The following lesson plan is an adaptation of an AIMS Activity on Proportional Reasoning. The AIMS activity was extended to include the use of the TI-73 or another graphing calculator.

**How Much Did It Shrink By?**

**Objectives:** Students will explore the characteristics of polystyrene plastic #6 when heated. They will make measurements of the plastic and draw pictures before heating, and then make measurements again after heating. Students will collect and record data, observe results, interpret data, and use their results to make predictions.

**NYS Standards:** (Grade 7-8)
Key Idea & Performance Indicators: 1A, 2A, 2B, 3G, 5B, 5E, 7B,

**Materials:**
- Clear polystyrene #6 (take-out containers for salad or baked goods)
- Colored Pencils
- Fine Sandpaper
- Rulers
- Scissors
- Single Hole Punch or magnets with adhesive backing/Card Stock & Glue
- Toaster Oven
- Cookie Sheet
- Oven Mitt
- Spatula
- Graphing Calculator

**Procedure:**
1) Cut out a flat rectangular piece of clear polystyrene #6. (take-out containers)
2) Use fine sandpaper to rough up one side of the plastic until it is cloudy looking.
3) Make a dot in each corner of the plastic with a dark colored pencil. Dots must be made on the roughed up side of the plastic. Trace the outline of your plastic and the measurement dots on the attached sheet.
4) Measure the length, width, and diagonal distance between the measurement dots on your rectangular plastic to the nearest millimeter. Record your measurements on your diagram.
5) Draw an original picture on the roughed up side of the plastic and color it with colored pencils. If you plan to include words then think about how to write them so they will read the correct way on the shiny side of the plastic.
6) If you would like to hang your shrunken plastic then punch a hole with the hole punch before heating. If the plastic will be made into a magnet then don't punch a
hole. Do a rough copy of your picture on your diagram. This will help you to duplicate your measurements after the plastic has been heated.

7) Make and record two additional measurements from your designed picture.

8) Place the plastic shiny side down on a tray and heat in a toaster oven at 350° for several minutes until the plastic is flat. The plastic may curl up while it is in the oven. Allow it to continue to heat and in most cases it will flatten out on its own. Take the shrunken plastic out of oven and allow it to cool. Use the spatula to press the plastic flat before it cools, if necessary.

9) Repeat the same measurements on your shrunken piece of plastic that you made before heating.

10) Enter your original measurements in List 1, and your new measurements in List 2 on your graphing calculator. Make a scatter plot of L1 vs. L2. What kind of relationship exists between these two sets of data?

11) Find and plot the curve of best fit and record the equation.

Questions for pondering:

1) By how much did your plastic shrink?

2) Did it shrink by the same amount in all directions?

3) Did everyone's art shrink the same amount? (Compare your results with a couple of your classmates) Would you expect everyone's art to shrink by the same amount? Why or why not?

4) Could you predict the final size of art on a new piece of plastic if you knew its size before it was heated? How?

5) Suppose the height of the sunflower on a piece of plastic was 12.5 cm before shrinking, what would you expect it to be after shrinking?

6) Given a piece of art already shrunk, could you tell the original size of the plastic?

7) Suppose the width of the letter on the shrunken plastic was 1.2 cm, what was the width before the plastic was shrunk?
Trace your plastic in this space.

Record the measurements of your plastic:

<table>
<thead>
<tr>
<th>Description</th>
<th>Original</th>
<th>Shrunken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagonal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Record the equation for the best-fit curve for your data: _____________________________