Physical Geography Working Group

Geographical Association

Exploring exciting ways to teach

Water, Air, Land & Life

Making the world come to life in the classroom

Conference Workshop – Derby 2010

Activity 1 Glacial Landforms – Happy Families and Card Sort

Aim: To understand the character, description, relative sizes, processes of formation and field relationships of a range of glacial and fluvio-glacial landforms. This can be done as a revision exercise at the end of a topic or at the start of a topic so the students have to research as they work through the sort exercise.

Resources required: Sets of cards (see separate document 'Glaciation Happy Familes Cards). Please note the images and line diagrams are not included in these cards due to size – insert your own – this does allow you to 'tailor' your cards to suit your case-studies or to widen students' knowledge).

Procedure: Initially the activity begins with a card sort (in pairs) where students sort out cards into sets comprising the photograph, drawing, description, processes of formation and field location. Once the students are familiar with the sets they can then tackle a game of 'Happy Families'. Winner is the one who collects most (correct!) sets.

Teaching Points: The card sort encourages students to talk and clarify their ideas as they sort through the related information – they can also be asked at this stage to classify the landforms into glacial and fluvio-glacial landforms. The teacher can move around listening to the discussions and helping/clarifying ideas. The discussion often highlights areas where they need to strengthen their knowledge and understanding. Some landforms are found in the same areas and there are cards which have the same data. This leads to a discussion on field relationships and situations which help to clarify their understanding. Students are able to support each other's learning – 'experts' can be paired with students who are less confident with the topic. The activity can be repeated and the time taken to complete the exercise notes. Students can be asked to assess their knowledge before and after the exercise and the cards can be leant out for homework/revision activities.

Application: This method can be used for a range of activities, particularly where there are 'families' of related information. Card sorts can also be used to sequence ideas, sort out theory from evidence.

Workshop activity devised by John Lyon.

Making the world come to life in the classroom
Physical Geography Working Group Conference Workshop – Derby 2010

Activity 2 Dramatic Geomorphology – Longshore Drift (or any other dynamic process in physical geography)

Aim:
To develop understanding about the process(es) relating to longshore drift (or any other physical geography process) and address any misconceptions. This can be done as a consolidation activity or as a revision activity at the end of a topic.

Resources required: Students, space for performance. A video camera (e.g. flip camera) can be useful to capture and discuss the accuracy of the performances (best played directly onto an interactive whiteboard).
It may also be useful to produce role cards (i.e. parts of the process) for students who forget to include all the important agents and parts in the process.

Procedure : Teach the topic or have the students research the (longshore drift) process – this can be via 'traditional means or student-centred research.
Pair the students and ask then to brainstorm/discuss how the process (of longshore drift) could be role-played and turned into a drama to show how the process happens and what effect it has on the beach and landscape. 5 minutes is usually enough.
Divide the class into two groups to discus their ideas and how they want to act out the process (of longshore drift) and show its results (on the beach). About 10 minutes is usually enough, although can be longer depending on how sophisticated you want to encourage the students to be in their performance.

Teaching Points : At the outset it is useful to stress that this activity is about representing the accuracy of the process and not about being a 'hollywood' actor.
The discussion allows the teacher to move around listening to the discussions and helping/clarifying ideas.
You may want to prompt the students to think about what is involved in causing the process (the parts) and how the parts interact to create longshore drift (the action).
A common issue can be that some aspects of the process are not considered and consequently (parts) are left out so you may want to present them with role cards of the parts – this can be especially useful for lower ability pupils.
One approach is to let the students complete the paired discussion – then as a group, students compare the roles (parts) and draw up a list of parts - this can be compared with the set of role cards, so they can include any parts they may have left out or not considered. You may want to monitor that all pupils have a reasonable role although some will be more active (e.g. crashing waves) and some more passive (e.g. groynes). If they left out a part asking why can be a useful clarifying discussion.
Students can be asked to peer assess the performances and it is helpful to devise success criteria - but be careful to focus on the accuracy and sequencing of the process rather than on the extravagance of the acting performance.
Capturing the performances on video can be a great motivator for pupils and can be instantly played back (on the interactive whiteboard) to assess and discuss the process.

Application: This method can be used to explore/consolidate a range of physical processes, particularly difficult concepts or 'hidden' processes (such as pathways of sub-surface water).

Workshop activity devised by Duncan Hawley

View a video of the delegates acting out longshore drift here: http://vimeo.com/12421588

Activity 3 - Experiments to Model Fluvial Processes

Aim : To develop understanding of fluvial processes through simulating and modelling.

Resources Required :

A4 box lids (copy paper boxes)
Plastic sheeting/plastic bag or sack.
Damp sand & Gravel (washed)
Water
Bucket or similar receptacle to collect drained water)
Dye & dropper
Wash bottle
Cocktail sticks
Plastic Guttering
Blocks (old books will do)
Plasticine
Stopwatch
Sprinkler

Procedure : Introduce by asking pupils to suggest how they think a river carves out a channel in the land, what happens to the sediment in the river, how and when they think the river might change course and shape.
Before starting the simulation, the lids should be lined with plastic sheeting. A small hole should be made at one narrow end through which water will drain into a bucket or other receptacle. Push the hole from inside as this will protect the cardboard for longer. Damp sand should be spread over the base of the lid.
Organise students into groups of three/four if the class is large. Half the class work on the sand tray and the other half on guttering experiments. Groups swap over halfway through the lesson. Highlight this is a simulation so emphasise the scale and how this differs from real situations (see next section).
Give students the following instructions:

- Read through all instructions before beginning each part of the simulation and follow these carefully.
- Watch the amount of water being sent through the system.
- Make sure the drain hole is kept clear at all times.
- At each stage sketches should be made or digital photos taken of what has/is happening.

