

Year 9: Small storage Project - 2022

During key stage 3 pupils use a wide range of materials to design and make products. In this project pupils will work out their ideas with some precision, taking into account how products will be used, who will use them, the process that will be used and their appearance. They will develop their understanding of designing and making and expand their practical skills. They will use computers, including computer-aided design and manufacture, as an integral part of designing and making. The main aim of this project is to develop pupils understanding of designing and manufacture.

The students challenge will be to design and make a personal storage unit for small items such as jewellery, phones, headphones and gaming equipment. Students will be given standard size pieces of MDF 6x350x250 with the intention to design a product than can be made from a limited resource as limited by the design brief. Pupils will need to take accurate measurements and plan their work with precision to enable their design to fit with their specific device. They will then learn to use the required equipment to safely and accurately cut the components to make their product.

Once built the designs will be finished to a high standard using a choice of finishes including wood dye, and acrylic paint.

Aims of the project:

To enable pupils to develop their practical skills.

To increase awareness of health and safety in a potentially dangerous area.

Gain research through the use of questionnaires and market research of target users.

To develop knowledge and understanding of materials, tools, machinery and processes.

Select and use a range of tools, equipment and processes safely and accurately.

Understand how to take account of working characteristics of materials and components and restrictions imposed by tools and equipment.

Knowledge and understanding required:

Health and safety with a particular focus on woodworking machines, and woodworking finishes.

Marking out techniques, accurate measurement in 3 dimensions.

Understanding of the different finishes available to them.

Understanding of ergonomics.

STEAM links

The project includes directed tasks that involve the accurate measurement and drawing of real world items. This means working in mm and transferring measurements on paper using 3D visualisation skills.

The development of mechanisms and complex elements is encouraged to push and enhance the experience of all students and to engage higher level thinking and planning.

SMART and modern materials linked to science curriculum are investigated in the lessons and homework.

The project includes activities that direct students to consider the meaning of the work of existing designers and to use descriptive terminology. The designers chosen (such as Alessi and Mackintosh) are relevant to the Design and Technology GCSE as well as Art and Design courses.

Homework titles:

Mood board.
Production plan.
Final design drawing
Ergonomics
Smart Materials

Areas of assessment:

Research, analysis and planning of making, research new technologies (SMART materials).
Design ideas and Development.
Evaluations, testing and modifications/ improvements, including analysis of ergonomics.
Production of effectiveness of outcome (level of accuracy and finish).

COSHH and Risk Assessments.

Reference should be made but not limited to the following model risk assessments. In particular students should wear appropriate PPE and tuck in loose hair when using machines.

BS 4163:2007

9.13.1 Hot Melt Glue Gun
10.5.2. Disc Sander
11.4.1 Drilling Machines
15.6.1 Dye
17.5.2 Timber and sanding thereof.

CLEAPSS

pva (1.009) (1.009)
Acrylic paint (4.012)
Oil (1.070)
Wax (1.070)
Hand Tools (1.073)
Disc Sander (1.083)
Craft Knives (1.011)
Glue Gun (4.021)
Chisels (1.011)

Hegner Saw (1.085)

NOTES

Chizels to be counted in and out of the classroom.

Key Terms:

Task Analysis, Function, Manufacture, Ergonomics, Time, Target Audience, Research, Materials, Industrial Processes, Durability, Cost, Environment, Purpose, Hole saw, Disc Sander, Extraction, Laminating, Wood Dye, Flow Diagram, Bench vice, G-Clamp, Man-made board, Plywood, Hardboard, MDF, Natural timbers, Pine, Oak, Beech, PVA, masking

Areas to be covered within the project:

During the project students will focus on Design Briefs, Task Analysis, Research, Wood based products, Design Ideas, Design Development, CAD -2D Design, Making, Flow Diagrams, and Plan of Making.

