

OxfordAQA

International GCSE

History (9245)

Scheme of work

Technology and change, c800 – present day

For teaching from September 2026 onwards
For International GCSE exams in June 2028 onwards

Contents

You can use the title links to jump directly to the different sections of this scheme of work
(Use Ctrl and click to follow the link)

Section title	Page
Introduction	3
Assumed coverage and teaching hours	3
Assessment	3
Resources	4
The Islamic Golden Age for technology (c800 – c1200)	5
The Printing Revolution (c1440 – c1800)	7
Review (1)	9
Steam Power (c1710 – c1900)	10
The Communications Revolution (1830 – 1950)	12
Review (2)	14
The Automobile (c1880 – present)	15
Computing and the Internet (1830s – present)	17
Review (3)	20

Introduction

This scheme of work is intended to help teachers plan and implement the teaching of Technology and change, c800 - present day option of the Oxford AQA International GCSE History (9245) specification. The purpose is to provide advice and guidance to teachers, not to prescribe and restrict their approach to the specification. There are obviously many other ways of organising the work, and there is absolutely no requirement to use this scheme. We hope the suggested activities will support your teaching of this topic.

The scheme focuses on six periods of significant technological change between c800 and the present day. Students will study the nature of the developments in each period of change and consider their social, cultural, economic, and intellectual consequences on a global scale. Each period of study will explore how ideas and inventions shaped and continue to shape, of people up to the present day.

Assumed coverage and teaching hours

This scheme of work assumes that the OxfordAQA International GCSE History (9245) is taught as a two-year linear course, with a total of approximately 120–140 guided learning hours in total, in line with specification guidance. This equates to approximately two hours of teaching per week over two academic years, although this may vary according to local timetabling arrangements and students' prior experience. As this optional topic equates to one quarter of the qualification, this scheme of work is designed to be taught in around 30–35 hours.

Work will also need to be completed outside of lessons. The amount of independent study required will depend on curriculum time, the pace of delivery and the extent to which assessment practice and consolidation activities are incorporated into timetabled lessons.

Assessment

Assessment points in the learning activity column indicate possible assessment opportunities. These could be short tests of about ten minutes (exam-style questions, short factual tests, source evaluation) or longer assessments (exam-style questions).

The assessment in Section B of Paper 2 is based on a series of short, medium, and extended response questions.

- Question 1 tests AO1 and is worth 3 marks. It requires students to show their knowledge of a given issue.
- Question 2 tests AO1 and AO2 and is worth 6 marks. It requires students to explain one way in which a given issue developed, supporting their explanation with knowledge and understanding. It will focus on the 2nd order concept of cause/consequence or change.
- Question 3 tests AO1 and AO2 and is worth 9 marks. It requires students to explain two changes or two ways/ reasons why a given issue developed, supporting their explanation with knowledge and understanding. It will focus on the 2nd order concept of cause/consequence or change.
- Question 4 tests AO1 and AO2 and is worth 12 marks. It requires students to construct an extended response with a line of reasoning. It requires students to explain a given cause/ consequence/ change and at least cause/ consequence/ change in the context of

a broader development leading to a judgement that evaluates their relative importance. It will focus on the 2nd order concept of cause/consequence or change.

Resources

Research exercises assume students have access to a textbook(s) and / or the internet. You can supplement textbook(s) by other sources. OUP support this option with 'Technology and change, c.800-present day,' published in 2026 as part of the OxfordAQA International series and available in various formats.

The Islamic Golden Age for technology (c800 – c1200)

Suggested timing

5 hours

Specification content

The Islamic Golden Age for technology (c800 – c1200): Astronomy and mathematical instruments, including the development of the astrolabe; water management, innovations and irrigation; agricultural improvements, new crops; improvements to building and architecture; automation, tools, clocks, maps and navigation, including the work of the Banu Musa and Al-Jazari; chemistry including the works attributed to Jabir ibn Hayyan, and the work of Al- Razi; preserving ancient knowledge; centres of learning – the House of Wisdom, including the work of Hunayn ibn Ishaq; developing and contributing to science in Europe and Asia, including the work of Gerard of Cremona.

