Edward Peake C of E VC Middle School

Medium Term Plan

Subject: Design Technology	Unit: Animal Automata	Term/Duration: Rotation 10 – 12 weeks	Year Group: 6

Prior Learning:

- · What a specification is and how to write one for a design brief.
- · How to produce design ideas.
- · About the material plywood.
- · How to work safely in the workshop.
- · How to use a coping saw to cut curved and straight lines in plywood.
- · How to use files and glass paper to smooth the edges of plywood.
- · How to evaluate design ideas and a finished design.

Key Vocabulary:

- Automata
- Mechanism
- Cam
- Follower
- Rotary motion
- Linear motion
- Dwell Reinforce
- Specification
- Evaluation
- Computer Aided Design
- Computer Aided Manufacture

By the end of this unit…

All pupils will be able to:

Explain how a simple cam mechanism works.
Identify cams and followers on a mechanism.
Know that different shaped cams create different movements.
Make a card model of a cam mechanism.
Think about what needs to be considered before designing.
Choose an animal to base the design on.
Base the design on one of the endangered animals.
Draw 2 different ideas for the animal automata that have the key decisions labelled.
Know the safety rules of working in the workshop.
Know plywood is the material the animal automata is made from.

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Use a coping saw to cut straight lines in plywood. Mark out the pieces of the automata frame. Use the tenon saw safely to cut out the parts. Use the flat file to make the edges more even. Glue the frame together. Mark out the pieces of the mechanical system. Use the tenon saw safely to cut out the dowel . Use the flat file to make the edges more even. Draw the outline of the animal using 2D Design. Think about how well the animal automata works and how well it would captivate someone's interest.
Most children will have made more progress; they will be able to:. Be able to explain what rotary motion and linear motion are. Be able to explain how using an egg shaped and snail shaped cam changes the movement. Make a model that works smoothly. Write a specification outlining what needs to be thought about before designing. Think about what features of the animal will move. Use the information about the animals to inform the design. Colour the ideas. Include in the labelling reasons for the decisions made. Ideas will show where the divisions will be for the pieces. Explain why it is important to follow the safety rules. Know some facts about plywood. Use a coping saw to cut curved lines in plywood. Use the flat file and half round file to remove some of the saw cuts. Use the glass paper to get a smooth finish. Glue the frame together and add triangle supports to the corners. Use the flat file and half round file to remove some of the saw cuts. Use the glass paper to get a smooth finish. Glue the frame together and add triangle supports to the corners. Draw the design for the animal on 2D Design using red lines for the part that will be cut out and black lines for the details that will be engraved..

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Know which points of the specification are met by the final animal automata.
Collect other people's opinions of their final animal automata.

***Some children will have progressed further; they will be able to*:**

Explain how rotary motion is converted to linear motion in a mechanical system.
Explain where the rise and dwell of the movement is when using an egg based and snail based cam.
Change the cams in their card model.
Explain the points of the specification.
Think about how the animals habitat will be included in the design.
Include the habitat of the animal as part of the design.
Link the labelling of the ideas to the individual points of the specification.
Explain how following the safety rules can prevent risks.
Explain why plywood is a suitable material for the animal automata.
Accurately mark out the sides of the frame.
Use the tenon saw accurately to cut along the division lines.
Glue the frame together so the sides and triangle supports fit accurately.
Accurately mark out the sides of the frame. Use the tenon saw accurately to cut along the division lines.
Glue the frame together so the sides and triangle supports fit accurately.
Draw the design for the animal on 2D design that matches their design idea.
Explain the changes they would make if they were to make the animal automata again.
Explain how other people's opinions affect the changes they would make.

♦ ***Notes:***
Visit: Stotfold Mill - Science and technology session: Cogs and gears a practical experience.

