



Medium Term Planning Design and Technology



Year: 6		Term: 5	Topic: Electrical Systems – Steady Hand Game
<u>Disciplinary Skills:</u> Analysis and investigation of existing products Designing for a function and testing of prototypes Making and constructing to a design Evaluation and reflection	<u>Subject specific substantive theme(s)</u> Electrical Systems: Suitability of materials Understanding of form and function Design and prototypes Construction of products – use of tools and materials (cutting, joining and finishing) Analysis and evaluation of end product	<u>Prior Learning:</u> Electrical Systems – Doodlers (Year 5)	<u>Future learning:</u> Mechanical Systems – Automata Toys (Year 6)
<u>Composites (end points):</u> • Design a steady hand game of their own according to their design criteria, using different perspective drawings. • Modelling ideas through prototypes and constructing and decorating a stable base for their game. • Making and testing a circuit, before incorporating a circuit into a base. • Testing their own and others’ finished games, identifying what went well and making suggestions for improvement.		<u>Key vocabulary:</u> Assemble, battery, battery pack, benefit, bulb, bulb holder, buzzer, circuit, circuit symbol, component, conductor, copper, design, design criteria, evaluation, fine motor skills, fit for purpose, form, function, gross motor skills, insulator, LED, user <u>Link to Kapow unit:</u> https://www.kapowprimary.com/subjects/design-technology/upper-key-stage-2/year-6/electrical-systems-steady-hand-game/	
<u>Component Knowledge:</u> • Investigate and analyse a range of existing products • To know that ‘form’ means the shape and appearance of an object and understand the difference between ‘form’ and ‘function’. • To understand that ‘fit for purpose’ means that a product works how it should and is easy to use. • To know that ‘form over purpose’ means that a product looks good but does not work very well. • Understand the importance of ‘form follows function’ when designing: the product must be designed primarily with the function in mind. • Identify and name the components of a steady hand game • Understand design criteria and create a design that meets the needs of the user • Understand how to draw diagram perspectives, including ‘top view’, ‘side view’ and ‘back’. • To understand how to make and test a circuit • To understand how to draw, cut and accurately fold a net			
<u>Assessment:</u> End points will be assessed via: • Pre and post unit assessments: multiple choice quiz and knowledge catcher • Pupil’s self and peer evaluation of end designs and products: Are they fit for purpose? What has worked well? Where could they make improvements? Pupils with secure understanding indicated by: Creating a secure base with neat edges that relates to their design. Making and testing a functioning circuit and assembling it within the case. Pupils working at greater depth indicated by: Creating a high-quality base with a good level of detail and adding a backboard that follows the same theme and references their original design. Creating a complex wire shape for their game and attaching this securely to their base.		<u>Links to other subjects:</u> Computing: • Use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content. Science: • Use recognised symbols when representing a simple circuit in a diagram. • Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches Maths: • Recognise, describe and build simple 3-D shapes, including making nets	

	Learning objective	Steps to get there (components)	Lesson plan	Resources
1	To research and analyse a range of children’s toys	- Investigate and analyse a range of existing products - To know that ‘form’ means the shape and appearance of an object and understand the difference between ‘form’ and ‘function’. - To understand that ‘fit for purpose’ means that a product works how it should and is easy to use. - To know that ‘form over purpose’ means that a product looks good but does not work very well. - Understand the importance of ‘form follows function’ when designing: the product must be designed primarily with the function in mind.	Presentation: Developing through play. Discussion points: Back in 1856, an American skyscraper architect called Louis Henry Sullivan coined the phrase ‘Form follows function’, which designers still use today. In other words, all products should be designed with the function in mind first, then the design (form) wrapped around it. Explain that when a product or service does what it is supposed to do, it is considered ‘fit for purpose’. Key questions: - What is meant by ‘fit for purpose’? - What is meant by ‘form’? - What is meant by ‘function’? - Why is it essential that form follows function? For children to apply functional knowledge to toys beyond their entertainment value, they first need to understand some of the skills that they develop through play. Read what is meant by ‘Fine motor skills’ and ‘Gross motor skills’. Activity 1: Research existing children’s toys (Children’s toy research PowerPoint) Activity 2: Analyse - children to choose two toys from their research. For each toy they will need to think about the products: form; function; whether the product is fit for purpose Key questions: - Can a toy (product) have more than one function? - Does the form of a toy (product) matter? - Are the toys you have chosen in your research fit for your purpose? Extension activity: Survey - children need to ask a range of adults familiar with Year 2-3 children and Year 2-3 children what they think about the toy and why. Gather the class together and explain that in the next lesson they will start a project to design a ‘steady hand game’. Ask the children the Key questions below and address any misconceptions that they may have. Key questions - What skills do you think steady hand games develop? - What kind of age group would you imagine playing this game? Why is that? - Could this example be improved? - In what ways could we change the difficulty of this toy? - Why does the form and function of this game matter?	Have ready - Presentation: Developing through play - Activity: Children’s toy research PowerPoint - Computer access or laptops for each child - A range of children’s toys to support product analysis Print - Activity: Children’s toy research - Activity: Toy images - Activity (extension): Toy survey

