JUNKO Zoomer, Session 1 - "Materials and Magnets"

Area of Learning: Science Year Group: 5 & 6 Duration: 45 minutes

1. Learning Intentions

Science - Properties and changes of materials:

Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, and response to magnets

Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals and plastic

2. Resources

JUNKO Zoomer Kits

A selection of packaging (e.g. cereal boxes, milk bottles, etc.) to be stored afterwards for later sessions

Magnet pieces (from JUNKO Zoomer kits)

Torch

Water

Large storage boxes for sorting packaging

J-Heroes Comic (Issue 1 - included in your JUNKO kit)

3. Key Vocabulary

Rust, card, hard, light, metal, absorb, opaque, reflect, predict, plastic, magnetic, flexible, reactions, recycling, materials, properties, attraction, waterproof, transparent

4. Introduction

Prior to the lesson, have pupils **collect around five different pieces of clean packaging each** (ask parents not to include sharp metals such as food cans, or glass. Also consider pupils with nut allergies.)

Explain that you will be **looking at different materials** and their **properties**.

The J-Heroes Comic (Issue 1)

5. Main Activity

Read pages 1-4 of The J-Heroes Adventures (Issue 1) to the class. Explain that Zeta and Bort, the inventors from Planet JUNKO, need their help to sort the packaging so that the 'junk' can be made into something useful, instead of being turned into waste, as it was on planet Jumo.

Put pupils into groups of four. At one end of the classroom, create piles of mixed packaging, with equal amounts of packaging for each group. At the other end of the classroom, provide boxes labelled plastic, metal, card, and other. Demonstrate an example of each, using the packaging (e.g. a milk bottle, a can, and a cereal box).

Have the groups race to sort their pile of recycling into the correct boxes. When they have all finished, go through the boxes as a class and check they are all correct.

Go through each of the boxes of materials and discuss the following questions with the class, carrying out mini experiments to find the answers.

1. Is the (cardboard/metal/plastic) hard/flexible?

a. What do you think (predict) will happen if we try to bend it? — 1.a. Medium
b. What happened when we tried to bend it? Was it what we predicted? — 1.b. Easy
c. Does this mean that the material is hard or flexible? — 1.c. Hard

2. Is the (cardboard/metal/plastic) transparent/opaque?

a. What do you think (predict) will happen if we shine a light through it? — 2.a. Medium
b. What happened when we shone a light through it? Was it what we predicted? — 2.b. Easy
c. Does this mean the material is transparent (see through) or opaque (not see through)? — 2c. Hard

3. Is the (cardboard/metal/plastic) magnetic?

a. What do you think (predict) will happen if we put a magnet on it? — 3.a. Medium
b. What happened when we put a magnet on it? Was it what we predicted? — 3.b. Easy
c. Does this mean the material is magnetic (attracts the magnet) or non-magnetic (does not attract the magnet)? — 3.c. Hard

4. Is the (cardboard/metal/plastic) waterproof?

a. What do you think (predict) will happen if we put water on it? — 4.a. Medium
b. What happened when we put water on it? Was it what we predicted? — 4.b. Easy
c. Does this mean the material is waterproof or not waterproof? — 4.c. Hard

Free play: Allow pupils to freely experiment with the packaging. They could all have a go at testing the magnetism of the different metals and sort these into magnetic/non-magnetic; or build the tallest tower they can without the use of glue/sellotape.

Have pupils **take apart their models at the end of the session** and sort them back into the plastic/cardboard/metal boxes and JUNKO bag to use again in the next session.

Differentiation:

Choose a pupil to use a magnet to test the materials in each box as you go through the questions.

6. Plenary

Definitions test / Spelling test: using the key vocabulary (extension: match up the opposites, e.g. hard/flexible)

Mini quiz:

1. Give one example of where you might find cardboard (extension: explain why you think this material was chosen).
2. Give one example of where you might find plastic (extension: explain why you think this material was chosen).
3. Give one example of where you might find metal (extension: explain why you think this material was chosen).

