	Science	Year 6
	Term 4 and Term 5	Topic Title: Animals including Humans

Key Question: How do our choices affect how our bodies work?

National Curriculum Objectives:

Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.

Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.

Describe the ways in which nutrients and water are transported within animals, including humans.

Vocabulary:

Heart, pulse, rate, pumps, blood, blood vessels, artery, vein, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs, liver, lifestyle

Prior Learning:

- Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans)
- Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. (Y3 - Animals, including humans)
- Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans)
- Identify the different types of teeth in humans and their simple functions. (Y4- Animals including humans)

Common misconceptions:

- Your heart is on the left side of your chest
- The heart makes blood
- The blood travels in one loop from the heart to the Lungs and around the body
- When we exercise, our heart beats faster to work the muscles more
- Some blood in our bodies is blue and some blood is red
- We just eat food for energy
- All fat is bad for you
- All dairy is good for you
- Protein is good for you, so eat as much as you want
- Foods only contain fat if you can see it
- All drugs are bad for you.

Knowledge: The heart pumps blood in the blood vessels around to the lungs. Oxygen goes into the blood and carbon dioxide is removed. The blood goes back to the heart and is then pumped around the body. Nutrients, water and oxygen are transported in the blood to the muscles and other parts of the body where they are needed. As they are used, they produce carbon dioxide and other waste products. Carbon dioxide is carried by the blood back to the heart and then the cycle starts again as it is transported back to the lungs to be removed from the body. This is the human circulatory system.

Diet, exercise, drugs and lifestyle have an impact on the way our bodies function. They can affect how well out heart and lungs work, how likely we are to suffer from conditions such as diabetes, how clearly we think, and generally how fit and well we feel. Some conditions are caused by deficiencies in our diet e.g. lack of vitamins. This content is also included in PSHE.

The new statutory requirements for relationships, Physical health and wellbeing.

Investigative skills

Fair/comparative testing	Identifying and classifying	Observations over time	Pattern seeking	Research
How long does it take my pulse rate to return to my resting pulse rate? (recovery rate) Given a range of resources, chn decide for themselves how to gather evidence to answer a question. Take measurements with increasing accuracy/precision. Evaluate choice of method used and accuracy of measurements. Repeat readings when appropriate. Ask further questions.	*Which groups of people may have higher or lower resting pulse rates?* Record data using tables, graphs and scientific diagrams and labels. Report and present findings including conclusions, causal relationships and explanations in oral and written forms. The structure/functions of the gas exchange system in humans, including adaptations to function. (KS3)	*What is the effect of different activities on my pulse rate?* Report and present findings including conclusions, causal relationships and explanations in oral and written forms. The effects of recreational drugs (including substance misuse) on behaviour, health and life processes. (KS3) The mechanism of breathing to move air in and out of the lungs. (KS3)	*Which groups of people may have higher or lower resting pulse rates?* *What is the recovery rate for different groups of people?* Record data using tables, scatter graphs, bar or line graphs. Use observations and subject knowledge to suggest answers to questions. The impact of exercise, asthma & smoking on the human gas exchange system. (KS3)	*Who was William Harvey how did he change the scientific understanding of the heart?* *What are the negative effects of drugs (e.g. tobacco)?* *What are the benefits of a healthy diet and regular exercise?* Identify scientific evidence that has been used to support or refute ideas or arguments. Explore the consequences of imbalances in the diet, including obesity,starvation and deficiency diseases. (KS3)

Significant Scientists:

William Harvey- English physician (double circulatory system)

Sir Richard Doll- Linking Smoking and Health Problem

Linda Buck- physiology and medicine

Science stories:

Pig-Heart Boy- Malorie Blackman (A valuable whole class novel to consider this term if possible.)

A Heart Pumping Adventure- Heather Manley

End point:

- Create a diagram of the circulatory system and label the parts and annotate it to show what the parts do
- Produce a piece of writing that demonstrates the key knowledge e.g. explanation text, job description of the heart.
- Use the role play model to explain the main parts of the circulatory system and their role
- Create models of blood samples to explore and explain the function of blood cells and blood vessels.
- Use subject knowledge about the heart whilst writing conclusions for investigations
- Explain both the positive and negative effects of diet, exercise, drugs and lifestyle on the body
- Present information e.g. in a health leaflet describing impact of drugs and lifestyle on the body

Cross Curricular Links:

PSHE: Know what constitutes a healthy diet, the characteristics of a poor diet and risks associated with unhealthy eating (including, for example, obesity and tooth decay) and other behaviours (e.g. the impact of alcohol on diet or health) recognise that habits can have both positive and negative effects on a healthy lifestyle, recognise choices that support healthy lifestyle & recognise what may influence these.

English: Present findings through oral and written explanations using scientific language and illustrations.

Maths: Record data using tables, scatter graphs, bar or line graphs. Construct and interpret tables, charts and graphs.

Art/DT: Constructing 3D models/ sculptures..

ICT: Select and use software (including internet services) on digital devices to collect, analyse, evaluate and present data and information (curiscope app.) Use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content.

