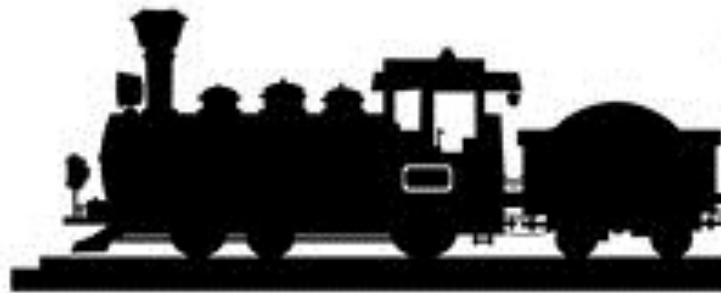


YEAR 6: THE INDUSTRIAL REVOLUTION

(6 lessons)



Contents Include:

Cotton Production

The Steam Engine

Iron and Coal

Canals

Trains

Suggested Teacher Resources:

- *The Young Oxford History of Britain & Ireland*, pages 286-320.
- *Great Tales from English History* by Robert Lacey, pages 327-378.
- The [BBC](#) website has some articles on the period, and clips from a [recent documentary](#) about the industrial revolution and a documentary about [trains](#).
- This topic lends itself well to local history, eg. canals and Victorian train stations.

Lesson 1. Introduction to the Industrial Revolution

The key point for pupils to understand about the Industrial Revolution is that it had a transformative effect on the world. Through harnessing fossil fuels to power engines, factories and machines, the Industrial Revolution fundamentally changed the way that human beings live. This single innovation gave birth to the modern world. It is a topic of particular interest to Britain, as it was in Britain that the key inventions of the industrial revolution were first created: the cotton mill, the steam engine, and the train. This lesson should introduce pupils to a broad overview of industrialisation, and some key concepts.

See pages 128 of *What Your Year 6 Child Needs to Know*.

Learning Objective	Core Knowledge	Activities for Learning	Related Vocabulary	Assessment Questions
<p>To begin to understand why the Industrial Revolution was important to Britain.</p>	<p>‘Industrial Revolution’ describes the transition from a society based on hand manufacturing and human or animal power, to a society based on machinery.</p> <p>It was characterized by the use of steam powered engines, the spread of factories and machines, mass produced goods and mechanised transport.</p> <p>The Industrial Revolution began in Britain around 1760, but really took off around the 1840s.</p>	<p>Arrange a selection of eight different inventions in order, and try to guess the date for each of them (resource 1).</p> <p>Look at a pre-industrial scene, and a post-industrial scene, of the same location. Ask the pupils to list as many things which they can think of which did not exist before the industrial revolution. Images from <i>A Street Through Time</i> (Dorling Kindersley) would work well.</p> <p>Ask pupils to write down five things that they enjoy doing on a regular basis. Collate a list of activities on the board. Then, tick any of the activities that could have existed before the Industrial Revolution. Also, this is an excellent short video introducing the Industrial Revolution.</p>	<p>industrial revolution factory engine machine mechanise mass produce</p>	<p><i>What was the Industrial Revolution?</i></p> <p><i>How does an industrial society differ from a pre-industrial society?</i></p> <p><i>What sorts of developments characterised the Industrial Revolution?</i></p>

1. Industrial Inventions

The first ever passenger train takes people from Liverpool to Manchester.

The first steam engine is invented, and used for jobs such as grinding corn.

Richard Arkwright builds the Cromford Mill for spinning cotton—Britain's first factory.

The *SS Great Western*, the first steamship to cross the Atlantic, leaves Bristol.

Cable laid across the Atlantic, allowing communication between UK and USA.

The first functioning camera, the daguerreotype, takes its first photograph.

The first bridge made from cast iron is built across the River Severn.

The first underground railway is built in London, giving birth to the 'tube'.

1. Industrial Inventions (complete)

1771

Richard Arkwright builds the Cromford Mill for spinning cotton—Britain's first factory.

1776

The first steam engine is invented, and used for jobs such as grinding corn.

1779

The first bridge made from cast iron is built across the River Severn.

1830

The first ever passenger train takes people from Liverpool to Manchester.

1838

The *SS Great Western*, the first steamship to cross the Atlantic, leaves Bristol.

1838

The first functioning camera, the daguerreotype, takes its first photograph.

1854

The first underground railway is built in London, giving birth to the 'tube'.

1858

Cable laid across the Atlantic, allowing communication between UK and USA.

