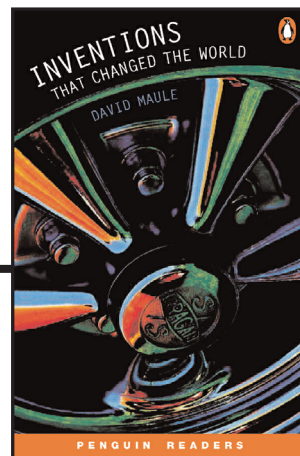


Penguin Readers Factsheets

Teacher's Notes

Inventions That Changed the World

By David Maule



Level 4 – Intermediate Inventions That Changed the World

Summary

This book covers the history and development of some of the world's most important and influential inventions. It is arranged thematically in nine chapters which discuss key inventions from their earliest beginnings to the present day. Information about the inventors, too, makes the text lively and engaging throughout.

Chapter 1 tells the history of printing from its roots in China, about one thousand years ago, to modern-day desktop printing. The chapter pinpoints the most significant developments in the long history of printing, such as the invention of reusable type and the development of full-colour printing. It also explains the social consequences of massively increased availability of the printed word around the world.

Chapter 2 explains the crucial role of mathematics in the development of science, engineering and technology. It also gives an interesting account of the changing attitudes towards mathematical science in ancient Greece, Rome and the Middle East. These early developments lead to mathematical theories and methods which are still used today.

Chapter 3 traces the development of navigation from ancient times until today. The very earliest sailors were able to determine their position north or south by observing the sun and stars, and with the help of simple wooden instruments. But the problem of how to measure east and west troubled sailors for centuries. Finally, the chapter covers twentieth century navigation methods, such as radar and satellites.

Chapter 4 tells the fascinating history of guns. In many ways, the development of firepower has determined political and social history since the invention of gunpowder in China in the eleventh century. This chapter points out the terrible results of increasingly accurate and efficient guns with examples of warfare from around the world.

Chapter 5 outlines the development of engines. Although there is some evidence of very small and basic steam engines as early as the first century, the real start of the modern age was brought about by the development of the industrial steam engine in the late seventeenth century. The mechanization of work revolutionized society in the eighteenth and nineteenth centuries, just as the invention of the gasoline and jet engines in the twentieth century mobilized society and changed the world for ever.

Chapter 6 tells the story of man's flight from individuals' disastrous attempts to fly like a bird (as early as the year 875), through the development of the hot air balloon, airships, the Wright brothers' early planes, jet aircraft and man's first flights into space. Finally, the chapter outlines America's plans for future manned flights to the moon and to Mars.

Chapter 7 explains the development of several crucial inventions in the history of communication. It begins with the development of the semaphore signalling system in the late eighteenth century and then traces the history of electronic communication from the telegraph in the early nineteenth century, to the ground-breaking inventions of the telephone, radio and television. Finally, it also covers instant communication by computer and the Internet.

Chapter 8 follows on from the previous chapter by describing the development of computers. The earliest computers were as big as buildings and needed huge amounts of electricity to work. This chapter explains the important role that modern computer companies (such as Apple, IBM and Microsoft) played in the early development of computers and highlights the essential part that computers now play in our everyday lives.

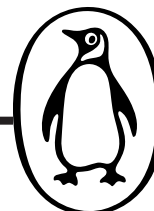
Chapter 9 outlines eight different modern inventions that were invented by 'ordinary' people. These people were all inspired by simple ideas but they had to work hard to get their inventions noticed by manufacturing companies. The inventions are Catseyes™, Post-it™ Notes, Velcro™, Lock-nuts, the sewing machine, the windshield wiper, Dyson's vacuum cleaner and a wind-up radio. They are all simple ideas that have made people's lives easier.

Background and themes

Human beings have been inventors from the earliest breakthroughs in understanding and application, such as the first use of tools and the discovery of fire. It is a part of what it means to be human to find new ways to solve problems and methods for making our lives easier. The inventors in this book may have lived centuries apart but they are united by their common goal of turning their ideas into reality and building upon the knowledge and experiences of the previous generations.

