looks at the object either in a chosen direction or, from a selected point of view.

Sketching - A hasty or undetailed drawing or painting often made as a preliminary study.

Lesson Plan

Introduction (LSI Quadrant I):

SAY: Remember from yesterday (or the past) that there were three major skills needed to manufacture any product. Can you name them? (Give students time for responses.)

Answer: They are: creating a drawing of the product, making a bill of materials, and writing a plan of procedure on how that item is to be produced.



Remember that the drawing is the first step in beginning the manufacturing process. We looked at examples of drawing plans and talked about drawing the top, front, and right side views of the product. Today, we are going to create a simple 3-view drawing of an acrylic photo frame. We are going to draw this plan from the actual product. This process is called reverse engineering--making the drawing, or modifications to a drawing, after the part or product has been manufactured instead of making the part from the drawing in the beginning.





Pass out the graph paper to the students at this time. Have examples ready for students to look at for assistance. Once again if the class is large, you may want to group the students in pairs for this activity.


Outline

Outline (LSI Quadrant II):

Instructors can use the PowerPoint presentation, slides, handouts, and note pages in conjunction with the following outline.

| MI | Outline | Notes to Instructor |
|--|---|--|
|   | <p>Measuring Project</p> <p>SAY: Looking at the photo frame, what do you notice about the product? (Ask for answers from your students). <i>Answers should include: It is bent, it can be turned 2 different directions, and it is made from one piece of material.</i></p> <p>Q. How are we going to draw this product since it has been bent? (Allow time for responses). <i>Answer: We will draw it as if it has not been bent—one flat piece.</i></p> <p>Let's begin with drawing the frame from the top view.</p> | <p><i>The measurements for the top view should be: 5 inches wide and 18 inches long—a rectangle at this point.</i></p> |

| | | |
|--|--|---|
|  | <p>This item started as a flat piece of acrylic plastic.</p> <p>Q. How long do you think it was, or is?</p> <p>Q. How wide is the plastic?</p> <p>Your paper is large enough that we will draw all the views full size. We also need to add the measurements to each view as we go.</p> <p>Measurements on drawings are called dimensions. Dimensions will be extremely important on your drawings, or plans, for the manufacturing crews as they make our product in a production facility. The product must be the correct size for our customers.</p> <p>Q. Why? (Allow time for students to respond.)</p> <p><i>Answer: So a 5" x 7" photo will fit in the frame.</i></p> | <p>Allow time for them to measure.</p> |
|    | <p>Sketching the Project</p> <p>SAY:</p> <p>Q. What is the front view of the frame going to look like?</p> <p><i>Answer: The front view will appear to be another rectangle. The measurements are going to be 1/8 inch thick by 18 inches long. (Give them time to draw this on the graph paper—you may need to explain that 1/8 of an inch is 1/2 a graph paper square—each square is 1/4 of an inch, and 1/8 plus 1/8 will be 1/4 of an inch).</i></p> <p>Q. How will the frame look from the right side?</p> <p><i>Answer: Another rectangle.</i></p> <p>Measurements for the right side are 1/8 inch thick by 5 inches long.</p> <p>Q. What else do you notice about the photo frame? From the top view, the ends of the base of the frame are on an angle.</p> <p>Q. Why do you think it is angled?</p> <p>The angles are there so that the frame can be used for both vertical and horizontal photos. Let's draw these angles in both places at 45 degrees. You can draw a diagonal line from the corners of a square to make the 45 degree lines. Now we have drawn the 3 views of the photo frame.</p> <p>Q. If the frame is designed to hold a 5" x 7" photo, why is it 18 inches long?</p> <p><i>Answer: We have to allow material for the 2 bends in the plastic since the frame is all one piece of material.</i></p> <p>Have the students select a pictorial view of one of the product examples. From that view, have them draw the top, front and right side views for that product.</p> | <p>(Allow time for responses.)</p> <p>(Allow time to respond.)</p> <p>(Time for response.)</p> <p>(Allow time for responses.)</p> |
| | <p>Drawing the Project</p> <p>SAY: We are going to look at a pictorial view, or</p> | |

| | | |
|---|---|--|
|  | <p>picture of a product. You (or you and your partner) are going to study the plan and sketch a 3 view drawing of that product on graph paper just as we did with the photo frame. The scale of your plan is up to you. However, your 3 view drawing needs to fit on one sheet of graph paper. When you are done, you should have a top view, a front view, and the right side view of the product you have selected. Since there are no measurements on the pictorial views, you do not have to include measurements on your 3 view plan. If you have any questions, please raise your hand and I will try to help you out. The more you can do on your own, the better.</p> | |
|---|---|--|

