Video question script: Any quarry guide: Good questions to ask, and answer at a quarry, cliff or rock face

NB. Videos A and B cover preparation for the visit to a case-study quarry, first at school and then with a teacher's reconnaissance visit. Numbering of the activities in the quarry follows the "Focus" numbering in the Any Quarry Guide pdf. Some of these are omitted, since they are irrelevant to our case-study quarry.

Video No:	Question/Activity	Likely response	Rationale, using "CASE"
A Preparation at school	In teaching about the Earth we use local opportunities for fieldwork to explore Earth products and processes. This example shows how to plan and carry out a class visit to an old quarry, as a case study, and provides leading questions for pupils, to guide teachers who may be unfamiliar with geological field investigations. This script will only outline the questions, but see the Guide for more detailed questions, most of which will be used in the video. As the guide seeks to cover any quarry cutting, cliff or rock face, only some of the questions in the guide can be used in this case study		Preparation for bridging to the field from classwork
A	Preparation at school. Locate a suitable quarry or rock face from geological guides, local knowledge or from maps. Check school's procedures on fieldwork and risk assessments. Check ownership of quarry and permission to visit. After your own reconnaissance inspection of the site, prepare the class re. clothing, footwear, parental permissions, medical conditions to be notified, pupil contact details, reasons for visit, background knowledge, etc. Note that the risk guidance given in the Guide is not a legal statement	Prepare equipment: Pupils: hard hats if needed; high vis if school requires it; clipboards; question sheets; pencils; hand lenses. Teacher: acid dropper bottle (0.5M HCl), water bottle, compass, clinometer or protractor; First Aid kit; mobile phone.	Concrete preparation for teacher in planning and sourcing of equipment
B Reconnaissance visit	Reconnaissance. Always visit a potential site in advance. Why?	Check for safety for the class; is there sufficient accessible geology to be worth going? Other possible considerations: • drive time? • bus. minibus parking/turning?	Concrete preparation for teacher in ensuring familiarity with location, its geology and potential hazards

		• walking time from bus to site? • nearby toilets? • possible shelter from inclement weather? • mobile phone signal?	
Focus 1 and 2 **Weathering and erosion**	Class visit in the quarry. What are the potential hazards here? On-site safety briefing. Issue question sheets and equipment. Ensure tasks are understood. Set small groups to work. Either give all relevant sheets to each group or divide up the tasks and compare notes later, depending on time available.	Overhanging rocks, unstable faces, pools, slippery slopes, discarded rubbish, class in view of teacher at all times.	Concrete preparation for pupils in ensuring understanding of safety rules, how and where to work
Focus 1 and 2	Weathering and erosion – what's the difference? (*Suggest that users pause the video at times throughout the different topics to answer the questions from the soundtrack)*	Weathering = break up and breakdown of rock material in place without the removal of solid material: erosion = removal of the loosened material.	**For pupils throughout the field visit:** Construction: looking for patterns in observations. Cognitive conflict may arise at any point, when an observation does not fit expectations. Pupils will use metacognition as they discuss their findings. Bridging skills are involved as pupils think back to their classwork, or in follow-up lessons after the visit.
Focus 1 and 2	Weathering questions: why are some rock surfaces crumbly? What is the process called?	Some may be more protected. There is evidence of change from chemical, physical, biological action. Weathering	See above throughout each topic that follows.
Focus 1 and 2	Erosion questions: how did the pile of rock fragments get there? How else are fragments being moved? What is the process called?	Fallen off under gravity. Washed down in the rain. Erosion.	
Focus 3 **Soil**	Soil: How many soil layers? How does rock give rise to soil?	Number will depend on situation. Weathering of rock, followed by microbial, plant and animal action.	
Focus 4 **Rock Group**	Rock group: Sedimentary, igneous or metamorphic? How can we tell? Questions as Guide	Look for: layers; colour, grain size porosity; rock strength (scraping grains off); possible acid reaction; fossil	

