



THRUPP PRIMARY SCHOOL: Progression of skills in Construction, Mechanisms, Structures and Digital World
(Year A) for EYFS, KS1 and KS2

		Kestrels	Hawks	Buzzards	Eagles	Owls
		(Y1) Mechanisms: Wheels & Axels(moon buggy)	(Y2) Structures: Baby Bear's Chair buggy)	(Y4) Mechanical systems: Slingshot chariot	(Y5) Structures: Bridges & (Y4) Electrical systems: Torches	(Y4) Digital world: Monitoring devices (Y6) Mechanisms: Automata Toys
Skills	Design	Y1 • I can design a vehicle that includes wheels, axles and axle holders, that when combined, will allow the wheels to move. • I can create clearly labelled drawings that illustrate movement.	Y1 • I can learn the importance of a clear design criteria. • I can include individual preferences and requirements in a design. Y2 • I can generate and communicate ideas using sketching and modelling. • I can learn about different types of structures, found in the natural world and in everyday objects.	Y3 • I can design a sling shot which uses a pneumatic system. • I can develop a design criteria from a design brief. • I can generate ideas using thumbnail sketches and exploded diagrams. • I can learn that different types of drawings are used in design to explain ideas clearly. Y4 • I can design a shape that reduces air resistance. • I can draw a net to create a structure from. • I can choose shapes that increase or decrease speed as a result of air resistance. • I can personalise a design.	Y4 • I can design a stable bridge structure that is aesthetically pleasing and selecting materials to create a desired effect. • I can build frame structures designed to support weight. Y4 • I can design a torch, giving consideration to the target audience and creating both design and success criteria focusing on features of individual design ideas. Y5 • I can design a stable structure that is able to support weight. • I can create a frame structure with a focus on triangulation.	Digital world • I can research (books, internet) for a particular (user's) animal's needs. • I can develop design criteria based on research. • I can generate multiple housing ideas using building bricks. • I can understand what a virtual model is and the pros and cons of traditional and CAD modelling. • I can place and manoeuvre 3D objects, using CAD. • I can change the properties of, or combining one or more 3D objects, using CAD. Y5 • I can design a automata toy which uses a mixture of structures and mechanisms. • I can name each mechanism, input and output accurately. • I can storyboard ideas for a toy. Y6 • I can experiment with a range of cams, creating a design for an automata toy based on a choice of cam to create a desired movement. • I can understand how linkages change the direction of a force.

						• I can make things move at the same time. • I can understand and draw cross-sectional diagrams to show the inner-workings of my design.
	Make	Y1 I can adapt mechanisms, when: • they do not work as they should. • to fit their vehicle design. • to improve how they work after testing their vehicle.	Y1 • I can make stable structures from card, tape and glue . • I can learn how to turn 2D nets into 3D structures. • I can follow instructions to cut and assemble the supporting structure of a chair. Y2 • I can make a structure according to design criteria. • I can create joints and structures from paper/card and tape. • I can build a strong and stiff structure by folding paper.	Y3 • I can create a pneumatic system to create a desired motion. • I can build secure housing for a pneumatic system. • I can use syringes and balloons to create different types of pneumatic systems to make a functional and appealing pneumatic toy. • I can select materials due to their functional and aesthetic characteristics. • I can manipulate materials to create different effects by cutting, creasing, folding and weaving. Y4 • I can measure, mark, cut and assemble with increasing accuracy. • I can make a model based on a chosen design.	Y4 • I can create a range of different shaped frame structures. • I can make a variety of free standing frame structures of different shapes and sizes. • I can select appropriate materials to build a strong structure and cladding. • I can reinforce corners to strengthen a structure. • I can create a design in accordance with a plan. • I can learn to create different textural effects with materials. Y4 • I can make a torch with a working electrical circuit and switch. • I can use appropriate equipment to cut and attach materials. • I can assemble a torch according to the design and success criteria. Y5 • I can make a range of different shaped beam bridges. • I use triangles to create truss bridges that span a given distance and support a load. • I can build a wooden bridge structure. • I can independently measure and mark wood accurately.	Digital world • I understand the functional and aesthetic properties of plastics. • I can program to monitor the ambient temperature and coding an (audible or visual) alert when the temperature rises above or falls below a specified range. Y5 • I can follow a design brief to make an automata toy, neatly and with focus on accuracy. • I can make mechanisms and/or structures using sliders, pivots and folds to produce movement. • I can use layers and spacers to hide the workings of mechanical parts for an aesthetically pleasing result. Y6 • I can measure, mark and check the accuracy of the jelutong and dowel pieces required. • I can measure, mark and cut components accurately using a ruler and scissors. • I can assemble components accurately to make a stable frame. • I understand that for the frame to function effectively the components must be cut accurately and the joints of the frame secured at right angles.

