Creating and deploying 'hinge' questions

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Simon describes how the formative assessment technique of 'hinge' questions can support geographical enquiry and provide useful evidence of student progress.

Accompanying online materials

In order to generate a 'need to know' (Roberts, 2006) in students' imaginations when planning a learning sequence with an enquiry-based approach, teachers of geography typically head up their enquiry with a 'rich' or 'big' geographical question, such as 'Why are some places more suited to particular forms of renewable energy production than others?' (Weeden and Lambert, 2006). As the learning sequence progresses and smaller geographical questions are explored, students come to understand how their newly acquired knowledge interacts to address the thrust of the enquiry question. It is usually obvious to teachers that a huge learning payload is delivered as this knowledge is synthesised in the students' minds.

During a geographical enquiry, teachers continually question students in an effort to assess the level of their understanding. However, obtaining useful whole-class data as students navigate an enquiry is challenging. Although it may please some school leadership teams, assessing progress by marking every student's work at the end of each lesson is unlikely to be sustainable: eliciting evidence of student achievement and progress without generating vast piles of marking requires more agile methods of assessment. This article describes how the formative assessment technique of hinge questions assists in obtaining evidence of student progress and achievement.

Formative assessment is a powerful tool for raising achievement in schools. *Inside the Black Box* (Black and Wiliam, 1998) challenged teachers to seek new ways of evidencing student achievement which could be reviewed to make better-informed modifications to their classroom practice:

> *The quality of the evidence – and, therefore, the quality of the instructional adjustments – depends on the quality of the questions asked* (Wiliam, 2011, p.93).

Hinge questions are multiple-choice assessment questions which require all students to respond. On his blog history teacher Harry Fletcher-Wood (2013) describes a hinge question as a technique which allows the teacher to check for understanding at a 'hinge-point' in a learning sequence, because of two interlinked meanings:

- it is the point where you move on from one key idea/activity/point to another
- understanding the content before the hinge is a prerequisite for the next phase of learning.

The deployment of a hinge question allows teachers to identify any student misconceptions as the enquiry unfolds, so they can make adjustments based on the evidence. Despite their pre-emptive efforts and carefully constructed lesson plans, teachers are frequently surprised by students' misconceptions when exploring new geographical content. Hinge questions have the capacity to quickly reveal student misconceptions at a whole-class level, so interventions can be made promptly. At the most fundamental level, designing an effective hinge question requires teachers to have a clear understanding of both their learning intention(s) and students' potential misconceptions. Although devising hinge questions can be time consuming and challenging, they are a powerful tool that can be reused with different classes annually.

> *Sharing high-quality questions may be the most significant thing we can do to improve the quality of student learning* (Wiliam, 2011, p.104).

Creating hinge questions

The following summary, influenced by Dylan Wiliam (2011), provides a range of subject-specific examples and guidance for designing an effective hinge question. Wiliam suggests that when designing hinge questions teachers should:

- focus on the critical aspects of the learning intentions, as opposed to ideas that are not essential for further progression
- receive student responses promptly. Ideally, students should respond within one minute and teachers should interpret responses within thirty seconds (figure 1). Hinge questions are a quick check on understanding, not a new piece of work
- aim to ensure it is impossible for students to reach correct answers using an incorrect thought process.

Figure 1: Students display their responses to the hinge question. **Photo:** Simon Renshaw.

Figure 2: Scree slopes on Beinn Eighe in the Torridon area of the Highlands of Scotland.
Photo: Ruth Totterdell.

Two examples of geographical hinge questions

What are scree slopes?

In a year 10 lesson which was part of a mountain landscapes unit, students explored the question 'How do physical processes create mountain landscape features?' Students had prior knowledge of the role of physical processes in the formation of desert landscapes, but the hinge point in this lesson was students' ability to understand the significance of freeze-thaw weathering as the driving process in the formation of scree slopes.

Display an image of a scree slope (Figure 2) and ask students to describe what they can see, but also to pay particular attention to the appearance, angle and surface of the slopes in the image. Then show a video of a runner on a scree slope *(www.youtube.com/watch?v=B5FMkCY5nCw)* and ask students to consider how the material on the surface of the mountain slope was formed. Students sequence evidence cards (Figure 3) to explain the formation of the rock fragments; to support their work display a diagram showing the processes of freeze-thaw weathering.

To assess their emergent understanding of the formation of scree slopes, at this point the teacher deploys a hinge question and students respond with their choice (Figure 4).

The nature of this whole-class response to a diagnostic question allows teachers to use the responses to elicit the thinking behind their choices. This gives rise to conditions in the classroom where students can act as mutual learning resources and address each other's misconceptions. To provide a further degree of challenge, teachers can discuss why north-facing slopes in the northern hemisphere might be more conducive to scree slope formation: this can create a useful link between prior learning, about the impact of aspect on mountain climate, and the current enquiry into physical processes and landscape features.

Where are you most likely to find scree slopes forming?