Teaching guidance

- This study can begin with a study of food and water. The ability of Islamic engineers to transport and distribute water was a great boost to agriculture. Where there was the supply of food and water, settlement thrived. Students can then be introduced to the built environment of the Islamic Golden Age.
- It is important that students appreciate that Muslim scholars and farmers did not start from scratch. They were careful to collect knowledge from their own lands, and places they visited or traded with about how to improve farming methods and grow more food.
- The main architectural innovations of the Islamic Golden Age were to do with Domes, arches, building materials, and design. Students will have the opportunity to consider both mechanical and chemical engineering and learn about the inventors in these fields.
- With regards to the Islamic Golden Age, it is important to appreciate how Islamic scholars and discoverers gained knowledge from other peoples and places, stored what they had learned and added their own discoveries to that knowledge. Finally, students should consider how Islamic knowledge was transmitted to Europe. As well as scientific and engineering knowledge, Muslim astronomy and mathematics were vital to later technological progress. The knowledge of the Islamic Golden Age found its way to Europe through translated books, the movement of individuals, and the observation and experience of travelers.

Possible teaching and learning activities

- Centres could organise their teaching around the Enquiry question: 'What was the Arab Agricultural Revolution?' This encompasses both the distribution of water and the crops that were raised (one hour teaching). Present students with basic diagrams of water raising and distributing mechanisms, asking them to work in pairs to annotate the

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diagrams with explanatory notes about how they worked. Students should investigate what was new about Muslim agriculture. They should identify three features of agriculture and then contribute to a class discussion and annotation of their findings.

- Having established that, during the Islamic Golden Age, agriculture was more productive and this led to the expansion of settlement. Consider the Built environment (one hour teaching) and the major advances in architecture by, again, identifying three features of Islamic architecture that were distinctive and new.
- Students will come to the lessons about Engineering (one hour teaching) having done preparatory reading about the inventions of the Islamic Golden Age and the advances made in Chemistry. Perhaps consider the Enquiry question: 'What were the discoveries and inventions of the Islamic Golden Age?' Ask students to research further and construct a chart comparing the work and discoveries of Banu Musa, Al-Jazari, Al-Zahrawi, Jabir ibn Hayyan, and al-Razi. They should record when and where they lived, their methods, their discoveries, and assess whether what they did was more important at the time or later on.
- Students should range widely in their studies to understand how knowledge was transmitted to Europe (two hours teaching). Present students with a worksheet containing 10 brief passages about the transmission of knowledge from the ancient world via the Islamic Golden age to Western Europe. The passages contain errors which need to be corrected and then they should be rewritten to be accurate. Two words will have been highlighted in each passage which are proposed as keywords. The student should evaluate the suggested keywords and either agree or propose alternatives.

The Printing Revolution (c1440 – c1800)

Suggested timing

5 hours

Specification content

The Printing Revolution (c1440 – c1800): Printing before the 15th-Century, including innovations in Asia; Johan Guttenberg and the invention of the printing press; the economies of book production; the development of printing industry, typefaces and layouts; new professions and opportunities, including for women; vernacular languages, copyright and intellectual property; the impact on the Renaissance and Reformation in Europe; increased literacy and its impact on society and politics; libraries and universities; the printing revolution and global scientific progress.