Oracy:

What's the link? Discussion prompted by images.
Odd one out Explorify activity- "Get your blood pumping"
Orally rehearse and present findings on transportation of nutrients and water.
Public service announcement- how do our choices affect how our bodies work?
How can we stay fit and healthy as we get older? Explorify Big Question activity.

Wider Reading

Jumpstart Science Games & activities ages 5-11- R. Feasey
Teaching Primary Science- Peter Riley
A creative approach to teaching Science- Nicky Waller
Twinkl Animals Including Humans lesson pack 3

Enrichment and Science Capital

- Curiscope virtuali-tee- 360° experience of own bodies.
- Encourage use of personal smartwatches/fitbits as instruments of measuring heart rate.
- Enterprise opportunity- children could organise and run a healthy school tuck shop or after school event. They will need to decide which snacks and drinks should be sold on the stall by researching nutritional information and using sugar smart apps to choose or rule out their stock items. The stock could consist of: smoothies, fruit kebabs, granola bars,frozen yoghurt etc.
- Invite a health professional to deliver a KS2 appropriate talk on smoking, medicines and drugs.

Sequence of Learning

Lesson	Key Question	Key learning/notes
1	Read "A heart pumping adventure" to kickstart the topic. What is a heart and how does it	• Play what's the link? (Nicky Waller pg37) Begin with a series of images to include a bicycle pump, athlete, upside down pear (shape of the heart), cupid (love), stethoscope (heartbeat), vampire (feeding on blood), hospital blood bank, industrial valve (valves open and close the heart) delivery van (delivery system) and ask children to discuss what the images have in common. Explain that the circulatory system is the body's delivery system and helps us to understand the important jobs of our blood, blood vessels and heart as blood is

	function?	circulated around our body. • Children to complete a KWL grid before practical exploration of the heart and its function. • Clench your fist and place it in the middle of your chest. Explain that the human circulatory system has a pump called the heart which is roughly the size of your fist. As it beats, it pushes blood around the body. Slightly unclench and clench your fist to illustrate the pumping action of the heart. Chn to copy. Explain that it is muscle tissue that contracts and relaxes. • Look in detail at the structure of the human heart and compare to other animal hearts. Label a given diagram of a human heart using word banks where appropriate and complete a cloze procedure of key facts using the vocabulary. • Explore! Use the Curiscope Virtuali-tee t-shirt to interactively explore the human body through augmented reality. Explore the circulatory, respiratory and digestive systems with fully immersive 360 video and allow chn to track their heart rate and see it animating live in the app on the ipads. (Precursor to investigation later in the unit.)
2	Who was William Harvey and how did he change the scientific understanding about the heart?	• Introduce Galen (a Greek physician and scholar) and explain the initial scientific understanding of the heart and the difference between veins and arteries. Explain how "modern" scientists many years later in the 16th and 17th centuries began to challenge his ideas and introduce William Harvey (English physician). • Listen to a heart beating and discover how it pumps blood to the lungs and the rest of the body in a double circulation. • Research the biographies of both Galen and William Harvey to find out more about the double circulation in humans and the history of this understanding- use a drama/ dance activity to explain the system e.g. tour guide open top bus excursion of the circulatory system. • Children create a detailed, labelled diagram of the double circulatory system including the correct positioning of the heart, lungs, blood cells and key vocabulary such as oxygen, (de)oxygenated, arteries, veins, blood cells. • https://explorify.wellcome.ac.uk/en/activities/odd-one-out/get-your-blood-pumping assess the key learning from today and compare the human circulatory system with other animals using the Explorify activity.
3	How important is our blood?	• Explain that before the heart beats, it fills with blood. Blood does not flow steadily but is "pushed" in a steady pulse as valves open/ close. • Blood has many important functions: transport of oxygen, nutrients and waste materials, fights against infection and helps keep the body at the right temperature. Find out about blood groups, blood transfusion, blood pressure and blood vessels! • Show image of blood vessels. Ask chn to describe what they can see. Reveal that they are looking at blood vessels-tiny tubes that carry oxygen-rich blood away from the heart (Arteries) and ones the carry deoxygenated blood back to the heart (veins.) Recap and embed key vocabulary from yesterday's lesson. Ensure that children understand the colour coding of blue and red as a way of differentiating in scientific diagrams. Do they understand that all blood is red? (clarify that bright red is oxygeneated and darker red is the deoxygenated blood. Some veins appear blue due to the effect of looking through the skin. Veins appear blue because light, penetrating the skin, is absorbed and reflected back to the eye. • Children go on to make a model sample of blood. Use Nicky Waller's learning more about blood activity on pg42) to complete the blood sample activity exploring plasma, red blood cells, white blood cells and platelets. • Photograph the models. Chn annotate these to explain how different ingredients in blood have special functions.
4	How are water and nutrients transported around the body?	• Why do we need nutrients? Children complete a matching activity with nutrients and the reasons we need them. • How Do We Get Nutrients? Show a picture of the digestive system. Recap Year 4 knowledge by placing children into small mixed ability groups to recall the functions of the different parts of the digestive system using the Digestive System Functions Activity Sheet. When the sheets are completed, groups swap their sheets, and peer mark using the answers on the Lesson