2	To design a steady hand game	• Identify and name the components of a steady hand game • Understand design criteria and create a design that meets the needs of the user • Understand how to draw diagram perspectives, including ‘top view’, ‘side view’ and ‘back’.	Starter: Show the class the video on Link: on VideoLink up to 13 seconds. This part of the video shows the buzz wire game being demonstrated. Ask pupils to discuss how they might make a simplified version of the game, considering the components that they would use. Activity 1: Steady hand game diagram comprises three parts: • A diagram with an illustrated list of components (simple version for children needing more support) • A diagram with no list of components • A diagram with circuit diagrams to show how the circuit works Children to complete the following: labelling the components and connecting the components Now ask the children to consider how the different parts will be joined and what steps they would need to follow to create this, encouraging them to point out relevant features and what they are for. Ask pupils to consider how the steady hand game is made: 1. Create the net for the base and decorate. 2. Assemble the base into a 3D shape (lid needs to be able to open). 3. Make the backboard and assemble with glue to one side of the base. 4. Make the wire shape. 5. Assemble the electronics and wire shape. 6. Test. Key questions • What makes the buzzer sound? • What is a net? • What would make the game difficult to complete? • What might the target audience for the game be? • What are design criteria for? • Give an example of what should be included in the design criteria. Activity 2 : Steady hand game design sheet Design criteria (section A) • Start by discussing the design criteria, encouraging the children to decide for whom they will design their game and therefore how challenging it should be. • Discuss and establish the success criteria for the game as a class. • All children should make sure they have a stable base and a working circuit, which should be concealed inside. Perspective drawings (sections B – D) • The children create a 3D perspective drawing as well as a side view and a plan or top view of their game. For more guidance on perspective drawings, watch the Teacher video: Be an architect (see . • The children should consider the shape of the base (which should be a simple 3D shape) as well as the wire shape. The wire could be something simple, but if you want to challenge your class, give them a theme. Either way, make sure that their design shows just one piece of wire bent into shape.For inspiration, see Presentation: One line drawings	Watch • Teacher video: Game plan • Pupil video: Game plan Have ready • Link: on VideoLink Print • Activity: Steady hand game design worksheet • Activity: Steady hand game diagram
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			Backboard design (section E) - This is an extension exercise for those pupils who need an extra challenge. It is not an essential part of the design and the steady hand game will function without it. - Pupils think about a theme for their game and how they could make it more effective by adding a backdrop. Pupil video: Game plan and consider leaving this to run on a continuous loop while the children work on their design sheets and you circulate. Plenary: Pupils swap their design sheets and complete the design criteria review table (section F) to judge how well the designs match up to the design criteria. Once these are complete, pupils revisit their own design sheet and identify any changes they need to make to their designs in light of what was found in the review.	
3	To construct a stable base	- Understand design criteria and create a design that meets the needs of the user - To understand how to draw, cut and accurately fold a net	Give children their design sheets and explain to the children that they are going to create the bases for their games. Show pupils the range of net templates and ask them to identify which net they will need to create the shape for their base. Model how to create one of the nets: - The children will either receive a template that has been printed onto card, or a template printed on paper which they will then need to glue onto card and cut out. The net needs to be on card to make it sufficiently strong to work as a base. When cutting out the net, stress the importance of not cutting off the tabs. You may want to encourage your more able children who need a challenge, to make their own nets without using a template. - Explain to pupils that they can decorate their nets before or after they have cut them out, but they must decorate before assembling the nets. If they decorate first, the children can ensure that their work is neat and easily goes right up to the lines; however, this may make it more difficult to visualise which side is which. - Folding and creasing the fold lines. - Assembling the 3D shape without glue to check that it makes the complete shape and has been folded correctly. - If happy that the shape has been folded correctly, open it up again and the children then need to mark with a pencil: - where to make holes for the wires in the face that will be the top of the base; - where to make holes in each of the two sides, one for the switch and one for wire going to the handle. - Open up the shape again and, using a sharp pencil and a rubber, pierce holes in the positions marked – it may be helpful to test whether the holes are large enough by testing them with the components that will be put into these positions. - Decorate if not already done so. - Apply small dots of glue to the tabs and assemble the base, leaving one side unglued so that the electronics can be inserted next lesson. Key questions - How can the design criteria help us with this lesson? - What would a good quality base look like? Hand out template nets for the children to create their nets and decorate their nets in line with their design criteria identified in their design sheets. They should take their time and make bases with a high-quality finish.	Watch - Teacher video: Base building Have ready - Pupils’ design sheets from the Activity: Steady hand game design sheets - Scissors - Glue stick - Set squares and rulers (extension) Print - Activity: Example nets