Teaching guidance

- This is an opportunity to understand the technology of printing and the impact that it had on people and society. Firstly, it is important to understand how books changed in their method of production, appearance, and as a commodity to be traded. Students need to understand how books were produced before printing. Draw out for students the important features of manuscript book production in terms of speed, accuracy, and cost. Examine with students the technological innovations that Guttenberg's press represented. Consider the improvements that printing provided in terms of speed, accuracy, and cost. It follows on from this understanding that students should be aware of how books acquired a more uniform appearance, and the printing industry created new jobs.
- The second aspect of the introduction of printing is the revolutionary impact it had upon society. Printed books transformed the communication of ideas as well as giving a boost to literacy and the development of language. It is important for students to understand that printing boosted how well people could read, and how many people could read, as well as what they read. Although it is difficult to gain precise information about literacy levels, students should recognise that the printed word had an impact to improve literacy and to standardise vernacular languages. Studying what people read during the Renaissance and Reformation offers an opportunity to evaluate the power and impact of printing. Some time will need to be devoted to helping students understand complex ideas such as the Renaissance, and the Reformation. It is important to explain to students why people were interested in knowledge about the ancient world and as they learned more, how this led them to question, and express new ideas. Furthermore, the position and importance of the Roman Catholic Church in people's lives needs to be grasped.

Possible teaching and learning activities

- Centres might choose to organise their teaching around an Enquiry question (two hours teaching) such as ‘How did Printing change books?’
- To begin, students might consider two images; one of a manuscript book, the other of a printed page. This might be an opportunity to identify the differences. Another way of approaching this basic understanding is to give students slightly different sized pieces of paper (some lined, some not) and ask them to copy out, in their own hand, a version of a short passage. Compare the results in pairs, then groups. Show them a clear typed version of the passage. Discuss the differences.
- It might be helpful if students could have an image of a printing press and from their study, identify its component parts. Along with this, a flow diagram might be completed showing the different workers who contributed to the printing process from author to buyer, and reader. Images showing the inside of a printing workshop are useful for students to see.
- From students’ own reading and research, allow them to complete a short worksheet detailing the features of the new, more uniform look of books. They might consider key terms and features such as, typefaces, title page, layout, mathematical symbols, and the people responsible for introducing them.
- In studying the impact of printing, students may wish to consider a second Enquiry question about the consequences of the new technology for people and society. They will already know that the new technology produced new jobs. Ask them further to consider ‘What impact did printing have on people’s lives?’ (three hours teaching).
- In completing this enquiry, students may record on a base map of Europe evidence of improved literacy, and book ownership.
- Some of the impact of the Renaissance can be discovered by students through a collection of images showing art, sculpture, or architecture. Remind students that many of the ideas and books that were in demand were those from the Ancient world of Greece and Rome. The explosion of interest in the ancient world was made possible by the translations of Muslim scholars in the House of Wisdom, and they found their way back to Europe through the work of men like Gerard of Cremona.
- Ask students to create a spider diagram, with added notes, about Printing and the Renaissance which covers Literacy, Language, Libraries, Learning & Science. It is possible then to use this as an opportunity for students to consider an examination question, possibly timed and/or open book, such as, ‘Explain one way that printing had an impact on the Renaissance.’
- Allow students to compare their answers, select a good answer to illustrate the way in which a Point has been made, and then supported by Explanation, and Evidence. After discussing the exercise, ask students to research and complete a similar question but this time, ‘Explain one way that printing had an impact on the Reformation.’

Review (1)

Suggested timing

1 hour

Specification content

Review and assessment of the Islamic Golden Age for technology (c800 – c1200) and the Printing Revolution (c1440 – c1800).

Assessment guidance

- This is the opportunity to develop your students' exam technique and to test their learning so far. There is no need to use all the time for assessment. Some of the time can be used for demonstrating or modelling memory and exam techniques.
- You can use exam-style questions based on the content of the Islamic Golden Age for technology (c800 – c1200) and the Printing Revolution (c1440 – c1800).
- Having practised a second order concept question on consequence in the study of the Renaissance, and Reformation, focus on memory techniques and questions that require retained knowledge, eg. 'Identify three features...'

Resources

Test exercises, Specimen papers, sample responses.