Lesson 2. Cotton Spinning

Cotton thread was the first product in the world to be mass produced in factories. Today we take it for granted, but raw fluffy cotton used to have to be carded, spun, and woven by hand. This began to change in 1769 when a man named Richard Arkwright discovered how to use water to power cotton spinning, so that a machine could make thread. He later used power from steam engines, and built factories across Britain. By 1830, steam engines were being used to weave cotton thread into textiles. This was an industrial breakthrough, as cotton textiles could be produced quickly and cheaply.

See pages 128-129 of *What Your Year 6 Child Needs to Know*.

Learning Objective	Core Knowledge	Activities for Learning	Related Vocabulary	Assessment Questions
To understand the significance of cotton spinning moving from being a hand craft, to being mechanised.	<p>Up until the 1770s, cotton was spun into thin threads by hand. This all changed with a series of inventions, which led to cotton spinning becoming a mechanised process in factories.</p> <p>Spinning cotton using machines was far faster and cheaper than spinning cotton by hand, and cities such as Manchester made enormous amounts of money.</p> <p>One of the most important inventions was the water frame, invented by Richard Arkwright. He built the first modern factory in England and died one of the richest men in Britain.</p>	<p>Study two images of cotton spinning. One image of a pre-industrial spinning wheel – the classic ‘cottage industry’ model. One of an early factory or ‘cotton mill’, with spinning mules at work. Compare the two ways of producing cotton, and explain why the mill is so much more efficient, produces so much more cotton, and most importantly allows for cotton to be much cheaper.</p> <p>Look into what life was actually like working in an early factory, particularly the high levels of heat, noise and danger.</p>	<p>water frame mill mass produce cottonopolis</p>	<p><i>How was cotton spun before the Industrial Revolution?</i></p> <p><i>Why was Arkwright’s invention so important?</i></p> <p><i>What were the advantages of spinning cotton in a factory, using machines?</i></p> <p><i>What do you think happened to the women who spun cotton on their spinning wheels?</i></p>

Lesson 3. Steam Engines

The steam engine was the most important invention of the industrial revolution. At first, cotton mills were powered by water, but then an engine was invented that could provide power through burning fossil fuels. A basic explanation of how cylinders can be used to create rotary motion will help pupils understand why the steam engine was so important. Once Watt and Boulton had perfected the design of the steam engine, it could be applied to innumerable new uses. At first, the engine was used for spinning cotton, powering trains, grinding grain, polishing metal and pumping water.

See pages 130 of *What Your Year 6 Child Needs to Know*.

Learning Objective	Core Knowledge	Activities for Learning	Related Vocabulary	Assessment Questions
<p>To understand the significance of the steam engine during the Industrial Revolution.</p>	<p>The steam engine was one of the most important inventions of the industrial revolution, and perhaps one of the most important inventions in human history.</p> <p>The first steam engine was produced by James Watt and Matthew Boulton in Birmingham, in 1776.</p> <p>The steam engine meant that humans could use the energy in fossil fuels to create power. This would revolutionise production of goods and transport.</p>	<p>Explain the principles of an early steam engine to the pupils: fuel heats water to boiling point; the steam powers a piston; piston drives a wheel; wheel creates rotary motion. This is an excellent animation, which could be used to annotate a diagram. This animation shows how the rotary motion of a steam engine was used to power the spinning machinery in a cotton mill.</p> <p>Ask pupils to come up with different uses that a steam engine could find, once the design had been perfected. Agriculture, pumping, transport, etc.</p> <p>This is a good video about James Watt and the invention of the steam engine, and some more good clips could be found in this video.</p>	<p>steam engine piston rotary motion Boulton and Watt</p>	<p><i>How did a steam engine work?</i></p> <p><i>Why was it necessary to burn fossil fuels to power a steam engine?</i></p> <p><i>Why did the steam engine have such an enormous impact as an invention?</i></p>

Lesson 4. Iron and Coal

Whilst studying the Industrial Revolution, it is important to understand how different discoveries and inventions all complemented each other, and together drove technological progress forward. The engines, trains, bridge, ships and tools of the industrial revolution were all made out of iron. During the 1700s, the blast furnace was developed to make large amounts of cheap, strong iron. The blast furnace and steam engine required vast supplies of coal, and Britain was lucky to sit on some of the most abundant coalfields in the world. Thus, smelting iron and mining coal became vital parts of industrialisation.

See pages 130-131 of *What Your Year 6 Child Needs to Know*.

