TIME REQUIRED
Approximately five 45-minute class periods for a simple pattern; or ten 45-minute class periods for a more complex pattern requiring the use of an electric grinder.

OBJECTIVES
Students will...
• Learn the basic steps of creating a stained glass panel (including glass cutting, copper foiling, assembly, soldering, and finishing).
• Practice accuracy and precision in the assembly of a stained glass panel.
• Practice safe work habits in the classroom.

INSTRUCTIONS
1. The first step is to choose a pattern. As a beginner, you are going to want to choose something with either straight lines, or something with gradual curves. Very sharp curves, like the ones at the center of the Celtic knot at right, are difficult to cut and often result in a lot of broken glass.
INSTRUCTIONS (CONT.)

2 Once you choose a design, number each piece of the pattern. Once numbered, make three copies of the pattern: copy or glue one onto card stock to use as pattern pieces (cut this copy apart and place in an envelope to avoid lost pieces. Place the second copy inside a plastic page protector to use as your template. Use the third copy as a place mat to line up your pieces for soldering.

3 After the pattern is selected and prepared, pull glass from your collection. It is wise as a beginner to choose glass with minimal texture. Textured glass can be difficult to score, and sometimes breaks irregularly. Lay your pattern pieces out on each sheet of glass to make sure you have enough of that color for your project.

4 Lay your pattern pieces onto your glass and trace with a marker or paint marker. Leave a little room between the edge of the glass and the pattern piece, so you have something to grab onto with your grozing pliers when it is time to break the glass. Once you trace the piece, write the piece’s number on the glass so you can figure out where to place it on the template when you are done. This is especially important when you are working with more complex patterns.

5 PUT ON SAFETY GLASSES NOW!

6 Run your glass cutter along the line that you drew with your marker or paint marker. You will only score and break one line at a time. You should hear a kind of squeaky/clicking noise if you are doing it correctly. To be as accurate as possible, you will want to either stay ON the line or on the INSIDE of the line that you drew to stay true to the actual shape.

7 There are different ways to break your scored glass…
   • If it is a straight line, you can use the running pliers. Line up the little line (the line should face up) on your pliers with your score line and gently press together. Your glass should break on the straight line.
   • If you have a large amount of glass on either side of your score line, you can use your hands. Hold your hand with your thumb up on either side of the score line (see illustration above for hand placement; one hand should be on each side of the score line). Rotate your wrists so that your thumbs are turning outward as you are breaking the glass. It should snap in half with a small amount of effort.
   • If you don’t have enough glass to use your hands, you will need to use a grozing pliers. Hold your hand to the side of the score line on the pattern piece side (as in the illustration above). Use the grozing pliers to grab onto the piece of glass you want to remove. The grozing pliers should look like a little alligator eating the piece of glass (flat edge on top).

8 Continue to score and break one line at a time until one piece is completed. Sometimes a single line will require multiple scores/breaks. See examples at top right for cutting sequence.
After the piece is completely cut out, you may need to do some grinding, especially for curved pieces. Make sure the grinder reservoir is full of water and switch the grinder on. Carefully run the glass edge up against the grinder bit to gradually shave away any rough or sharp edges. Do this until the piece fits on the template perfectly. NOTE: If you place your pattern in a plastic sheet protector, the water from the grinder won’t ruin your pattern.

Repeat these steps until you have all of the pieces cut out and ground to fit your pattern.

The next step is to clean and replace your pieces. Wash the pieces in warm soapy water with a rag to remove any cutting oil, glass residue, and marker from the pieces. For a complex pattern, wash pieces one at a time and renumber them with a tiny number so you can replace all the pieces when you begin foiling.

When all pieces are clean and DRY, you can begin the foiling process.

• Work from the inside of your pattern outward. Pieces that touch the outside (border) of the piece usually get foiled a little differently.
• For inside pieces, wrap the copper foil around the entire piece, with about a ¼” or ½” overlap. Try to center your glass on the foil. This will help to make your solder lines as even as possible.
• For outside pieces, you do not have to foil the outside edge if you are using “U” channel to finish your piece. You may want to foil about ¼” or ½” into the outside edge just to be safe.
• Once a piece is foiled, you will need to burnish the foil to the glass. This ensures the foil is completely “stuck” to the glass and will not separate over time. The foil and solder are what makes your piece stay together.

When all pieces are foiled, lay them down on your pattern sheet. Make sure this sheet is NOT in a plastic protector, since you will be soldering on top of it — Plastic+Hot Solder=Disaster! Use metal T-pins around the outside of your piece to hold everything in place. If you are using a pattern that has straight borders, use metal rulers to help keep lines straight.

When everything is in place, plug in the soldering iron and prepare your workstation. Use a metal brush to apply flux to the copper foil. The flux basically acts as a magnet. Without it, the solder will not “stick” to your foil.

Work with one side at a time, so when you have one side all set and flux applied, you will tack solder. This is done by applying a small dot of solder where each piece connects, usually at a joint. This will keep all of the pieces together so they don’t wiggle around when you start soldering longer lines. It is easiest to hold your iron in your writing hand, and your solder roll (with about 5” of solder pulled out) in the other hand.

After you have the first side tack soldered, begin working on the longer lines. Work from top to bottom, since it is easiest to pull the iron and solder toward you as you work. Begin at the top of a solder line and work with your iron at a 45° angle, with your solder touching the iron. You can drag the iron along the line as the solder melts and falls into place. The first pass may look rough, but once you have solder applied to all lines, you can go back over it with just the soldering iron to smooth out the lines.

When the first side is done, flip the piece over to flux and solder the second side. Keep in mind that the piece is probably very hot…don’t burn yourself!

When all soldering is complete, clean your piece well. You may want to use a flux remover to help clean the piece. Dry it off.

Add “U” channel and hook(s) to complete your piece.

After the finishing touches are added, use soapy water to clean the piece of any remaining oil or flux. Once dry, go over the solder lines gently with steel wool. This prevents tarnishing of the solder.

Add a chain (or chains) to the hook(s) and your stained glass piece is finished!
MATERIALS LIST

- Beginner’s Complete Stained Glass Kit — contains many of the individual items in this Materials List — 9717453
- Stained Glass, 10-sheet pack — 9723054 (transparent), 9723055 (opalescent), 9723056 (transparent & opalescent)
- Pattern for Stained Glass Design
- Black Sharpie® Marker — 9726841(A) or Sharpie® Paint Markers, oil-based, set of 5 — 9729709 (black, gold, red, silver, white)
- Fiskars® Nonstick 8” Scissors — 9730434
- Safety Glasses — SB39510
- Glass Cutter, fluid-dispensing — 9715467
- Running Pliers — 9723066 (helpful for straight lines, optional)
- Grozing Pliers — 9716691 (2 are needed if working with pieces too small to safely hold with your fingers)
- Glass Grinder — 9716688
- Copper Foil, 36 yds — 9733371 (½" W), 5500221 (¼" W), 9716692 (¼" W)
- Burnisher for Foil
- Solder, 1-lb. spool — 9703439 (50% tin/50% lead) 3400175, (60% tin/40% lead), 9721737 (99% tin/1% copper)
- Flux Soldering Paste, 2 oz. — 9725071
- Flux Brush
- Flux Remover (optional)
- Metal T-Pins, box of 100 — 2500120
- Ruler, 12” aluminum — 2100207 or T-Square, 18” aluminum — 6100116
- Aluminum “U” Channel
- Steel Wool
- Hooks
- Chain