

ROBOT LESSONS

KS2 Design and Technology - Teachers Notes



Light Stitches
www.lightstitches.co.uk

Here are some STEM engineering activities based on the theme of robots. Can your students complete these to become robotic experts?

Activity 1 - Designing My Own Robot

Activity 2 - Draw/Doodle/Scribble Bot

Activity 3 – Bristle Bot Bugs

Activity 4 - Bristle Bot Race Track

Activity 4 - Other Robot Designs

Health and Safety

Ensure a suitable “risk assessment” has been completed.

General health and safety rules apply i.e. proper use of scissors and sharp items and if using a glue gun the risk of heat and burning.

Students need to be aware of the risks of batteries and the small components in the kits.

Warning – choking Hazard – Batteries and small components are extremely dangerous if swallowed.

General Set Up for all the activities

- Place all the materials on a central desk.
- Student can also bring in their own recyclable materials – see suggested list.
- Make sure there is a suitable area for the construction of the robots
- Students to look at their plan before building their robots

Each activity is a suggestion please feel free to adapt and change. Your feedback on the activities would be greatly appreciated. We would love to see your designs at Light Stitches. Send us your class photos of your Robots designs for a chance for your school to win a class Bristle Bot Eco Kit worth £85 with bamboo toothbrushes. Email sales@lightstitches.co.uk. The prize draw takes place on 31st December 2019

Activity 1 - Designing My Own Robot

Using the recyclable materials can you design and make your very own robot to complete for a specific task eg robot cleaner, excavator, litter picker etc



Teacher Instructions

Use the Power Point Presentation for further information. Materials: (per classroom) Assortment of scrap materials cardboard, cans, plastic bottles, boxes, paper, foil, straws, pipe cleaners, bottle caps, egg cartons, toilet/kitchen roll paper tubes, split pins (brads), elastic bands and paper clips.

Glue gun, tape, scissors, tape measure and glue.

Research robots - [Light Stitches Robots](#)

Set-Up

Place all the materials on a central desk. Student can also bring in their own recyclable materials.

Make sure there is a suitable area for the construction of the robots

Students to look at their plan before building their robot

Student handbook

Aim: Students will design and construct a robot from recyclable materials to complete the activity.

- In the space below, draw a sketch of your robot design.
- Label the recyclable materials you will use.
- What will your robot be used for?

Rules

- Only use the materials provided by you or the school.
- You must use your original design
- Your goal is to make a robot that can do a task.
- Have fun and be creative

Student feedback sheet

Were you successful in this activity yes/no and explain why ?

What was the most difficult part of the activity– explain your answer ?

What task can/should your robot complete ?

What did you learn about structures and mechanics by doing this activity?

Further STEM activity

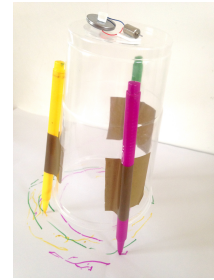
Using the internet and books research robot usage.

What robots are used in industry?

What robots are used in the home ?

Activity 2 - Draw/Doodle/Scribble Bots - Group activity

In small teams design a draw bot.



What you will need

Paper or plastic cup, strong tape, double sided tape, play doh (optional), 3 or 5 thick or thin felt pens, white paper, battery case, small motor, split pins (brads), CR2032 batteries, elastic bands and paper clips, scissors and glue gun.

Teachers notes

Select a couple of ideas from the videos on You Tube see [Light Stitches Robots](#). Use the Power Point Presentation it may be a good idea to research these before setting the tasks as there are lots of variables on this idea. A couple of my favourites are:-[Scribbling bot](#) from We The Curious and Homemade [doodlebot](#)

Aim

Students to design a draw bot and then complete the group challenge by making the draw bot from recyclable materials.

Student activity

In small teams using the recycled materials available design and then make your very own Draw/Doodle/Scribble Bot. This robot needs to be designed to complete a specific task - drawing. In the space below, draw a sketch of your robot design. Label all the recyclable and other materials you will use.

