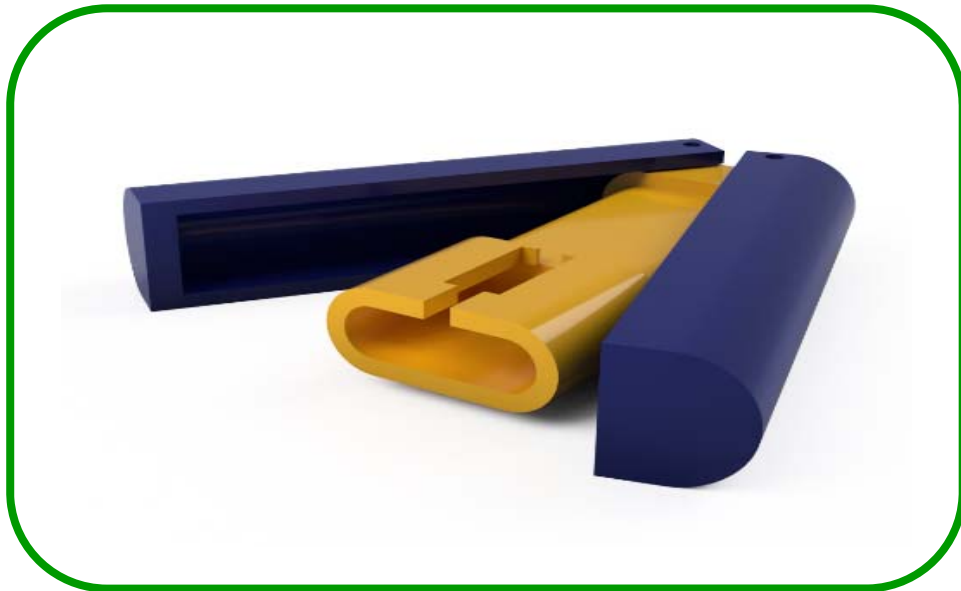




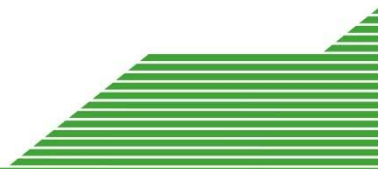
DENFORD[®]

CAD/CAM Projects

Earphone Buddy Project



TEACHER SUPPORT GUIDE





Denford: Earphone Buddy Project – 3D Printer

Teacher Support Guide

This project takes the form of a marketable product. Students are tasked with designing and manufacturing a pocket-sized device for keeping their earphones stored safely and tangle-free. Students have the choice of a single or multi-part product - however, they should be guided towards one or the other, depending on ability.

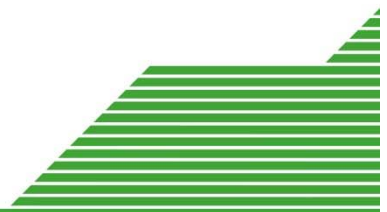
The final product will be manufactured on either an UP 3D Printer or MakerBot 3D Printer. Students will need to have an assembly of two or more components, which clip together without the need for additional components.

Project Timeline Summary

It is anticipated that learners will spend a total of approximately **6** 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	Introduction & Analysis	Analysis of the design problem / understanding the context of the product. Students to perform primary research on problem.
2	Designing – Breaking Down the Problem – Mix & Match	Two different activities to arrive towards final solution: one for initial concepts, one for development.
3	Realising the Final Idea	Students need to decide on their final idea and sketch out an assembly sketch and exploded sketch.
4	CAD Design	Using Fusion 360, generate a CAD version of their design.
5	CAD Design / CNC Post Processing	Complete Fusion 360 CAD file. Export the file as STL's for 3D printing.
6	Manufacture, Assembly & Finishing	Use an UP 3D Printer, or a MakerBot 3D Printer to make the final product. Clean up parts, assemble and test to finish.

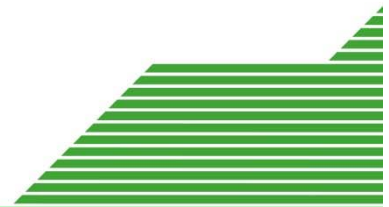


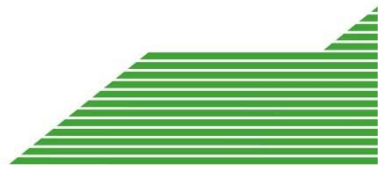
Project Delivery Session Detail

Session	Focus	Session Content
1	Product Analysis & Designing	<p>Start the session off with a discussion around the following questions:</p> <p>Who has in-ear headphones? Where do they put them when they are not using them? How many of you have a broken pair at home? How and why do you think they break?</p> <p>Ask students to read the design problem, then working as a group, work through the Primary Research Page.</p>
2	Designing – Breaking Down the Problem – Mix & Match	<p>Designing - Breaking Down the Problem Ask students to work individually on generating some solutions for each part of the problem. It is suggested that students take no longer than 5 minutes per part of the earphones.</p> <p>Allow students 5 minutes' peer review time, before moving on to the next page.</p> <p>Designing - Mix and Match After students have looked at their own solutions, as well as those of their peers, mix and match any of the ideas they have seen to produce four different ideas to satisfy the problem.</p>
3	Realising the Final Idea	<p>On the Design Realisation Page, ask students to sketch out their final idea in two ways: the first needs to be a complete assembled design, and the second an exploded view of their final idea.</p> <p>Students will need to add approximate dimensions to these sketches to aid in drawing in CAD .</p>



Session	Focus	Session Content
4	CAD Design	<p>Using Fusion 360, with the aid of the CAD support booklet, students are to draw their earphone container ready for manufacture.</p> <p>The process in the booklet takes students through designing the inner core, then on to the outer case, through to assembly and finally outputting the file for 3D printing.</p> <p>Students need to have the core element complete by the end of this session, as a minimum.</p>
5	CAD Design / CNC Post Processing	<p>By the end of this session, it is expected that the students will have their design finished.</p> <p>Students will need to use this session to firstly complete any outstanding CAD work and secondly export their file for use in the UP Studio or MakerBot Print Software. This will need to be in STL format.</p> <p>Follow the CAD Support Booklet to ensure that the file is ready and exported correctly.</p> <p>Using the CAD Support Booklet, Students will need to import their parts into UP Studio or into MakerBot Print and set-up ready for printing.</p> <p>The 3D printing of parts could take some time. It may be necessary for the Teacher/Technician to collate several students' parts and print all at the same time (or as many as can fit on the build plate), ready for the next session. Otherwise, it could take several sessions to get all of the parts printed.</p>
6	Manufacture, Finishing & Assembly	<p>This session will be used to finish off any 3D printing.</p> <p>Students will then need to clean any build materials from their designs, assemble and test their product by putting their earphones in the container and checking that they fit.</p>





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