7. Answers

Main Activity Answers:

1. Is the (cardboard/metal/plastic) hard/flexible?

a. Thin cardboard, metal, and plastic will bend; thick cardboard, metal, and plastic will not bend.

b. Discuss what you observed and compare the differences and similarities between and within materials. Highlight that the thicker materials are often stronger than the thinner materials.

c. Materials that didn't bend easily are likely to be hard; materials that did bend are flexible. e.g. thin card, foil, and cling film are flexible; tin cans and milk bottles are hard.

2. Is the (cardboard/metal/plastic) transparent/opaque?

a. The cardboard will block the light; the metal will block or reflect the light; some plastic will let the light through.

b. Discuss what you observed and compare the differences and similarities between and within materials. Highlight that some plastics let the light through (can depend on thickness, or colour) and some do not. e.g. milk bottles will let light through, a microwave meal tray will not.

c. If you can see the light through the material, it is transparent (see through); if you can't see the light through the material, it is opaque (not see through). e.g. a plastic milk bottle is transparent; a cereal box is opaque.

3. Is the (cardboard/metal/plastic) magnetic?

a. The magnet will not be attracted to (will not stick to) the cardboard or the plastic; the magnet will be attracted to (stick to) some but not all metals.

b. Discuss what you observed and compare the differences and similarities between and within materials. Highlight that some metals are magnetic (e.g. those with iron, steel or nickel such as paper clips), and some are non-magnetic (e.g. those with silver, copper, or aluminium such as foil). (Extension: Discuss what types of metal the materials you are testing are likely to be made from, based on this observation).

c. If the material attracted the magnet (the magnet stuck to it), it is magnetic; if the material didn't attract the magnet (the magnet didn't stick to it), it is non-magnetic. e.g. a paperclip is magnetic; a kitchen roll tube is non-magnetic.

4. Is the (cardboard/metal/plastic) waterproof?

a. The cardboard will absorb the water; the water will drip off of the metal and plastic.

b. Discuss what you observed and compare the differences and similarities between and within materials.

Highlight that although metal is waterproof, over time it will react to the water and begin to rust (you could support this with a video of a timelapse of a rusting can, e.g. https://youtu.be/6gWnAvL8e4s).

c. If the material absorbed the water is it not waterproof; if it did not absorb the water, is it waterproof. e.g. a cereal box is not waterproof; a milk bottle is waterproof.

Plenary Answers:

1. **Cereal boxes,** because the cardboard is light and can be printed on.
2. **Milk bottles,** because it is waterproof so it can hold the milk.
3. **Drinks cans,** because metal can be bent into the shape needed.

JUNKO Zoomer, Session 2 - "Design and Build"

Area of Learning: Design andTechnology Year Group: 5 & 6 Duration: 45 minutes

1. Learning Intentions

Learn to use the JUNKO construction kit to build successful, static models

Design and Technology - Design:

Generate, develop, model and communicate their ideas through discussion, annotated sketches, and prototypes

Design and Technology - Make:

Select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately

Select from and use a wider range of materials and components, including construction materials and textiles, according to their functional properties and aesthetic qualities

Design and Technology - Evaluate:

Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work

Design and Technology - Technical Knowledge:

Apply their understanding of how to strengthen, stiffen and reinforce more complex structures

2. Resources

A selection of packaging (e.g. cereal boxes, milk bottles, etc.) collected for Session 1;

JUNKO Zoomer Kits (excluding chassis, wheels and wheel grips, and elastic bands); Scissors

3. Key Vocabulary

Card, hard, metal, tools, model, brief, opaque, design, plastic, develop, magnetic, flexible, evaluate, annotate, materials, prototype, properties, strengthen, waterproof, transparent, freestanding

4. Introduction

Share out the packaging and JUNKO Kit pieces equally between the tables.

Remind pupils of the material properties learned in the previous session. In particular, discuss how thicker materials are often stronger and that some metals are magnetic.

Explain that pupils will be **learning how to use the JUNKO Kit pieces** by building a model.

5. Main Activity

Ask pupils to imagine that Zeta and Bort, the inventors from Planet JUNKO, want to build a large statue that spells out "JUNKO". They need to design and build a prototype (a mini test version) of this statue.

Explain that inventors like Zeta and Bort start by designing their ideas, then building them, then evaluating them to see how they could be made better.

Allocate each pupil a letter to build, from the word "JUNKO". Have pupils start by individually designing a 3D model, using annotated sketches, with the following brief; it must be freestanding (hold up its own weight, without any other support), use only the materials given, and include at least one piece of packaging.

