

Introduction:

This set of activities is about understanding parts of the body and what they do.

Part 1 is on the skeleton and muscles; it gets pupils to think about how a skeleton does the different things it needs to.

Part 2 is on digestion and how the body gets what it needs from food.

Part 3 is on circulation and how this system works.

All three sections are directly related to the 'Inside the Human Body' interactive tool, which can be used before, during or after working on the activities with the pupils.

Overall learning objectives	Overall learning outcomes
<p>Part 1 – The Skeleton-muscular system</p> <ul style="list-style-type: none"> To understand the functions of the skeleton To be able to explain various features of the skeleton To relate images of bones, muscles and joints to diagrams and the body 	<p>Part 1 – The Skeleton-muscular system</p> <ul style="list-style-type: none"> To clearly identify the key features of the skeleton To explain the form and function of parts of the skeleton
<p>Part 2 – The Digestive System</p> <ul style="list-style-type: none"> To identify parts of the digestive system To describe their function 	<p>Part 2 – The Digestive System</p> <ul style="list-style-type: none"> To describe what happens to food as it goes through the body
<p>Part 3 – The Circulatory System</p> <ul style="list-style-type: none"> To describe how the circulatory system works To describe the purpose of the main parts of the circulatory system 	<p>Part 3 – The Circulatory System</p> <ul style="list-style-type: none"> To be able to explain what the circulatory system does and how

Curriculum learning objectives:

The human body will support the following national curriculum learning objectives at KS2.

Science:**Pupils should be taught to:**

- identify that humans and some other animals have skeletons and muscles for support, protection and movement (Part 1)
- describe the simple functions of the basic parts of the digestive system in humans (Part 2)
- identify the different types of teeth in humans and their simple functions (Part 2)
- identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood (Part 3)
- describe the ways in which nutrients are transported within humans (Part 3)

Links to Curriculum for Excellence and Northern Ireland Curriculum are also available at: www.siemens.co.uk/education/curriculum

Part 1

The skeleton-muscular system**Introduction:**

This series of activities is designed to run over several lessons and to involve pupils in a range of learning activities relating to the human body. Some of these activities make use of the Siemens Education resource 'Inside the Human Body' interactive tool. Others make use of different materials. The ideas are divided into episodes which can be drawn upon as appropriate.

Overall learning objectives	Overall learning outcomes
<ul style="list-style-type: none"> To understand the functions of the skeleton To be able to explain various features of the skeleton To relate images of bones, muscles and joints to diagrams and the body 	<ul style="list-style-type: none"> To clearly identify the key features of the skeleton To explain the form and function of parts of the skeleton

Curriculum learning objectives:

The human body will support the following national curriculum learning objectives at KS2.

Science:**Pupils should be taught to:**

- identify that humans and some other animals have skeletons and muscles for support, protection and movement

Resources required:

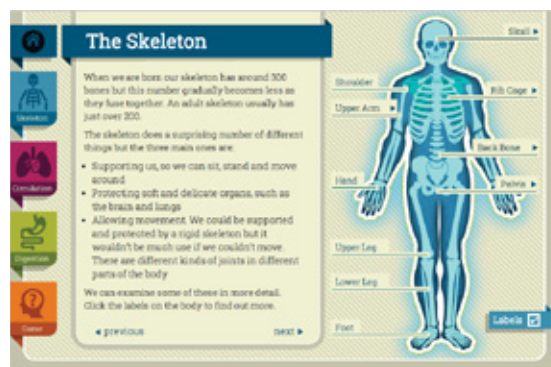
- Pictures of invertebrates
- Image of a human body

Part 1, Episode 1 cont'd**The skeleton-muscular system****Learning activities****1. Begin by displaying a picture of the human skeleton.**

Use could be made of 'Inside the Human Body' and invite pupils to suggest what it is. Ask pupils if they have ever seen a real one. Ask them if they have one. Ask them how they know they have one.

Ask for suggestions as to what evidence they have – what can they do to show you that they have bones? Take ideas and recognise that there are parts of the body where the bones can be felt quite easily. You might need to indicate that some parts, such as the nose, are not bones (but cartilage) but that nevertheless we can tell a lot about the shape of the bones by gently feeling.

Ask what would happen if we didn't have bones. Most pupils will probably realise that without support we couldn't stand or walk, but they should also be encouraged to think about other aspects, such as protection for organs such as the brain or lungs. Movement depends upon bones as well as muscles.

**2. Ask pupils what other animals do – whether they have skeletons.**

Draw out that some do, and show some images. Ask pupils to compare images of different skeletons and identify similarities. Draw out that even though the shape and size varies, a common feature is the backbone. This is why scientists use the presence (or absence) of a backbone as an important way of grouping animals. Animals with backbones are vertebrates.

