1. Your heart is really a muscle. It’s located a little to the left of the middle of your chest, and it’s about the size of your fist. The heart sends blood around your body. The blood provides your body with the oxygen and nutrients it needs. It also carries away waste. Your heart is sort of like a pump, or two pumps in one. The right side of your heart receives blood from the body and pumps it to the lungs. The left side of the heart does the exact opposite: It receives blood from the lungs and pumps it out to the body.

2. The left side of your heart sends that oxygen-rich blood out to the body. The body takes the oxygen out of the blood and uses it in your body’s cells. When the cells use the oxygen, they make carbon dioxide and other stuff that gets carried away by the blood. It’s like the blood delivers lunch to the cells and then has to pick up the waste.

3. The returning blood enters the right side of the heart. The right ventricle pumps the blood to the lungs for a little freshening up. In the lungs, carbon dioxide is removed from the blood and sent out of the body when we exhale. What’s next? An inhale, of course, and a fresh breath of oxygen that can enter the blood to start the process again. This all happens in about a minute.

4. The heart is a myogenic muscular organ found in all animals with a circulatory system (including all vertebrates), that is responsible for pumping blood throughout the blood vessels by repeated, rhythmic contractions. The term cardiac (as in cardiology) means “related to the heart” and comes from the Greek καρδία, kardia, for “heart”. The vertebrate heart is composed of cardiac muscle, which is an involuntary striated muscle tissue found only in this organ, and connective tissue. The average human heart, beating at 72 beats per minute, will beat approximately 2.5 billion times during an average 66 year lifespan, and weighs approximately 250 to 300 grams in females and 300 to 350 grams in males.

5. Individual heart muscle cells undergo natural rhythmic contractions and beat 20 to 30 times per minute. The synchronous contractions of the muscle cells are coordinated by the pace maker cells.

Common Misconceptions

- The heart stops when we are asleep.
- Pulse is different from heart rate.
- Many children ignore the function of internal organs that are not measurable. Lungs, heart, stomach, bones have a clear function that can be physically felt. Kidneys, liver, intestine have functions that cannot be felt.
- The most common misconception is the “single loop” model, wherein the arteries carry blood from the heart to the body (where oxygen is deposited and waste collected) and the veins carry blood from the body to the heart (where it is cleaned and re-oxygenated).
- That only human beings have hearts.

Termly Scientific Skills Development Focus: Evaluation

Questions that should be asked: (For more suggestions see page 20 of the Scheme of Work)

- Are there any results/observations which don’t seem to match others?
- How would you explain any results/observations that you were not expecting?
- How would you use science to explain any results/ observations which don’t seem to match others?
- What could you do to make your method better?

Opportunities should be given throughout the lesson for children to use and develop their knowledge of planning investigations and collecting data. They should be encouraged to question the validity of their results.

Cross curricular links

Literacy

- Heart phrases: broken heart - to lose love, heartfelt - deeply felt, have your heart in the right place - to be kind hearted.
- Write the journey of a red blood cell – as an explanation text or as a diary.
Human Health and Fitness – Exercise and Heart Rate
Lessons 3 and 4

- Poetry: Look at this link for a suggestion
  http://sciencepoems.net/sciencepoems/heart.aspx#.VgpUq_lViko
- Write a historical news story on the first successful heart transplant by Christiaan Barnard in 1967.

Numeracy
- Pupils can find various ways to chart and graph data collected.
- Find averages of heart rates before and after exercise.

Other subjects
- PE – What is the effect of different types of exercise on heart rates?
- Music – Compose a piece which to accompany changing heart rates or emotions.
- Art – Use examples of Banksy to inspire children’s work. Is the child happy or sad? What is the story behind the picture?
- Art/DT - Make a 3D poster on the circulatory system, with labels.
- Philosophy – Why is the heart associated with love?

Starter Activity

Begin by asking the children what they know about their hearts.
Are there any common misconceptions? Record ideas on the board to come back to at the end of the lesson, children can then see their progress.