1. What material will each part of the model be made from?

2. Why have you chosen to use this material?

Once they have drawn their design, have pupils build it with the materials provided. While building, allow and encourage pupils to play with the magnets to reinforce their learning from the previous session (e.g. experimenting with using a magnet to move the magnetic pieces, when held at a distance)

3. Have you had to make any changes to your original design while building it? What could you change/have you changed?

4. If you have changed your design, why was this?

5. If you have changed your design, what did you/could you do differently and why?

Ask all pupils who were able to build a model to the brief (freestanding, use only the materials given, and include at least one piece of packaging) to stand on the right side of the room and those who were not to stand on the left.

6. What worked well and what didn't work so well?
If/how/why you changed your original design

Free play: Allow pupils to freely experiment with the packaging and JUNKO kit. They can make changes to their model or build something completely new.

Have pupils **take apart their models at the end of the session** and sort them back into the plastic/cardboard/metal boxes and JUNKO bag to use again in the next session.

Differentiation:

While the class is drawing their designs, ask individual pupils to describe their design to you.

1. Easy

2. Medium

While the class is building their designs, ask individual pupils to evaluate their model.

3. Easy

4. Medium

5. Hard

Ask several pupils from each side of the room.

6. Medium

You could have pupils put their letters together to spell JUNKO and take a photo to document the class's work.

6. Plenary

Definitions test / Spelling test: using the key vocabulary

Mini quiz:

1. In what order did we carry out the following steps today?
   a. Design
   b. Evaluate
   c. Build
2. Why did we evaluate our designs?

7. Answers

Main Activity Answers:

1. For example, cardboard/metal/plastic - ask pupils to label their models with their chosen materials.
2. Discuss the properties learned in the previous session - hard/flexible, transparent/opaque, magnetic, waterproof - and why they think these are good choices for their design. e.g. they might choose waterproof materials because their statue will be outside and it might rain / or flexible materials because they are easier to build with.
3. Ask them to point out the differences between their design and their model.
4. For example, they may have found they didn't have the materials needed, the materials didn't join the way they expected them to, or weren't sturdy enough.
5. Discuss the changes they have made or, if they aren't sure what to change, give suggestions or ask another pupil for ideas. Ask why they think this might work better - e.g. why they think thicker cardboard might work better than thinner cardboard (it's sturdier).
6. Highlight common themes between the successful models (e.g. if they used the same materials).

Plenary Answers:

1. (a) Design (drawing and annotating) > (c) Build (constructing the design) > (b) Evaluate (thinking about how the design could be better and making changes based on our observations).

2. To think about what worked well and what didn't, and make changes so that the model met the brief.

JUNKO Zoomer, Session 3 - "Friction (Part 1) - Design and Build a Car"

Area of Learning: Design and Technology Year Group: 5 & 6 Duration: 45 minutes

1. Learning Intentions

Learning Intentions:

Work collaboratively with peers

Design and Technology - Design:

Generate, develop, model and communicate their ideas through discussion, annotated sketches, and prototypes

Design and Technology - Make:

Select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately.

Select from and use a wider range of materials and components, including construction materials and textiles, according to their functional properties and aesthetic qualities

Design and Technology - Evaluate:

Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work

Design and Technology - Technical Knowledge:

Apply their understanding of how to strengthen, stiffen and reinforce more complex structures

2. Resources

A selection of packaging (e.g. cereal boxes, milk bottles, etc.) collected for Session 1; JUNKO Zoomer Kits

(including chassis, wheels and wheel grips); LEGO bricks (optional); Scissors; Chassis building

3. Key Vocabulary

Card, hard, metal, tools, model, brief, opaque, design, wheels, plastic, develop, chassis, magnetic, flexible, evaluate, annotate, materials, prototype, properties, strengthen, waterproof, transparent

4. Introduction

Share out the packaging and JUNKO Kit pieces equally between the tables. Put pupils into groups of four and ensure each group has all of the JUNKO pieces shown on the Chassis building Instruction Sheet.

Remind pupils of the design process learned in the previous session (design, build, evaluate).

Explain that pupils will be building a working model car for a science experiment in the next session.