Lesson	Lesson content/Activity	Differentiation	Resources	Homework
1 pva (1.009) (1.009) Acrylic paint (4.012) Oil (1.070) Wax (1.070) CLEAPSS Hand tools (1.073) disc sander (1.083) Craft knives (1.011) Glue gun (4.021) Chisels (1.011) hegner saw (1.085)	Starter/ bell activity: What is made from wood based material? Identify 4 different wood based materials from samples (MDF, plywood, hardboard, pine). Ask which is the best material? How it's made video showing an example of making the project. Students are introduced to the project via the Design Situation. Students are required to write their own Design Brief and Task Analysis mind map. Introduction to the room and subject. Equipment talk room demonstration, show different equipment. Students to complete initial research by measuring their phones and the materials available using rulers. Record the information on their booklets as an orthographic diagram. Examples are on the ppt and can be printed as needed. Discussion of plan, side, end views, 3rd angle and British Standards or dimensioning. (GCSE linked content).	Support material Key words. Example of a task analysis. Example of a mind map. Examples of orthographic diagrams. Extension material Use of levels ladder to make clear the criteria for high standard of work. Examples of high quality work to demonstrate.	A3 Learning mats. Example work. Sample materials. Presentation including making video. A4 Homework sheets.	Mood board ideas for their project. Including references /sources.

	Plenary: safety questioning, share important information (e.g. where is the microphone, where is the speaker). and setting of homework (mood board).			
2 pva (1.009) (1.009) Acrylic paint (4.012) Oil (1.070) Wax (1.070) CLEAPSS Hand tools (1.073) disc sander (1.083) Craft knives (1.011) Glue gun (4.021) Chisels (1.011) hegner saw (1.085)	Bell activity: Consider the work of existing designers and suggest a range of adjectives that describe their work. Starter: Using the visual materials provided draw a range of designs in the style of the designer shown. Each design should take only 1 minute in style of a thumbnail sketch. Students will generate a range of neatly presented design ideas. Students should ensure that that include labels, colour and evaluation. Students to develop their skills in communicating their initial ideas for a product. Students are to learn to use the coloured pencil first and then using a darker/opposite colour pencil to make the actual outline stand out). Pupils to rate their designs and get the opinions of their group. Develop one design into different options, draw to scale. Plenary: Check the vocabulary is understood. e.g. Hole saw/batch/mass/one off	Support material: Sentence starters to answer the worksheets. Word walls. Graded examples of previous students work. Isometric Extension material: Examples of excellent work demonstrated and available for handling to prompt high quality responses.	Hole Saw Pine blanks G Clamp and wood for jig. Homework example/grading descriptions. Batch/mass/one-off worksheet. Coloured pencils A3 paper / isometric paper	Collect hwk : mood board.
3 pva (1.009) (1.009) Hand tools (1.073) disc sander (1.083)	Bell task: Pupils receive feedback on their initial work and act upon it. Starter: Using the visual materials provided draw a range of designs in the style of the designer shown, this is a timed activity and is linked to the GCSE programme that includes studies of influential designers.	Support material Recap basic skills. Remind them about safety precautions. Examples of storyboards available to copy and complete. Extension material	Visual resource of the work of existing designers. Examples of students work as a levels ladder. Samples of past work to be on each desk for handling and inspiration.	Manufacturing process storyboard / production plan.

Craft knives (1.011) Chizels (1.011) hegner saw (1.085)	Each design should take only 1 minute in style of a thumbnail sketch. Main: Modelling and development of design ideas. Cardboard modelling to be used to practise using cutting knives, cutting boards and appropriate tools including steel rulers and coping saws to model real woodworking joints. Modelling of joints and including dowels for pegs and dowel joints is encouraged. Plenary: How far is everyone along the process flow chart? Check understanding of the symbols.	Explanation of the purpose of the tools and equipment as per levels ladder. More complex shapes/designs. Include the use of other materials.		
4 pva (1.009) (1.009) Hand tools (1.073) disc sander (1.083) Craft knives (1.011) Chizels (1.011) hegner saw (1.085)	Bell task: Tools wordsearch. Starter: Discussion Which is the most useful tool? Drill / hegner saw / disc sander Main Activity: Development and marking out of the components of their work. Students to draw their models and make changes to iterate their designs. Focus on quality of communication and labelling / annotation. Moving on to marking out the components on sheet material prior to cutting.	Support material. Basic example designs. Extension tasks. More complex designs to inspire creativity. Examples of more challenging joints and techniques (dovetail joint, heat formed plastic, laser engraved designs etc.)		(Hand in production plan.)

