This teacher’s handbook gives you vital support for geog.1:
- starters and plenaries
- objectives and outcomes
- answers for the “Your turn” activities
- further suggestions for class and homework
- help at a glance – for example, key ideas and key vocabulary for each double-page spread

geog.1 is also supported by Kerboodle online resources and a fill-in workbook.

The geog.123 course combines a rigorous approach with a uniquely engaging style. It has been fully revised to match the new National Curriculum at Key Stage 3. It will help you deliver a vibrant Geography course.

Kerboodle provides digital Lessons, Resources and Assessment for your classroom, plus a Kerboodle Online Student Book available for separate access by teachers and students.

Did you know?
- There are glaciers on every continent...
- ...and in more than 40 countries.

What if...
- ...another ice age came to Britain?
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4.1 Your place ... 20 000 years ago!

About this unit

This unit describes what the British Isles were like 20 000 years ago, during the last ice age, at the maximum extent of glaciation.

Key points

◆ The last ice age began about 110 000 years ago, and ended about 10 000 years ago. The maximum extent of glaciation was around 20 000 years ago.
◆ At that point much of the British Isles was covered by an ice sheet, and the southern parts were tundra.
◆ Water levels in the ocean fell because water – that would otherwise return to the ocean in rivers – became locked up in ice on land. As a result, shallower parts of the ocean floor were exposed as land, joining the British Isles to the rest of Europe.
◆ When the ice finally melted, water levels rose again. The British Isles were once more cut off from the rest of Europe.
◆ People first reached the British Isles during the ice age, about 40 000 years ago. As it got colder, we left. When the ice sheet started to shrink we returned, about 12 000 years ago.
◆ There were animals (such as mammoth, bison, arctic fox, reindeer, antelope) in the tundra of the British Isles, 20 000 years ago. Many came here to feed in summer.
◆ Note that we use ‘ice age’, as the programme of study does, to mean the last extended cold period. But there are still ice sheets in the Arctic and Antarctic. So technically, we are still in a long ice age, that began about 2.6 million years ago.

Key vocabulary

ice age, ice sheet, tundra

Skills practised in ‘Your turn’

◆ Geography skills: q1, define; q3, q4, interpret a map
◆ Numeracy skills: q1, work out how long the ice age lasted
◆ Literacy skills: q3, write a blog, describing a place during the ice age
◆ Thinking skills: q3, come up with reasons; q4, list items to take on time travel back to the ice age, and explain the choice

Unit outcomes

By the end of this unit, most students should be able to:

◆ explain the terms given in ‘Key vocabulary’ above
◆ state when the last ice age began, how long it lasted, and when it ended
◆ describe the extent of the ice sheet over the British Isles, 20 000 years ago
◆ explain why the British Isles were joined to the rest of Europe at that point, and how they were cut off again
◆ say how the ice age affected people and animals, in the British Isles

Suggestions for a starter

1 Ask: In the British Isles, is there widespread snow and ice anywhere all year round? Why not? Do you think it has always been like this?
2 With books closed, ask: What do you think the British Isles were like 20 000 years ago? Write words on the board. You can check back at the end of the lesson.
3 Brainstorm to find out what students already know about ice ages.
Suggestions for plenaries

Plan plenaries at strategic points throughout the lesson, as well as at the end.

Mid-lesson
1. Do ‘Your turn’ question 3 as a plenary.
2. Ask: Who can explain why water levels fell in the ocean, during the ice age? Draw out the facts that when snow fell it did not melt, so the rain did not run back to the ocean. In addition, lower temperatures around Earth meant a lower rate of evaporation from the ocean, so there was less precipitation.
3. Look at map B. Say: The main ice sheet did not extend to southern Europe. Why not? But there are some areas of ice in southern Europe. Why?

End-of-lesson
4. Start a big spider map on the board, with some headings in place, to summarise today’s lesson. Students call out terms and phrases to add to it.
5. If you used starter 1, you can revisit the word list. Ask: Which words can be crossed out?
6. Ask: What exciting / interesting things did you learn today that you did not know before?

