Build-a-House

Lesson Plan

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Product Code: TE10017

Build-a-House Summary

Recommended level – Years 4-6
Time taken – 5-6 hours
Pupils to work individually
Additional adult help is useful – you could invite in parent helpers
Expectation – each pupil to complete one working house
Associated resources:
Build-a-House PowerPoint
Build-a-House worksheet
Build-a-House worksheet - suggested answers
How to build-a-house blog

STEM Links

- Science: construct simple series circuits; use their circuits to create simple devices
- Technology: design, make and evaluate; understand and use electrical systems in products
- Engineering: doorbell and lamp circuits, uses of different types of switch
- Mathematics: draw lines to the nearest mm, measure angles using a protractor

Curriculum Learning Objectives – it is recommended to cover these topics prior to the exercise so that the pupils are reinforcing their knowledge and understanding, rather than meeting the topics for the first time.

Science: Electricity
(Years 4 & 6)

Pupils should be taught to:

- construct a simple series electrical circuit, identifying and naming its basic parts
- recognise that a switch opens and closes a circuit
- recognise some common conductors and insulators, and associate metals with being good conductors
- use their circuits to create simple devices
- use recognised symbols when representing a simple circuit in a diagram
- pupils should be taught about precautions for working safely with electricity

Design and Technology
(Key Stage 2)

Through a variety of creative and practical activities, pupils should be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making. When designing and making, pupils should be taught to:

Design and Technology: Design

- design innovative, functional, appealing products that are fit for purpose

Design and Technology: Make

- select from and use a wide range of tools and equipment to perform practical tasks
- select from and use a wide range of materials and components according to their functional properties and aesthetic qualities

Design and Technology: Evaluate

- evaluate their ideas and products

Design and Technology: Technical knowledge

- understand and use electrical systems in their products

Mathematics

Pupils should be taught to:

- Draw lines with a ruler to the nearest mm
- Measure angles in degrees (°) using a protractor

Equipment needed

Parts included in class kit (per house):

- 1 cardboard box (total 30)
- 1 buzzer (total 30)
- 1 push-to-make switch (total 30)
- 1 bulb holder with bulb (total 30 bulb holders, 50 bulbs)
- 1 slide switch (total 30)
- 6 crocodile leads (total 180)
- 2 battery holders (total 60)
- 25 cm square of corrugated plastic sheet
- 12.5 cm square of corrugated plastic sheet Offcuts of corrugated plastic sheet (total 1 pack of coloured corrugated plastic sheet containing 10 sheets 500mm x 500mm)
- Self-adhesive foam sheet (total 1 pack of 10 coloured sheets 200mm x 300mm)
- Pipe cleaners (total 1 large pack)
- Pompoms (total 1 large pack)
- Wiggly eyes (total 560)

Check you have received the correct contents in your class kit. Please let TTS know if there are any problems as soon as possible.

Tools and consumables (not included – one each unless otherwise specified):

- AA cell (this is often called a battery). It is very important to use **zinc chloride** or similar type of cells, **not** alkaline or re-chargeable ones. If the pupils accidentally short circuit their battery (which often happens) then alkaline or re-chargeable cells get hot and can cause burns. Zinc chloride type cells are cheap and easily available (e.g. from discount stores).
- Pointed scissors, e.g. nail scissors. The scissors need to be pointed in order to pierce the cardboard – most school scissors are too rounded for this.
- Large scissors
- 30cm ruler
- Felt tip pen
- Protractor
- Sharp pencil
- Blunt pencil (or crayon)
- Transparent sticky tape 25 mm wide (preferably one tape dispenser per table)
- Pair of pliers or a 10 mm spanner (preferably one per table)
- Low melt glue guns and glue sticks (several needed, e.g. 5-6, as there is likely to be a large queue to use them!). **Note: High melt temperature glue guns should not be used, as they can cause nasty burns.**
- Optional – you could ask pupils to collect transparent plastic sheet, e.g. the display panel from cake or biscuit boxes, to use for window glazing. Also pine cones and other decorations.

