Challenge your imagination

TEACHERS GUIDE

GO TO SESSION PLANS >

This year-long programme is a fun, team-based programme created with ZEISS to inspire your students to find out more about STEM (science, technology, engineering, and maths). It has been designed with the STEM curriculum at the centre and will support you to exposes pupils to different careers within STEM.

The programme is aimed at upper KS2 (year 5 - 6) and is open to primary schools across Birmingham. At its core are real-world problems in need of innovative engineering, technology, and computing solutions – based on the application of key engineering and science with lots of fun activities along the way.

What does the programme include?

Teacher CPD

We will run you through everything you need to know during a 30-minute video call meeting and make sure you are confident supporting your pupils to take part in the programme throughout the academic year.

In school See it - Solve it workshop

We will come into your school and support you to engage pupils in the competition by running a 2-3hr workshop with your pupils. The workshop will include:

- • See it – Solve it: Robotics
  (a hands-on programming workshop)
- • See it – Solve it: Optics~
  (a hands-on experiment workshop)

Competition resources and extension activities

We will provide you will access to all the resources you need to run the competition in school across the coming months including:

- Competition challenge guide
- 10 session plans (each including a 20 min core activity that uses the pupil workbook and a 60 min extension activity) – in this teacher guide!
- Supporting pupil workbook

In school Competition Check-In workshop

We will come back into your school in the new year to run a 1hr workshop to help pupils to develop their competition entries with the help of a Zeiss ambassador

Celebration Day

You will be invited to select one team from your school to come along to a celebration day where they can showcase their idea and enjoy lots of fun interactive activities thought the day.

Delivered by LEARN by design

ZEISS Seeing beyond

FIVE THINGS TO DO

1

Read the challenge guide

The student friendly guide (and workbook) contains everything that you and your pupils need to know about taking part in the competition. The workbook will guide your pupils through the background and science central to the challenge, support coming up with ideas, researching and presenting their final project idea.

2

Create your teams

Now that you are familiar with what is required, it is time to create your teams! Try and select teams with a 50:50 boy: girl spilt of between 4-6 pupils.

3

See it - Solve it workshop

Kick off the excitement with the See it - Solve it workshop! This 2-3hr session will introduce pupils to the competition and allow them to get hands on with some optics experiments as well as a robot programming challenge.

4

Support your teams

As a facilitator, the key role you will play is to support and encourage your pupils and help keep them on track. The session plans and checklist will help you to cover all the key areas of learning linked to the challenge. We love to see the solutions pupils have come up with so please share pictures or videos with us on social media* or by email.

5

Join us at the celebration

We cannot wait to see you at the celebration event. Run an in school mini celebration to select the team that will come along to the main celebration event. It does not matter where your students have got up to, the celebration is a great way for students to challenge themselves, meet more people in STEM and develop their future career aspirations. The celebration is not about the best and the brightest but the pupils you think will get the most from the event.

Contact details:
EllieLewis@bydesign-group.co.uk

*** Tag us in any photos or videos of your progress on social media: #learnbydesign**

@bydesigngroup @LearnbyDesign learn.by.design

CURRICULUM LINKS

Below is an overview of the curriculum links in the programme, each session plan provided also indicates where the curriculum links are and key learning takeaways for that session.

Subject	Area	Where (see it solve it workshops or competition challenge session)
Science	Working scientifically	See it – Solve it: Optics Challenge session: Vision and light Challenge session: Amazing colours Challenge session: Lenses and mirrors Challenge session: Creative ideas
	Animals, including humans	Challenge session: Ageing eyes
	Properties and changes of materials	Challenge session: Amazing colours
	Evolution and Inheritance	Challenge session: Adapting Animals
	Light	See it – Solve it: Robotics See it – Solve it: Optics Challenge session: Vision and Light Challenge session: Lenses and Mirrors
Computing	Programming	See it – Solve it: robotics
	Using technology	Challenge session: Adapting Animals Challenge session: Visual disabilities Challenge session: Creative ideas
Design and technology	Design	Challenge session: Ageing eyes Challenge session: Lenses and Mirrors Challenge session: Developing ideas
	Make	Challenge session: Developing ideas
	Technical Knowledge	See it – Solve it: Robotics
	Evaluate	Challenge session: Creative ideas Challenge session: Developing ideas
History	Post 1066	Challenge session: Creative ideas
English		Throughout

THE SKILLS BUILDER FRAMEWORK

The programme also links with the skills builder framework and each session plan will indicate which skills are linked to the activities.