5. Main Activity

Ask pupils to imagine that Zeta and Bort, the inventors from Planet JUNKO, are building a car to help them explore the Earth. **Pupils need to design and build a prototype of this car**, using the **design/build/evaluate** cycle they learned in the previous session.

Have pupils follow the instructions to build the chassis (frame with wheels) in their groups. Skip step 9 (attaching elastic bands) for this session.

In their groups have pupils design a car, using annotated sketches, with the following brief; it must use the chassis they have built, be able to roll along a surface when pushed, use only the materials given, and include at least one piece of packaging.

1. How will you join the pieces together?

2. Why have you decided to join the pieces together this way?

3. Who came up with each part of the design? Has everyone had a chance to suggest an idea?

Once they have drawn their design, have pupils build it with the materials provided, working as a group.

4. **Have you had to make any changes** to your original design while building it? What could you change/have you changed?

5. **If you have had to change your design,** why was this?

6. **If you have had to change your design,** what did you/could you do differently and why?

Free play: Allow pupils to play with the cars they have made. For example, they could try them out on different surfaces, or race one another.

Have **pupils label their models with the names of their group members** at the end of the session and save them to use in the next session.

Differentiation:

While the class is drawing their designs, ask groups to describe their design to you.

1. Easy
2. Medium
3. Easy

While the class is building their designs, ask groups to evaluate their model. Encourage them to test that the car works as expected.

4. Easy
5. Medium
6. Hard

6. Plenary

Definitions test / Spelling test: using the key vocabulary

Mini quiz:

1. What is a prototype?
2. Why do inventors make prototypes?

7. Answers

Main Activity Answers:

1. Discuss how they will join their model together and which JUNKO pieces they will use.
2. Discuss what they think makes this a good choice for joining - e.g. they might use magnets to attach metal, or use corner J-Fix pieces to make a box shape.
3. Who came up with each part of the design? Has everyone had a chance to suggest an idea?
4. Ask them to point out the differences between their design and their model.
5. For example, they may have found they didn't have the materials needed, the materials didn't join the way they expected or weren't sturdy enough.
6. Discuss the changes they have made or, if they aren't sure what to change, give suggestions or encourage the group to brainstorm ideas. Ask why they think this might work better - for example, why they think thicker cardboard might work better than thinner cardboard (thicker is sturdier).

Plenary Answers:

1. A prototype is a test model that lets you see if/how your design works.
2. Inventors make prototypes so they can evaluate and improve the design for the final model.

JUNKO Zoomer, Session 4 - "Friction (Part 2) - Testing the Cars"

Area of Learning: Science, Maths Year Group: 5 & 6 Duration: 45 minutes

1. Learning Intentions

Work collaboratively with peers

Science - Forces:

Identify the **effects of friction** that acts between moving surfaces

Experience forces that make things begin to move, get faster or slow down

Explore the **effects of friction on movement** and find out how it slows or stops moving objects

Science - Working Scientifically:

Carrying out fair tests to determine which designs are the most effective

Maths - Statistics:

Complete, read and interpret information in tables

2. Resources

Prototype cars from the previous session; Metre stick; Stopwatch; Two different flat surfaces (e.g. carpet, wooden floor, matt, playground tarmac);

Session 4 Worksheet (data table)

3. Key Vocabulary

Slip, grip, rough, tread, model, wheels, effect, smooth, faster, slower, forces, method, chassis, measure, surface, testing, seconds, friction, prototype, condition, hypothesis, reliability

4. Introduction

Put pupils into their groups from the last session and hand out the model cars they have made

Explain that pupils will be carrying out **fair tests to find out what can affect the speed of a moving object**, using their model car.

5. Main Activity

Discuss how **friction is a force that acts between moving surfaces**. The smoother the surfaces are, the less friction there will be.

Have pupils remove the two rear wheels from their car, then remove the wheel grip from one, and leave the wheel grip on the other. Ask them to rub each wheel's outer surface on the desk, without allowing the wheel to turn.

1. Is there a difference between the wheel with the wheel grip, and the one without the wheel grip?
2. Why do you think there is a difference between the wheels?
3. Which wheel do you think creates the most friction?