Risk Assessment

Conduct a risk assessment before undertaking the activity. A sample risk assessment is given below; you can use this as a starting point when writing your own.

Activity	Identified Hazard	Initial Risk Rating L/M/H	Control Measures	Controlled Risk Rating L/M/H
Use of glue guns	Burns	H	Children should be supervised by a responsible adult at all times when using the glue guns. Explain to children how to use the glue guns. Warn them that the ends are very hot. Use only low melt temperature glue guns. If burned hold under running water for ten minutes. Don't switch on the glue guns until after the safety briefing. In some schools children wear safety goggles when using glue guns.	M
Accidentally short-circuiting battery	Burns, smoke inhalation	M	Explain how to avoid short circuits. Use only zinc chloride cells, not alkaline or re-chargeable ones as these can get very hot if short circuited.	L
Use of pointed scissors	Injury e.g. to fingers	M	Make the children aware of the dangers. Do not give out the scissors until after the safety briefing.	L
Use of sharp pencils	Injury, e.g. to fingers	M	When piercing holes in plastic or cardboard it is possible to injure your fingers. Explain the dangers to the children and tell them to take care.	L
Use of tape dispensers	Injury, e.g. to fingers	M	Make the children aware of the dangers. Show them how to use the tape dispensers safely.	L
Running extension leads along floor for glue guns	Trip hazard	M	Avoid using extension leads if possible. Otherwise make sure extension leads are run where they cannot be tripped over.	L
Damaged extension leads or glue gun leads	Electrocution hazard	H	Conduct a visual check of all electrical items before session to ensure the leads are undamaged.	L

Vocabulary list

Battery / cell – this converts chemical energy into electrical energy. It is used to 'push' electricity around a circuit. If you connect cells together you get more 'push' – a battery consists of two or more cells.

Conductor – an electrical conductor allows electricity to flow through it. Metals are good conductors.

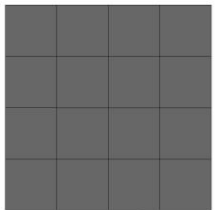
Insulator – an electrical insulator stops electricity passing through. Plastic, wood, rubber and glass are insulators.

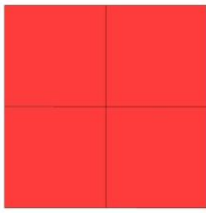
Push-to-make switch – this is a switch which allows electricity to flow only when the button is being pressed.

Slide switch – this switch is operated using a slider. When the slider is pushed to one end of the switch the electricity can flow, and when pushed to the other end it can't.

Short circuit – an electric circuit which allows the electricity to flow round it with very little resistance, so the battery will drain quickly and get hot.

Preparation needed





- Take the two black sheets of corrugated plastic and use a craft knife, straight edge and cutting mat to cut them each into 16 squares (12.5 cm x 12.5 cm).
- Take the remaining eight sheets of corrugated plastic and cut them each into 4 squares (25 cm x 25 cm).
- Build a sample house to explore any pitfalls. Instructions are given in the 'How to build-a-house' blog. If you have 30 pupils then you will need to dismantle your house to re-use the parts.
- Lay out the electrical parts in trays (e.g. re-use clean plastic food trays) for the pupils to collect.
- Use bowls or use plastic food trays for the pupils to collect their electrical parts in. Then they are less likely to drop or lose them, particularly when dismantling the switch.
- Print out a worksheet per pupil.
- You could screw the bulbs into the bulb holders in advance so they don't get dropped or lost.

Hints and tips

Glue Guns

- Allow ten minutes for them to warm up before use. You can jam the glue guns by trying to use them before they are fully warm.
- Do not use the glue guns after they have been switched off, as you could jam them while they are cooling down.
- Keep spare glue sticks in a bag or box. If you leave them out on the gluing station they can get glue on and then jam the glue gun when inserted.
- Keep the glue guns spaced well apart to avoid gluing up the glue stick of the gun next to them.
- Don't pull the glue sticks out of the glue guns, as you could damage them.