Copy and paste Multiple Intelligences Graphic in appropriate place in left column.

| | | | | | | | | |
|-------------------|----------------------|----------------|------------------|--------------------|----------------|----------------|------------|----------------|
| | | | | | | | | |
| Verbal Linguistic | Logical Mathematical | Visual Spatial | Musical Rhythmic | Bodily Kinesthetic | Intra-personal | Inter-personal | Naturalist | Existentialist |

Application

Guided Practice (LSI Quadrant III):

Give students time to work on the handout. (Allow the rest of today's class time for this part of the activity. You may need some time the next day to finish this activity.)

Independent Practice (LSI Quadrant III):

If students finish the 3 view part of the assignment, have them begin the pictorial drawing of the photo frame. This is the next part of the drawing phase for the production of the product.

Summary

Review (LSI Quadrants I and IV):

If your product is bent, how would you draw it?

A. *Draw it as if it has not been bent – one flat piece.*

Why are dimensions important?

A. *So the product is the correct size for the customers.*

In making our 5" x 7" picture frame, why was it 18 inches long?

A. *We have to allow material for the bends in the plastic since the frame is all one piece of material.*

Evaluation

Informal Assessment (LSI Quadrant III):

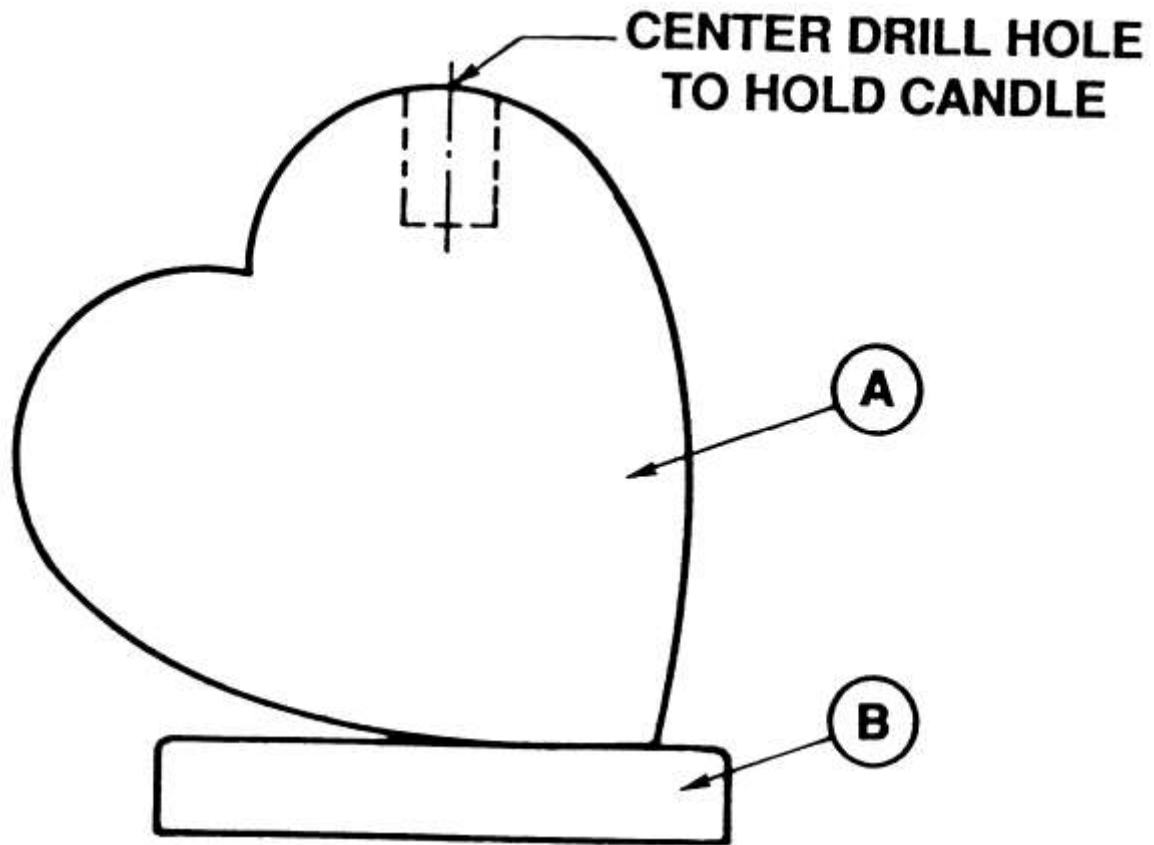
Grade plan that was created in a group setting for accuracy and correct responses.
Assign a grade for class participation and discussion.
If you use groups for this activity, assign a grade for group involvement.
Grade the plans that were completed independently by students.