Further class and homework opportunities

Suggestions 1–6 on page 98 of this book
geo.1 workbook, page 33
geo.1 Kerboodle: see lesson presentation, worksheets, end-of-lesson assessment

Answers for ‘Your turn’

1. a. A long-term reduction in the average temperature around Earth, leading to the spread of glaciers.
   b. A cold region where the ground is permanently deeply frozen. Only the surface thaws in summer, allowing small low plants such as shrubs, mosses, lichens, sedges, and grasses to grow. There are few or no trees, since their roots cannot penetrate the frozen ground. (Note: tundra is a biome, and the frozen ground is called permafrost.)
2. 100 000 years; around 10 000 years ago
3. a. Water on land was locked into ice, so it no longer flowed back to the ocean. So water levels in the ocean fell. As a result, the more shallow parts of the ocean floor, between the British Isles and the rest of Europe, were exposed as land.
   b. Because as the ice age ended, and ice melted, water levels around the British Isles rose again.
   c. Answers will vary, but may include: our history would be different – we’d be part of a bigger land mass, with less coast; fewer seaside resorts; London might not exist, since no longer a port.
4. a. Some students may need help about where they are on the map.
   b. Answers will vary, but all students will need suitable clothing, food, and something to drink. Also a tent – unless they can sleep in the time machine? Sleeping bag? Source of solar power? Snow goggles? Helmet? Boots with a good grip? Skis or snow shoes? A weapon, just in case? Camera / video camera? Something to write on / with? Perhaps the time machine has equipment for sending messages into the future.
   c. You might want to give students a minimum word count.

by road, making travel and trade easier; climate would be at least a bit different as we’d be part of a bigger land mass, with less coast; fewer seaside resorts; London might not exist, since no longer a port.

geog.1 4 Glaciers
4.2 Glaciers: what and where?

About this unit
This unit looks at what glaciers are, how they form, and how they flow. It also shows where they are found on Earth today.

Key points
◆ During the last ice age, about a third of Earth was covered in ice. Today, about a tenth is.
◆ The ice occurs as glaciers in Earth's coldest places.
◆ Glaciers form when layers of snow build up (over years) and compact to form ice, which eventually starts to flow. (Flowing is a key feature of glaciers.)
◆ Very large glaciers, covering big areas, are called ice sheets. They are found in Greenland and Antarctica.
◆ Glaciers on mountains slopes are called mountain glaciers (or alpine glaciers).
◆ Within a glacier, ice flows because the ice crystals slide over each other. The whole glacier also flows, when pressure causes the ice at its base to melt. It slides along on the water.
◆ Mountain glaciers flow down slopes. The ice in ice sheets flows out to where it is thinner.
◆ An ice sheet may flow into the ocean to form a floating ice shelf. Some of this breaks up, or calves, from time to time, giving icebergs.

Key vocabulary
glacier, ice sheet, mountain glacier, ice shelf, iceberg, crevasse

Skills practised in 'Your turn'
◆ Geography skills: q1, define; q3, interpret a map; q4, interpret a satellite image
◆ Literacy skills: q6, describe being stuck down a crevasse (if written answer)
◆ Thinking skills: q2, come up with reasons; q4, explain choice; q5 come up with ways to show that a glacier is flowing, and to measure its speed

Unit outcomes
By the end of this unit, most students should be able to:
◆ explain the terms given in 'Key vocabulary' above
◆ explain what a glacier is, and specifically, include the fact that a glacier flows
◆ explain the difference between an ice sheet and a mountain glacier
◆ say where glaciers are found on Earth today
◆ describe how glaciers form
◆ explain why glaciers are able to flow, and where they flow to

Suggestions for a starter
1 Show students an interesting / stunning unlabelled photo of a mountain (alpine) glacier. Ask them to make up questions about what it shows. (Prompt for What? Where? Why? How? questions.) Can anyone answer the questions?
2 Ask: What can you tell me about glaciers? Push for details. Write answers on the board. You can check back later. (Some students may have seen glaciers.)
3 Recap. Ask: When did the last ice age end? How long had it lasted? How much of the British Isles was covered by ice? How did it affect people in the British Isles?
4 Play an audio track of sounds from a glacier, from the internet, as a mystery. Ask: What do you think is making this sound? Then say you will ask again at the end of the class.
Suggestions for plenaries

Plan plenaries at strategic points throughout the lesson, as well as at the end.