Learning Objective	Core Knowledge	Activities for Learning	Related Vocabulary	Assessment Questions
<p>To understand why coal and iron were so important for the Industrial Revolution.</p>	<p>Much of the machinery and buildings needed by the industrial revolution (trains, railway bridges, steam engines) were built out of iron.</p> <p>A new process for producing strong, cheap iron was perfected by a man called Abraham Darby during the 1700s, called the blast furnace.</p> <p>Steam engines and blast furnaces also needed a huge amount of coal, so coal mining became a very important industry.</p>	<p>Study an animated diagram of a blast furnace to understand how it worked, and why it needed both coal, and rotary motion (provided by water or a steam engine).</p> <p>The National Museum of Mining has fact sheets about different aspects of mining life. Pupils could study the dangers of gas in the coalmine, the use of canaries, and the significance of the Davy lamp. This is a good video about coal. This is a good video about the development of coal mining in South the Welsh valleys.</p> <p>Study and annotate the painting Iron and Coal (resource 2) and the painting Coalbrookdale by Night (resource 3). They have two very different views on industrialisation.</p>	<p>blast furnace smelting coalfield coalmine</p>	<p><i>Why was iron needed during the Industrial Revolution?</i></p> <p><i>How did the 'blast furnace' improve iron production?</i></p> <p><i>Why was coal needed during the industrial revolution?</i></p> <p><i>How was coal mined?</i></p>

2. Iron and Coal (complete)

Iron and Coal, William Bell Scott (1861). Full title, 'In the nineteenth century the Northumbrians show the world what can be done with iron and coal'.

Look at the image [here](#), and see which of the following features you can locate.

Workmen are producing guns and ammunition, helping the military dominance of Britain and her Empire.

Mining boy, who is responsible for mining coal. He is holding a Davy lamp, designed as a safe flame that would not light dangerous gasses underground.

Steam train, powered by coal, passing over an iron bridge, which is strong enough to carry such heavy machinery.

Workman's daughter, symbolising the importance of the man's work for his family. She is holding her father's packed lunch, and a school book, showing a respect for the need to educate the younger generation.

Design for a Stephenson's steam train, made out of iron. This is Celebrating the number of inventions that were taking place in Britain at the time.

Iron being produced by a blast furnace, involving coal to heat it. Workmen are then hammering the molten iron into shape whilst it is still hot and able to mould.

Newspaper, showing that the workmen are well educated and intelligent.

Photographer, again celebrating the importance of new inventions.

Barges bringing coal from the Northumbrian mines to power the iron works.

3. Coalbrookdale by Night (complete)

Coalbrookdale by Night, Phillip James de Loutherbourg (1801). French artist Loutherbourg travelled Britain recording the marvels of industrialisation.

Look at the image [here](#), and see which of the following features you can locate.

Large cast iron pipes lie alongside the river which would be used for transport. In the bottom right hand corner, there is a large iron cylinder for a steam engine.

The blast furnace is being kept firing at night, lighting up the sky. The painting makes the scene appear like the fires of hell. Perhaps it is giving a negative view of industrialisation.

This river would have been very important for powering the bellows, cooling the furnace, and providing transport for the heavy iron goods. Coalbrookdale is right next to the River Severn, which provided an essential transport link.

Coalbrookdale is the village in Shropshire, where Abraham Darby invented the blast furnace. It has lots of coal, and a river (brook), which could power the furnace. Nearby, Darby built the first ever iron bridge.

Two horse pull a cart laden with iron products away from the furnace. Iron is extremely heavy, and before the invention of the train it was difficult to transport for long distances.

This is the casting house, where the iron would be taken and turned into parts for machines and buildings. It may be moulding the pistons for a steam engine, or the joints for an iron bridge.

Workers cottages on the bank of the river. Can you imagine how noisy it would be to live there? A woman and her child have left their house to watch the furnace.

Lesson 5. Canals

Canals were essentially a pre-industrial invention, but their development during the 1700s was vital to the industrial revolution. A single horse can only carry a small amount of heavy goods such as iron or coal on its back. However, it can transport 400 times more if it pulls such heavy goods in a floating barge, as the water takes most of the weight. For this reason, manmade rivers called canals spread through cities and around the country. This single innovation greatly expanded Britain’s capacity for transporting goods such as bricks, iron and pottery, allowing for the further spread of industry.

See pages 132 of *What Your Year 6 Child Needs to Know*.