Draw out that many (indeed, most) animals don't have skeletons, or at least, not skeletons made of bones. Show pictures of invertebrates, such as:

- Beetles (exoskeleton – instead of our endoskeleton)
- Snails (no skeleton but a shell)
- Octopus (no skeleton)

3. Ask pupils to identify the reasons why we have a skeleton. Group the ideas and develop these points:

- A skeleton provides protection, e.g. skull and ribs
- A skeleton provides support, e.g. legs and backbone
- A skeleton enables movement in conjunction with muscles, e.g. arms and legs

At this stage use could be made of the 'Inside the Human Body' resource to consolidate ideas about the functions of the parts of the skeleton, images of bones and supporting information.

Part 1, Episode 1 cont'd

Support

Learning activities

Part of the function of the skeleton is to provide support. Without the skeleton it would not be possible for people to stand, walk or run.

Starter:

Ask pupils to imagine what a human body without bones would be like. Use prompt questions such as:

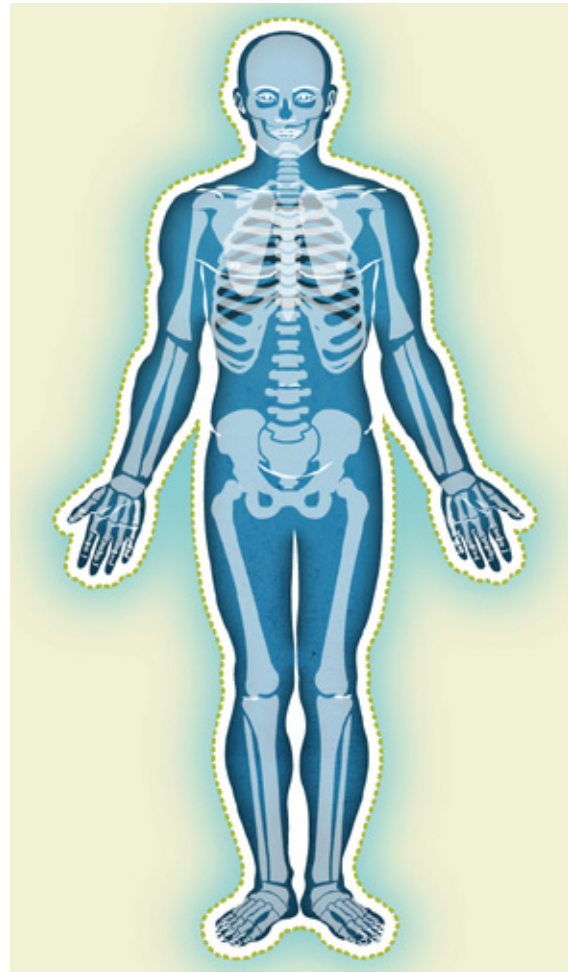
- What would our limbs feel like?
- Could we move and, if so, how?
- Could we stand?
- Would our muscles still function?
- How do animals that don't have bones function (e.g. octopus, snail, spider)

Draw out that we depend on bones to give our bodies support and enable us to stand and walk. Bones aren't essential for life but without them it limits the size an animal can be. Our muscles are attached to our bones and work with them to provide support.

Development:

Ask pupils to suggest the names of bones in the body. Make it clear you're not looking for the scientific names but accept common terms such as 'skull' and 'pelvis'. Assemble a list on the board. Use the 'whole skeleton' image on the resource and help pupils to navigate around firstly the resource and secondly the skeleton. If resources allow, provide pupils with the opportunity to use the 'build a body' function.

Ask pupils to suggest which bones help to support us. Encourage pupils to go beyond 'legs' and identify other bones, which should include pelvis, backbone and arms. Take responses and discuss.



Part 1, Episode 1 cont'd

Support

Resources required:

- Tennis ball
- Ten sheets of A4 paper
- Metre of sellotape

Learning activities

Exploration:

Ask pupils to work in teams to compete in a challenge. Provide each team with a tennis ball (or similar), ten sheets of A4 paper (recycled is fine) and a metre of sellotape (these can be varied but should be the same for all teams). Ask each team to design and construct a structure that will support the ball as high above the table top as possible. The structure should be stable and may not be fixed to the table. This is supported by [Activity sheet 1](#).

Allow pupils to develop responses and construct structures; then test and compare the structures. Encourage students to identify key features of effective solutions, which might include the use of tubes and the structure being broader at the top where it supports the ball.