Slide 2 – Electrical parts

- You could hold up each electrical component and ask pupils to name it.

Slide 3 – Electrical circuit

- How to operate the push-to-make switch – you press the button to allow electricity to flow. When you release the button the electricity stops flowing.
- How to operate the slide switch – you push the slider to one end to allow electricity to flow. When you push it to the other end the electricity stops flowing.
- A circuit diagram is easier to draw and to interpret than drawing the actual circuit and components.

Slide 4 – Avoid short circuits

- Explain what a short circuit is. If the wires from the battery are accidentally connected together there is very little resistance to the flow of electricity and the battery can get hot and drain quickly. That is why the wires from the battery need to be connected across components such as the bulb or the buzzer which resist the flow of electricity

Slide 5 – Make your circuit.

- It is helpful to lay out a set of components in a triangle and then demonstrate how to connect them up and fit the cells.

- Only lay out the electrical parts needed for the buzzer circuit at this stage.
- Pupils can then go and collect their electrical parts in a bowl or tray so they don't drop or lose them.
- It is useful for the pupils to collect wires of three different colours, including one red one. This makes it easier to identify exactly what is connected to what.
- Pupils can bend the contacts of the switch apart a little to fit the crocodile clips on. The metal ends of the crocodile clips mustn't be touching.
- If the buzzer is connected back to front it won't do any harm, it just won't buzz!
- Pupils often clip the crocodiles onto the plastic insulation instead of the bare metal ends of the wires. This makes a useful demonstration of conductors versus insulators!

Slide 7 – Make your door and windows

- Only hand out the pointed scissors at this stage, not the large scissors, so the pupils can't use the wrong ones.

Slide 8 – Prepare your doorbell attachment

- Hand out only the sharp pencils at this stage; blunt pencils are likely to just bend the plastic.

Slide 9 – Fit your push-to-make switch

- Make sure the pupils place their nuts and washers in their bowl so they don't lose them.
- If the nut is very tight they may need to loosen it with the pliers or spanner.

Slide 10 – Fit the buzzer and re-make your circuit

- Don't fit the buzzer too close to the roof line or it can stop the roof fitting on properly.

Slide 11 – Make your lighting circuit

- Lay out just the parts needed for the lighting circuit.
- Advise the pupils to collect wires of three different colours to help them work out what is connected to what.
- If you haven't screwed bulbs into the bulb holders beforehand then ask the pupils to screw them in right away before they lose or drop them.
- If the bulbs don't light up they may not be screwed in hard enough.
- It doesn't matter which way round you connect the bulb.

Slide 14 – Electrical safety

- Hazards include electric shocks, electrocution and electrical fires.
- Possible ways to avoid electric shocks include: don't put your fingers in plug sockets, switch off at the socket before unplugging devices, switch off before changing light bulbs, don't use a switch with wet hands because water can conduct electricity, don't touch live wires.

Slide 15 – Start making the roof

- Hand out the blunt pencils and collect in the sharp ones, so the pupils can't use the wrong ones.
- Make sure the indent is made parallel with the corrugations so that the roof will bend properly.
- The indented side should be at the top.

Slide 16 – Make the ends of the roof

- Collect in the nail scissors.
- Hand out the large scissors and protractors.

Slide 18 – Finish the roof

- Make sure the lines are marked on the underside of the roof, across the corrugations.

- It may be easier to work in pairs when gluing on the ends of the roof. Then one pupil can hold the roof in a folded position while the other glues on the ends.

Slide 19 – Decorate and populate your house

- If you have transparent plastic sheet it can be used to glaze the windows.
- Any decorations you have can also be used on or in the houses for decoration or furnishing.
- Pine cones with wiggly eyes can also be used as people.

Slide 20 – Plenary

- If you use a push-to-make switch for a lighting circuit then as soon as you take your finger off the switch the light will go out.
- If you use a slide switch for a doorbell then the person ringing the bell might just switch it on and leave it ringing, which would be really annoying!