		content.	
Focus 5 **Grains**	Grains: What are the grain sizes? Sediment laid down in high, medium or low energy conditions? Have the grains travelled far?	Grain sizes will give clues about the conditions of transport and deposition.	
Focus 6 **Sedimentary structures**	From the sedimentary structures, what would it have been like here at the time of deposition? Any fossils? How has the altitude changed? (400m above M.S.L. now)	Sedimentary structures will give further clues about the conditions of transport and deposition. When laid down, the rocks would have been at a much lower altitude than now.	
Focus 7 **Fossils**	Omitted. None have been found in the case study quarry	-	
Focus 8 **Crystals**	Omitted, since crystalline rocks are not found in the case study quarry	-	
Focus 9 **Tilted rocks**	Tilted rocks. Were these sediments laid down flat? What is their angle now? What might have caused the tilting? Which came first the deposition or the tilting?	Originally laid down flat, or nearly so. Measure the angle and direction of apparent and then true dip. Earth movements related to distant plate tectonic processes.	
Focus 10 and Focus 11 **Folds and faults**	Omitted. Folds and faults are not seen in the case-study quarry.	-	
Focus 12 **Metamorphism**	Omitted. Metamorphic rocks are not seen in the case- study quarry.	-	
Focus 13 **Sequencing**	Sequencing. In a layered succession, which layer came first? If one feature cuts another which came first? If this rock contains pebbles of another rock, which came first? What is the sequence of geological events here?	Oldest at base, unless the sequence has been overturned = Principle of Superposition. The feature that is cut is always older than the one which cuts it = Law of Cross-Cutting Relationships. The pebbles must be older = Law of Included Fragments. The geological history starts with the deposition of the lowest bed and ends with the uplift and erosion, followed by soil creation and human use.	
Focus 14 **Tectonic plates**	Tectonic plates. Are there any clues that suggest that this place had a very different climate in the	Thick sediments suggest much wetter climate in the past. Associated rocks	

	past? What might have caused the changes in climate between then and now? Is there any evidence that this place a) was near a plate margin b) is near one today?	have fossils typical of hotter climates. Moved up from nearer to the Equator by plate tectonic movements. No evidence of plate margin igneous activity of major folding and faulting in the past, or today.	
Focus 15 Landscape	Landscape. Which landforms are formed of a) the most, b) the least resistant rocks? How might ridges form? Going downhill, are you going to weaker or stronger rocks? How can human use affect the landscape? (For use of the stone from the quarry see Focus 16)	Generally more resistant rocks form the higher land. Tilted rocks of alternating resistance often produce ridges. Going downhill usually implies going onto weaker rocks. Quarries, stone walls, rough grazing, tree plantation.	
Focus 16 Quarry economics	Quarry economics. What are the dimensions of this quarry (m)? What is its volume (m^3)? How many tonnes is this, at roughly 3 tonnes per m^3? What is the economic value of stone at today's prices? Where might stone from this quarry be used today? Might it reopen?	Pace out length, breadth and estimate depth via a known object. Multiply length x breadth x height A lot of quarried output is waste. Reclaimed "stone slates" £780 per tonne. Stone for cut blocks £330 per tonne. Riven (split) stone for paving £660 per tonne. Need for "stone slates" for repairs to historic buildings. Need to consider environment and situation in a National Park. i.e. No!	
Focus 17 Quarry potential	Quarry potential: Disposal of nuclear, household, builders' waste?	Depends on escape of noxious substances, related to porosity and permeability of rock. Local environmental considerations.	
Focus 18 Recording	Recording. If this site were to be filled in or destroyed in what ways could the geological information be recorded for future use? Where should the information be held?	Record: Grid references of quarry limits; collections and descriptions of rock types; continuous record of the layers from bottom to top; measurements of dip amounts and directions; drawings and photographs of key features; GoogleEarth™ images, or air photos. File the information with the local Geological Records Centre, Geology Trust or museum.	