1A

Comprehension: Coal, iron and steam

The Industrial Revolution began before Victorian times and depended on coal, iron and steam.

Iron does not exist as a metal in the ground that is simply dug up. It is combined with other substances to make a rocky material called iron ore. This is dug up but it has to take part in a process called smelting before the iron metal is released from it. Up until the early eighteenth century, iron smelting was performed by heating iron ore with charcoal. Large amounts of wood were needed to make charcoal and in the eighteenth century there were not enough forests left in Britain to provide all the wood that was needed. In 1709 Abraham Darby used coke instead of charcoal in iron smelting. The coke was made by heating coal and there was plenty of coal underground so coal mining greatly increased.

Small amounts of coal had been mined for some time and burnt on fires to keep people warm. One of the problems that coal miners faced was the flooding of the mine. In 1699 Thomas Savery invented a water pump called the 'Miner's Friend'. It was powered by a steam engine but the engine was not very efficient and was only used in a few mines. In 1712 Thomas Newcomen invented a more efficient steam engine which was installed in over a hundred mines in Britain in the eighteenth century.

In 1765 James Watt made an even more efficient steam engine and this, too, was used for pumping water out of mines. This steam engine, like the ones before it, just made a pump piston go up and down but Watt saw that new machines being invented in the textile industry needed a steam engine that turned a wheel to give them power. He invented one. Watt's steam engine had a large wheel. It was used in textile mills in the following way. The large wheel passed its turning motion to other smaller wheels inside the mill. The turning motion of these wheels was passed to the machines in the mill by belts. Watt's steam engine was also used to make steam locomotives. They pulled carriages and trucks along railways.

Steam engines and the machines they powered were made of iron. The railways were made of iron, too. This meant that there was a great demand for iron and more people worked in smelting and making iron products. As coke, made from coal, was used in iron smelting and also used as a fuel for steam engines there was a great demand for coal so more people worked as miners, too.

1A

Teacher's sheet

Coal, iron and steam

Age range

- Years 3/4 (SP4/5).
- Years 5/6 (SP6/7).

Resources

Copies of the worksheets, dictionary.

Using the worksheet

There is so much information about the Victorians that there is a danger of some ideas becoming mixed up. One idea might be that the Industrial Revolution occurred in Victorian times. In fact, it began before the nineteenth century. The purpose of this sheet is to provide some simple background to the origins of the Industrial Revolution to set the scene for entering Victorian times. You might like to begin by showing the students a lump of coal and a lump of iron ore and refer to the steam produced by a kettle to say these were some of the major raw materials on which the Industrial Revolution was based. Activity 1B develops this theme a little more by looking at textiles.

Younger students

The students could answer the questions on page 26 to test their comprehension of the text.

Answers

1. Iron ore.
2. Wood.
3. Coal.
4. It had a large wheel which moved small wheels, which in turn moved the machines.
5. It was used in textile mills to operate the machinery. It was also used in steam locomotives to pull carriages and trucks along the railway.

Outcomes

The students can:

- Know that the Industrial Revolution took place before Victorian times.
- Extract information from a text.

Older students

The students may have considered steam as part of their work in science when looking at how materials change and may need reminding of it now. Most people think of steam as the clouds of water droplets issuing from a boiling kettle. This is not steam. The steam is the hot colourless gas that rushes out of the kettle spout. You can see where the steam is but not the steam itself – it is in the gap between the clouds of 'steam' and the rim of the spout.

The students could answer the questions on page 27 to test their comprehension of the text.

Answers

1. Iron ore and charcoal.
2. Iron metal.
3. A timeline with the correct distance between Savery(1699), Darby (1709), Newcomen (1712) and Watt (1765).
4. Because of the demand for iron to make steam engines, machinery and the railways.
5. Because of the demand for iron. Iron smelting used coke and coke was made from coal.

Outcomes

The students can:

- Know that the Industrial Revolution took place before Victorian times.
- Extract information from a text.
- Construct a simple timeline.

1A

See **1A Comprehension: Coal, iron and steam**

Questions (i): Coal, iron and steam

1. What is the rocky material that contains iron?

✎ .....

2. What is charcoal made from?

✎ .....

3. What is coke made from?

✎ .....

4. How was Watt's new steam engine different from other steam engines?

✎ .....

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5. Where was the new steam engine used and what was it used for?

✎ .....

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Use a dictionary to find out the meaning of words which you are not familiar with.

Teacher's sheet

Questions (ii): Coal, iron and steam

1. What substances are used in the smelting of iron?

✎ .....

2. What is produced by the smelting of iron?

✎ .....

3. Make a timeline linking Watt, Darby, Newcomen and Savery.

4. Why was more smelting done as time went by?

✎ .....

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5. Why did more people start working in the mines?

✎ .....

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Use a dictionary to find out the meaning of words which you are not familiar with.