

Video question script: Heat flow, age of ocean floor and plate speed

Question/Activity	Likely response	Rationale
This data provides evidence for plate tectonic theory, including the Earthlearningidea: 'Which is the fastest spreading oceanic ridge?'		Some of the ocean floor evidence and its importance for plate tectonics
Heat flow evidence		
<p>Show a plot of the Earth's heat flow and point out its key features:</p> <ul style="list-style-type: none"> • The graph shows the amount of heat that is being lost from the Earth at different places • The graph is very high at oceanic ridges where heat comes from the hot mantle comes to the surface within liquid magma and new plate material is made • The heat flow graph from the sea floor above the oceanic plate that is carried away from the ridge slopes gently downwards – showing the cooling plate • The plate becomes coolest and most dense at the trench, where it sinks in subduction • The other high area is caused by the volcanic activity linked to partial melting above the plate as it is subducted • This all provides excellent evidence supporting plate tectonic theory 		Concrete preparation about heat flow Construction, with guidance, of the heat flow pattern
Ask: What would the heat flow on the other side of the ridge be like?	<ul style="list-style-type: none"> • a mirror image of the other heat flow graph – if the plate on that side was also being subducted 	Cognitive conflict: applying one pattern elsewhere
Age of the ocean floor and plate speed		
<p>Show the map of the Earth showing the ages of the ocean floor. Show that:</p> <ul style="list-style-type: none"> • The dark yellow is the youngest ocean floor • The pale green areas are covered by younger sediment, but if you drill through that, you find that the oldest rocks of the ocean floor are beneath • Ask: what pattern does the age of the rocks show? 	<ul style="list-style-type: none"> • The youngest ocean floor rocks are found at the oceanic ridges • The oldest ones are found near the subduction zones • The patterns show a mirror image of one another • Many of the blocks are offset by faults - transform faults 	Construction: pattern-spotting
Ask: What could explain these patterns?	<ul style="list-style-type: none"> • Oceanic ridges being divergent margins 	Cognitive conflict: seeking explanation
Note that the rocks of the continents are much more varied and mostly much older than the ocean floor rocks. Ask: Why?	<ul style="list-style-type: none"> • Continental rocks are formed by different processes from oceanic rocks – during plate collisions • Continental rocks are too low density to subduct 	Construction; application of previous knowledge to a new pattern
Based on the map of the age of oceanic lithosphere, ask: Which is the fastest-spreading oceanic ridge?	<ul style="list-style-type: none"> • The one with the widest spread of youngest rocks 	Bridging; applying the pattern noted above to this new question
Ask: What measurements could you make to show you are correct	<ul style="list-style-type: none"> • Measure the width of rocks of a certain age (e.g. less than 30Ma) at a certain latitude and compare 	Cognitive conflict: this only works if you compare at a certain latitude

Ask: How could you measure the speed of a plate? (Note the linear scale given on the map for 20° latitude)

- Measure the width of a certain age of rocks (e.g. less than 30Ma); divide the width by the age to give the spread rate in kmMa^{-1} ; divide by two to give the speed of an individual plate

Arithmetical thinking: calculating the speed