ABOUT ZEISS

Established in 1846 by Carl Zeiss in Jena, Germany, ZEISS is an internationally leading technology enterprise operating in the optics and optoelectronic industries. They work to develop, produce and distribute innovative solutions for:

- Spectacle lenses
- Camera and cine lenses
- Binoculars
- Microscopes
- Medial technology
- Measuring technology
- Semiconductor manufacturing technology

In Birmingham is the vision care branch of the business, ZEISS Vision UK.

Challenge your imagination

SESSION PLANS

Workshops session plan overview

These session plans have been develop to support teachers to facilitate pupils when developing their competition entry for the challenge your imagination competition.

They are designed to be a starting point after the digital launch workshop to keep pupils engaged an motivated towards the competition. We would encourage pupils and teachers to continue developing their competition ideas after they have completed all the suggested core challenge activities.

Any in school see it – solve it workshops that the school receives as part of the programme will complement these activities.

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VISION AND LIGHT 1

Core Challenge - 20 min

Session aims

- Understand where light comes from and identify different sources
- Understand that light is reflected from different objects to our eyes
- Understand that our brain uses the information from both eyes to create what we see
- Understand that light travels in straight lines and shadows are formed when objects are in the way

Skills Builder links

Curriculum Links

- Science – Working scientifically
- Science – Light

Links to other activities

- See it – Solve it: robotics and optics workshops.
- Challenge sessions: 2, 3, 4, 5, 6, 7, 9

Resources required

- Paper, chalk, torches, solid objects
- Student workbook

Health and Safety

- There are no extra health & safety concerns above the normal precautions that should be in place for other sessions and workshops

Expected duration

- 20 minutes + 60-90 minutes across the day

How do we see?

1. Start the session by turning off all the lights (and closing the curtains) ask a pupil what they can see: very little if not very clearly. Why is this? Because there is no light source.

   How can they make it so they can see again? Turn on the light or open the curtains. Explain that these are both sources of light, the light we are seeing is the light that is reflected off objects or that is coming directly from the source.

   Get pupils to draw or write as many sources of light as they can in their challenge workbook, and draw how light reaches their eyes using arrows.

2. After discussing the different sources of light and that they are important to see, move onto how we see things.

   What do we use to see? Our eyes and our brain (to put together the information).

   Get every student to roll up a piece of paper into a tube. Then ask them to look up through it like it is a telescope, closing the eye that is not looking through the tube. Get them to place their other hand next to the tube (back of their hand facing their face). It is best to demonstrate at the same time. Finally, ask the students to open both eyes what do they see? A hole in their hand!

   Why is this? Because our brain uses the light coming into both eyes to make the picture we see. This is called binocular vision.

3. Finally get students to think about how light only travels in straight lines. Give each student a torch and an object (e.g. Duplo brick). Get them to cast the light on it from different angles and heights over the object (on their piece of paper). What happens? Shadows are formed because the object is blocking the light. The closer the light source is to the object the greater the shadow

Bonus Challenge - 1-1.15 hr

Human Shadow Clock

Get the pupils to go out at least 4 different times in the day (on the hour if possible). They can do this in small teams.

They must:

1. Decided on an open spot in the playground where you can easily mark the floor with chalk
2. Pick one student who is going to be the centre of the clock. They will need to mark this spot
3. The other pupils simply draw around the shadow or mark the top of the shadow on the floor and mark the time on the floor next to the cross

Through the activity, pupils should recognise that the light source is the sun, that it travels in straight lines causing shadows and that because the sun is moving the shadows are in different points across the day.

Experiment questions for the pupils:

Q – Why do they need to use the same person as the centre each time? Variables

Q – Why does the shadow get longer or shorter, and how much by?

Q – Why would you have more than one group doing the same experiment? Repeats

Q – Ask the students to make a prediction at the start of what they think will happen

Q – What happens to the shadows if the centre person crouches down or stands up tall? Why is it important to stay in the same position?