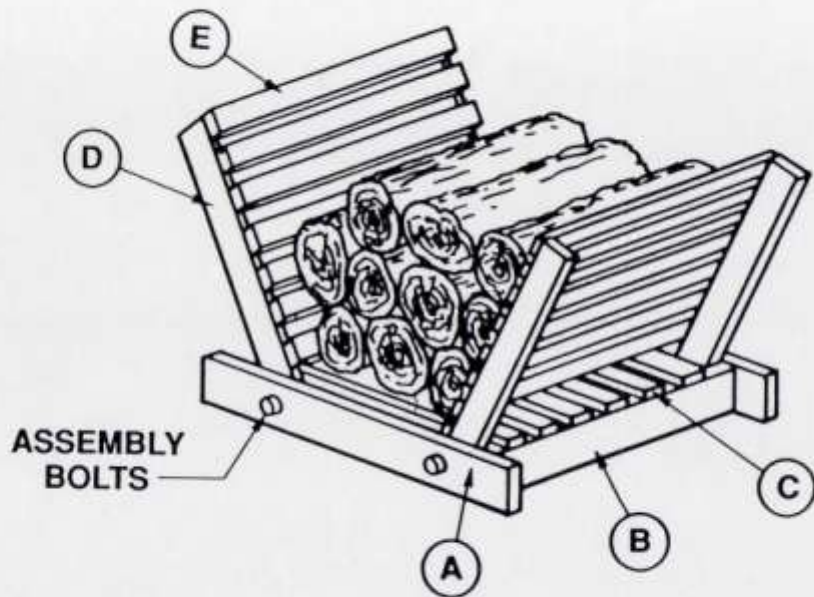
Formal Assessment (LSI Quadrant III, IV):

Creating a Plan or Drawing Rubric

Extension/Enrichment (LSI Quadrant IV):

None





Three View Drawing Rubric (Plan of student's choice)

| | Exceptional | Above Average | Average | Below Average | Unacceptable | Comments |
|---|--|---|---|--|--|-----------------|
| Criteria | 20-16 | 15-11 | 10-6 | 5-1 | 0 | |
| Views in correct location | All 3 views are in the correct location | Two of the 3 views are in the correct location | Only 1 of the 3 views is in the correct location | All three views are in the wrong location | Missing views and none are in the correct location | |
| Appropriate views and lines | Lines are all straight and views are accurate | Lines are correct, but the views have errors | Not all lines are straight and views have many errors | Sloppy work, views were done in a hasty manner | Unacceptable lines and views | |
| | 50-45 | 44-35 | 34-25 | 25-10 | 10-0 | |
| Accuracy of the 3 views on the drawing | Top, front and right side views are all correct | 1-2 errors with the 3 views on the drawing | 3-4 errors with the 3 views on the drawing | 5-6 errors with the 3 views on the drawing | More than 6 errors with the 3 views on the drawing | |
| | 10-9 | 8-7 | 6-5 | 4-3 | 2-0 | |
| Neatness and overall appearance of drawing | Paper is very clean, views are very legible and line work is precise | Paper is clean and views are legible, but line work is a less precise | Many erasures, views are sloppy and line work is sloppy | Views are all over the paper and line work is sloppy and very hard to identify | Very sloppy work and views and line work are illegible | |