Steam Power (c1710 – c1900)

Suggested timing

5 hours

Specification content

Steam Power (c1710 – c1900): Power sources before the 18th-Century; Thomas Newcomen and the steam engine; James Watt and later innovations in steam power, including Richard Trevithick; impact on agriculture, transport, factories, and cities; safety and skilled professions; consequences for the environment and attempts to address these, including the work of Mary Walton.

Teaching guidance

- The focus should be on how Steam technology had an impact on the world of work in cities and in the countryside. There are four major areas to investigate about steam and employment. They are agriculture, industry, railways, and shipping. Students need to be aware of the ways in which steam power was applied to each of these areas.
- Having established the advantages of steam technology in terms of employment and efficiency, students should be given the opportunity to study the ‘hidden costs of steam progress’ – unemployment, pollution, and the impact of steam technology on the environment.
- Students need to be aware of the problems caused by steam technology and the various ways in which people at the time tried to address and mitigate its impacts. Those students who have studied agriculture should be able to identify job loss and rural depopulation. Those students who have studied the industrial revolution will be able to explain some of the results of rapid urban growth. The railways witnessed contemporary fears about the destruction of the landscape and the social mingling of different classes. Regarding shipping, there are issues to do with colonisation and global trade that need to be drawn out.
- Students will benefit from appreciating that many people at the time worked to make steam technology safer for all concerned, for example, Mary Walton.

Possible teaching and learning activities

- Students should understand the basic workings of steam technology. Colleagues in the Science department may welcome the opportunity to explain and demonstrate the physics of the Steam engine (one hour). Many ingenious, working representations are available on the internet.
- Students can be reminded about the new jobs that printing technology produced. Their answers in turn can link to the new jobs produced by Steam technology. Ask students to consider two Enquiry questions, ‘What impact did Steam technology have on the world of work?’ and ‘Who benefited from the introduction of steam technology... (in agriculture, in industry, on the railways, in shipping?)’ (three hours).

- Students may be allocated one of the four areas for study and research – agriculture, industry, railways, or shipping. The students may create a brief presentation (between four and six slides) about their allocated area and address the two Enquiry questions in relation to their area – working in factories, on the land, on the railways or in shipping. Having accounted for increased employment in their allocated area, the students should be reminded that they should mention that the introduction of steam technology also caused the loss of jobs.
- The second Enquiry question requires a judgement about those benefits beyond job creation. Students should be encouraged to identify different groups. For example, farmers, landowners, miners, factory owners, engineers, builders as well as the general population. If time allows, students can give the presentation to the class and/or circulate a printout.
- It may be helpful to allocate a lesson to the ‘hidden costs of progress.’ Each group should report back after a review of their allocated area about the disadvantages and drawbacks associated with the introduction of steam. These issues can be reported back to the class to be added to any handouts or notes the students have produced. A useful way of guiding students to look for the drawbacks is to ask them to consider the problems of land, air, and water. In each case, trace these back to their origins in steam technology.
- As a final exercise, students complete a short piece of research about people seeking to make steam technology, urban life, and the environment safer and better for all. For example, Andrew Shriver, Joseph Chamberlain, John Muir, Mary Walton, John Ramsbottom, William Fairbairn.
- As an in-depth research exercise, students may wish to research some contemporary views about the railways. There were those observers who were critical of the railways such as John Ruskin, ‘*the loathsome form of devilry*’ and William Wordsworth, ‘*Is then no nook of English ground secure, from rash assault?*’ These commentators may be set against those who were more charitably disposed towards the railways, the understandably so, Henry Booth (1788 – 1869, treasurer of the Liverpool & Manchester railway), ‘*the sudden and marvelous change which has been ‘effected’ in our ideas of time and space. What was quick is now slow; what was distant is now near.*’ There was also Charles Dickens who observed, ‘... *The railroad was in progress, upon its mighty course of civilisation and improvement.*’ An examination of these opinions might then be tracked back to see which parts of the students’ study they reflect.