Learning Objective	Core Knowledge	Activities for Learning	Related Vocabulary	Assessment Questions
<p>To understand the impact that canals had on trade and transport in Britain.</p>	<p>Before the invention of the canal, packhorses had to be used to transport heavy goods around the country. This was inefficient, and made goods much more expensive.</p> <p>Because heavy goods can float on a canal, one horse can transport an enormous amount – nearly 400 times as much as on its back! This increased the quantity that could be traded, and lowered the cost.</p> <p>Canals spread around British towns and countryside, and many can still be seen today.</p>	<p>Compare and annotate an image of a packhorse with an image of a horse pulling a barge in order to understand the significance of the canal.</p> <p>Further work on canals could involve looking at the navvies who built the canals, a local study into a nearby canal, or the construction of locks and aqueducts. The canal museum has some excellent resources for schools, a does the canal and river trust. This is a particularly useful ‘topic pack’.</p> <p>This is an excellent video on the first canals. This video explains the origin of the canal, this video shows how a lock works, this explains the aqueduct.</p>	<p>packhorse canal barge aqueduct</p>	<p><i>Why were packhorses so ineffective for transporting heavy goods?</i></p> <p><i>Why were barges on canals so much more effective for transporting goods?</i></p> <p><i>What was an aqueduct?</i></p>

Lesson 6. Trains

Of all of the inventions of the industrial revolution, the train had perhaps the biggest impact on daily life in Britain. Fifty years after Boulton and Watt perfected their steam engine, and engineer named George Stephenson found a way to place the steam engine on a cart, so that it could power its own forward motion. He called it the *Rocket*, and it became the world’s first working passenger train. From 1830 onwards, train lines multiplied across Britain, and the world. Fast, cheap travel became available to all people, and fresh sea fish caught in the morning could be eaten for lunch in inland towns.

See pages 132 of *What Your Year 6 Child Needs to Know*.

Learning Objective	Core Knowledge	Activities for Learning	Related Vocabulary	Assessment Questions
<p>To know about the first train lines to be built in Britain.</p>	<p>The steam train placed a steam engine on a carriage, which meant it could power its own forward movement. This was called a ‘locomotive’.</p> <p>The first fully functioning passenger steam train was built by George Stephenson between Liverpool and Manchester and opened in 1830. It was called the <i>Rocket</i>.</p> <p>Train lines rapidly spread across Britain, transforming British life and making easy travel possible for the first time.</p>	<p>Read extract from Fanny Kemble’s memoirs about her first journey by train, and contrast it with the account of William Huskisson MP’s death. Pupils then compose their own account imagining they have travelled on the maiden journey of the Liverpool to Manchester railway (resource 4).</p> <p>This is a clip from Dan Snow’s documentary about the birth of the British railway, and this is about their effect on Britain.</p> <p>The National Railway Museum has an array of classroom resources, such as a worksheet on how a steam engine works.</p>	<p>locomotive steam train George Stephenson</p>	<p><i>How did a steam train work?</i></p> <p><i>Where was the first passenger steam train built?</i></p> <p><i>Who designed the first passenger steam train?</i></p> <p><i>How did people react to the arrival of the train?</i></p>

4. Two views of the Railway

SOURCE A: The adapted account of Fanny Kemble, an actress, who accompanied George Stephenson on a test journey of the Liverpool to Manchester railway in 1830.

The train set off at its utmost speed, thirty-five miles an hour, swifter than a bird flies (for they tried the experiment with a snipe). You cannot conceive what that sensation of cutting the air was; the motion is as smooth as possible, too. I could either have read or written; and as it was, I stood up, and with my bonnet off “drank the air before me.” ...When I close my eyes this sensation of flying was quiet delightful, and strange beyond description; yet, strange as it was, I had a perfect sense of security, and not the slightest fear.

SOURCE B: On the opening of the Liverpool to Manchester railway, a great disaster occurred. The local Member of Parliament William Huskisson got off the train when it stopped to fill up with water, and did not see a train approaching in the opposite direction. He was hit by the train, and died later that day. Lady Wilton described what she saw.

The engine had stopped to take a supply of water, and several of the gentlemen in the directors' carriage had jumped out to look about them. Lord Wilton, Count Batthyany, Count Matuscenitz and Mr. Huskisson among the rest were standing talking in the middle of the road, when an engine on the other line, which was parading up and down merely to show its speed, was seen coming down upon them like lightening. The most active of those in peril sprang back into their seats; Lord Wilton saved his life only by rushing behind the Duke's carriage, and Count Matuscenitz had but just leaped into it, with the engine all but touching his heels as he did so; while poor Mr. Huskisson, less active from the effects of age and ill-health, bewildered, too, by the frantic cries of "Stop the engine! Clear the track!" that resounded on all sides, completely lost his head, looked helplessly to the right and left, and was instantaneously prostrated by the fatal machine, which dashed down like a thunderbolt upon him, and passed over his leg, smashing and mangling it in the most horrible way.