Key takeaways

- Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- Pupils learn to take measurements with accuracy and precision
- Using test results pupils make predictions to set up further comparative and fair tests
- Light appears to travel in straight lies
- Light reflects off objects enabling them to be seen
- Shadows have the same shape as objects that cast them

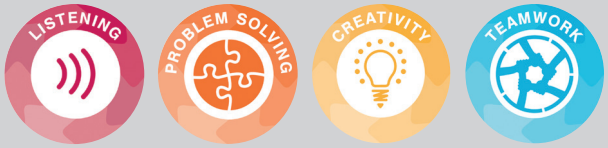
AMAZING COLOURS 2

Core Challenge - 20 min

Session aims

- Understand that light is made up of different colours
- Understand that they are our other colours which we cannot see
- We have adapted to see certain colours
- Colours are important for presenting information
- Chromatography is one way to separate out liquid solutions

Skills Builder links



Curriculum Links

- Science – Working scientifically
- Science – Properties and changes of materials
- Science – Light, evolution, filtering
- Design – Using colour to present ideas and products

Links to other activities

- Challenge sessions 1, 3, 4, 6, 7, 10
- See it – Solve it workshop: optics

Resources required

- Torch or sunlight, smooth glass or bowl, paper, student workbook
- Bonus – Filter paper, pots, water, felt tip pens, chromatography instruction sheet

Health and Safety

- There are no extra health & safety concerns above the normal precautions that should be in place for other sessions and workshops.

Expected duration

- 20 minutes + 60-90 minutes across the day

What is light made of?

1. Start by recapping from the last activity

   Can anyone name a source of light?

   What do we use to see? (our eyes and our brain)

2. Make a rainbow (individually, in groups or as a class): Using a glass or small bowl, fill ¾ full of water and place on a piece of paper. Using a torch (or you could place it outside) shine light through the bowl.

   W**hat can they see?** A rainbow. Get students to write all the colours they can see in their booklet. These are the colours of the visible spectrum. We can see them because the water is bending the white light.

3. Ask the class if they think there is any light they cannot see? Why might this be? Explain that our eyes have developed in a way to see these colours but there are other types of light that we cannot normally see.

   Why is it still important to be able to see colours/ why have we developed to see different colours? So that we can find food, identify things, be better at hunting.

4. Get everyone to write down their favourite colour and why they like it? How does it make them feel, what do they associate with it? Explain why colour is important when designing products and they will need to remember this when they think about presenting their competition entry.

AMAZING COLOURS 2

Bonus Challenge - 15 mins + drying time

Colourful Chromatography

This activity looks at how they can separate out the different pigments in a pen.

What you need:

Filter paper

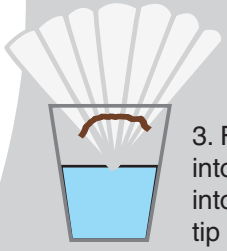
Felt tips

Glass of water

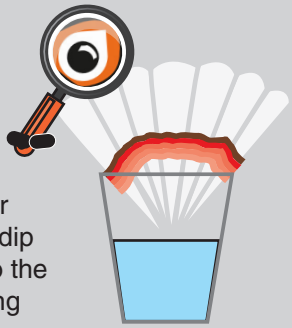
Pipe cleaners

1. Fill a small pot with water

2. Pick a single felt tip pen to draw a circle in the middle of the filter paper



3. Fold the paper into a cone and dip into the water so the tip is just touching



4. Leave the paper and watch as the pen ink start to separate

5. Once fully separated hang up to dry

6. Repeat with different coloured pens

Q – What colour do the different pens separate into? (mainly the primary pigment colours) Why does yellow not separate much but black separates a lot?

Q – Which colours travel the furthest?

Q – Time how long it takes each colour to move through the paper.

Q – What type of paper takes less or more time?

After they have dried, and the pupils have experimented with lots of different colours. Scrunch each piece of paper in the middle and tie a pipe cleaner around it. These butterflies can then make a colourful display.

Key takeaways

- Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.
- Pupils learn to take measurements with accuracy and precision.
- Using test results pupils make predictions to set up further comparative and fair tests.
- Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentation.
- Use knowledge of solids, liquids, and gases to decide how mixtures might be separated.

ADAPTING ANIMALS 3

Session aims

- Understand the key words evolution, adaptation, fossils, biomimicry, species, and variation
- Understand that not all animals need eyes
- Understand that animals' eyes have adapted in different way to best suit them
- Understand that animals have adapted their skin in ways to make them less visible

Skills Builder links

Curriculum Links

- Science – Evolution and Inheritance
- Computing
- Design and Technology

Links to other activities

- Challenge sessions 2,4,10

Resources required

- Student workbook
- Computer room for bonus challenge

Health and Safety

- There are no extra health & safety concerns above the normal precautions that should be in place for other sessions and workshops.