The Communications Revolution (1830 – 1950)

Suggested timing

5 hours

Specification content

The Communications Revolution (1830 – 1950): Samuel Morse, the telegraph, and the railway; Alexander Graham Bell and the telephone, uses and jobs; Guglielmo Marconi and the radio, including the impact on commerce, entertainment, politics; innovations in photography, film, and cinema; business machines, and opportunities for women; news gathering, broadcasting, entertainment; communication and the family; government regulation.

Teaching guidance

- The focus initially should be the nature of each innovation, telegraph, telephone, radio, early film/cinema. The conceptual grasp to be explored is the reduction of distance, speed of communication and a sense of a shrinking world. In the previous lesson with regard to the railways, it had been observed that, 'it was a device for making the world smaller.' The quotation is often misattributed to Ruskin but the sentiment more properly matches Henry Booth's observation 'what was quick is now slow; what was distant is now near.' This can be a useful link to changing perceptions of time and space caused by new technology. The teacher should reinforce the idea that the telegraph, telephone, and radio together made it possible to know what was happening far away almost immediately and that changed how people thought that time and distance.
- For the second, longer enquiry, students may focus on the nature of the innovations in terms of business, entertainment, news gathering and broadcasting. The focus of the lesson should be on work, including women's employment, commerce, entertainment, family life, politics, and government regulation. The students should gain knowledge of how people's lives changed and how governments recognised and sought to control the new technology.
- There are simple similarities between government and society's desire to control the new technologies in the 20th-Century with a similar recognition of the need for control of communication technology in the 21st-Century. In relation to government control of communications technologies, students need to think about why the government wish to control the new technology. They should consider which groups would welcome censorship or licensing, and which might resent it.

Possible teaching and learning activities

- A useful way to link the different communication technologies is to ask students to consider as an Enquiry question, 'How did new communication technologies change

how people experienced time and distance?’ (two hours). Present students with the simple contrast of a message sent by horse (days/weeks) with a telegraph message (minutes) and later a phone call (instant) linking the same two cities.

- Dividing the class into four expert groups, allocate each group a new technology – telegraph, telephone, radio, early cinema/film. They should investigate the nature of the technology. The textbook will explain what the technology was, how it worked, and where and when it first spread. It might be helpful to provide students with a diagram or photograph to annotate. These groups can then be ‘mixed’ and each expert teaches what they have learned into a two to three minute talk to the others. Each student will have a blank timeline to place the technology and make a comment about its effect on ‘speed’ and ‘distance.’
- A class discussion might bring increased understanding by considering some comparative questions such as, ‘Which innovations brought the biggest change in speed of communication?’, ‘Which technology reached more people first?’ or ‘How would people in 1900 think about distance differently from people in 1830?’
- Another way of approaching the material would be through a ‘before/after’ approach to the different technologies. If students consider different technologies, eg. the telegraph, telephone, or business machines and reflect on how work was done before and afterwards in terms of the pace, the tools available and the extent of the communication. Students should note the way in which tasks changed, jobs were being created, and the speed and scale of work altered.
- A second Enquiry question can be focused on, ‘How did new communications technologies change ordinary people’s lives?’ (three hours). This question might be introduced with two images: one of a commercial office in 1850 with its letters and ledgers, and another in the 1930s with telephones, typewriters early calculating machines and perhaps a radio. Students should be able to point out how communication has changed and suggest some of the new jobs that have been created. The same approach might work with images of a domestic setting.
- They will already be familiar with some material from the previous enquiry. Students may be given a table on which to identify two changes or impacts that the new communications technologies brought about in the following areas of Entertainment, politics, family life, employment opportunities, marketing and commerce and news gathering. Each change or impact must come from a different area.
- Alternatively, a simple four column organiser may be given to students identifying
 - (1) Technology mentioned
 - (2) Where it was used or had an impact
 - (3) What it changed
 - (4) Who benefitted or missed out?
- This topic provides an opportunity to consider one formulation of the examination questions, ‘The main impact of the communications revolution was on jobs and employment. How far do you agree with this statement?’
- Students will come to the lessons having read about government control of the new communications technologies. Students could complete a short, guided worksheet. This may be used to begin a wide-ranging debate on the topic of whether ‘Government control of the media was or is a good thing.’

