



**DENFORD<sup>®</sup>**

CAD/CAM Projects

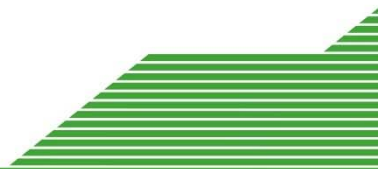
*Living Hinge Container Project*



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**TEACHER SUPPORT GUIDE**

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# Denford: Living Hinge Container Project – VLS Series Laser Cutter

## Teacher Support Guide

This Project takes the form of the design and manufacture of a saleable product. Students are tasked with designing and manufacturing a container using living hinges to hold a product from a range given. It is expected that the product will be glued, assembled and will be a saleable item. The final product will be designed using CAD and will be manufactured on a VLS Series Laser Cutter using an aluminium-effect ABS laminate.

Students have one sheet of A3 1.5mm ABS aluminium-effect laminate sheet to make their designs from, so they will need to ensure that all of the parts for their designs will fit on the sheet.

As a guide, students should not make their containers any larger than 300mm x80mm x60mm.

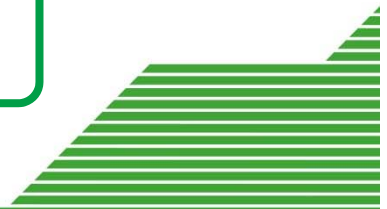
### Project Timeline Summary

It is anticipated that learners will spend a total of about 8 hours in producing the work for this project. Learners will be expected to have had previous experience in using Autodesk Fusion 360.

Throughout this project, learners will need to apply problem-solving and designing skills developed in earlier years, in order to achieve a successful outcome.

Session	Focus	General Content
1	Understanding the Problem	Analysis of the Design Problem and understanding the context of their product.
2	Designing	Producing a concept sketch idea of their storage container.
3	Developing the Solution	Modelling of the idea and producing a final 3D sketch and layout sketch.
4	CAD Design	Using the sheet metal function in Fusion 360, generate a model of the design which can be “flat packed”.
5	CAD Design	Produce a rendered output of the file as a design concept.
6	CNC Post Processing	Export DXF files of all parts for use on the LaserCAM software.
7	Manufacture, Finishing & Assembly	Cut the final design out on the laser cutter, sand and finish edges, assemble and glue the final product.
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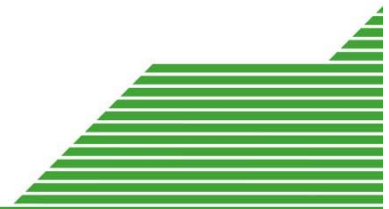
Note: This project uses AutoDesk Fusion 360. However, the project can be adapted to be used with other 3D Design Software Packages.





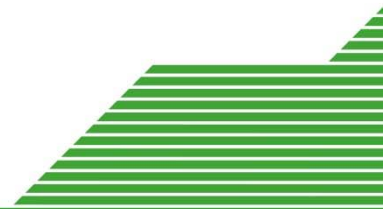
## Project Delivery Session Detail

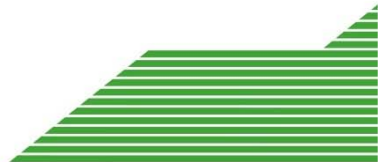
Session	Focus	Session Content
1	Product Research & Design	<p>Ask students to read through the design problem, then, working individually, ask them to visit the Alessi website and make rough sketches of products they like the look of. Ask them to annotate any design features they particularly like.</p> <p>Now tell students to look at the key information page and talk them through how living hinges work.</p> <p>Introduce students to the Design Considerations - Primary Research page. Students have the option of four different products to choose from. Once chosen, ask students with the same products to group together.</p> <p>Introduce the overall size of the product and explain how the product will be manufactured.</p> <p>Ask students to start some primary research as a group, listing the size and shape of the products they will be storing. Get them to note this down on the sheet (this may need to be finished at home).</p>
2	Designing	<p>Students will need to draw a concept idea.</p> <p>Encourage the students to keep to basic shapes when designing, but remind them they will be using living hinges as part of their design to “wrap around” their product.</p> <p>Once complete, ask students to discuss/present their idea to another group, and note any relevant feedback on to their own sketch.</p> <p><b>Note:</b> To fasten the product, students can choose a mechanical tab, as shown on the example. Alternatively, they can use magnetic tape, along with steel washers for the tape to stick to. These would need to be glued on to the product.</p>





Session	Focus	Session Content
3	Developing the Solution	<p>Students will now test their idea, by drawing and cutting out their design idea on A3 Paper.</p> <p>Once happy with their net, ask students to produce a final “quick” sketch and layout of the idea.</p>
4	CAD Design	<p>Students will use the next two sessions to draw their idea in Fusion 360.</p> <p>Students are encouraged to draw their design whilst working through the CAD Support Booklet for this project, where there is a space for the design to be drawn. However, students will need to independently draw their own idea using the same principles.</p>
5		<p>By the end of the two sessions, students should have a 3D model ready for manufacture and rendered drawing.</p>
6	CNC Post Processing	<p>Explain to the students the difference between DXF files and STL files and which CNC machines utilise each.</p> <p>Students will need to export DXF’s of “faces” of their model. For my example, there is one main face and two identical side faces.</p> <p>Once exported, ask students to import these into LaserCAM and prepare the drawing for manufacture on the Laser Cutter</p>
7	Manufacture, Finishing & Assembly	<p>The next two sessions will be used to programme and cut out objects on the Laser Cutter.</p>
8		<p>Once machined, students will need to glue their models together using ABS glue and masking tape to hold until set.</p>





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