Expected duration

- 20 minutes + 60-90 minutes across the day

Core Challenge - 20 min

Adaptations and variations...

1. Start by asking the students to match up the key word in their workbooks (evolution, adaptation, biomimicry etc) and then have a discussion around each of these words.

   Answers:
   Evolution = statement 5 *(The process by which living things can gradually change over time)*
   Adaptation = statement 4 *(How living things are specialised to suit their environment)*
   Fossil = statement 1 *(The preserved remains or traces of a dead organism)*
   Biomimicry = statement 3 *(A practice that learns from and mimics the strategies found in nature to solve human design challenges)*
   Species = statement 6 *(A group of living things with very similar characteristics. They can breed together to make more living things of the same type)*
   Variation = statement 2 *(The differences between living things in a species)*
   Camouflage = statement 7 *(A defence or tactic that organisms use to disguise their appearance, usually to blend in with their surroundings)*

2. Then ask students to look to the person next to them and draw their head/eyes.

   Get them to label the picture with all features they can think of (placement of eyes, shape of pupil, colour of eyes, glasses)

   Discuss if these features are adaptations or variation and why (e.g. our eyes have evolved to be close together so that we can see depth well, colour of eyes is variation).

ADAPTING ANIMALS 3

Bonus Challenge - 60 mins +

Adapting animals research challenge

Students (individually, in pairs or groups) are tasked to pick their favourite animal or one from the following list:

- Pigeon
- Cat
- Cuttlefish
- Snake
- Sheep
- Deer
- Eagle
- Guitarfish
- Chameleon
- Gecko
- Zebra

They should then spend around 30 minutes researching their chosen animal using computers or books. They then need to make a poster presentation about their animal that includes the following:

1. Has the animal evolved to have any unique eye adaptations? e.g. shape of pupil, eyelids, size of eye, colour filters, placement of eyes. Why have they done this?
2. Has the animal evolved to have any unique skin/coat adaptation to make them less visible to other animals? e.g. colour changing skin, lighter belly. Why does this work?
3. Could we learn anything from these animals that could help us design a product for humans?

Some students could then present their ideas to the class.

Key takeaways

- Recognise that living things have changed over time
- Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution
- Select, use, and combine a variety of software (including internet services) on a range of digital devices to accomplish given goals, including collecting, analysing, evaluating and presenting data and information
- Use technology safely, respectfully, and responsibly, recognise acceptable/unacceptable behaviour, identify a range of ways to report concerns about content and contact

AGING EYES

4

Core Challenge - 20 min

Session aims

- To understand that our eyes change as we age
- To recognise some of the key changes
- To identify problems
- To design possible solutions.

Skills Builder links

PROBLEM SOLVING · CREATIVITY · TEAMWORK

Curriculum Links

- Science – Animals, including humans
- Design and Technology

Links to other activities

- Challenge sessions: 1, 3
- See it – Solve it: optics

Resources required

- Student workbook. Information sheet
- Paper for designing

Health and Safety

- There are no extra health & safety concerns above the normal precautions that should be in place for other sessions and workshops.

Expected duration

- 20 minutes + 60 minutes

How do our eyes change?

Using the information sheet, get students to complete the workbook timeline of how our eyes change over time.

Using this information, students should then write down as many different challenges that humans may face with their vision over time. As part of this they can also include all the other challenges they may face which would affect how they could wear glasses or other vision correction.

Important – Emphasise that all good products start with a problem that needs to be solved.

AGING EYES

4

Bonus Challenge - 40 mins +

Glasses frame design

For the bonus challenge students are tasked to design 3 different pairs of glasses.

1. For a toddler aged 3
2. For a year 7 (aged 12)
3. For someone in their 70s

When doing this they need to consider:

Q – What design features they need?

Q – What other activities they may be doing that affect the glass they choose?

Q – What makes their glasses different?

Q – What other glasses for that age group are already available (they could look online)?

Q – What technology could be included in their design?