Changes in technology and the invention of new machines do not happen in isolation. This book points out the effects that important innovations have had upon society and history. The invention of the steam engine, for example, marked the beginning of the industrial revolution in Europe. Society was irrevocably changed by the revolution: class boundaries blurred, traditional women's roles almost disappeared and the shape of Europe's towns and cities changed for ever. The social and historical effects of the other inventions in the book are no less revolutionary.

Risk and danger is a recurring theme in the history of inventions. Time after time, individual inventors have faced poverty, failure and even death in order to push the levels of human understanding one step further.



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Teacher's Notes

Communicative activities

The following teacher-led activities cover the same sections of text as the exercises at the back of the Reader, and supplement those exercises. For supplementary exercises, see the photocopiable Student's Activities pages of this Factsheet. These are primarily for use with class readers but, with the exception of discussion and pair/group work questions, can also be used by students working alone in a self-access centre.

ACTIVITIES BEFORE READING THE BOOK

- 1 Students work in small groups. Ask them to look at the front cover of the book and to read the blurb on the back cover but NOT to look inside. Which inventions do they think might be in the book? Each group makes a list of ten inventions. Finally, ask students to read out their lists and write the inventions on the board. Ask students to identify the most popular choices and to discuss reasons why they think these inventions are so important.
- 2 Put students into pairs or small groups. Ask them to look closely at the pictures of inventions in the book and to guess in which century each thing was invented. Finally, give the students the answers and see how accurately the class was able to guess. Ask students which dates were easy to guess and which were more difficult.

ACTIVITIES AFTER READING A SECTION

Chapters 1–3

- 1 Students work in groups. Allocate one of the inventions from this section (printing, mathematics or navigation) to each group. Each group should prepare a short presentation about the history of their allocated invention to perform in front of the class. Allow groups enough time to prepare any props or visual aids they may want to include in their presentations. (This activity may extend over two or three class sessions).
- 2 Students work individually. Ask them to read the section entitled 'East and west' (pages 15–17). They should then write and design a newspaper notice about the law passed in 1714 by the British government. The notice should call for people to find solutions to the problem of navigating east and west. It should outline the urgency of the situation and advertise the prize money of £20,000 available to anyone who can solve the problem.

Chapters 4–6

- 1 Class discussion: 'Should people be allowed to carry guns for self-defence?' Explain the concept of carrying a gun to prevent violence (as a deterrent) and encourage members of the class to give their opinions about whether this is right or wrong. At the end of the discussion, ask students to answer 'yes' or 'no' to the question and count the numbers of each.
- 2 Write the names of the inventors from these chapters on separate pieces of paper. Then fold the papers so that the names are not visible. Choose a student to come to the front of the class, pick up a piece of paper and read the name in secret. The other students must ask questions to try and guess the identity of the student at the front of the class. This game works best if the student at the front of the class can only answer 'yes' or 'no'.

Chapters 7–9

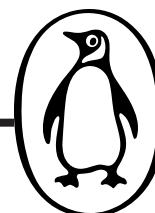
- 1 Students work in pairs. They should choose one of the inventions from Chapter 9 and prepare a television interview between the inventor and the television presenter. The presenter should ask questions about where the inventor's idea came from, how long it took to develop and what difficulties the inventor faced. The inventor should answer the presenter's questions and explain how useful his or her invention is. Finally, you can choose some pairs to show their interviews to the rest of the class.
- 2 Students work individually. Ask them to write a few short paragraphs about the future of computers. How will they change the world in the future? Will the changes be positive or negative?