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	Learning Objectives	Content	Assessment	Resources /Health and Safety	ICT Opportunities
1	**To be able to explain how a cam mechanism works.**	Starter - What do all these animals have in common? Students feedback to get the correct answer, discuss what endangered means. Explain what a situation is and read through the situation for the animal automata project. Explain what a design brief is and read through the design brief for the project. Discuss what an automata is and show examples. Explain the mechanism that makes the animal automata work. Focus on what a cam and follower are and how rotary motion is converted to linear motion. Show students the video clips (embedded in the powerpoint) of how a cam mechanism works. Students answer the questions in their work booklet that relate to this. Monitor students progress and give assistance as required. Show students the pictures of the automatas and ask them to identify the cam and follower and the different types of motion in their work booklets. Recap on the key words learnt in the lesson and their definitions using random questioning.	Highlight learning objective, must, should or could in the booklet. Questions on cam mechanisms.	Year 6 Animal automata powerpoint Printed work booklet Example animal automatas H&S - see Room 5 risk assessment	
2	**To understand the path of movement of different shaped cams.**	Starter - How do you think this works? Use random questioning to recall knowledge learnt last lesson. Look at the different shapes of cam and explain how the different shapes create different movements. Watch the video clip (embedded into the powerpoint) on egg shaped cams and discuss the movement	Highlight learning objective, must, should or could in the booklet. Model of cam mechanism and	Year 6 animal automata powerpoint Printed work booklet	

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		created, focus on what is meant by the rise and the dwell. Watch the video clip (embedded into the powerpoint) on snail shaped cams and discuss the movement created and at which point there is a rise and dwell. Demonstrate how to make a cam mechanism from card. Students make a cam mechanism from card, making two cams, one egg shaped and one snail shaped. Students glue their cam mechanism into their work booklet and fill out the table to explain the movement of both cams. Students can swap over the cam on their mechanism to see the movements. Monitor students progress and give support as required. Recap using random questioning on the key terms of the lesson, cam, rise, dwell and the movements made by the different shaped cams.	table about movement.	Example cam models Card Split pins Scissors Pritt Stick H&S - see Room 5 risk assessment Focus on use of scissors	
3	**To be able to write a specification for the automata animal.**	Starter - What can you tell me about these designs? Students look at the three automatas and feedback their thoughts on the different designs. Read through the design brief and discuss. Explain students need to make a decision about the animal they are basing the automata on, the type of movement they would like and the background that links to their chosen animal. Read through the information about the six animals the students can choose from. Students answer the questions in their work booklets about their decisions.	Highlight learning objective, must, should or could in the booklet. Completed specification.	Year 6 animal automata powerpoint Printed work booklet Animal information sheets H&S - see Room 5 risk assessment	

		Discuss what a specification is and why it is important to have one before designing a product. Read through the example focusing on why it is important to have a reason and discuss the key things that need to be thought about before designing. Students think about how they could write a specification point for one of the key things. Think,pair and share. Students fill in the specification tables in their work booklets writing the points and reasons. Students feedback their specification points.			
4	**To be able to create a design for the animal automata using the images as a starting point. To be able to evaluate the strengths and weaknesses of the designs.**	Starter - Show students the picture of the cam mechanism. Can you remember which part is the cam and which part is the follower? Can you remember what linear and rotary motion are? Explain and model how to produce design ideas. Recap on drawing in pencil, colouring in coloured pencil, labelling the design decisions, labelling how the design links to the points of the specification, explaining the points in the labelling. Remind students they need to show the frame and mechanism, which cam is being used, the movement being created, the background, the animal, and what it teaches people about the animal. Monitor students progress as they produce their ideas giving assistance as required. Discuss identifying the strengths and weaknesses of the designs. This should focus on how well it teaches people about the animal, how appropriate the movement would be, how well the background and	Highlight learning objective, must, should or could in the booklet. Completed design ideas.	Year 6 animal automata powerpoint Printed work booklet Animal sheets H&S - see Room 5 risk assessment Focus on safe use of scissors.	

