Pulse of Life

Key Questions
How does your heart rate change after exercise?
What can change your heart rate besides exercise?

Materials
For each child
- copy of "Pulse Rate for Different Activities" chart
- clock or watch with a second hand or a digital reading

Procedure
Help the kids locate their pulse points either on their wrists or necks.
Ask them to place their right index and middle finger on the palm side of their left wrist. On the neck, the pulse point is located beneath the ear and jawbone.
Count the number of beats in 15 seconds. Multiply this by four (15x4=60, there are 60 seconds in one minute). This is how many times the heart beats in one minute. Have kids enter this "at rest" heart rate on their chart. (Pulse rates for children at rest will vary between 60 - 110 beats per minute. Adult rates are lower.)

Do some exercise such as running in place, jumping jacks, or other exercise for one minute.
Stop and calculate pulse again over 15 seconds.
Calculate the heart rate for each activity and show this on the graph.

Extensions
The amount of time the heart takes to return to a normal at-rest rate after exercise is called recovery time. This is a measure of the body's general fitness. The shorter the recovery time, the higher the level of fitness. Determine recovery rate by first measuring and recording the pulse rate at rest. Next, run in place for two minutes. Now measure the pulse rate every minute until the at-rest rate is reached. How long did it take the heart to return to the normal rate?

What's Going On: Pulse Rates
During each heartbeat, the muscles of the heart contract causing a wave of pressure which forces blood through the arteries. This wave of pressure is known as a pulse. There is one pulsation for each heartbeat. The pulse can be felt at various points on the body where the arteries are just under the skin, such as the temples, neck, crook of the elbow, wrist, groin, back of the knee, and the inside back of the ankle. The normal pulse rate varies with age. Below is a chart listing the range of heart rates and average heart rate for various ages.
Extension
A mouse's heart beats about 700 times per minute and an elephant's about 30. A mouse lives less than three years, an elephant more than 60. What's the connection? Compare the heart rates of various animals. Is there a relationship between size of animal and heart rate? Research the longevity of various animals and compare this to their heart rate. Is there a relationship between the average lifetime of an animal and its heart rate?

Notes
Over 1,500 Gallons of Blood Pumped Daily
The heart is a powerful muscle that beats without stopping throughout a lifetime. It pumps about 55-80 ml (1/3 cup) of blood with each beat for adults and around 25-85 ml per beat for children. An adult heart pumps about 6,000-7,500 liters (1,500-2,000 gallons) of blood daily. The average adult body contains about five quarts of blood which continually circulates throughout the body. The shortest trip to the heart muscles takes only a few seconds. The trip to the toes takes over a minute.

With exercise or physical activity, the heart rate increases to supply the muscles with more oxygen to produce extra energy. The heart can beat up to 200 times per minute with extreme exercise. The brain sends nerve signals to the heart to control the rate. The body also produces chemical hormones, such as adrenaline, which can change the heart rate. When we are excited, scared, or anxious our heart gets a signal to beat faster. During a fever, the heart beats faster to bring more blood to the surface of the body to release heat and cool the body. The heart rate increases during and after a meal to send more blood to the digestive system. A trained athlete's heart can pump more blood with each beat so his or her heart rate is slower. Likewise, an athlete's recovery time is shorter.
There are two ways the heart can meet the body's need for oxygen during exercise. It can beat faster or it can beat harder, moving more blood per pump. But it can only beat harder if it has been strengthened through regular exercise.

### Range of Heart Rates per Minute and Average Heart Rate for Various Ages

<table>
<thead>
<tr>
<th>Age</th>
<th>Range</th>
<th>Average Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 month</td>
<td>100-180</td>
<td></td>
</tr>
<tr>
<td>2-3 months</td>
<td>110-180</td>
<td></td>
</tr>
<tr>
<td>4-12 months</td>
<td>80-180</td>
<td></td>
</tr>
<tr>
<td>1-3 years</td>
<td>80-160</td>
<td>(130)</td>
</tr>
<tr>
<td>4-5 years</td>
<td>80-120</td>
<td>(100)</td>
</tr>
<tr>
<td>6-8 years</td>
<td>70-115</td>
<td>(100)</td>
</tr>
<tr>
<td>9-11 years</td>
<td>60-110</td>
<td>(88)</td>
</tr>
<tr>
<td>12-16 years</td>
<td>60-110</td>
<td>(80)</td>
</tr>
<tr>
<td>&gt;16 years</td>
<td>50-90</td>
<td>(70)</td>
</tr>
</tbody>
</table>
Respiratory Rate for Different Activities

Breaths per Minute

At Rest  Walking  Running in Place  Jumping Jacks  Another Activity  Another Activity

Activity