Mid-lesson
1 After question 4, discuss photo A. Ask for comments on the shape. Who goes to Antarctica? Does anyone live there full time? Any animals? (Polar bars: no. Penguins: yes.)
2 Do ‘Your turn’ question 5 as a plenary.
3 Look at photo B. What do you think draws tourists to glaciers?

End-of-lesson
4 Write the following answers on the board. Ask what the questions would be. (Sensible ones, related to what you learned today!) Answers:
   a a glacier  b 99%  c an ice sheet
   d they flow  e a crevasse  f sea ice
5 Write a set of say ten true / false statements based on this unit, on strips of paper. Sample statements:
   – There are no glaciers in Africa.
   – Glaciers are frozen rivers.
   – Crevasses are where the ice has started to melt.
   Fold the strips and put them in a tin. The class plays Pass the parcel, with music. When the music stops, the holder chooses one, reads out the statement, and declares it true or false. Those who disagree put their hands up, and say why.
6 If you used starter 4, replay the audio now. Ask: What is making these sounds?

Further class and homework opportunities

Suggestions 7–15 on page 98 of this book
geog.1 workbook, page 34
geog.1 Kerboodle: lesson presentation, worksheets, end-of-lesson assessment

Answers for ‘Your turn’

1 a A large mass of ice, that flows across the land or down a slope, like a river of ice
   b A very large glacier, that covers a huge area
2 Overall, the climate is too warm. And none of the mountains are high enough – and therefore cold enough – to have glaciers.
3 Students have a choice of over 40 countries. Answers might include some of these: Canada, the USA, Mexico, Chile, Argentina, Iceland, Greenland (Denmark), Norway, Sweden, Switzerland, France, Italy, Austria, Germany, Russia, Iran, Pakistan, Nepal, New Zealand, Tanzania.
4 Answer is b: over the South Pole – because it shows the complete land mass. Because Earth is round, none of Antarctica would be visible from over the North Pole. It is unlikely that any would be seen from above the UK. (It depends on the height of the satellite.) You could refer back to the globe and map in Unit 2.10.
5 a Put a marker, like a flag, on the glacier and record its position relative to the valley side. Leave it for a period of time (months), then come back and see if it has moved down the valley.
   b Measure how far the marker (flag) has moved. Divide the distance by the number of months, to find the speed per month, then multiply by 12 to get the speed per year.
   c Put a set of markers (flags) across the glacier, at regular intervals. After a period of time (months) those in the middle will have moved further than those at the sides.
6 You might yell out in case the others have not noticed. You might want to describe the cracking sounds, and the ice closing in, and how you are feeling: panicky – or calm? You might try scrambling up the walls, but it won’t be easy. Perhaps the others can pull you out. But they are not carrying rope, so might use clothing instead. Perhaps they fail, while the ice closes further, locking you in. Perhaps one has a satellite phone. Perhaps, just as the last chink of sky is disappearing above you, a well-equipped snowmobile arrives …
4.3 Glaciers at work

About this unit
This unit explains how mountain glaciers scrape and shape the landscape through erosion, transport, and deposition of material. It also explains the process of freeze-thaw weathering.

Key points
◆ A glacier shapes and changes the land it flows over.
◆ First it erodes or 'wears away' the land. Water under the glacier freezes around rocks and stones in the ground, then plucks them out; they in turn scrape the ground as they are dragged over it.
◆ Then the glacier carries away or transports the eroded material. Most is frozen into its base. Some is carried on top, where it fell from the valley sides. Anything that falls into crevasses is carried inside the glacier.
◆ As the glacier flows down the mountain, the front eventually reaches a warmer place, where it melts. So the transported material is deposited.
◆ This deposited material is a mix of rocks, stones, clay, and sand, called till.
◆ The meltwater from the glacier runs off, and will feed a river or lake.
◆ The result of erosion, transportation, and deposition is glacial landforms.
◆ Erosion is helped by freeze-thaw weathering, where water freezes in cracks in rock, expanding as it freezes. Over time, repeated cycles of freezing and thawing break rock into smaller pieces.