Rules

- Only use the materials provided by you or the school.
- You must use your original group design
- Your goal is to make a draw/doodle/scribble bot that can create art.
- Use as many of the resources as you need including 3 - 5 felt pens.
- Have fun and be creative

Student feedback sheet

Were you successful in the activity yes/no explain why ?

What was the most difficult part of the activity – explain your answer ?

What drawing tasks can/should your draw bot robot complete?

What did you learn about structures and mechanics by doing this activity?

Further STEM activity

Use the internet and books research draw bots further. How could you modify your design to achieve different drawing designs - straight lines, circles etc.

Activity 3 - Bristle Bots Bugs



What you will need

Light Stitches Bristle Bot Bug kits – class or individual packs. Pipe cleaners and other decorative items.

Teachers notes

Use the Power Point Presentation. Select a couple of ideas from the videos on You Tube see [Light Stitches Robots](#) there is also a [step by step video](#) on how to make the Light Stitches Bristle Bot Bugs. Full instructions are also included in the kits. You will also need scissors and a glue gun or extra double side tape to glue on the pipe cleaners etc.

Rules

- Only use the materials provided by you or the school.
- You must use your own original design
- Your goal is to make the fastest Bristle Bot for the next activity.
- Have fun and be creative.

Aim

Students to design a bristle bot and then complete activity by making and creating their own bristle bot.

Student activity

Using your own design create your very own Bristle Bot be as creative as you like you can add pipe cleaners, felt and wiggly eyes but remember if it is too heavy it will not move. Give your Bristle Bot a name.

Student feedback sheet

Were you successful in this activity yes/no and explain why?

What was the most difficult part of the activity– explain your answer?

How quickly does your bristle bot move – does it move in one direction or around in circles?

Can you change your design to make it move in different directions?

What did you learn about structures and mechanics by doing this activity?

Further STEM activity

Now test your Bristle Bot on different surface areas e.g. carpet, smooth plastic, cardboard, metal and at different angles – does it move quicker or slower on different surfaces? You could also make a Bristle Bot by using a nail brush or hand brush – what other materials would you need?

Further Teachers Notes – Bristle Bots – Questions and Answers

Why will my Bristle Bot Bug not go straight?

A Bristle Bot's motion is random, meaning that it has no steering. It is very difficult to build a Bristle Bot that will go perfectly straight on its own. This is why the instructions recommend on activity 4 will guide the Bristle Bots on a straight path.

Why does my Bristle Bot keep falling over?

If your Bristle Bot falls over frequently, there is a chance that your motor and battery are slightly off-centre. Try adjusting the motor and battery to make sure they are centred on the toothbrush head. Your Bristle Bot will also move faster and be more likely to fall over for the first 5–10 minutes of use. As the battery drains, the robot will slow down and will not fall over as much. If you cannot get the robot to stop falling over even after adjusting the motor and battery, let it run continuously for 5–10 minutes and then try again.

Why does my Bristle Bot suddenly stop moving?

If your Bristle Bot abruptly stops moving, two of the wires you twisted together probably came loose. Constant vibrations can cause the wires to wiggle and gradually come apart. Check to make sure the wires from the motor and battery are tightly twisted together.

How long will my Bristle Bots' batteries last?

Your Bristle Bots' motors use a lot of electricity. Each battery should last for about one hour, but the robots may start to slow down after 30–45 minutes of continuous use.

Hints and Tips

- A Bristle Bot is a simple robot with a rigid body. A simple firm bristle toothbrush makes the bristle bot move quickly.
- The current from the battery to the pager motor causes the toothbrush head to vibrate up and down. When you connect the wires you create a closed circuit this makes the Bristle Bot move.
- Bristle bots are easy to assemble although the battery has a + and – it doesn't matter how it is connected you can place the red or black lead on the top or bottom.
- The pager motor and battery can go at the front or the back of the toothbrush. Changing these will move your bristle bot bug in different directions.
- You can decorate your bug with legs a pipe cleaner works well but remember the heavy you make it the slower it will be.
- We added adhesive felt and pipe cleaners to make a Bristle Bot Bee – it is very speedy.
- We have also introduced Eco Bristle Bot this uses a Bamboo toothbrush head with multicoloured nylon bristles.