					• I can select appropriate tools and equipment for particular tasks. • I can use the correct techniques to saw safely. • I can identify where a structure needs reinforcement and using card corners for support. • I can explain why selecting appropriating materials is an important part of the design process. • I can understand the basic wood functional properties.	• I select appropriate materials based on the materials being joined and the speed at which the glue needs to dry/set.
	Evaluate	Y1 • I can test the wheel and axle mechanisms, identifying what stops the wheels from turning, and recognising that a wheel needs an axle in order to move.	Y1 • I can evaluate a chair according to the design criteria, testing whether the structure is strong and stable and altering it if it isn't. • I can suggest points for improvements. Y2 • I can explore the features of structures. • I can compare the stability of different shapes. • I can test the strength of own structures. • I can identify the weakest part of a structure. • I can evaluate the strength, stiffness and stability of own structure	Y3 • I can use the views of others to improve designs. • I can test and modify the outcome, suggesting improvements. • I can understand the purpose of exploded-diagrams through the eyes of a designer and their client. Y4 • I can evaluate the speed of a final product based on: the effect of shape on speed and the accuracy of workmanship on performance	Y4 • I can evaluate structures made by the class. • I can describe what characteristics of a design and construction made it the most effective. • I consider effective and ineffective designs. Y4 • I can evaluate electrical products. • I can test and evaluate the success of a final product. Y5 • I can adapt and improve my own bridge structure by identifying points of weakness and reinforcing them as necessary. • I can suggest points for improvements for own bridges and those designed by others.	Digital world • I can state an event or fact from the last 100 years of plastic history. • I explain how plastic is affecting planet Earth and suggesting ways to make more sustainable choices. • I explain the key functions in my program (audible alert, visuals). • I explain how my product would be useful for an animal carer including programmed features. Y5 • I evaluate the work of others and receiving feedback on own work. • I suggest points for improvement. Y6 • I evaluate the work of others and receiving feedback on own work. • I apply points of improvement to their toys. • I describe changes I would make/do if I were to do the project again.

Knowledge

Y1 • I know that wheels need to be round to Rotate and move. • I understand that for a wheel to move it must be attached to a rotating axle. • I know that an axle moves within an axle holder which is fixed to the vehicle or toy. • I know that the frame of a vehicle (chassis) needs to be balanced. • I know some real-life items that use wheels such as wheelbarrows, hamster wheels and vehicles.	Y1 • I understand that the shape of materials can be changed to improve the strength and stiffness of structures. • I understand that cylinders are a strong type of • I begin to understand that different structures are used for different purposes. • I know that a structure is something that has been made and put together. Y2 • I know that shapes and structures with wide, flat bases or legs are the most stable. • I understand that the shape of a structure affects its strength. • I know that materials can be manipulated to improve strength and stiffness. • I know that a structure is something which has been formed or made from parts. • I know that a 'stable' structure is one which is firmly fixed and unlikely to change or move. • I know that a 'strong' structure is one which does not break easily. • I know that a 'stiff' structure or material is one which does not bend easily. • I know that natural structures are those found in nature. • I know that man-made structures are those made by people.	Y3 • I understand how pneumatic systems work. • I understand that pneumatic systems can be used as part of a mechanism. • I know that pneumatic systems operate by drawing in, releasing and compressing air. Y4 • I understand that all moving things have kinetic energy. • I understand that kinetic energy is the energy that something (object/person) has by being in motion. • I know that air resistance is the level of drag on an object as it is forced through the air. • I understand that the shape of a moving object will affect how it moves due to air resistance. Additional knowledge: • I understand that products change and evolve over time. • I know that aesthetics means how an object or product looks in design and technology. • I know that a template is a stencil you can use to help you draw the same shape accurately. • I know that a birds-eye view means a view from a high angle (as if a bird in flight). • I know that graphics are images which are designed to explain or advertise something.	Y4 • To understand what a frame structure is. • To know that a 'free-standing' structure is one which can stand on its own. Y5 • I understand some different ways to reinforce structures. • I understand how triangles can be used to reinforce bridges. • I know that properties are words that describe the form and function of materials. • I understand why material selection is important based on properties. • I understand the material (functional and aesthetic) properties of wood. • I understand the difference between arch, beam, truss and suspension bridges. • I understand how to carry and use a saw safely. Y4 • I understand that electrical conductors are materials which electricity can pass through. • I understand that electrical insulators are materials which electricity cannot pass through. • I know that a battery contains stored electricity that can be used to power products. • I know that an electrical circuit must be complete for electricity to flow.	Digital world • I know that a 'device' means equipment created for a certain purpose or job and that monitoring devices observe and record. • I know that a sensor is a tool or device that is designed to monitor, detect and respond to changes for a purpose. • I understand that conditional statements (and, or, if booleans) in programming are a set of rules which are followed if certain conditions are met. Y5 • I know that mechanisms control movement. • I understand that mechanisms can be used to change one kind of motion into another. Y6 • I understand that the mechanism in an automata uses a system of cams, axles and followers. • I understand that different shaped cams produce different outputs. • I understand key developments in thermometer history. • I know events or facts that took place over the last 100 years in the history of plastic, and how this is changing our outlook on the future. • I know the 6Rs of sustainability. • I understand what a virtual model is and the pros and cons of traditional vs CAD modelling.
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