A where the altitude is high

B where the gradient is steep

C where it is very cold

D where the temperature fluctuates around 0°C

E where rainfall is low.

Figure 4: The hinge question used to establish whether students understand how scree slopes are formed.

Why is Svalbard so cold?

In a year 8 lesson, part of a scheme of work on Fantastic Places, students carry out an investigation into the physical and human characteristics that make Svalbard a unique location (Figure 5). They explore the question 'Why does air temperature vary across the world?' During the sequence of activities students interrogate atlases to locate Leicester and Svalbard, interpret climate graphs of Svalbard and Leicester and consider a map of average global annual air temperature and a diagram showing the sun's rays meeting the Earth. A hinge question is used at this point to assess where students are in their understanding (Figure 6). The question seeks to establish whether students understand that the spherical nature of the planet helps to explain why places near the Equator are warmer than places near the poles. Typically, year 8 students know that locations near the Equator are hotter and polar regions are colder: but they often do not know, or have many misconceptions about, why this is the case. Hence the learning intention behind the key enquiry question for this lesson.

This question requires all students to think carefully about physical processes on a global scale and select the most appropriate response. If a class responds with C, the teacher can be reasonably confident that the students understand that the shape of the Earth has a significant impact on differences in air temperature across the globe. In the past, year 8

Figure 3: Evidence cards on the formation of scree.

Water from rainfall or melting snow and ice becomes trapped in a crack or joint.	If the air temperature drops below freezing the water will freeze and expand by 9–10 %, putting pressure on the rock.
The ice will melt when the temperature rises above freezing.	If this process happens repeatedly the rock will weaken and eventually shatter into angular fragments.
The fragments may then be deposited as scree at the foot of the slope.	Freeze-thaw weathering is most evident where the temperature fluctuates around 0° C, e.g. on north-facing slopes in the northern hemisphere.

Figure 5: Svalbard, a Norwegian archipelago in the Arctic Ocean, between 74° to 81° North. These mountains are near Longyearbyen, Svalbard's main settlement. **Photo:** © Billy Lindblom.

students had offered explanations A, B and D, so these are used as distracters.

In the reflection stage, during which students develop their thinking, the question of global air temperature anomalies usually arises and there is a brief exploration of why these occur. Although this provides an additional degree of challenge to students' thinking, teachers do not usually dwell on these anomalies: the year 9 curriculum provides opportunities to explore the interactions between global climate patterns, atmospheric circulation, surface albedo and ocean currents.

Conclusion

While they can be difficult to devise, hinge questions are a powerful diagnostic tool which can help teachers elicit evidence of student understanding as a geographical enquiry progresses. Additionally, collaborative attempts to devise and refine hinge questions can facilitate subject-specific professional development within a department. Their development and refinement allows groups of teachers to focus squarely on the core learning intentions and geographical concepts which underpin their particular enquiry sequence. Indeed, since the removal of national curriculum levels, Tim Oates, Group Director of Assessment Research and Development at Cambridge Assessment, has suggested teachers should '… think hard about questions they put to children both through question and answer and on paper. They need to really probe pupils' understanding.' He also urges them to become 'assessment kleptomaniacs' – building banks of questions from the internet and other sources – to support learning and to see if a child has understood the key ideas' (Oates, 2014).

Investing time in the development of hinge questions will allow teachers to begin to curate a range of diagnostic assessment items for their learning sequences which not only probe the extent of student understanding but also, crucially, give teachers the chance to adapt their teaching and explanations to ensure individual and whole-class learning during a geographical enquiry. | TG

What is the main reason air temperature varies across the globe?

A the Earth orbits the sun

B the Earth orbits the sun at an angle

C the Earth is a sphere

D the Earth has a hot core.

Figure 6: The hinge question used to establish whether students understand how scree slopes are formed.

Online resources

Simon presented a workshop on using hinge questions to highlight student misconceptions at the GA Annual Conference in 2015. The resources from the workshop can be downloaded from *www.geography.org.uk/cpdevents/*annual conference/#18360

References

Black, P.J. and Wiliam, D. (1998) *Inside the Black Box: Raising standards through classroom assessment*. London: King's College.

Fletcher-Wood, H. (2013) 'Do they understand this well enough to move on? Introducing hinge questions'. Available online at *http://improvingteaching.co.uk/2013/08/17/do-they-understand-this-well-enough-to-move-on-introducing-hinge-questions* (last accessed 24 June 2015).

Roberts, M. (2006) 'Geographical Enquiry' in Balderstone, D. (ed) *Secondary Geography Handbook*. Sheffield: Geographical Association.

Weeden, P. and Lambert, D. (2006) *Geography Inside the Black Box: Assessment for learning in the geography classroom*. London: nferNelson.

Wiliam, D. (2011) *Embedded Formative Assessment*. Bloomington, IN: Solution Tree Press.

Oates, T. (2014) 'Opening the door to deeper understanding' Available online at *www.cambridgeassessment.org.uk/insights/national-curriculum-tim-oates-on-assessment-insights* (last accessed 24 June 2015).

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