Activity 4 Bristle Bot Bug Race Track Activity



Using the recyclable materials available can you design and create your very own Bristle Bot Race Track.

Teacher Instructions

Materials: (per classroom) Assortment of scrap materials cardboard, boxes, paper, foil, straws, pipe cleaners, bottle caps, egg cartons, toilet/kitchen roll paper tubes, split pins (brads), tape, scissors, tape measure, shoe box lid, glue and glue gun.

Use the Power Point Presentation.

Rules

- Only use the materials provided by you or the school.
- You must use your original group design
- Your goal is to make a race track with 4 lanes.
- You cannot change your bristle bot it must be the original design.
- Have fun and be creative with your race track design.

Aim

Students to design a Bristle Bot race track with 4 lanes and then complete activity by racing the Bristle Bots and record the results.

Student activity

In teams of 4 design and create your very own Bristle Bot race track - be as creative as you like but remember not to put any obstacles in the way that will prevent your Bristle Bot completing the race.

Student feedback sheet

Were you successful in the activity yes/no and explain why?

What was the most difficult part of the activity– explain your answer?

What was the best idea your team came up with?

Further STEM activity

Now in teams of 4 place the Bristle bots at the start of race track. Use a timer now race the Bristle Bots. Which Bristle Bot won? Why do you think this Bristle Bot won ? Record the timings for each and then create a graph/chart to show your results.

Activity 5 Other Robot Designs



Using the materials available can you design a robot that uses LED's as part of the design.

Teacher Instructions

Materials: (per classroom) Assortment of scrap materials cardboard, cans, plastic bottles, boxes, paper, foil, straws, pipe cleaners, bottle caps, egg cartons, toilet/kitchen roll paper tubes, split pins (brads), wooden clothes pegs, tape, scissors and glue, LED's, CR2032 batteries, tape measure, pager motor and glue gun.

Rules

- Only use the materials provided by you or the school.
- You must use your original design
- Your goal is to make or adapt a robot that has LED's in the design
- Have fun and be creative.

Research robots - [Light Stitches Robots](#)

Set-Up:

Use the Power Point Presentation. Place all the materials on a central desk. Student can bring in their own recyclable products.

Make sure there is a suitable area for the construction of the robots

Students to look at their plan before building their robot

Students to understand a basic circuit.

Aim Using the recyclable materials available can you design adapt/make your very own robot to add LED's to the design.

Student feedback sheet

Were you successful in the activity yes/no and explain why ?

What was the most difficult part of the activity– explain your answer ?

Did your circuit work? If not why do you think this was ?

What did you learn about circuits by doing this activity?

Further STEM activity

Research other designs for your bristle bot how could you adapt your Bristle Bot to add more LED's. How many LED's do you think you can use with one CR2032 battery?

Glossary

Anode - the positively charged electrode by which the electrons leave an electrical device.

Cathode – The cathode is the negative terminal where current leaves an electronic device.

Circuit - a complete and closed path around which a circulating electric current can flow.

LED – Light Emitting Diodes small electrical components that glow.

Motorised – to add a motor

Lever- to lift or move with a lever

STEM – science, technology, engineering and mathematics

Websites

[Robotshop](#) - lots of ideas for robots

[NASA](#) National Aeronautics and Space Administration. Their [resources page](#) has lots of links to other robotic websites.

[Robot wars](#) the BBC programme for Robot enthusiasts

[Robot books](#) American website that has many books about robots.

[Wethecurious](#) based in Bristol have a great school programme including push and pulls for KS1 and Scribble Bots and Lego Robots for KS2

[Stem organisation](#) resources, news and advise on STEM

Recyclable Resources

Get your students to bring in some resources from home they may have spare shoe box lids ideal for activity 4. Also anything they may want to decorate their robots with.