



Night Light

Completion time: 3-4 Lessons

Materials and Resources:

- Sheet MDF, approx. 1cm thickness
- A large pair of compasses, or other tool to draw a circle
- Disc sander, sandpaper, wood glue, acrylic paint
- Hand or machine saw, drill press and 2mm drill bit
- Formech vacuum forming machine, suitable clear vacuum forming plastic material (PVC, PE, PP)
- A simple battery powered circuit of LED lights
- <https://formechusa.com/case-studies/forming-lessons-oakland-high-school-illinois>

Skills at a glance:

Mathematics

Measurement, scale

Language

Reading, listening

Thinking skills

Design, expression, applied knowledge, material selection, independent thought, and questioning and reasoning

Science

Design, incorporating learning and skills from both electronics, and design and technology, interpreting a given brief, tool selection, independent thought, and problem solving

Project Outline:

Students will produce a simple night light for use in the home. It will be vacuum formed using a mold made from MDF, and be eye catching and beautifully decorated with acrylic paint, which when the light shines through will have a dramatic visual impact. This project will provide a lesson for a circular and tiered night light, although other shapes can be explored should the teacher wish to utilise different ideas, mold materials or tooling methods. This project requires the making of a simple circuit capable of powering just a small number of bright LED bulbs, powered by a battery rather than mains electricity to ensure safe use in the home. This also makes this project ideal for cross-subject learning with Electronics or Science.

Method:

The mold will consist of six circles of MDF sheet material of decreasing sizes, which when stacked on top on each other will create a tiered effect. The bottom MDF circle should be a diameter of 30cm, and the remaining five decreasing by 4cm in diameter with each cut and stacked. Before committing to these dimensions, ensure that they conform to the forming area measurements of the Formech vacuum forming machine available. Make adjustments to measurements accordingly if necessary.

Students can measure and cut these circles using a variety of hand or machine sawing methods. Once all six circles have been accurately cut out, they can be taken to the disc sander to have draft angles uniformly applied to their edges.

Placing the largest circle on a flat surface, students may secure the next smaller concentric piece to it using wood glue, ensuring that it is centred accurately. Repeat this process with the remaining four circles. A weight can be placed atop the glued circles, and the glue allowed to dry.

The dried mold will require a series of venting holes drilled around the circumference of each of the layers. This can be completed using a drill press and 2mm drill bit. Starting at the bottom tier and along the line where the second tier meets it, students can drill a series of venting holes at 2cm intervals all the way around the mould. The holes must pass all the way through the MDF material and penetrate the mould's base. Repeat this venting process for each of the remaining tiers of the mold.

The mold is now ready to be vacuum formed using suitable sheet plastic material. Clear material such as PVC, PE, or PP is advised to allow light to shine through once back-lit.



Homework Tasks:

Vacuum forming is used to create a whole range of products that we might find in our homes. Students might explore their homes and communities and photograph other items which they believe to have been vacuum formed. With their knowledge of the mold making process, they can then predict, or even write a simple project plan as if they were going to replicate the item in the school workshop using the tools and materials they have available to them. This will provide teachers with a deeper understanding of what students have taken away from their learning around vacuum forming, and how they are able to apply this to future manufacturing and design they undertake.

Optional Extras:

This project creates a simple circular and tiered shaped night light. There is huge scope for students to take the skills and techniques utilised in this brief, and adapt and change them to explore other shapes, forms, and themes. Adopting the night light theme, what other shapes, materials, and tooling techniques might students explore in producing their mold? What new and interesting elements might they work into this project, given the chance to utilise other skills and knowledge?

Method: (Continued)

Once formed, the night light dome will need excess material trimmed off.

The final vacuum formed piece will now require a base board to rest upon, which will also create a housing for the completed LED lighting circuit. This can be made from MDF much the same way as the circles used to make the mold, and should measure 30cm in diameter. Similarly, it should have draft angles around its edge to allow a snug fit when the molded plastic is placed on top.

Using thin layers of acrylic paint, students can now decorate their vacuum formed night light cover however they choose, creating a colorful and impactful visual effect.

Once dry, the battery powered LED lighting circuit can be secured on the circular base and the decorated shade placed over it. The completed night light is ready to gently light up any darkened room, emitting just a subtle colourful glow.

Student Accomplishments:

- The production of a night light for safe use within the home
- Designing and building a simple battery powered LED circuit
- Demonstrating capabilities with wood saws, disc sanders, and a variety of drilling equipment
- Utilise and demonstrate a variety of different skills and tools within the workshop
- Using MDF as a principal material
- Practical hands on experience using a vacuum forming machine, and understanding its wider application
- Adding personal and creative detail to a given brief

Teachers notes:

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