		Presentation. Address any misconceptions or errors arising from this activity. • How Does It Work? Give each child a copy of the differentiated Transporting Water and Nutrients Planning Activity Sheet. Read through the information on the following 5 slides to explain the processes of the digestive and excretory systems while children take detailed notes. • Explanation Diagram: In ability groups children use notes from their Transporting Water and Nutrients Planning Activity Sheets to create a diagram on A3 paper explaining the transportation of water and nutrients through the body. Children orally rehearse then present their findings to the rest of the class. • Can children now add to their labels from their blood models in lesson 3 to make particular reference to how blood transports nutrients and water around our bodies?
5	What is the effect of *different* activities on my pulse rate? (Double session)	• What is your pulse and where can you feel it? Ask chn to locate their pulse in different parts of their body (inside wrist, side of neck, temples, behind the knee etc) Take time to look at the equipment available today including the curiscope virtualitee app, a stethoscope, heart rate monitors, timers etc. Encourage chn to look at their fitbits, smartwatches if they have them. • Remind children of their work on muscles and bones in Year 3. Encourage them to feel their biceps and triceps and remind that muscles need nutrition and energy from food to make them work efficiently. The heart pumps the blood in one direction along the blood vessels. Arteries take the blood away from the heart. They divide up into tiny blood vessels called capillaries, in organs like the muscles. The capillaries join together and deliver blood into the veins which take blood back to the heart. • Watch/ discuss the BBC clip on how our circulatory system keeps us alive to inspire chn with how to collect information and present results. • Ask the lesson key question. How do you think our pulse might change if we complete some physical activities? • Collect initial responses and establish that the more energy required, the more the muscle cells need "food." The body needs oxygen to release energy from food for the muscles to work. Where does the oxygen come from? How does it get into our bodies? Where does it go? Children write/draw initial predictions and responses on post-its. Display on class f/c or in WS floor book. (Use to later address/plan for misconceptions) • Set up an investigation (could be completed in a PE lesson) to investigate the effect of physical activity on the pulse rate. • Give a range of resources including various instruments to measure time, Chn decide for themselves how to gather evidence to answer the question. • Chn take measurements with increasing accuracy/precision by evaluating the methods used and considering the accuracy of their measurements. Encourage chn to repeat readings when appropriate. • Use the UKS2 investigation template to formally record results including plotting graphs to look for patterns. Children to use I notice to focus on what their graph results tell them. • Have their investigations led to further questions? How else or what else could they investigate to do with this question? Display next lesson's key question and ask children to generate their own questions ready for an arranged talk with a visiting health professional.
6	**What is the impact of diet, exercise, drugs and lifestyle on the way our bodies function?** This lesson needs to take place alongside/ in addition to PSHE lessons prescribed by school in line with the PSHE statutory guidance.	• Introduce **Sir Richard Doll** and explain that he was a pioneer in research linking smoking to health problems. With Ernst Wynder, Bradford Hill and Evarts Graham, he was credited with being the first to prove that smoking caused lung cancer and increased the risk of heart disease. • Invite a health professional to deliver a talk on the impact of diet, drugs and lifestyle choices such as smoking. (This could be a parent or contact from the school if they are willing or contact NHS providers.) • Set up an observation over time activity to demonstrate the impact of smoking. Use a large jar and a sponge as in Nicky Waller's The impact of smoking: a model (pg41) or various alternative activities can be found online. Rpt the procedure over a number of hours to represent how an average smoker has 15 cigarettes a day. • Children to complete the end of unit quick quiz independently. (Use next lesson

		to address any remaining gaps in knowledge or misconceptions that are apparent in the quiz, using the PSA activity for children to collaborate and embed the key learning.) PSHE Pupils should be taught: • the facts about legal and illegal drugs & associated risks, including link between drug use, & associated risks, including the link to serious mental health conditions • the law relating to the supply and possession of illegal substances • physical and psychological risks associated with alcohol consumption and what constitutes low risk alcohol consumption in adulthood • physical and psychological consequences of addiction, including alcohol dependency • awareness of the dangers of drugs which are prescribed but still present serious health risks • facts about the harm from smoking tobacco (particularly link to lung cancer); the benefits of quitting and how to access support to do so.
7	How do our choices affect how our bodies work? Assessment lesson	• To finish the unit, explain that the NHS need their support with their "health literacy campaign" to raise the public's awareness of how to make informed health and wellbeing decisions. Children plan a PSA (Public service announcement) on the unit's big question. Chn use the oracy template to help them cover the key points of learning across the unit and then rehearse and finally present their findings to an audience (either physically or a video of their presentation aimed at another Year 6 class) • Final thought: How can we stay fit and healthy as we get older? Use Explorify activity to promote discussion and recap the key points presented in the lesson.