Subject: Science
Year 6: Animals including humans: Circulation and Health
NC/PoS:

- 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 way in which nutrients and water are transported within animals, including humans.

Prior Learning (what pupils already know and can do)
https://www.kapowprimary.com/subjects/science/science-lower-key-stage-2/year-4/animals-digestion-and-food/
Also, to know exercise is important for a healthy body. To know the rib cage protects the heart. To know all animals need water and nutrients from food for a healthy body.

End Goals (what pupils MUST know and remember)

- Know the circulatory system is made up of blood, blood vessels and the heart
- Know blood moves food, waste oxygen and waste products around the body
- Know there are three kinds of blood vessels: capillaries, veins, and arteries
- Know arteries, carry oxygenated blood away from the heart to the body
- Know veins, carry de-oxygenated blood back to the heart
- Know exercise strengthens the muscles, develops the lungs, helps body coordination, uses up food for energy and can prevent the body getting fat and helps the body to sleep at nighttime
- Know that taking health risks can damage the body
- Know that smoking causes heart attacks, blocked arteries, lung cancer and breathing problems
- Know sniffing solvents is extremely dangerous as damages the brain
- Know that drinking alcohol slows down the reactions
- Know heavy drinking damages the liver, heart, and stomach
- Know drugs can be dangerous if misused and can cause damage to the brain
- Know tobacco, sniffing solvent and some drugs are addictive

Key Vocabulary
Circulatory system, oxygenated, de-oxygenated, veins, arteries, blood vessels, capillaries, heart, arteries, veins, red and white cells, platelets, plasma, pulse rate, heart rate, heart attacks, blocked arteries, lung cancer, tobacco, alcohol, drugs, addictive, medicine, vaccination, legal, illegal

Session 1:
review prior learning. Can use the *Activity: Nutrition and health mind map* if needed.
Skeleton purpose - **Support** – the skeleton keeps the body upright and provides a framework for muscle and tissue attachment. **Posture** – the skeleton gives the correct shape to our body. **Protection** – the bones of the skeleton protect the internal organs and reduce the risk of injury on impact.
Digestive system - breaks nutrients into parts small enough for your body to absorb and use for energy, growth, and cell repair. It includes the mouth, pharynx (throat), oesophagus, stomach, small intestine, large intestine, rectum, and anus.
Use Kapow lesson 1: Factors affecting health
LO: To identify factors that affect our health and how to reduce their negative impact.
Use the *Presentation: Advice about health*
Children write 3 pieces of advice they would give to others to improve their health.
Vocabulary: heart attacks, blocked arteries, lung cancer, tobacco, alcohol

Session 2: Recap: function of each part of the digestive system. Can use *Presentation: Digestion brain dump* and watch *Pupil video: The digestive system* from *Lesson 1: The human digestive system*
Use Kapow lesson 3: Blood
LO: To identify the key roles of blood.
Children learn the circulatory system is made up of blood, blood vessels and the heart. Blood moves food, waste oxygen and waste products around the body. There are three kinds of blood vessels: capillaries, veins, and arteries. Arteries, carry oxygenated blood away from the heart to the body. Veins, carry de-oxygenated blood back to the heart.
Use *Presentation: Guess the zoom* and discuss **What is the function (job) of the blood?** (It transports substances around the body, including oxygen, carbon dioxide and nutrients. See if any pupils are aware of any of the other functions.)
Watch the clip in slide 1 of the *Presentation: White blood cell vs bacteria* and ask **Why do you think it is described as the white blood cell 'digesting' the bacteria?** (The white blood cell uses chemicals similar to those that are used in the digestive system to break up the bacteria into smaller pieces.)
Teacher to do the Modelling Blood activity within the Main Event part of the lesson. Display the *Presentation: Modelling blood* and ask the class to use the image of the modelling equipment to summarise the model observed in their books and explain why blood is so important in the body.

- It is needed to transport substances, including delivering useful substances like oxygen, nutrients and water around the body. It also transports waste products, such as carbon dioxide, to where they are disposed of.
- It helps with the defence against disease.
- It helps with clotting and scab formation to prevent germs from entering the body and loss of blood.

Vocabulary: heart, blood vessels, capillaries, arteries, veins, red and white cells, platelets, plasma

Session 3: Recap and recall: Gimme 5- list five things found in the blood.
Use Kapow lesson 2: The heart and circulatory system
LO: To summarise the key structures and purpose of the circulatory system.
Play the *Pupil video: The heart and circulatory system* and ask the children to look for one new fact they did not already know. Collect their facts and ask:

- **What is the function (job) of the circulatory system?** (To transport blood throughout the whole body to every cell or building block; the movement also allows for picking up oxygen, removing **waste** carbon dioxide in the lungs and absorbing nutrients.)
- **What is the function (job) of the heart?** (To push the blood around the circulatory system.)
- **What is the function (job) of the vessels?** (To carry the blood around the body.)
- **Why is breathing so important?** (It brings **oxygen** from the air into our lungs and the bloodstream so it can be delivered to every cell of the body. Our cells and organs need a constant supply of oxygen to work and stay alive. The reverse is also true of **carbon dioxide**; a build-up of waste carbon dioxide in our body is toxic so it must be transported in the blood to the lungs to be breathed out.)

