



Backlit Solar System

Completion time: 3 Lesson

Materials and Resources:

- Sheet MDF, 2cm – 4cm thickness
- Pencil, ruler, and pair of compasses
- Hand or machine sawing apparatus, disc sander, sandpaper, band saw, scissors, acrylic paint, glue and strong tape, thick cardboard, black craft paint, silver glitter, 2 strings of Christmas or celebration lights
- Formech vacuum forming machine
- Clear 1mm plastic material
- <http://formechinc.com/case-studies/afishal-djing-hit-new-visual-level-help-formech/>

Skills at a glance:

Mathematics

Measurement, scale, numeracy

Language

Listening skills, following instructions, communication and teamwork, negotiation

Thinking skills

Design, problem solving, research and development, independent thought

Science

Heating plastics and effects, plastic/polymer material knowledge, computer technology, knowledge of the solar system

Project Outline:

This project will see students make a long rectangular wall display for use in their school, which can be used as a learning aid for students who are studying the solar system. It will represent the relative size, shape, order and colour of all the planets in the solar system. Our planet and our neighbours will be mounted on a black backboard and backlit using simple lighting, and so with the lights dimmed students will see their solar system come to life. This is a class wide project which will require working in small groups, class-wide communication and collaboration. Students will expand their knowledge of vacuum forming and associated tooling techniques, whilst also expanding their knowledge of astronomy.

Method:

With the class split into small groups, each group will be assigned one of the eight planets for which they will produce the MDF mould to be vacuum formed. Groups must take into consideration the size of their planet in relation to the relative size of other group's planets. This is to ensure that planets are represented in terms of their sizes. Exact scale will not be achievable due to the colossal size difference between planets.

Using sheet MDF material a minimum of 2cm, and a maximum of 4cm thick, students can draw a circle of the required diameter. This must now be cut out by either hand or machine sawing methods. The group producing the mould for Saturn will also need to design and cut material to represent its band of rings.

3D details such as craters, swirls of gases etc. can be represented by gluing string, or balled up newspaper to the mould's surface.

The MDF planets can now be taken to the disc sander to have edges neatened up, have a slight dome appearance applied around their entire circumferences, and have several venting holes drilled around their tops and around any significant 3D detail.

Each planet can now be taken to the vacuum forming machine and formed using any clear plastic material.

Excess plastic material can be trimmed off, but not entirely. Trimming away excess material whilst leaving an a 2cm lip around the circumference of the moulded planet, will provide the necessary material to adhere the planet to the backboard later in the process.



Homework Tasks:

Vacuum forming used to create backlit visual displays is very common in museums, interior design, signage, and more. With students having worked as a team to complete a class-wide project, perhaps they could demonstrate what they have learned in class by applying it to a simple solo project. With backlit signage in mind, and with their knowledge of the vacuum forming process and associated mould making methods, students can write their own project for some form of backlit signage, which differs from the method completed in class. They might explore different mould materials, or different applications to demonstrate their understanding of the potential of vacuum forming in this area.

Optional Extras:

With this project being so closely linked to Science classes and being conducted in small groups, there is a great opportunity here for students to continue their group work, and research and prepare an oral presentation on their planet. Presenting their findings to the rest of the class, students will be able to develop their speaking and listening skills, whilst being increasingly invested in the lesson, as they themselves produced the teaching aid they will use. Talking about a planet's size, climate, atmosphere, chemical composition etc., this is a wonderful chance for students to learn from each other, as well as being teachers themselves.

Method: (Continued)

Each planet can be accurately decorated in accordance with its appearance using acrylic paint. A very thin layer of paint is required as to give each planet maximum opacity when backlit.

Whilst paint dries, the class can turn their attention to producing a long rectangular backboard on which to mount their vacuum formed planets. This can be produced with pieces of thick cardboard, joined together appropriately to make one long piece. This will need to be wide enough to accommodate the largest planet, and long enough to accommodate all the planets when lined up.

The class may now take their original MDF moulds and place them on top of the cardboard in the order of their positions within the solar system. Students can draw around each planet, and neatly cut these circles out, producing a space for their vacuum formed planets to be placed. This large cardboard backboard can now be painted black using simple craft paint, and even have a little silver glitter sprinkled around for increased visual effect and to represent stars.

The planets can now be mounted by simply pushing them through their corresponding hole from the rear of the cardboard. Planets should fit snugly, although strong tape can be used to secure them in place.

2 strings of Christmas tree or celebration lights, can be evenly placed behind each planet and secured with tape.

The entire solar system display is now complete, and ready to be mounted securely on the classroom wall, and with the classroom lights off, the Christmas lights can be plugged in and the solar system will spring into life for all to see.

Student Accomplishments:

- The production of a backlit solar system
- Experience using MDF as a principal material
- Experience using a range of sawing and sanding equipment
- Teamwork
- Communication with a common goal in mind
- Learning around the solar system
- Applied knowledge for the production of professional signage and lighting
- Practical hands on experience using a vacuum forming machine, and understanding its wider application

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