	Plenary: Line up all of the completed work and discuss / share ideas.			
5 pva (1.009) (1.009) Hand tools (1.073) disc sander (1.083) Craft knives (1.011) Chizels (1.011) hegner saw (1.085) Disc Sander (1.087)	Bell Activity: Cutting, gluing Starter Demonstrate the correct method of applying dye/paint/wax. Main Work on their projects including applying finishes. Using coping saws, tenon saws and disc sander. Demonstrations as appropriate after initial safety reminders especially the use of extraction, goggles, aprons and appropriate work holding. Plenary: Sharing problems and checking every ones progress as a group.	Support material Word wall. Extension Flow chart word bank Flow chart blanks	.	Final Design Drawing
6 pva (1.009) (1.009) Acrylic paint (4.012) Oil (1.070) Wax (1.070) CLEAPSS	Bell Activity: Match the finishes to the uses. i.e. wax – pine, interior varnish – boat, exterior paint – man made board Starter: Demonstrate the final construction and addition of foam and logos to the product. Discuss and agree quality criteria for Top/Middle/Lower grades.	Support material Key words Extension material		(Hand in final design drawing)

Hand tools (1.073) disc sander (1.083) Craft knives (1.011) Glue gun (4.021) Chizels (1.011) hegner saw (1.085)	Final finishing of the projects. Evaluation of the project. Plenary: Assess them using the quality control criteria. Photograph the projects.			
7 pva (1.009) (1.009) Acrylic paint (4.012) Oil (1.070) Wax (1.070) CLEAPSS Hand tools (1.073) disc sander (1.083) Craft knives (1.011) Glue gun (4.021) Chizels (1.011) hegner saw (1.085)	Starter/bell activity: Which is the best? Put three examples of projects in order of quality. Activity: Stick in photos of their storage products and evaluate their work against ACCESSFM. Then draw a revised design with improvements. Demonstrate 2 point perspective drawing and isometric drawing techniques. Use CAD if facilities available (Sketchup). Demonstrate the use of SMART materials. Students to include one or more of these materials into their designs. Extension – Further questions and information about smart materials. Plenary: What does SMART materials mean? Complete a chit. This to be taken home to enable homework.	Support material Sentence starters for ACCESSFM Extension material. Examples of A* evaluations and revised Sketchup if available.		Smart Materials.
8	Starter/ bell activity: Odd one out? MDF, CHIPBOARD, PLYWOOD Starter What is lamination? Why is it useful?	Support material Key words on the wall. Extension material More complex examples of the key		Hand in Smart Materials

	Show a video of chair or skateboard manufacture using plywood. Discuss and demonstrate manmade boards. Complete the definitions and worksheet to do with laminates/ man made boards. Main Demo the lamination of woods to make an attractive key fob. Pupils can choose three blanks of wood. Dye them if necessary / as desired. Then Laminate them. Plenary: Discuss the environmental benefit of lamination. Which products have been made using a laminate and why?	fob to be inspired by.		
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Risk Assessment of Tools, Materials and Processes (BS 4163:2007 and CLEAPS)

Workshop Health and Safety: General Health and Safety

Electric shock from machinery, loose clothing not worn, jewellery removed, eye protection (goggles) worn when working, ventilation, extraction, equipment properly adjusted / used when working and emergency stop locations in the workshop. **Workshop rules and behaviour (safe working practice).**

Aprons and Goggles must be worn at all times when using machinery.

Loose hair tied back and jewellery taken off. Shirt / pullover sleeves pulled up.

Know where the Emergency stops are - locations within the room.

Workshops should be kept clean and tidy. Scrap material should be put in bins.

Never run in a workshop.

Stools under desks if practical work is being undertaken.

Never blow dust sweep into a bin.

Excess tools and materials put away after use. Carrying tools the correct way.

Main risk when people do not know or understand how to use something correctly -if not sure always ask.

LOCATION	DT2/ DT3	HAND TOOLS	RISK LEVEL	LOW
HAZARDS		RISK CONTROL MEASURES		
Sharp tools, falling tools, tools breaking or coming apart in use, slipping tools (which can occur when pressure is applied to them) can all cause injury.		Hand tools should be stored at a suitable height for access. Hand tools should not be left projecting from a bench. Faces of hammer heads and hammer shafts should be frequently inspected. Edged tools should be kept sharp and in good condition. Sharp or pointed tools should be handled with care (with cutting edges protected or pointing downwards). Bench hooks should be maintained in good condition. Tools should not be carried in pockets or under belts.		