Consolidation:

Now go back to images of the skeleton and ask pupils to identify what makes bones such as the legs, pelvis and backbone effective at support. Draw out points such as:

- Tubular structure (such as legs and backbone) being light and strong
- Broader structure (such as pelvis and feet) providing stability

Plenary:

Ask pupils to consider whether we would be more stable if we walked on 'all fours'; give them a couple of minutes to consider the questions:

- Would that make us more or less stable?
- What is it about our arms that might make us more stable?
- Why don't we walk on 'all fours'?

Part 1, Episode 2

Protection

Resources required:

Enough for pupils to work in teams

- Egg box
- Paper
- Card
- Drinking straws
- Sellotape
- Jiffy bag, moulded packaging containers
- Chocolate covered teacake

Learning activities

Starter:

Show pupils an egg box and ask what it is for. Follow up with asking how it protects eggs. Then provide pupils with a number of packaging materials and containers, such as boxes with expanded polystyrene in, jiffy bags, moulded plastic containers etc. Note that the focus should be upon the shape of the container rather than just the material, so several (or all) of the items should be boxes or packets. Ask pupils to identify how those packets protect the contents.

Development:

Now use the resource to show pupils the skeleton and ask them to suggest which bones are there to protect. Pupils are likely to identify the skull, rib cage and pelvis. Add that the spinal cord also protects some important nerves.

Exploration:

Provide teams of pupils with materials such as paper, card, drinking straws and sellotape (each team having the same quantity). Ask them to design and construct something that will protect the chocolate covering on a chocolate teacake from cracking if dropped. The teacake cannot be attached to the structure; the structure will be dropped from, say, 0.5m above the floor. This is supported by [Activity sheet 2](#).

Test and compare the devices, encouraging pupils to identify key features of effective designs. Draw out various features, including protecting the teacake (as far as possible) from all angles and also that effective designs aren't necessarily rigid.

Consolidation:

Now go back to the resource and draw attention to the images and information around protective structures, drawing attention to features in common with pupils' designs, possibly including:

- All round protection (e.g. skull)
- Flexibility (e.g. rib cage and backbone)
- Lightweight structure (e.g. rib cage)

Plenary:

Ask pupils to compare the skeleton with a suit of armour and identify what is similar, what is different and why. Draw out that movement is important as well as protection.

Part 1, Episode 3

Movement

Resources required:

- Firm card
- Elastic
- Paper fastener
- Access to Inside the Human Body interactive tool

Learning activities

Starter:

Begin by asking pupils how a skeleton made of rigid bones can move. Draw out that there are joints and that joints need muscles.

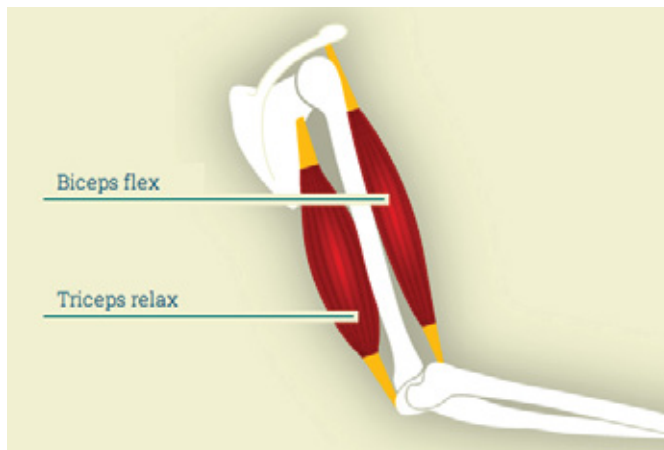
Development:

Show pupils the Inside the Human Body interactive and the images of bones, muscles and joints. Explain that we have joints in many parts of our bodies and that they are essential for movement.

Exploration:

Supply groups of pupils with two pieces of firm card, two pieces of elastic and a paper fastener. Holes should be made in advance and assistance may be required in tying knots.

The purpose of the model is to represent the arm, showing how it is jointed and how the lower arm is controlled by two sets of muscles. Ask pupils to construct the model and explore how it works. They should then compare it to an image of the elbow joint and identify what they have made and how it compares with the actual joint. This is supported by [Activity sheet 3](#).

**Consolidation:**

Ask pupils to feel their upper arms and identify the bones and muscles in their own arms. They should feel which muscles are tensed when they:

- Raise their lower arm
- Force their lower arm down

Plenary:

Ask pupils to comment on their model of the arm and discuss how good a model it is, using questions such as:

- How well does cardboard represent bone?
- How well elastic represent muscle?
- How well does the paper fastener represent a joint?