			Extension: Challenge any children who have finished decorating and building the base for their game to create a backboard linked to the theme of their game. They can draw and colour this on plain card, before folding the bottom edge to create a tab, then attaching it to the back of their game. Plenary: Talk pupils through the success criteria once again before they walk around the room to see the work of their peers. Ask them to identify exemplary work (not their own) and explain to the class why they think it is an example of a well-made base.	
4	To assemble electronics and complete their electronic game	- Understand design criteria and create a design that meets the needs of the user - To understand how to make and test a circuit	Main activity: - Gather children together with the components listed in the Have ready section of this lesson. - Ask the children how to build a circuit and get them to consider whether they want a bulb, a buzzer for our game. - Create a simple circuit and then ask the children how they would add a switch. Model how to do this. - Get the children to discuss what we would need to do to this circuit if the circuit is to be used within our steady hand games. Show one piece of that which will act as the shape on top of the game and another piece of wire that will be used to follow the path of the first wire. - Remind the children that wire can be sharp, so they will need to work carefully with it. Model how to use the pliers to shape the wire. The children should try to bend or curl the ends of the wire to avoid sharp edges. Key questions - Describe the function of each component in the circuit. (Buzzers make a noise/bulb makes light when the circuit is closed, batteries supply the electricity to the circuit, wire conducts electricity through the circuit.) - How can you make the buzzer sound or make the bulb light up – depending on which of these you are using? (Touching the handle on the wire shape closes the circuit and allows electricity to flow into the bulb or buzzer and make a noise.) Ask children to build the circuit using: - A buzzer or bulb. - A switch. - A handle. - A wire shape – at this stage, the wire will not have been bent into its final shape. This can be done later after the circuit has been tested. Once the children have built and tested their circuits, they shape the wire. They may find it useful to draw the shape to scale on A4 paper first so that they can follow the lines and use the pliers to bend the wire into shape. To complete their games, the children will need to hide the electrical components inside their bases and place two large balls of plasticine or blue tac at the bottom for the wire pieces to stick into. Show them how to stick the edges of wire through the holes in the top of their base shape and into the plasticine or blue tac balls to secure them.	Watch - Teacher video: Electronics and assembly Have ready - Pupils’ design sheets from the Activity: Steady hand game design sheets - Pupil’s bases constructed in Lesson 3 - Electrical wires – preferably with crocodile clips - Buzzer or bulb and bulb holder - Battery pack - AA batteries - Tinned copper wire (50cm per pupil) or other uncoated conductive flexible wire. You will need approximately 15m for 30 pupils at 50cm per pupil. - Wire cutters - Pliers - Switch (e.g. 2-pin SPST rocker switches) - Scissors - Plasticine or blu-tack

			They should all: • measure and cut components • connect the battery cage • connect the buzzer or bulb • create a loop and handle • connect the loop and wire • join the wire and connector Finally, when the circuit is built and tested and all is finished, the children should glue down the final side of the base shape, concealing the circuit. Once everyone has finished, ask them to test their games by playing their own and one another's games. Then discuss what went well with their game and what they could possibly do to improve it referring back to their design criteria on the Activity: Steady hand game worksheet from Lesson 2.	
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