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		animal work together not on the neatness of drawing, colouring etc. Students evaluate the strengths and weaknesses of their designs in their work booklets. Students explain which idea they plan to make and why.			
5	**To know what CAD and CAM are and the advantages of using them to manufacture a product.** **To be able to draw the design for the animal using 2D Design.**	Starter - Show pupils an image of a 2D Design drawing and the laser cutter, use random questioning to determine any prior knowledge about CAD/CAM. Explain what CAD and CAM are and how they are used to design and manufacture products. Discuss the advantages of using them when designing and making products. Demonstrate the stages of drawing an animal on 2D Design. Explain the importance of it being the same animal as the one in their design ideas and in the same pose. Demonstrate how to open and save the file in the correct folder in the student area. Explain pupils will be sat in pairs at the computer, one will be drawing their animal and the other will be completing tasks in their booklet. The pupil completing tasks in their booklet will also be there to support the pupil using 2D Design. Hand out instruction sheets and monitor pupils' progress. Give individual support as required. Using questioning recap the main points about CAD/CAM and the advantages of using it.	Highlight learning objective, must, should or could in the booklet. Completed animals.	Year 6 animal automata powerpoint Printed work booklet 2D Design instruction sheets Music computer room - 2D Design package Laser cutter	
6	**To be able to draw the design**	Starter - Display the questions about CAD/CAM on the board, pupils think about the information they can	Highlight learning objective, must,	Year 6 animal automata powerpoint	

	for the animal using 2D Design.	recall from last lesson. Use random questioning for pupils to feedback the answers to the questions. Recap how to open up the saved drawings from last lesson and the stages of drawing the animal using 2D Design, and the booklet tasks that need completing if pupils are not on the computer. Pupils work through drawing their animals using 2D Design and completing the worksheet on CAD/CAM. Monitor pupils progress and give individual support as required. Check all pupils have a completed drawing. Pupils check the drawing of the person they have been working with to make sure the parts that are to be cut out are drawn in a red line and the parts that are to be engraved are drawn in a black line.	should or could in the booklet. Completed animals.	Printed work booklet 2D Design instruction sheets Music computer room - 2D Design package Laser cutter	
7	**To understand how to prevent risks by following the workshop rules. To have knowledge of plywood and why it is a suitable material to make the animal automata from.**	Starter - Can you think of any rules for working in the workshop? Think, pair, share. Show students the images that relate to the key workshop rules. Go through the example rule and the reason why it is important and discuss what the other rules could be and why they would be important. Students fill out the table in their work booklet with safety rules and reasons. Monitor progress made and give support as required. Recap the material being used to make the animal automata is plywood. Explain that it is a manufactured board, how it is constructed and its properties. Demonstrate how to mark out the sections of the frame on the strip of plywood and how to cut it up. Students mark out and cut the sections of the frame.	Highlight learning objective, must, should or could in the booklet. Completed frame	Year 6 animal automata powerpoint Printed work booklet Coping saw Flat file Half round file Sanding block Glass paper Pillar drill Safety goggles Centre punch Ball pein hammer Machine vice	

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	To be able to use hand tools to make the animal automata.	Monitor progress and give support as required. Demonstrate how to mark out the position of the holes in the top and side pieces of the frame, using the diagonal method and centre punch. Demonstrate how to drill the holes using the pillar drill, focusing on the health and safety rules. Students drill the holes in the top and side pieces. Support students with the drilling of the holes. Recap the names of the tools and what they are used for.		H&S - see Room 5 risk assessment Focus on safe use of the pillar drill, coping saw, files, glass paper	
8	**To be able to use hand tools to make the animal automata.**	Starter - What can you remember about plywood? Think, pair, share. Through random questioning recap the stages completed last lesson, focusing on the tools used, how to use them, health and safety. Demonstrate how to glue the frame together and how to add triangular supports to the corners. Explain the benefit of adding the triangles to the frame. Demonstrate how to make the parts of the mechanism, cutting the dowel to length, drawing and cutting out the cam focusing on the fact the sides need to be very smooth, drilling the hole in the cam. Students work through the stages of making, if they haven't finished the frame, this should be done first. Students use their instruction sheets as prompts. Monitor student progress and give support as required. When drilling the holes in the cam students need supervision. Recap the names of the parts of the mechanism and how the mechanism works.	Highlight learning objective, must, should or could in the booklet. Completed frame Parts of the mechanism.	Year 6 animal automata powerpoint Printed work booklet Making the mechanism sheets Animal automata instruction sheets Coping saw Flat file Half round file Sanding block Glass paper Pillar drill Safety goggles Centre punch Ball pein hammer Machine vice	