Key points about each of these functions can be reinforced either now or at a later stage by using the 'Inside the Human Body' resource.

Part 2

The Digestive System**Introduction:**

The digestive system is quite complex but can be understood in fairly simple terms as long as the key points are focused on. Its purpose is to break down food, extract nutrients we can use and dispose of the rest. Some of the breaking down is done physically and some chemically.

Overall learning objectives

- To identify parts of the digestive system
- To describe their function

Overall learning outcomes

- To describe what happens to food as it goes through the body

Curriculum learning objectives:

The human body will support the following national curriculum learning objectives at KS2.

Science:**Pupils should be taught to:**

- describe the simple functions of the basic parts of the digestive system in humans
- identify the different types of teeth in humans and their simple functions

Part 2 cont'd

The Digestive System

Resources required:

- Small banana
- Digestive biscuit or Weetabix
- Funnel
- Small container of water
- Small container with very small amount of food colouring in it (preferably green)
- Small cup of water
- Kitchen towels, plastic bin bags, scissors.
- Pipette or syringe
- Plastic bag rolled and taped to form a tube (with the bottom cut off)
- Plastic sealable bag
- Stocking or leg from tights
- Small plastic bag with a small hole cut in the bottom

Learning activity

Provide pupils with an outline of the body and ask them to draw and annotate what they think happens to food when they've eaten it. Monitor carefully the developing ideas and select pupils to share their ideas. This might work well using a visualiser.

Draw out the points that the digestive system has a number of stages to it and each has a particular function (use could be made of 'Inside the Human Body').

Organ	What happens	Why
Mouth	Food is chewed up and mixed with saliva	Breaking it down into smaller pieces
Stomach	Food is mixed with chemicals and churned up	Continuing to break it down
Small intestine	Some chemicals are absorbed into the blood	Those nutrients can then be used to supply parts of the body with energy and what they need to stay alive and grow
Large intestine	Absorbing water	Water is re-used by the body

Now explain that pupils are going to make a model of the digestive system to show how it works. This is supported by [Activity sheet 4](#).

- 1. Cover the floor in front of you with newspaper or large bin bags, taped to the floor.**
- 2. Pupils sit in a circle around you.** Explain that together with the pupils you are going to construct a human digestive system in the classroom. Everyday materials will represent each main part (so they will need to use their imagination) and pupils will follow the journey that a banana (moist food) and a biscuit (dry food) would take as they travel through the body, starting at the mouth. Ask for volunteers to help with each part of the digestive process and ask them to help you keep everything over the floor covering and use kitchen towels to clean themselves if they need to.
- 3. One pupil 'chews' the biscuit by placing in their hand and squashing and grinding it (chewing).** Put a few drops of water (representing saliva) into their hands as they are 'chewing'. They should end up with a ball of food (bolus) just as we do in our mouths.

Part 2 cont'd

The Digestive System**Learning activity cont'd**

4. **Chop up the banana with scissors (representing teeth).** Another pupil pushes the biscuit and chopped banana, with their finger (representing tongue), through the funnel and into the plastic bag tube (representing the oesophagus).
5. **Another pupil uses hands to grip and squeeze food hand over hand, down the 'oesophagus' into the sealable bag (representing the stomach).** Pour the water from the cup (representing stomach acid) into the bag.
6. **Another pupil seals the bag (representing closing the valve to the stomach) without much air in the bag.** Ask what happens if there is too much air in the bag (stomach)? They burp/belch from their mouths. (Note: Wind from the other end is what happens when they have gas in their intestine!)
7. **Have them squeeze the food and water in the 'stomach' until it's fairly liquid and smooth.** While they are doing this ask pupils what is happening and draw out that digestion is taking place here. At this point explain that if food escapes from the top seal (valve) this is what happens when a person vomits. However, normally food stays in your stomach for around 6 hours.
8. **Next pupil cuts a small hole in the bottom of the bag (representing the pyloric sphincter) and with a partner, pours 'food' into only the top 1/3 of the stocking/tights leg (representing the small intestine).** This will take two people. Whilst one cuts the hole, the other holds the leg open at the top and uses their other hand to squeeze the material together a bit lower down, in order to prevent the food from going immediately down the whole leg!
9. **When they have the food in the top 1/3 of the leg, use the pipette to squirt the water with the food colouring (representing bile) in and say you are squirting in bile which breaks down fats.** [Note: This part is particularly messy!]
10. **Have them squeeze the food through the stocking (the small intestines).** The water coming out through the walls represents the nutrients going to the rest of the body.
11. **At the end of the stocking leg is the foot (large intestine).** Explain there are 'good' bacteria here and last bits of water and nutrients are absorbed into the body. Teacher cuts a hole in the end as the food approaches.
12. **Next pair of pupils squeeze the remaining food into the small plastic bag with a small hole cut in the bottom (representing the rectum and anus).** Then have them squeeze their waste through the hole in the cup into a bowl (toilet).