Explain to pupils that Zeta and Bort, the inventors from Planet JUNKO, may need to escape from the evil Wasters - so they **need their car to move as fast as possible**. They would now like the pupils to find out whether a car with wheel grips will travel faster than a car without wheel grips, on different surfaces.

Tell pupils the two surfaces they will be testing their cars on and as a class, predict which will be the fastest and which will be the slowest (both with and without wheel grips).

Explain the method of the experiment: For each of the four conditions (**two surface types**, and **two wheel types**), they will use a stopwatch to time how long the car take to travel between a start and end point in seconds. They will repeat this three times for each condition and record the time in a table.

4. What **two things will we be changing** in this experiment?
5. What will need to **stay the same throughout** to make this a fair test?
6. Why should we **repeat** each condition three times?

Help groups set up their experiments and assign roles: one person each to use the stopwatch and one to push the car. Have groups carry out their experiments and **have all pupils record their times on individual Experiment Worksheets** (they do not need to include the mean in this session).

Free play: Allow groups to try out each other's cars to see how they differ and compare how fast their cars travelled.

Keep the worksheets to use in the next session.

Differentiation:

You could support this with a video demonstrating friction (e.g. https://www.bbc.co.uk/bitesize/topics/zsxxsbk/articles/zxqrdxs)

1. Easy
2. Medium
3. Hard

Write the predictions on the board and make a note of them to revisit in the next session.

4. Medium
5. & 6. Hard

Run one example experiment in front of the class to show pupils how to carry this out in practice. While pupils are carrying out their experiments, move around the groups and check they are carrying out fair tests - prompt where needed.

6. Plenary

Definitions test / Spelling test: using the key vocabulary

Mini quiz:

1. What two things did you change in this experiment?
2. What did you measure in this experiment to find your results?
3. Describe one way you made sure this was a fair test. (Extension: Why did this make it a fair test?).

7. Answers

Main Activity Answers:

1. Yes - it's harder to rub the wheel with the wheel grip.
2. The wheel without the wheel grip is smoother and the one with the wheel grip is rougher.
3. The wheel with the wheel grip creates the most friction because it is rougherand stickier.
4. The surface type and whether or not the car has wheel grips.
5. Everything else - including the length between the start and end point (suggest 1-2 metres), the person pushing the car (and the amount of force they use), the design of the car (e.g. they can't remove/add parts - if something falls off, they need to reattach it in the same way as before, or repeat the experiment), the angle of the surface (this should be flat) - should remain the same.
6. We measure the same condition more than once so we know it is less likely that the results are a 'one-off'. This is known as reliability and means we can be more confident that the results are true.

Plenary Answers:

1. The surface that was being used and whether or not the wheels had wheel grips.
2. The time (in seconds) it took for the car to travel between two points.
3. Pupils may give an example of one of the things they kept the same (see answer 5. above), say that they carried out more than one test for each condition (see answer 6 above), or say that they used a standard measurement (time in seconds) so we know that we are using the same unit each time (rather than guessing or describing what we think happened).

JUNKO Zoomer, Session 5 - "Friction (Part 3) - Reporting Results"

Area of Learning: Science, Maths Year Group: 5 & 6 Duration: 45 minutes

1. Learning Intentions

Science - Forces:

Identify the effects of friction that acts between moving surfaces

Explore the effects of friction on movement and find out how it slows or stops moving objects

Science - Working Scientifically:

Carrying out fair tests to determine which designs are the most effective

Maths - Measurement:

Solve problems involving converting between units of time

Use all four operations to solve problems involving measure (Y6 - using decimal notation up to three decimal places where appropriate)

Maths - Statistics:

Complete, read and interpret information in tables

Y6 - Calculate and interpret the mean as an average, know when it is appropriate to find the mean of a data set

Y6 - - Draw graphs relating two variables, arising from their own enquiry and in other subjects

2. Resources

Session 4 Worksheet (with data from previous session)

Session 5 Worksheet (x2 per pupil)

3. Key Vocabulary

Row, data, mean, speed, table, column, seconds, average, convert, compare, bar graph, condition, milliseconds

4. Introduction

Hand out the Experiment Worksheets (with data from previous session)

Explain that pupils will be analysing and reporting the data from their experiment in the previous session

5. Main Activity

Ask pupils to convert the times in their tables from seconds into milliseconds.