LOCATION	DT2/ DT3	GLUE GUN 9.13.1	RISK LEVEL	MID
HAZARDS		RISK CONTROL MEASURES		

Hazards Employees and students should be aware of the following hazards: a) electric shock; b) leads, which could be tripped over; c) hot glue nozzle tips, which can cause burns; d) splashes of glue, which can cause burns.	Risk control measures Supply leads for glue guns should be heat resisting. Care should be taken to ensure that trailing leads do not become entangled with the operator, others in the vicinity or the hot glue nozzle. Instruction should be given on correct use of the glue gun including warning students of the hot surfaces of the gun and the risk of burns from the residual heat of any molten glue that comes into contact with the skin. Suitable eye protection should be worn. Where possible, low melting point glue guns should be used, but in certain situations where a higher temperature is required for satisfactory gluing, standard hot melt glue guns may be used. Consideration should be given to providing the glue gun with an appropriate stand to ensure that hot glue that dribbles from the nozzle when the glue gun is switched on but not in use does not result in a glue build up on a surface under the gun that could easily be touched by students.
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LOCATION	DT2/ DT3	Powered Fretsaw (Hegner Saw) -10.6.3.2	RISK LEVEL	MID
HAZARDS		RISK CONTROL MEASURES		
Hazards Employees and students should be aware of the following hazards. a) Hands or fingers can come into contact with the saw blade. b) The powered fret sawing machine can become detached from the bench. c) Wood dust can be inhaled. d) Inadvertent starting of the machine can present a hazard.		It is essential that the machine is provided with: • a means of electrical isolation using a fused switch-disconnector on or adjacent to the machine, and that it is controlled by a starter incorporating overload protection and no-volt release; • a conveniently positioned, mushroom-headed stop button or suitable other control device that can quickly stop the machine in an emergency. The saw should be securely fixed to the bench. Alternatively, if on a floor mounted stand, the stand should be securely fixed. The height of the machine should be set for comfortable working as appropriate. A risk assessment should be carried out to evaluate the likely risks to health from inhalation of wood dust, and any action required to prevent or control the		

	risks (see 10.1). Suitable eye protection should be used if deemed appropriate by the risk assessment. Long hair should be protected from entanglement. Blades should be sharp, and should be of the correct pattern and distortion-free. (Blunt or distorted blades can break in use.) Blades should be guarded at all times. The hold-down foot should be used where possible. The machine should be included in a planned maintenance programme that should include electrical safety tests.
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LOCATION	DT2	LASER CUTTER 16.1.1.	RISK LEVEL	LOW
HAZARDS		RISK CONTROL MEASURES		
The equipment can present an electric shock hazard. Leads could be tripped over. Fumes from materials being cut might be harmful. Looking into the light source when working on reflective materials might be harmful. Moving parts might present a tripping hazard.		Ensure extraction is switched on prior to use. Ensure materials being cut are of appropriate composition.		

LOCATION	ALL	DRILLING MACHINE 11.4.1	RISK LEVEL	LOW
HAZARDS		RISK CONTROL MEASURES		
Chuck keys, broken drills, work pieces, etc. can be violently ejected. The chuck key should be removed immediately after use and before starting using the machine. The machine should be fitted with a spindle guard. Unexpected spinning of hand held work pieces could cause injuries to hands. The work piece should be prevented from spinning around by using a vice, hand grips		The machine has a means of isolation, emergency stop. A foot operated emergency stop so the machine can be stopped quickly in an emergency with the operator not having to let go of the spindle feed or work piece. Fixed guards should enclose the pulleys and belts. Eye protection (goggles) should be worn whilst operating the machinery. Long		

or clamping to the table.
The drill table can slip down and heavy objects can fall from the table.
Machine presents an electric shock hazard.
Closing movements between parts can lead to trapping, sharp edges on drills, work pieces and swarf can cause cuts.
Inadvertently starting of the machine can present a hazard.
Lack of space around the machine can lead to the

operator being pushed by passers-by, slippery floors or loose items around the machine can result in contact with the moving parts.