Key takeaways

- Pupils can describe the changes as humans develop to old age
- Use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose, aimed at particular individuals or groups
- Generate, develop, model, and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design

VISUAL DISABILITIES 5

Core Challenge - 20 min

Session aims

- To understand what it means to have a disability
- To identify challenge an individual may face due to a physical disability
- To understand what careers are linked to supporting people with visual disabilities or impairments

Skills Builder links

Curriculum Links

- Computing

Links to other activities

- Challenge session: 4, 9, 10
- See it – Solve it: optics

Resources required

- Student workbook
- Computer room for research challenge

Health and Safety

- There are no extra health & safety concerns above the normal precautions that should be in place for other sessions and workshops.

Expected duration

- 20 minutes + 60 minutes

What is a disability?

To start this session, get students to think about how they are different from each other. With the person next to them they could try and identify 3 things that are different about themselves (height, hair colour, favourite subject). Explain that everyone is different and unique and that this is a good thing.

Next discuss what the word disability means. They can write down their ideas in the workbook. The full definition is below:

"A disability affects a person's physical or mental ability and "makes it difficult or impossible for a person to walk, see, hear, speak, learn, or do other important things. Some disabilities are permanent, or last forever. Others are temporary, or last for only a short time. A disability can be something a person was born with. Or it can be the result of an illness or an accident."

https://kids.britannica.com/kids/article/disability/390729

Next ask student if they can think of any specific visual disabilities or impairments that would impact someone's life. They do not need to know the exact names of these (examples: blindness, extreme light sensitivity, night blindness, loss of central vision, blurred vision, glaucoma, brain damage, amblyopia).

Finally ask pupils to select one of these impairments and then ask students to colour in the areas of their house that they may have difficulties with if they have a visual impairment (e.g. TV, stairs, cooking). They can also add notes of any solutions they already know of that would help.

Important: Throughout the session, focus on the fact that despite someone being labelled as having a disability it does not mean that they cannot do everything and that it is only one of the 3 things that makes them different.

Bonus Challenge - 60 mins +

Who can help?

For the bonus challenge students are tasked to find out more about the different people that work to help people with visual disabilities. This can be done in teams or individually.

Give each team/individual one of the following jobs:

- Optometrists
- Ophthalmic laboratory technicians
- Opticians
- Ophthalmologists
- Eye care assistant
- Engineer
- Orthoptist
- Visual neuroscientist
- Eye clinic liaison officer
- Guide dog trainer

They should then make a poster about the job that includes:

- What does the job involve?
- What training do they need to do it?
- How do they help people with visual impairments?
- Do they use any special technology?
- Do they need any special skills? Are there any key subject links?

Groups can then present what they have learnt about the job back to the class.

Key takeaways

- Select, use, and combine a variety of software (including internet services) on a range of digital devices to accomplish given goals, including collecting, analysing, evaluating and presenting data and information
- Use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact

LENSES AND MIRRORS 6

Core Challenge - 20 min

Session aims

- To understand that light travels in straight lines
- To understand that lenses and mirrors have many different uses
- To understand the basic principle of how lenses refract light
- To understand that mirrors reflect light

Skills Builder links

Curriculum Links

- Science – working scientifically.
- Science – light
- Design and technology

Links to other activities

- Challenge sessions: 1, 4, 5, 9, 10
- See it – Solve it: optics

Resources required

- Student workbook. Different lenses to look at e.g. magnifying glass, glasses, camera
- For bonuses challenge each team needs: one shoe box, sliver card (as reflective as possible), Lego/playmobile people, glue, sticky tape, and scissors, coloured pens for decoration

Health and Safety

- There are no extra health & safety concerns above the normal precautions that should be in place for other sessions and workshops.

Expected duration

- 20 minutes + 60 minutes

What are lenses for?

Start by recapping that light travels in straight lines.

Can everyone give an example of how they can show this? (e.g. create a shadow)

Then move on to explain that optics is the use of lenses and mirrors to bend light.

Why would we want to do this? (to make things clearer and focused)

Ask the students if they can think of anything that contains a lens or mirror (e.g. glasses, microscope, telescope, binoculars, magnifying glass, car mirrors). Next, get the pupils to write down these different uses in their booklet along with a reason why we use/need lenses for that item (e.g. to help people see, to see small things, to see into the distance).

With all the different purposes of lenses ask the student if they think that all lenses work the same way. No: they are all designed of their specific use and we use maths and physics to work out how the light will be bent to create the best result.