1. What number do we need to multiply by to convert seconds into milliseconds?

   Have pupils draw one bar chart for each of the four conditions, showing the times for all three tests in milliseconds. Ensure they label the X and Y axis, include a title, label the categories, use equal measurements on the Y axis, and leave gaps between the bars.

2. Fastest condition:

a. What was the fastest speed your car travelled?

b. In what condition did your car travel the fastest overall?

c. How can you tell this by looking at the bar graph(s)?

d. Remembering what we have learned about friction, why do you think the car travelled fastest in this condition?

3. Slowest condition:

a. What was the slowest speed your car travelled?

b. In what condition did your car travel the slowest overall?

c. How can you tell this by looking at the bar graph(s)?

d. Remembering what we have learned about friction, why do you think the car travelled fastest in this condition?

4. Were your fastest and slowest conditions the same as the ones we predicted in the last session?

5. From what you have learned in your experiment, do you think Zeta and Bort's car should have wheel grips?

Free play: Allow pupils to play freely with the JUNKO cars they have built. For example they could experiment with more conditions (e.g. other surfaces, having two wheels with wheel grips and two without), or add to their designs.

At the end of the session, ensure pupils have taken the cars apart and sorted the packaging and JUNKO pieces ready to be used in the next session.

Differentiation:

1. Medium

Alternative activity (Hard): Have pupils calculate the mean for each condition. Plot the means for all four conditions onto one bar graph.

2.a. Easy

2. b. & c. Medium

2.d. Hard

3.a. Easy

3. b. & c. Medium

3.d. Hard

4. Medium

5. Hard

6. Plenary

Definitions test / Spelling test: using the key vocabulary

Mini quiz:

1. Where in the table would you look to find the results for Test 1 of all four conditions?
2. Where in the table would you look to find all of the results for Condition 1?
3. What does it mean when one bar in a graph is higher than another?

7. Answers

Main Activity Answers:

1. As when converting metres to millimetres, you multiply by 1,000. This is because there are 1,000 millimetres in a metre; and 1,000 milliseconds in a second (highlight the matching 'milli-' prefix).
2. Fastest condition:
   a. Ask for the fastest speed in both seconds and milliseconds (i.e. the lowest number).
   b. The fastest condition is likely to have been with wheel grips on a rough surface, such as carpet.
   c. The fastest speed is shown by the lowest bar on the graph (indicating the shortest amount of time taken).
   d. The two surfaces are rougher (and the rubber on the wheel grips is also softer) so they generate more friction, which creates more speed.
3. Slowest condition:
   a. Ask for the fastest speed in both seconds and milliseconds (i.e. the highest number).
   b. The slowest condition is likely to have been without wheel grips on a smooth surface, such as tiles.
   c. The slowest speed is shown by the highest bar on the graph (indicating the longest amount of time taken).
   d. The two surfaces are smoother so they generate less friction, which creates less speed.
4. Compare the conditions to the predictions noted in the previous session. Highlight which ones were supported by the results and which were not.
5. Zeta and Bort should have wheel grips on their car. The wheel grips have more friction, on different surfaces, so the car can move faster (and they can escape the Wasters).

Plenary Answers:

1. Down the first column (labelled Test 1).
2. Along the first row (labelled with the first condition).
3. The higher bar in a graph shows a higher number than the other bar. (Extension: In our experiment, a higher bar/number means a longer amount of time).

JUNKO Zoomer, Session 6 - "Class Challenge"

Area of Learning: Science, Design and Technology Year Group: 5 & 6 Duration: 45 minutes

1. Learning Intentions

Applying Science theory learned in the previous sessions:

Properties and changes of materials - the particular uses of everyday materials, including metals, wood

and plastic

Forces - the effects of friction on movement and how this slows or stop moving objects

Collaboratively using Design and Technology skills from the previous sessions:

Design - Generate, develop, model and communicate their ideas through discussion, annotated sketches, and prototypes

Make - Select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately, and select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities

Technical Knowledge - Apply their understanding of how to strengthen, stiffen and reinforce more complex structures

Evaluate - Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work

2. Resources

A selection of packaging (e.g. cereal boxes, milk bottles, etc.) collected for Session 1

JUNKO Zoomer Kits (including chassis, wheels and wheel grips, and elastic bands); **Scissors,** pencils, rulers