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				H&S - see Room 5 risk assessment	
9	**To be able to make the mechanical system for the animal automata.**	Starter - Can you name the parts of the mechanical system? Recap the stages of making the animal automata focusing on how to make the mechanical system. Demonstrate how to file and sand the frame, focusing on filing and sanding in the direction of the grain. Demonstrate how to glue the mechanical system within the frame, focusing on where to put glue and where glue must be avoided if the animal automata is to work. Students work through making their animal automatas. Using the instruction sheets as prompts. Monitor student progress and give assistance as required. When students have glued the mechanical system within the frame they colour their animals and mark out,cut and colour their background pieces. Students discuss with their partner the progress they have made and what they need to do next lesson.	Highlight learning objective, must, should or could in the booklet.	Year 6 animal automata powerpoint Printed work booklet Making the mechanism sheets Animal automata instruction sheets Coping saw Flat file Half round file Sanding block Glass paper Pillar drill Safety goggles Centre punch Ball pein hammer Machine vice PVA glue H&S - see Room 5 risk assessment	

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10	**To be able to make the mechanical system for the animal automata** **To be able to assemble the animal automata**	Starter -How far have you got with making the animal automata? Set yourself a target for this lesson. Students share their targets for the lesson. Recap the stages of making the mechanical system for the animal automata focusing on how to make the mechanical system. Demonstrate how to file and sand the frame, focusing on filing and sanding in the direction of the grain. Demonstrate how to glue the mechanical system within the frame, focusing on where to put glue and where glue must be avoided if the animal automata is to work. Students work through making their animal automatas. Using the instruction sheets as prompts. Monitor student progress and give assistance as required. When students have glued the mechanical system within the frame they mark out,cut and colour their background pieces. Students glue their animal to the follower and the larger piece of dowel to the bottom of the follower. Students glue the background pieces to the top of the frame. As students finish their animal automata they can fill out the table of definitions of the parts of the mechanical system. Students evaluate whether they have met their target for the lesson.	Highlight learning objective, must, should or could in the booklet.	Year 6 animal automata powerpoint Printed work booklet Making the mechanism sheets Animal automata instruction sheets Coping saw Flat file Half round file Sanding block Glass paper Pillar drill Safety goggles Centre punch Ball pein hammer Machine vice PVA glue H&S - see Room 5 risk assessment	

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11	**To be able to evaluate the final animal automata.**	Starter - Why do you think it is important to find out what other people think about your finished animal automata? Whose opinion would be useful to know? Use random questioning for students to feedback. Discuss how to fill out the production record for making the animal automata. Explain how a plan of production is usually made before making a product and why. Recap on the tools and equipment needed to make the animal automata and the stages of production. As students complete their animal automata they can work through filling out the production plan. Explain why it is important to carry out an evaluation. Discuss the questions in the evaluation and the level of detail needed in the answers. Monitor student progress and give assistance as required. Explain how to do an evaluation against the specification, using the points written in the specification. Discuss how this can show you what improvements could be made to the animal automata if you were to make it again. Students work through their evaluation against the specification in their work booklets. Monitor student progress and give assistance as required. Recap on why it is useful to find out other people's opinions of a completed product. Discuss what would be useful to know about the final product to work out how successful it is. Give some examples. Discuss how this can show you what improvements could be	Highlight learning objective, must, should or could in the booklet.	Year 6 animal automata powerpoint Printed work booklet H&S - see Room 5 risk assessment	

		made to the animal automata if you were to make it again. Students think, pair, share and then write 5 questions in their work booklets. Discuss what kind of responses are suitable when feeding back to somebody about their work and give some examples. Students ask 3 people to feedback on their completed animal automata using the questions written. Monitor student progress and give assistance as required. Students consider their evaluation against the specification and feedback from other people and suggest improvements they would make if they were to make the animal automata again.			