hair and loose clothing should be secured so as not to come in to contact with moving parts.
Dangling jewellery should be removed.
Gloves or bandages should not be worn whilst operating the machine.
Manual handling tasks of lifting materials and the table should be reduced as can be beyond the physical capabilities of some persons.
Coolant nozzles should not be adjusted while the machine is in operation.
Suitable implements should be used to remove swarf to avoid hand contact

Assessment Levels:

Level 4

Pupils generate ideas by collecting and using information. They take users views into account as they respond to briefs. They communicate alternative ideas using words, labelled sketches and models, showing that they are aware of constraints. They apply their knowledge and understanding of materials, ingredients and components, and work with them with some accuracy, paying attention to quality of finish and to function. They use some ideas from others designing to inform their own work. They produce -by-step plans and then select and work with a range of tools and equipment. They identify what is working well and what could be improved to overcome technical problems. They reflect on their designs as they develop, recognising the significance of knowledge and previous experience

Level 5

Pupils develop ideas by drawing on and using various sources of information. They clarify their ideas through discussion, drawing and modelling, showing understanding of aesthetic and economic dimensions. They respond to briefs showing understanding of how culture and society are reflected in familiar products when developing and communicating their own ideas. They show that they are aware of constraints as they apply knowledge and understanding of materials ingredients and techniques. They use their use understanding of others' designing as they develop their work.. They work from their own detailed plans, modifying them where appropriate. They work with a range of tools, materials, ingredients, equipment, components and processes with some precision. They check their work as it develops, solve technical problems and show some evidence of creativity as they modify their approach in the light of progress. They test and evaluate their products, showing that they understand the situations in which the products will function.

Level 6

Pupils draw on and use a range of sources of information, and show that they understand the form and function of familiar products as they develop and model ideas. They respond creatively to briefs, exploring and testing their design thinking. They develop detailed criteria for their products and use these to explore proposals. They apply their knowledge and understanding by responding to several aspects of the problem. They recognise the significance of others designing and modify their approach accordingly. They produce plans that outline alternative methods of making progress. They work with a range of tools, materials, ingredients, equipment, components and processes, showing that they understand their characteristics. They check their work as it develops and solve technical problems by modifying their approach in the light of progress. They evaluate how effectively they have used information sources, using the results of their research to inform their judgements when developing products. They evaluate their products as they are being used, and identify ways of improving them

Level 7

Pupils use a wide range of appropriate sources of information when developing and modelling ideas. They investigate form, function and production

processes as they respond creatively to briefs. They apply their knowledge and understanding, recognising the different needs of a range of users, and search for trends and patterns in existing solutions as they develop fully realistic products as they communicate creative ideas. They produce plans that predict the time needed to carry out the main stages of making products. They work with a range of tools, materials, ingredients, equipment, components and processes, taking full account of their characteristics. They adapt their methods of manufacture to changing circumstances as they solve technical problems, providing a sound explanation for any change from the design proposal. They select appropriate techniques to evaluate how their products would perform when used and modify their products in the light of this evaluation to improve their performance

Level 8

Pupils use a range of strategies to fully develop and model appropriate ideas, responding to information they have identified. They identify conflicting demands on a product and respond creatively to briefs, suggesting ways forward and explaining how their ideas address these demands. When applying knowledge they make decisions on materials, ingredients and techniques based on their understanding of physical properties and working characteristics. They use their understanding of others' designing by reinterpreting and applying learning in new contexts. They organise their work so that they can carry out processes accurately and consistently, and use tools, equipment, materials, ingredients and components with precision. They use accurate testing to inform their judgements when solving technical problems. They identify a broad range of criteria for evaluating their products, clearly relating their findings to environmental, ethical, and social and cultural dimensions

Exceptional Performance

Pupils seek out information to help their design thinking. They recognise how products contribute to lifestyle and choices of a variety of client groups as they develop and model ideas in an innovative way. Responding creatively to briefs, they are discriminating in their selection and use of information sources to support their work. They interpret and apply knowledge and understanding creatively in new design contexts and communicate ideas in new design contexts and communicate ideas in new or unexpected ways. They use understanding of others designing in innovative ways. They work with tools, equipment, materials, ingredients and components to a high degree of precision. They make products that are reliable and robust and that fully meet the quality requirements given in the design proposal. They reflect critically and effectively throughout designing and making processes

