

Teaching geology to students with visual impairment (VI) - 1 Modifying block models to teach map-work to students who cannot see

The Earth Sciences use a wide variety of visual stimuli to communicate how our planet works. It is possible to make this accessible for students with visual impairments (VI). However, it does require some careful thought and adaptation for such students to be able to go through the same processes of observation and discovery as visually acute students.

Recent experience of preparing a student with VI (who was registered blind, with virtually no sight) for public examinations in geology required a new teaching approach in order to give this student a similar meaningful learning experience. This Earthlearningidea activity summarises the key lessons learnt from this experience.



Fig: 1 Some of the three-dimensional tactile models made to teach structural geology and geological map interpretation skills.
(Photo: M. Walsh)

The back up

Title: Teaching geology to students with visual impairment (VI) -1

Subtitle: Modifying block models to teach map work to students who cannot see

Topic: Making geology accessible to all

Age range of pupils: All ages

Time needed to complete activity: Variable, once the models have been made before the session.

Pupil learning outcomes: Pupils with visual impairments can:

- actively participate in learning geology;
- understand the three-dimensional aspects of geology, particularly those associated with geological map-work required for public examinations.

- share in learning, using these models alongside visually acute students

Context:

Block diagrams on paper are frequently used to aid understanding of geological structures and in the interpretation of geological maps. Many teachers construct cardboard models in 3D to help their students, but these are not sturdy: neither do they have any tactile features for the partially sighted to feel. This activity describes how tactile three-dimensional models can be constructed, using pieces of scrap timber and a belt-sanding machine (Fig: 1).

Sands and gravels of different textures (both size and shape) are stuck onto the surface of the block with PVA glue to represent different rock units. Masking tape can be used to maintain the form of the beds and structures during the making process.

Linear features, including fold axes may be indicated using Wikkistix™. These are flexible, sticky, repositionable sticks. Features such as dip arrows can be made from sticky Bumpons™, e.g. square shapes cut in half diagonally to make an arrow, as in the left hand model in Figure 1.

The models are quite time-consuming to make, with each bed on each side of the block needing to be glued and allowed to dry individually. The models have proved to be very effective teaching and learning tools for both structural geology and map interpretation –and they are robust!

Underlying principles:

Starting to teach geology to a student with VI can seem intimidating at first. There may be guidance available locally from VI specialist teachers. However, they may lack experience in the subject-specific detail that a teacher who is modifying course materials will need to consider. Written guidance for modifying resources can be found, though it may be quite generic. However, there are some principles to follow that can help with the modification of any learning resources and activities:

- Only give essential information required to understand a concept.
- Any resources that need to be understood in 3 dimensions should be given as a three-dimensional object.
- Sands of different grain sizes and shapes are invaluable in making tactile resources.
- It can be tempting to just tell students with VI what a feature/specimen is, but it is important for such students to go through the same process of discovery that all visually acute students in the same class would experience.

Thinking skill development:

- Building up a mental image from handling a model is construction.
- Cognitive conflict will occur as one interpretation is balanced against another.
- If a group of students discusses the outcome, then metacognition is involved:
- Application to the real world involves bridging.

Resource list for block models:

- scrap timber
- access to a jig saw or band saw
- sandpaper for removing splinters
- sand and gravel with a range of grain sizes
- PVA glue
- Wikkistix™: <https://www.wikki-stix.co.uk/>
- Bumpons™: <https://shop.rnib.org.uk/Products/SearchProduct?searchstring=bumpons> from the RNIB

Useful links: Earthlearnigidea activities which might be adapted for use with students with visual impairment include:

- Identifying minerals - use your sense(s)! https://www.earthlearningidea.com/PDF/131_Identifying_minerals.pdf
- Rock detective - rocky clues to the past https://www.earthlearningidea.com/PDF/Rock_detective.pdf
- Found in the ground: sorted! https://www.earthlearningidea.com/PDF/155_Found_in_ground.pdf
- Fossil or not? https://www.earthlearningidea.com/PDF/What_is_a_fossil.pdf

Source: Mike Walsh, Cowbridge School, Wales with input from the ELI Team

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