To aid with this, pass round different lenses and mirrors for students to look at. This could be a mobile phone (with camera), a magnifying glass, a pair of glasses, a pocket mirror etc.

Finally based on their observations ask students to complete the sentences in their workbooks about concave and convex lenses.

LENSES AND MIRRORS 6

Bonus Challenge - 60 mins

Make a Mirrored Fun House

For this challenge, introduce students to mirrors. Explain that were lenses bend light as it passes through them. Mirrors reflect light. If the mirror is bent this can affect the reflection.

For this challenge, each team will need:

- One shoe box
- Sliver card (as reflective as possible)
- Lego/playmobile people
- Glue, sticky tape, and scissors
- Coloured pens for decoration

Challenge your pupils to build a mirrored fun house for their Lego people (explain that they may have been in one of these at a fair or seen them on TV). It may help to remove one short side and one long side of the box to make it easier to build (or cut each shoe box diagonally in half, giving one side per team).

By placing and bending the card they should try and make their Lego person look:

1. Longer
2. Shorter
3. Wider
4. Narrower
5. Visible from all sides

Can they explain how they achieved the above?

Depending on time they can continue to be creative by decorating the outside of their box to create a fun and appealing fun house entrance.

Key takeaways

- Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentation
- Recognise that light appears to travel in straight lines
- Recognise that light can be reflected
- Generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design

ROBOTS

7

Core Challenge - 20 min

Session aims

- To understand what a robot is
- To be able to recognise the different uses for robots and why they are used
- To produce an advertising campaign for a new product

Skills Builder links

PROBLEM SOLVING · CREATIVITY · TEAMWORK

Curriculum Links

- Computing
- English

Links to other activities

- Challenge session: 10
- See it – Solve it: robotics

Resources required

- Student workbook
- Coloured pens, Akito fact sheet and design sheet

Health and Safety

- There are no extra health & safety concerns above the normal precautions that should be in place for other sessions and workshops.

Expected duration

- 20 minutes + 60 minutes

What is a robot?

In this session pupils learn about what robots are and why we use them.

Start with a quick discussion around what robots are. Explain that they are a machine that can perform some level of tasks by themselves (independently) based on instructions from humans or sensing their environment.

They should match up the different robots pictured with a description and add a reason for why a robot is used for the activity over a human, e.g. a robot is used on Mars to explore the surface of the planet because people cannot survive on Mars.

This robot has helped search for survivors after earthquakes and tsunamis in Japan. Its tracks allow it to move across uneven surfaces and there is a camera attached to the extendable arm.

This robot is used to help surgeons with difficult neurosurgery.

This robot can fly and is often used for surveillance.

This robot is cute and can be easily programme by pupils to teach coding.

This robot performs repetitive tasks using its large strong arms in a factory

This robot can dive deep underwater and perform many different tasks.

This robot hoover can clean up your home by itself. It has sensors to stop it hitting the walls.

ROBOTS

7

Bonus Challenge - 60 mins

Market a new toy robot

For this activity explain that some robots are created for learning and entertainment. In teams, students should be given the Akito fact sheet. This includes a picture of Akito and what its functionality is. Student should first decide (15 mins):

- Who would want Akito?
- Who would buy Akito?
- How much might Akito cost?
- What is Akito's best feature?
- Does Akito have any other unique features not included on the info sheet (they can be creative here)

Once pupils have decided this, they should then create their own advertisement for the robot (30 minutes). This could be:

- A TV advert
- A radio advert
- A poster
- A magazine article
- A dance
- A performance
- A short video for social media
- Anything else they think would work

Teams should then present or perform their advertisement back to the class making sure the key details are included in the advert.

Key takeaway

- Understand that programming used to make a robot perform tasks

CREATIVE IDEAS

8

Core Challenge - 20 min

Session aims

- To come up with creative ideas
- To recognise unique ideas
- To understand the meaning of invention, innovation, and product
- To understand that innovations happen throughout history
- To use research skills to evaluate an innovation and present ideas

Skills Builder links

Curriculum Links

- Science – Working scientifically.
- Computing
- History

Links to other activities

- Challenge sessions: 3, 5, 9
- Students should build on their research skills from previous sessions.

Resources required

- Student workbook

Health and Safety

- There are no extra health & safety concerns above the normal precautions that should be in place for other sessions and workshops.

Expected duration

- 20 minutes + 60 minutes

How to come up with good ideas?