Watch
https://www.youtube.com/watch?v=gxUNxvsG7lc (straightforward information for younger children) OR
https://www.youtube.com/watch?v=-sSiCoCaofc (Children’s videos with more detailed language)

Get the students to place the tips of their index and second fingers on their lower neck, on either side of their windpipes and see if they can find their pulse. What can they recall about what is happening every time they feel their pulse?

Possible Questions/Suggestions for discussion

Which new words have we learnt?
What role does the heart play?
How do we measure our heart rate?
What happens to our heart rate during the day...Why?

Teacher Demonstration

Three Demonstrations
- Model heart/ Stethoscope
- Sphygmomanometer
- Video clip
  1. Show the students the model of the human heart and ask them questions to check understanding about where it is in the body, and what its function is. Children can make a list of key vocabulary. Use a stethoscope to listen to heartbeats.
  2. Then using the sphygmomanometer, show the students how to measure blood pressure.
  3. Watch the video clip to consider the size of animal hearts:
    The dissection of a whale which died from illness and suffocation on a sand bar in Ireland can be seen at:
    https://www.youtube.com/watch?v=kJnKuw7Wvz4
    Water flea heart: http://http://www.youtube.com/watch?v=ibDwYghgb2k&feature=related

SOME CHILDREN MAY FIND PARTS OF THE WHALE CLIP UPSETTING, SO PLEASE PREPARE THEM FOR THIS.
The whole programme, ‘Inside Nature’s Giants - The Fin Whale’, was originally broadcast on Channel 4 and lasts for 48 minutes.
To see where they get to the lungs and heart, skip to 36 minutes through the programme. The heart is not removed from the whale because as the team are prevented from cutting the ribcage open. A picture of a model blue whale heart is reproduced at the end of this lesson plan to show the colossal size. Showing some clips/pictures of the range in size of different animal hearts from YouTube and Google is always interesting at this point.
**Children’s Investigation**

**Children’s Investigation: How does exercise affect your heart rate?**
Demonstrate the apparatus that the students will be using and depending on the class either show / give them some written / verbal instructions on how to carry out the investigation.

Either issue a simple results table or use the opportunity to get the class to draw their own. E.g.

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Resting Heart Rate (1 min)</th>
<th>Heart Rate Immediately after exercise (1 min)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Press Ups</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Running for 1min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Possible Questions/ Suggestions for discussion**

- What happened to heart rates after exercise?
- Why would this happen? What do we need more of when we exercise?
- What is happening to our heart during/after exercise?
- What is happening to our breathing during/after exercise?
- Ask the class if they can think how this kind of investigation may be useful?

**Learning Outcomes**

**All children should**
- Learn that different forms of exercise cause heart rate to change.
- Develop the skill of recording and analysing scientific investigation.
- Be able to make predictions about which types of exercise will cause the biggest change in heart rate.
- Learn that our heart beats faster when our muscles work harder to deliver more oxygen to them.
- Know that the heart is a ‘pump’ and pumps blood around the body.

**Some children could**
- Develop the skill of plotting and presenting data graphically.
- Know parts of the circulatory system, and the role blood cells play.
- When we exercise the muscles have to work harder and therefore need more oxygen and so the heart beats faster to deliver oxygen to the working muscles.

**A few children could**
- Explain in detail the best way of presenting data from this experiment.
- Label and explain the circulatory system in depth.
- Devise a class glossary including scientific vocabulary involving the circulatory system.
- That the blood contains dissolved oxygen, which it delivers to muscles.

**Plenary/Review including Skills Progression focus: Evaluation**

- Can we spot any patterns in our results?
- What is the class average?
- Are there any results we should discount, and if so why?
- What do we know now that we didn’t at the beginning of the lesson?
- If we had to do the investigation again, how could we improve it?

**Useful websites**

Link on animal hearts: [http://www.bbc.co.uk/guides/zxm2tyc#zphtsg8](http://www.bbc.co.uk/guides/zxm2tyc#zphtsg8)
Appendix: A model of a blue whale heart to show the scale