Chassis building Instructions (included in the comic book provided)

Printed award certificates

3. Key Vocabulary

Card, hard, slip, grip, metal, tools, model, rough, brief, design, wheels, smooth, faster, slower, forces, plastic, develop, chassis, friction, magnetic, flexible, evaluate, annotate, recycling, materials, prototype, properties, strengthen

4. Introduction

Explain to the class that they will have just 30 minutes to design and build a new car, to compete for several JUNKO awards

Put pupils into new groups and share out the packaging and JUNKO pieces equally, as well as the Chassis building instructions (have groups choose a team name)

Encourage pupils to reflect on their experiment from the previous sessions, particularly how the wheels and wheel grips affected the speed of the car

5. Main Activity

Introduce pupils to the JUNKO Awards:

Best Zoomer Award: The car that won in the final race (i.e. the fastest).

Most JUNKOtastic Award: The car voted by the pupils as the best visually designed car.

Recycling Heroes Award: The car that used the most pieces of packaging.

Zeta and Bort's Teamwork Award: The group that worked best together.

In their groups have pupils design a car, using annotated sketches, with the following brief; it must use a chassis, be able to roll along a surface, use only the materials given, and include at least one piece of packaging. Pupils can use the Chassis building instructions to help and can follow Step 9 if they would like to try including elastic bands in their design. Once they have drawn their design, have pupils build it with the materials provided, working as a group.

Put the models and the annotated designs on display and allow pupils to walk around the room and look at their classmates' work.

Have pupils write down their answers to the following, to be used for the awards.

Collect their answers when finished:

1. Do you think your group worked well as a team? Why/why not?
2. Which team's car you think is 'best looking'? Give one reason why you like this design.
3. How many pieces of packaging did you use for your car?

Mark a 'start' and 'finish' line, and have pupils race their cars.
Choose one pupil from each group to launch the car. Record the winner of the race. Put the models to the side for the awards.

Free play: Allow pupils to experiment with the remaining packaging and JUNKO pieces.

Differentiation:

Mix more and less able pupils in each group. This session could also be done as a larger scale competition with other classes. Move around the class and ask them to describe their design.

Use this time to consider which groups are working well together.

1. Medium

2. & 3. Easy

You may want to take a photo of models and awards, to document the class's work.

During free play, allocate the awards.

6. Plenary

Definitions test / Spelling test: using the key vocabulary

Announce the winners of the awards and hand out certificates, using this to reflect on the session:

Best Zoomer Award: Announce the winner of the race and talk about what might have made their design the fastest. For example, their car may be lighter, use wheel grips, or they may have used elastic bands to give their car more power.

Most JUNKOtastic Award: Announce the car with the most votes for best visual design. Use the reasons given by the pupils who have voted for the winner (without giving their name). You may also want to mention one or two things that pupils liked about the rest of the models.

Recycling Heroes Award: Announce the car that used the most pieces of packaging (based on pupil's earlier answers) and how many pieces they used. Remind them that turning 'junk' into something useful, by reusing or recycling it, saves it from being turned into waste (as it was on planet Jumo in the comic. By reusing/recycling, they are helping to save Earth from the same fate!).

Zeta and Bort's Teamwork Award: Announce the winner and describe the reasons, from your observations and their own suggestions written down earlier. You may also want to mention one or two things that other groups did well.

7. Answers

Main Activity Answers:

1. For example, did they listen to everyone's idea or let all the team members take on a role while designing/building.
2. For example pupils may comment on the colours, patterns, pictures, or imagination used (e.g. they like the one that's been made to look like a rocket).
3. Check that pupils' answers are correct by counting together in groups. You could also have the groups add up their totals to find out how much junk they have used altogether. (Extension: Ask pupils to count the metal/card/plastic/other packaging separately).