You can now introduce that the next few sessions will be focusing on the project brief but that it is important they do not forget what they have already learnt.

Before they come up with their idea however they can do this simple activity to test their creativity. Give everyone a single paper clip. Then say they have 2-5 minutes to write down as many things that the item (avoid calling it a paperclip) can be used for as possible in their workbooks. Hopefully, they will all come up with some good ideas but if not, here are some suggestions:

1. Nail cuticle remover & cleaner
2. Bubble wrap popping tool
3. Carve fine details into nail polish on finger and toenails
4. Lock picker
5. Graffiti on plastic scratch tool
6. Worm hook
7. Paper note/memo hanger
8. To make pixel holes in paper
9. Narrow crack dirt remover
10. Pixel stamp
11. DVD drive opener
12. Aerial for radio
13. Aerial for small TV
14. Plastic hole maker
15. Scratch beneath a bandage or plaster of pairs cast
16. Finger/toe splint
17. Earrings
18. Make into alphabet letters
19. Make into numbers
20. Decorative string for hanging light ornaments
21. Necklace

Discuss everyone's ideas and then explain that the best way to come up with really good ideas is to come up with lots of ideas and then pick the best one.

Next make sure everyone is happy with the definition of invention, innovation and product. Get everyone to complete the definition in their workbooks. (Answers on the next page)

Definition answers:

Invention = is the creation of a new idea or concept, e.g. a ball point pen

Innovation = is the process of turning a new concept into something you can buy or that has widespread use, e.g. creating the brand biro

Product = A thing that is produced and sold, e.g. an individual Bic Biro

CREATIVE IDEAS 8

Bonus Challenge - 60 mins +

Incredible Innovations

For this research challenge pupils need to look back in time and find an innovation that used lenses or mirrors.

Pupils should research the innovation and then write a page about it (with a pictures) that includes:

- What the innovation is?
- When it was first made/ produced/ came about?
- Who was in the team that created the innovation?
- What problem did it solve?
- Was there more than one version?

Pupils could then present their findings to each other in groups or to the wider class.

Key takeaway

- Identifying scientific evidence that has been used to support or refute ideas or arguments.
- Select, use, and combine a variety of software (including internet services) on a range of digital devices to accomplish given goals, including collecting, analysing, evaluating and presenting data and information.
- Use technology safely, respectfully and responsibly, recognise acceptable/ unacceptable behaviour, identify a range of ways to report concerns about content and contact.
- The study of an aspect or theme in British history that extends pupils' chronological knowledge beyond 1066.

DEVELOPING AN IDEA 9

Core Challenge - 30 min +

Session aims

- To understand that a good product should solve a problem
- Most students should generate a product idea
- Most students should sketch their product idea
- Some students should build a prototype of their product idea in teams
- To understand the engineering design process
- To understand that their idea will go forward into their competition entry

Skills Builder links

Curriculum Links

- Design and Technology

Links to other activities

- Challenge sessions: 1, 2, 4, 5, 6, 7, 8, 10
- See it – Solve it workshops
- Digital welcome workshop

Resources required

- Student workbook.
- Craft materials

Health and Safety

- There are no extra health & safety concerns above the normal precautions that should be in place for other sessions and workshops.

Expected duration

- 20 minutes + 60 minutes

Design Idea

In this session they should come up with their competition entry idea.

First, get pupils to write around the brief any problem a lens or robot could help solve. Examples include visual disabilities, things in the distance, severity, building very small things, seeing inside the body. Around 5-10 minutes.

Next, students should come up with as many ideas a possible for product that use lenses or mirrors to solve these problems. 5-10 minutes.

Finally, they should select their favourite idea and write it in their booklet.

If time they could also do an initial sketch of their idea in their workbook.