Make sure everyone is clean and all the 'mess' is on the covered part of the floor to be disposed of.

Afterwards, go through the digestive system using a diagram again. Key points about the function of organs can be reinforced either now or at a later stage by using the 'Inside the Human Body' resource.

Part 3

The Circulatory System**Introduction:**

All pupils will know that we have blood in our bodies and most will know it's pumped around by the heart. Fewer pupils will know just what a range of functions the circulatory system actually performs or how long it took for people to realise that it is a continuous circuit around which the blood flows continuously.

Overall learning objectives

- To describe how the circulatory system works
- To describe the purpose of the main parts of the circulatory system

Overall learning outcomes

- To be able to explain what the circulatory system does and how

Curriculum learning objectives:

The human body will support the following national curriculum learning objectives at KS2.

Science:**Pupils should be taught to:**

- Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood
- Describe the ways in which nutrients are transported within humans

Part 3 cont'd

The Circulatory System**Learning activities**

Start off by asking pupils to suggest what they already know about the blood system. Use these as prompt questions:

- Which parts of the body does the blood system include?
- What does blood do?
- What else do you know about the blood system?

Use these to gather ideas and see what pupils are aware of already.

Then show pupils a diagram of the body (use could be made of 'Inside the Human Body') and ask them where the heart is. Ask them to translate this into its position on their own body.

Then ask where they can feel a pulse and take suggestions. There are, in fact, several places:

- Side of the neck
- Side of the wrist
- Inside of the foot
- Ankle
- Behind the knee

Ask what the pulse is and draw out that it is the heart beating, pumping blood around the body.

Part 3 cont'd

The Circulatory System**Resources required:**

- Human body image
- Diagram of the human double circulatory system
- Diagram that indicates how blood flows from arteries through capillaries
- Access to Inside the Human Body interactive tool

Learning activity

Then ask pupils to work in pairs to explore these questions and suggest answers:

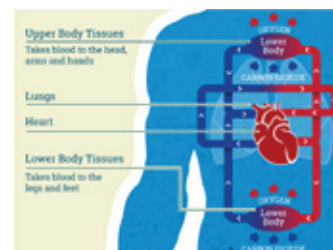
- There are many places where blood vessels can be seen, such as on the palm of the hand. Why can no pulse be felt there?
- When you're feeling your pulse, you should use your finger tips and not your thumb. Why?
- Why is the heart pumping blood around your body?

Take ideas and establish that blood flows out from the heart and then back again. A pulse is felt on the outward journey, where the pressure is higher. This is where the blood flows in veins and they tend to run deeper (away from the likelihood of damage). The thumb has its own pulse, which is why fingers should be used to find a pulse.

Blood has a number of functions and there may be several suggestions that can be accepted at this stage. This includes:

- Carrying oxygen to where it is needed
- Removing carbon dioxide
- Carrying warmth around the body
- Fighting infection
- Sealing gaps and cuts
- Carrying nutrients
- Getting rid of waste chemicals

Now show a diagram which represents the double circulatory system that humans have (use could be made of 'Inside the Human Body'). Trace around with your finger, showing how blood is pumped to the lungs where oxygen is collected and carbon dioxide released, and then returns to the heart. It then goes to other parts of the body, carrying oxygen and nutrients, and collecting carbon dioxide and waste.

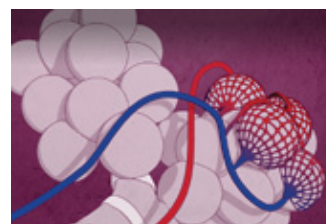


Part 3 cont'd

The Circulatory System**Learning activity cont'd**

Finally show a diagram that indicates how blood flows from arteries (at high pressure), through capillaries (very narrow) and back via the veins (lower pressure) to the heart again (use could be made of 'Inside the Human Body'). Explain that it is in the capillaries where the transfers take place. There is then a consolidation activity, supported by [Activity sheet 5](#), which revisits these ideas and enables learning to be embedded.

Key points about the form and function of the circulatory system can be reinforced either now or at a later stage by using the 'Inside the Human Body' resource.

**Plenary:**

Revisit the initial activity, in which students shared their ideas about blood and the circulatory system. See if there are any ideas that pupils now decide aren't right, or that they want to develop. Ask for other ideas to add.