Sources

DEPARTMENT FOR EDUCATION (2013). Design and Technology Programmes of Study: Key Stages 1 and 2. Retrieved May 2020 from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/239041/PRIMARY_national_curriculum_-_Design_and_technology.pdf

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Table 1: Time taken for the car to travel between two points

Condition	Time (seconds)			
	Test 1	Test 2	Test 3	Test 4
Example: *CARPET, WITH GRIPS*	*3.2*	*3.6*	*3.3*	*3.4*

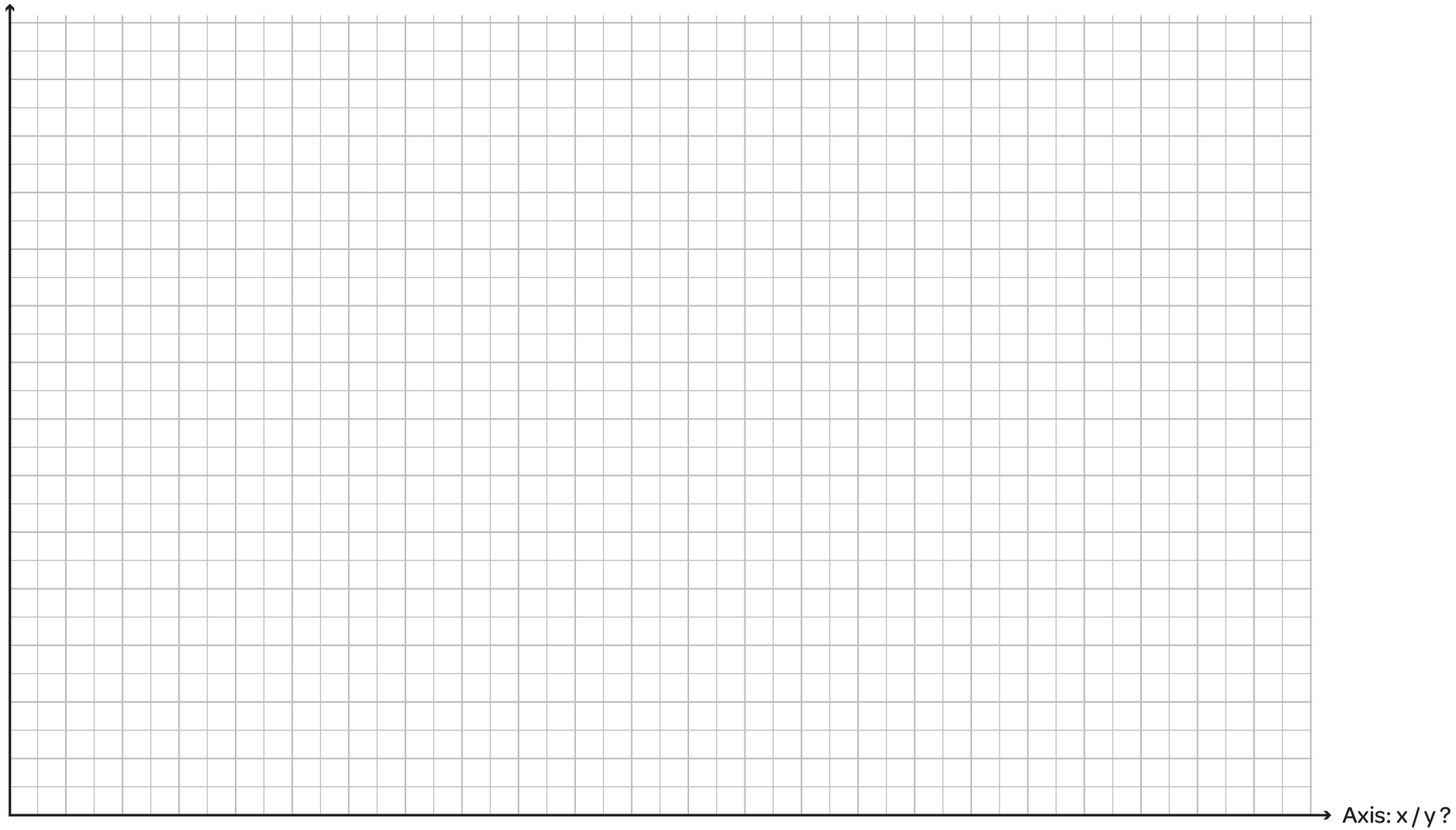
JUNKO Zoomer, Session 5 Worksheet

Bar Graph Showing: _____

Axis: x / y ? (Circle)

Units: _____

Axis name: _____



Axis: x / y ?
(Circle)

Axis name: _____