Review (2)

Suggested timing

1 hour

Specification content

Review and assessment of the steam Power (c1710 –c1900) and The Communications Revolution (1830 – 1950).

Assessment guidance

- This is opportunity to develop your students' exam technique and to test their learning of Steam Power (c1710 – c1900) and The Communications Revolution (1830 – 1950).
- You could use this as an opportunity to develop their understanding of how to answer AO1/AO2 questions such as the 6 and 9-mark questions and the bullet-point 12-mark evaluative question.
- It is always helpful to give students an opportunity to prepare for a short test of factual recall. This may include material from all the units covered so far.
- A useful way of demonstrating or modelling performance in examination questions is to supply two sample answers. There is no need the answers to be from the same topic. For example, one answer could be about Steam power and the other could be about the Communications Revolution. At a simple level, just determining which answer is the better answer is helpful. This then leads to an understanding of why one answer is better than another. Introducing the mark scheme to students at this stage then helps them to further refine their understanding of the demands of the question.
- Having acquired an understanding of the demands of the question, it may be helpful for the students to take the weaker answer and improve it.

Resources

Test exercises, Specimen papers, sample responses.

The Automobile (c1880 – present)

Suggested timing

5 hours

Specification content

The Automobile (c1880 – present): the development of the internal combustion engine; Henry Ford and manufacturing; impact on employment and international trade, including oil; the transformation of everyday life; cities, roads, and environmental effects; cultural impacts including leisure, crime, sport, advertising; developments in automobile safety and control; modern innovations, including electric cars.

Teaching guidance

- The important aspect of the study is to understand the technological development of the internal combustion engine, Henry Ford's manufacturing revolution and its consequences for employment, trade, and the industrial economy.
- In considering a broader question, students will be allowed to evaluate the benefits and costs of the automobile across everyday life, culture, the environment, and safety.
- Both Enquiry questions are designed so that the writing tasks directly reflect the two assessment aspects students will face: understanding the nature of each technological innovation and understanding its impact on people's lives.

Possible teaching and learning activities

- Students might focus on the overall Enquiry question: 'How did the invention of the automobile change the way people worked?' (two hours).
- Initially, students may engage with the topic by considering two images: one of a horse-drawn carriage and the other of a Ford Model T on the production line. Ask students to discuss in pairs what it might mean for the world if one machine replaces the other.
- If students have a simple diagram of a production line, they can annotate it with notes about the process and use key terms such as assembly line, division of labour, mass production and standardisation. Encourage students to add notes about why Ford's factory was a new kind of workplace.
- After some textbook reading, have a class discussion about the kind of jobs that the automobile created and the jobs it destroyed or changed.
- Following from the previous work and discussion, students should do focused internet research based on a structured worksheet, individually or in pairs, to consider the oil industry and car manufacturing. The first important topic is the growth of the international oil industry due to the spread of automobile ownership, and secondly, to study one example of a country or region, which has had its economy shaped, positively or negatively by oil or car manufacturing. For example, Detroit, Gulf states, post-war Germany, Japan, Venezuela etc.
- Students could use their research to answer (with examples) the following question,

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‘How did the development of the automobile become a global industry?’