Allow the class to create the model that represents the heart and circulatory

system as suggested in the Main Event section of the lesson.
Children draw and annotate a diagram of the heart and circulatory system in their books. Can use the *Presentation: Greetings from the circulatory system* to help them.
Vocabulary: circulatory system, oxygenated, de-oxygenated, lungs

Session 4: Recap and recall: the circulatory system – components function and how it works.
LO: To explore the relationship between animal size and heart rate.
Working scientifically LO: To interpret patterns in data.
Watch the link: Operation ouch - The heart on VideoLink. Warning: this video shows a real heart being dissected and experimented. Ask the children:

- **What is the purpose of the heart?** (To pump blood around the body and transport substances such as oxygen, carbon dioxide, water and nutrients.)
- **What is the heart made from?** (Muscle.)
- **What is meant by 'heart rate'?** (Take initial responses from the class.)

Watch the link: Heart size comparison on VideoLink that shows 3D models of hearts from different animals, as well as some fictional creatures at the end. Ask the children to look for any patterns.
Children research and collect data for a variety of different animals.
Display the *Download: Data entry for animal mass vs heart rate* and input the children's data to create a scatter graph. Ask the children to discuss in pairs their conclusion of the pattern between an animal's mass or size and heart rate, quoting values as evidence. Encourage them to spot any results considered anomalous.

Vocabulary: pulse rate, heart rate

Session 5: Recap and recall: Display the *Presentation: Circulation true or false* and ask the children to discuss in pairs whether they think each statement is true or false.
Use Kapow lesson 5: Investigating exercise and heart rate
LO: To investigate the relationship between exercise and heart rate.
Working scientifically LO: To write a method
Children learn exercise strengthens the muscles, develops the lungs, helps body coordination, uses up food for energy and can prevent the body getting fat and helps the body to sleep at nighttime
Ask the class to suggest ways that someone's heart rate can be measured. These may include:

- A pulse.
- A pulsometer (a device that clips onto the end of a finger).
- Data loggers (with pulsometer clips).
- Smartwatches.

Explain to the class that a **pulse** is the regular beating of the heart. Demonstrate to the class how they can feel their own pulse by either gently pressing with the index and middle fingers into the groove next to the voicebox on the neck, or on the thumb side of the wrist, just below the base of the thumb. Inform the class that to work out the heart rate, the number of heartbeats can be counted in 60 seconds to give the beats per minute, count the number of beats in 30 seconds and multiply by two or count the number in 15 seconds and multiply by four. Practise.
Inform the class that they will begin by planning an enquiry to find out 'How does exercise affect heart rate?'
Children write variables that could affect heart rate on sticky notes. Establish that for this enquiry the variable we will change is 'type of exercise' and all other variables should be

kept the same 'control variables'.

Children come up with a method in pairs/groups considering:

- When to measure the resting heart rate.
- The number of different exercises being completed and how long for.
- How the heart rate will be measured.

Can use the *Pupil video: Investigating exercise and heart rate* if children need further input.

Children write up their methods in their books and then complete the investigation.

Vocabulary: method, heart rate, variable, control variable, fair test

Session 6: Recap and recall: Display the *Presentation: Spot the mistake in the graph* and ask the children to discuss in pairs any mistakes with the graph.

Use Kapow lesson 6:Heart rate and fitness

LO: To describe the relationship between heart rate and fitness.

Working scientifically LO: To draw a line graph.

Use the *Presentation: Comparing heart rates* and allow the children to use the data to plot their line graph using the guidance given. Once they have completed their graphs ask the following:

What happens to Person A's heart rate over the 14 minutes? (It increases from 80 to 140 beats per minute in the first 3 minutes, then slowly decreases back to 80 beats per minute.)

- **Why does this happen?** (During exercise, the muscles need more energy to work; this requires more oxygen and sugar transported by the blood, so the heart beats faster to transport it to where it is needed.)
- **When do you think Person A stopped exercising? Why?** (At 3 minutes, because after this their heart rate began to slow down.)
- **How does Person B's data compare?** (Person B's heart rate is lower than Person A's throughout the 14 minutes and returns to normal quicker.)

Vocabulary: fitness, line graph, resting heart rate

Link to career scientist:
https://pstt.org.uk/application/files/2816/4572/2472/Associate_Scientist_Vaccine_Development_-_Rebecca_Hand_-_v2.pdf - develops flu vaccines for children