ACTIVITIES AFTER READING THE BOOK

- 1 Ask students to think of their own inventions. They can work in pairs or small groups. They should prepare a short presentation to explain what their invention does, why it is necessary, and how it works. Students can vote for the best inventions after all the presentations have been seen.
- 2 Ask students to vote for the invention in the book which they think has changed the world the most. Encourage them to give reasons for their answers. As a follow-up activity, students should write about their chosen invention, giving a summary of the reasons for their choice.

Word list

It will be useful for your students to know the new words found on the inside back cover of the Reader. They are practised in the 'Before you read' sections at the back of the book. (The definitions are based on those in the Longman Active Study Dictionary.)

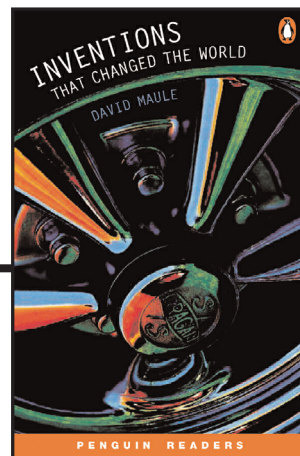


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Student's Activities

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Level 4 – Intermediate Inventions That Changed the World Photocopiable

These activities can be done alone or with one or more other students.

ACTIVITIES BEFORE READING THE BOOK

1 Read the Introduction on page iv and then use these words to complete the sentences below.

advice batteries company improvement inventors

- Today you can buy a radio which has no wires or _____.
- It was very difficult to make a _____ believe in Trevor Bayliss's radio.
- People in poorer countries use Trevor Bayliss's radio to listen to the news and get _____.
- _____ look at things that we all see, and they think of something new.
- New inventions can change our lives, but the change is not always an _____.

2 Do you know of any famous inventors? What did they invent? How many can you think of in five minutes?

ACTIVITIES WHILE READING THE BOOK

Chapter 1

1 Put these sentences in the right order from 1–9.

- The first fully coloured pictures were printed in Germany using three separate coloured blocks.
- Block printing appeared in Europe and it was used to print playing cards and a small number of books.
- Johann Fust printed in colour for the first time.
- Frederick Koenig invented the steam press.
- Bi Sheng cut single words onto separate blocks and put them together to make a page. The blocks could be reused.
- Computerized printing replaced traditional methods.
- Gutenberg started using different metals and better paper for printing.
- Hot metal printing meant that printing became faster than ever before.
- The Aldine Press produced smaller books for people to carry in their pockets.

2 The invention of better printing meant that by 1530, 60% of the population of Europe could read. What were the social effects, do you think? Give reasons for your answers.

Chapter 2

1 Write a short paragraph about mathematics. Why is mathematics important? Who uses it? What other inventions use mathematics to work? Do you enjoy mathematics?

2 Answer these questions:

- Who sent Pythagoras to Babylon as a prisoner?
- Where did Pythagoras start his most successful school?
- Why was $\sqrt{8}$ a problem for the Pythagoreans?
- Why is Euclid's book, the *Elements*, important?
- What did the Romans use mathematics for?
- Who first used nine numbers for counting?
- How can you make equations easier to solve?

Chapter 3

1 Choose the right answer.

- Sixteenth century sailors navigated using (i) two bits of wood. (ii) string and maps. (iii) a compass.
- John Davis's invention used the sun's (i) heat. (ii) distance. (iii) shadow.
- The first simple compass was invented in (i) Alexandria. (ii) England. (iii) China.
- When Columbus reached America, he thought it was (i) Asia. (ii) India. (iii) America.
- Before 1770, sailors could not tell their distance to the (i) east. (ii) north. (iii) south.
- Until the Second World War, people navigated using (i) the sun and stars. (ii) watches and the sun. (iii) radar.
- Satellite navigation can tell your position to within (i) a centimetre. (ii) a few metres. (iii) a kilometre.