- About 3 hours should be devoted in lessons to considering the Enquiry question, ‘Did automobiles make life better or worse for ordinary people?’
- Students read the textbook sections on the transformation of everyday life and cultural impacts (leisure, sport, advertising, crime). They compile a graphic ‘Organiser’ — a simple spider diagram around the word “Change” — with branches for: travel and leisure, cities and roads, crime, advertising and consumption, sport and culture. Under each branch, they note one specific change and record, in a word or phrase, whether they instinctively consider it positive, negative, or mixed.
- Another way to bring change to students’ attention is to present them with two contrasting images: one of a busy late 20th-Century street and the other of a rural road. They annotate each image identifying the visual effects of automobile culture and use vocabulary from their study.
- There are many opportunities for teachers to guide or summarise with whole class discussion. For example, ‘Who benefited most from the car in everyday life?’, ‘Was it the same for everyone?’ (bearing in mind differences between wealthy and poor people, men and women, urban and rural communities).
- Students should spend some time reading and reflecting upon the environmental effects, road safety, and modern innovations such as electric vehicles. Textbook study can be organised and recorded in columns, ‘Costs and problems of the automobile’ and ‘Possible solutions.’ This work can then be used to prepare for a debate. Students work in pairs. Each pair is assigned a position – either ‘the automobile has done more good than harm’ or ‘the automobile has done more harm than good’ Each pair should try together two or three points from their notes and the textbook to support their position. They should then briefly share their argument with another pair who holds the opposite view.
- Some time could be given to discussing a summary judgement about the topic. This can be formalised in a piece of extended writing. If the question to be tackled is, ‘The main impact of the automobile was on employment. How far do you agree with this statement?’ some help should be given on how to construct a structured response. For example, give advice about how to structure a response, deal with the judgement in the questions statement, and then how to propose alternative opinions, supported by evidence and explanation. This can be achieved by giving students a planning framework with space. For example, a brief introduction explaining their overall view, some support for the interpretation contained within the question, with two or three points in favour, then an alternative view with two or three points against, and finally a conclusion with a clinching piece of evidence to support the student’s preferred opinion. With the first opportunity for this type of work, history or extended writing students are reassured both by the framework and by being allowed to use their notes. However, this may mean that they need more time than they would normally have in an exam.

Computing and the Internet (1830s – present)

Suggested timing

5 hours

Specification content

Computing and the internet (1830s – present): Charles Babbage, Ada Lovelace and the 'Analytical Engine', George Boole, Herman Hollerith; Alan Turing and later innovations; the development of computers – transistors, integrated circuits, and programming languages including the work of Grace Hopper; software design, and the influence of the Xerox Alto, the Apple Macintosh, and Microsoft Windows; the development of the World Wide Web including the work of Tim Berners-Lee; email; computers and the world of work; cultural impacts, including news and social media; global internet access and the digital divide; Artificial Intelligence and its impact, including opportunities and risks.

Teaching guidance

- There are a number of technological inventions and developments, which should be understood in general terms but not in overwhelming detail. The first Enquiry question 'Who are the hidden heroes of computing and why does it matter that we know about them?' aims to take students in a different direction from the automobile unit where the student learning activities started with the machine. With computing, the study starts with people and works outwards to the technology and eventually its consequences.
- In bringing students together to consider and discuss the research they have done on the individuals of early computing, the teacher may choose to point to a number of conclusions. Students are encouraged to notice, for instance, that Lovelace and Hopper were women working in periods when this was unusual, that Turing's story involves both achievement and tragedy, and that Hollerith's work on data sorting was adopted by governments with very different intentions. This can be brief but it introduces the idea that technology is not necessarily neutral. It is shaped by, and shapes the people involved.
- In turning students' attention to the ways in which computing use became more widespread, stress the importance of software and the standardising of computers on the IBM PC.
- Students should consider working towards an extended piece of writing to answer a second Enquiry question 'Has the Internet connected the world or divided it?' This is a contentious question covering the World Wide Web, email, social media, the digital divide, and Artificial Intelligence. Students may use their knowledge to weigh up the extent of global connection against evidence of exclusion, manipulation, and risk.