Key vocabulary
erode, transport, deposit, abrasion, plucks, freeze-thaw weathering, striations, glacial till, meltwater, snout, glacial landform, glaciated, glaciation

Skills practised in 'Your turn'
◆ Geography skills: q2, distinguish between processes and features; q2, q4, draw diagrams to illustrate geographical processes and features; q3–5, interpret photos
◆ Communication skills: q3, describe what's shown in a photo
◆ Literacy skills: q6, write a set of bullet points; q7, start a glossary
◆ Thinking skills: q1, q4–6, explain

Unit outcomes
By the end of this unit most students should be able to:
◆ explain the terms given in 'Key vocabulary' above
◆ describe the processes of glacial erosion, transport, and deposition
◆ explain how freeze-thaw weathering works, and how it affects glacial erosion

Suggestions for a starter
1 Play a time-lapse video clip from the internet, showing a glacier flowing. Ask for comments, in particular about how the glacier might affect the place it's flowing in.
2 Show an image of a glacier. Ask: Why do we bother studying glaciers in geography?
3 With books closed, show a photo of a glacier, and a photo of a big bulldozer. Ask: What's the link? Say that the question will be answered in this lesson.
Suggestions for plenaries

Plan plenaries at strategic points throughout the lesson, as well as at the end.

Mid-lesson

1. Before question 2, discuss the difference between processes and features. (Then you, or a student, could complete question 2 on the board, with help from the class.)

2. Use ‘Your turn’ question 5 as a plenary. Then ask students to say what else they can see in photo C. (A cave in the ice; glacial till; muddy sediment made of the fine particles carried by meltwater. Any sign of people?) What would happen if the temperature rose?

3. Draw a chunk of rock in cross-section on the board, with a V-shaped crack in its upper surface. Choose a student or students to add notes and further drawings to show how freeze-thaw weathering works. The class can direct, and suggest labels.

End-of-lesson

4. Write the word GLACIERS in big letters down the board, as the base for an acrostic. Ask students to fill in the horizontal words, using glacial terms they have met so far. Your letters can be in any position in their words. For example, S could start striations or be contained in abrasion. (Longer terms to try: GLACIATION or GLACIAL TILL.)

5. Hand out numbers on folded slips of paper, up to the number of students in the class. List terms from the lesson on the board: abrasion, glaciation, striations, and so on. Call out a number. The student chooses a term and gives a sentence about it. Call out another number. That student adds a bit more detail. Continue until each term has been explained in detail.

6. Ask: What did you find easy / difficult about today’s lesson? Why?

Further class and homework opportunities

Suggestions 16–20 on page 98 of this book
geog.1 workbook, page 35
geog.1 Kerboodle: lesson presentation, worksheets, end-of-lesson assessment

Answers for ‘Your turn’

1. It can pick up large amounts of solid material (including huge rocks), carry them away, and drop them somewhere else. Because it is so big, and heavy, and thick, it can scrape away a lot of material.

2. a. You might want to discuss with students the meaning of process (in which something undergoes a change) and feature (a distinctive characteristic or part of something; it may be the result of a process).

<table>
<thead>
<tr>
<th>Processes</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>melting</td>
<td>meltwater</td>
</tr>
<tr>
<td>abrasion</td>
<td>striations</td>
</tr>
<tr>
<td>plucking</td>
<td>glacial till</td>
</tr>
</tbody>
</table>

3. It shows scratches and grooves in an area of flat rock. They are called striations, and are the result of abrasion by rocks and stones that were frozen into the base of a glacier.

4. Some was scraped from the sides of the valley by the glacier. Some may have fallen from above, as rock got broken up by freeze-thaw weathering.

5. a. It is the water from melting ice. It looks milky because of all the tiny particles of rock in it. (These particles are called glacial flour, or rock flour.)
   b. It’s here because the glacier has flowed down slopes to this place, where the temperature is high enough to make it melt.

6. a. For example:
   - Water freezes in cracks in rock.
   - As it freezes it expands, making the cracks wider.
   - Then the ice melts. The cracks fill up again with water.
   - The water freezes, making the cracks even wider.
   - After repeated freezing and thawing, the cracks get so big that the rock breaks up into smaller pieces.
   b. When the rock is in smaller pieces, it’s easier for the glacier to pluck it out.

7. Remind students to include terms from Unit 4.2 too, in their glossary. They’ll find definitions in the text, and in the glossary at the back of the students’ book. As they work through the rest of the chapter, remind them to add further terms.