2 What difficulties did sailors have before they could navigate east and west?

Chapter 4

1 Are these sentences True (T) or False (F)?

- Gunpowder was invented by the Mongols.
- The method of making gunpowder arrived in Europe from the Arab world.
- In 1805 the *Mary Rose* fought at the Battle of Trafalgar.
- Before guns, people did not die in great numbers at war.
- The first handgun was invented by Samuel Colt.
- Colt handguns are often seen in films about the American West.
- Americans used hunting rifles against the British during the American War of Independence.
- The Gatling machine gun could fire bullets faster than the Maxim machine gun.
- The race between European countries to control Africa and get better guns led to the First World War.

2 What was the most important development in the history of the gun? Give reasons for your answers.



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Student's Activities

Chapter 5

- 1 Match the dates in the box below with the events, (a) – (h). Try to work out the answers without looking at the book.

1 AD 1690 1725 1765 1825 1862 1885 1941

- (a) Newcomen's low-pressure steam engine begins to be widely used in Britain and several other countries.
(b) Stevenson's high-pressure steam train travels at twenty-five kilometres an hour.
(c) Whittle's first jet airplane reaches 600 kilometres an hour at 7,500 metres.
(d) Papin's simple steam engine lifts water to a higher level.
(e) The first gasoline engine is invented in France.
(f) Hero invents the first steam engine.
(g) In Germany, Daimler makes the first motorbike and Benz makes the first car – both with gasoline engines.
(h) James Watt invents a steam engine four times more powerful than Newcomen's.
- 2 Imagine living your usual life without gasoline or jet engines. Would you have the same hobbies, friends, job or school? In what other ways would your life be different?

Chapter 6

- 1 Answer these questions.
- (a) Why can't people fly like birds?
(b) Who (or what) were the first passengers in a Montgolfier brothers balloon?
(c) The first international balloon flight went from France to which country?
(d) How was Giffard's airship powered?
(e) How long did the Wright brothers' first powered, manned, heavier-than-air controlled flight last?
(f) Why did the first fighter airplanes carry two people?
(g) When was the Atlantic first crossed by airplane?
(h) What was the problem with the de Havilland Comet?
(i) Who was the first man in space?
(j) What do the Americans plan to do by 2020?
- 2 Would you like to fly into space? Do you think man will ever live on the moon or on Mars? Give reasons for your answers.

Chapter 7

- 1 Who or what:
- (a) killed himself because his signalling invention was not successful enough?
(b) carried letters across six states in ten days?
(c) was completed in 1861?
(d) invented the first printing telegraph?
(e) were the first words spoken by Bell on the telephone?
(f) did the first cell phones look like?
(g) received the Nobel Prize for his work with radio?
(h) was met by police in Canada when he arrived by ship?
(i) was the first person to send good pictures by television?
- 2 In what ways have computers and the Internet changed the way we communicate in recent years?

Chapter 8

- 1 Finish these sentences in your own words. Don't look at the book!
- (a) Before computers, people wrote letters _____.
(b) Charles Babbage's work was not recognised in his _____.
(c) During the Second World War, Turing worked on reading _____.
(d) Early computers were very large and needed _____.
(e) IBM did not realize that more money is made by systems than by _____.
(f) Affordable personal computers first appeared in _____.
(g) The power of the Internet to help people communicate means that ideas _____.
- 2 Where and when do you see or use computers in your life? Think about computers in shops, machines and companies as well as at home, at school or at work.

Chapter 9

- 1 Choose one or more of the inventions from Chapter 9 for each sentence below.
- (a) They make driving safer and easier.
(b) They are used in the fashion industry.
(c) You find them in offices around the world.
(d) They were invented by English inventors.
(e) It is very popular in poorer countries.
(f) They are used to build many types of machines.
- 2 Choose one of the inventions in this chapter and read about it in your book. Now close your book and write down everything you remember about the invention.

ACTIVITIES AFTER READING THE BOOK

- 1 Choose three of the inventions in this book. How do these three inventions affect your life every day?
- 2 Would you like to be an inventor? What difficulties do many inventors have, do you think? What is the best thing about working as an inventor? What kind of inventions would you like to work on?