Possible teaching and learning activities

- Consider the following as an Enquiry question around which to begin studying the impact of computing: 'Who are the hidden heroes of computing and why does it matter that we know about them?' This is an opportunity to consider the stories behind the technology of people like Babbage, Lovelace, Boole, Hollerith, Turing, and Hopper.
- Divide the class into pairs and allocate them one pioneer per pair. Each pair reads the relevant section of the textbook about their assigned figure, conducts Internet research, and completes a small, structured card (provided on a handout) with four questions as guides:
 - What did this person invent or work on?
 - What problem were they trying to solve?
 - What was original or remarkable about their approach?
 - What happened as a result?
- Re-organise the students so that, in groups, there is one representative who has studied a different Computing pioneer. Each student has five minutes to brief the others on their pioneer, with the rest of the group completing the cards for figures they have not yet read about. The teacher may circulate throughout, clarifying and prompting.
- Following this, the students may be given a handout with a simple illustrated timeline from the 1830s to the 1950s, with key dates but no labels. Students can annotate the timeline with each pioneer's contribution perhaps using a colour-code: blue for the nature of the technology, red for its human or social impact.
- It can be helpful for the teacher to draw all of this work together and ask, 'Is there anything surprising about who these people were or the circumstances in which they work?'
- In later lessons, students may be given a short quiz to see if students remember the individuals. Reading out one short clue per pioneer, can they write down the name of the person being described? This is meant to be a quick, easy, revision exercise that builds familiarity and confidence.
- Students should read the textbook section that cover transistors, integrated circuits, programming languages, and the development of other hardware through to the personal computing era. They should make notes in a two-column format about, (1) 'what the technology was' and (2) 'what it changed for people.' Students might also be asked to consider whose work each invention or improvement built upon. This will establish some continuity across the unit. For example, connecting Boole's logic to binary code or Hopper's compilers to accessible programming.
- Alternatively, students could select one development from the following list and research it briefly online: the transistor, the integrated circuit, COBOL, or the graphical user interface. They use a focused research frame on a handout: (a) What was the innovation and when did it emerge? (b) What did it make possible that had not been possible before? Findings are recorded in note form.
- Use an examination question to focus students' attention on the role of software in making computers more widespread and easier to use. Students should consider, 'Why were changes in the 1980s to computer software important. Explain two reasons.' Use the textbook to make notes towards an answer to this question noting, for example, MS DOS, open source software, and the graphical user interface.
- Students should consider working towards an extended piece of writing to answer the question, 'Has computing and the Internet connected the world or divided it?'
- Present students with a photomontage of images showing the use of computers in the

world of work. Students should use their textbook and research to annotate the images with historical information about the use of computers to control machines, in banking & finance, design, and office work.

- To begin considering the impact of the computer and the internet, students might be asked to write down all of the ways that they (or their family) interacted with a computer or computer technology – eg. messaging, streaming, searching, gaming, social media, working on the previous day.
- After reading about Tim Berners-Lee, the World Wide Web, email, and early digital communication, ask students to complete a brief analytical narrative, following the opening sentence which is given to them, ‘In 1989, Tim Berners-Lee was working at CERN when he began to think about problem that computing had not yet solved...’
- Finally, turn students’ attention to the Enquiry question, ‘Has computing and the Internet connected the world or divided it?’ Ask students, in pairs, to identify four points where the internet has been a force for ‘connection’, and four points where it is a source of ‘division or harm’. Their notes might be organised in a two-column table. Students should be reminded that some points may occur in both columns.
- The teacher may decide through discussion to help with the gathering of the evidence, organising on the board under the two headings, ‘the internet has connected the world’ and ‘the internet has divided the world’ – taking contributions from students. Students can update their notes. Finally, students should be able to write and be able to reflect upon the nature of the technology and its impact on people.

Review (3)

Suggested timing

1 hour

Specification content

Review and assessment of the Automobile (c1880 – present) and Computing and the internet (1830s – present).

Assessment guidance

- This is an opportunity to review and assess Parts one, two and three and to develop your students' exam techniques.
- Give your students a Section B question from one of the specimen papers.

Resources

Test exercises, Specimen papers, sample responses.