DEVELOPING AN IDEA 9

Bonus Challenge - 60 mins +

Develop and model

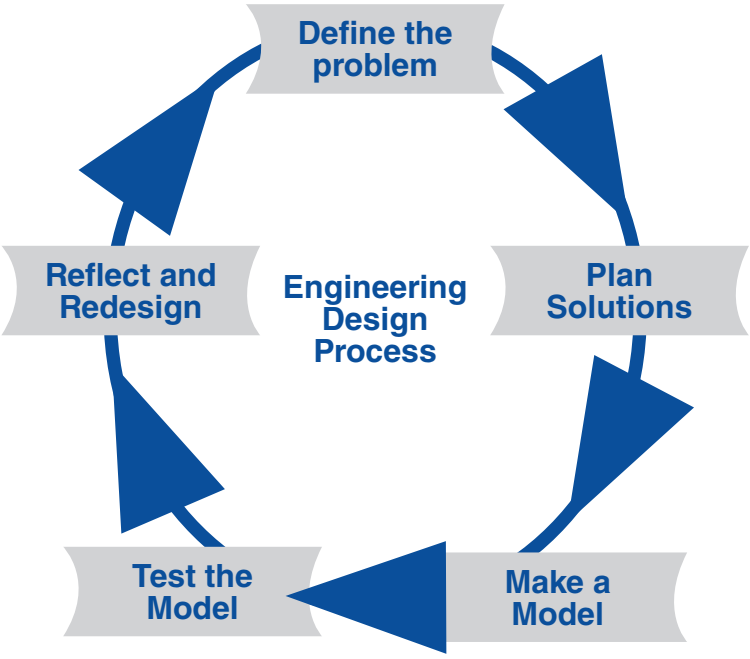
For this challenge, students should develop their idea further but using the engineering design process. Hopefully, they have been able to define the problem and come up with their idea/solution. The next step is to create a model (prototype of their product).

They should spend around 15 minutes sketching their product. When they are ready, they can then move onto modelling (around 20-40 minutes).

Using any paper, cardboard and other craft materials available, encourage students to build a model of their design. The models should be able to demonstrate how it would work and what areas involve robots or lenses.

Get students to present their model to the class. Encourage team to feedback with questions and comments. Then allow 15 minutes for the students to make changes to their models or notes on how they would improve them further.

Depending on how much time you have available they could continue developing their model, sketches and booklet section across a week or longer.



Key takeaway

- Use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose, aimed at particular individuals or groups
- Generate, develop, model, and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design
- Select from and use a wider range of tools and equipment to perform practical tasks 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
- Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work

PRESENTING YOUR IDEAS 10

Core Challenge - 20 min

Session aims

- To understand what an elevator pitch is
- To write a short pitch about their idea
- To practice presenting their pitch in small groups
- To learn simple tips to develop their presentation skills
- To recognise their strengths within a team

Skills Builder links

LISTENING SPEAKING CREATIVITY AIMING HIGH TEAMWORK

Curriculum Links

- English

Links to other activities

- Challenge sessions: 3, 5, 6, 7, 8, 9
- Students should have their confidence presenting to the class through previous sessions and work in this session to put together the skills and knowledge they have gained throughout the challenge sessions.

Resources required

- Student workbook

Health and Safety

- There are no extra health & safety concerns above the normal precautions that should be in place for other sessions and workshops.

Expected duration

- 20 minutes + 60 minutes

Write the Pitch

In this session your pupils should write their elevator pitch.

Explain that an 'elevator pitch' comes from the idea that you get into an elevator (lift) with an important person and you only have 2 minutes (the time it takes for the elevator to reach its destination) to convince them of your idea.

To do this they should work as a team to answer each of the questions as clearly as possible.

Once they have done this, they should practice presenting their pitch.

When everyone is happy with their idea and presentations, they can complete their final version of their pitch in their challenge guide

PRESENTING YOUR IDEAS 10

Bonus Challenge - 60 mins +

Practice the Pitch

For the bonus challenge each team should try and develop their pitch more.

Start by going through some presentation tips.

1. Get everyone to line up based on how confident they are presenting in front of the class. Explain the importance of everyone being involved and working to each other's strengths.

2. Get students to move to either side of the classroom based on whether they think something is a good presentation tip or bad:

    - Start by introducing yourself (yes, but don't waste too much time introducing each team member. Wear name tags instead)
    - Use list of three (yes)
    - Make up facts (no)
    - Thank the audience at the end (yes)
    - Talk over each other (no)
    - Have nominated people of answer different questions (yes)

You can also introduce the idea of power poses to feel more confident ahead of a presentation. Play musical statues but when the music stops pupils need to do a power pose.

Here are some example poses:

Teapot **Roar** **Trump** **Wonder Woman** **Bolt**

There is space in the workbook for students to add more tips to the presenting your ideas page.

For the remainder of the time students should practice their presentation and try and use the different strategies to improve their pitch.