Sand Tray Experiments

A Normal Discharge

1. Add extra sand to make a slope facing the drain hole.
2. Mark out a channel with at least one bend.
3. Pour a steady trickle of water though the channel observing what happens at the bend.
4. If necessary, use dye to detect the flow more easily.
5. Watch for erosion and deposition.

B Flood Discharge

1. Let the sand settle and dry off a little from the first simulation.
2. Mark the position of the bend with broken cocktail sticks.
3. Pour enough water to flood the channel, but not the whole tray
4. Use dye as before.
5. Note any changes; look at the position of the sticks.

C Erosion

1. Make a new landscape with a clear break of slope.
2. Create a straight channel.
3. Pour water gently into the channel.
4. Note the results on the channel and landscape.

D Rivers on Plains

1. Spread damp sand about 1 cm thick across the base of the tray.
2. Prop up one end slightly.
3. Make a sinuous channel.
4. Trickle water gently through the channel. Use dye to make processes clearer.
5. Note what happens.
6. Repeat with a flood discharge.

E Transport

1. Repeat some/any of the simulations but replace some of the sand with gravel of different sizes and colour if possible.
2. Note the differences between "normal" and "flood" discharges.

Guttering Experiments

Be sure to have the collecting bucket directly below the end of the guttering.

A Slopes

1. Put a small block or book under one end of the guttering.
2. Pour water slowly into the guttering.
3. Add a drop of dye.
4. Time how long it takes the water to reach the end of the guttering (easier with dye).
5. Repeat with a steeper slope made by adding more blocks/books under the guttering.
6. Remember to maintain the flow at the same rate. Note all results.

B Current Speed and Bedload

1. Set up the guttering with a gentle slope.
2. Put a thin layer of sand in the base.
3. Pour water through a sprinkler onto the sand.
4. Time how long it takes to wash all the sand away.
5. Clean the guttering.
6. Repeat using gravel.
7. Repeat with different slope angles.

C Channel Width Variations

1. Using strips of plasticine make the guttering narrower for a few centimetres.
2. Prop one end up by about 6 cms.
3. Pour a steady stream of water through.
4. Add dye and observe what happens as the water passes through the narrower section.

D Discharge Changes

1. Take clean guttering and prop up by 6cms.
2. Put a layer of sand and gravel in the base of the guttering.
3. Pour 500ml water slowly; take a minimum of 10 seconds.
4. Repeat taking only 5 seconds.

Teaching Points : The simulations can be carried out entirely by students if they are given clear instructions – these are best written on a worksheet or on cards (laminated works best as they don't get wet!)

What you see in the simulations is much exaggerated. A three to four second flood in the simulation is the same as many hours of severe flooding on a large river and this should be discussed with students and emphasised – see key points on scaling the simulation below.

- Size can be altered but time cannot.
- This model can be said to represent a landscape 1 km. by 800 metres.
- 20cm movement in 2 seconds is actually the equivalent of 2000 kph.
- Sand of 1mm diameter represents 40cm diameter boulders.

The results can be different every time - just as with real rivers but general patterns and principles can be drawn out.

Following the activities students should be asked to draw out general principles as conclusions.
Different groups can be asked to outline their conclusions so you can check they have not developed misconceptions. Different groups may arrive at different ideas but this can be used to debate and argie which ideas are more likely to be corrects
Ask students to 'bridge' (apply) their understanding to identify similarities and differences in images or video clips of real rivers and ask students to explain what they can see. The differences are particularly important in high level reasoning and it is useful to ask students to
The simulation results can be used to explain

Application: Similar classroom-based 'sand tray' simulations can be devised to investigate drainage basin processes, such as runoff and rock type (sand tray divided, and half filled with a gentle slope of sand, the other half with clay), infiltration and runoff on saturated and dry ground, delayed discharge (using foam rubber mat) etc.

Workshop activity devised by Janet Hutson.

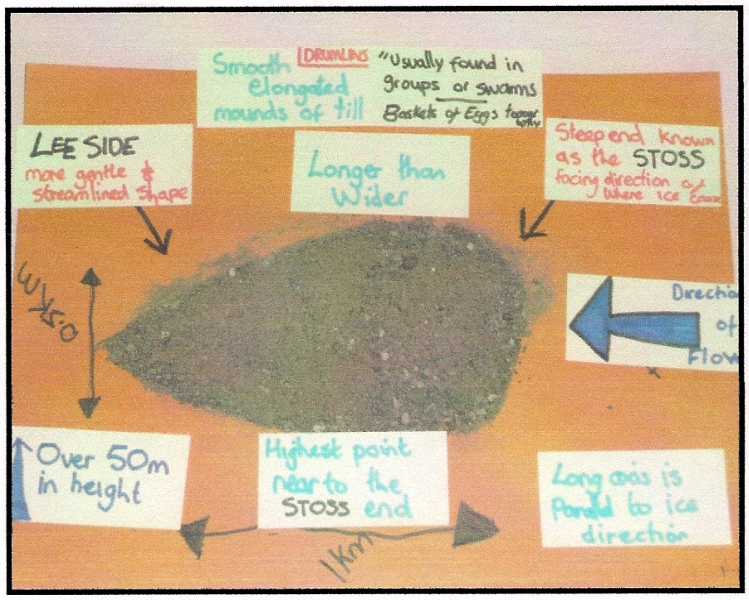
Activity 4 - DIY Drumlins

Aims: To describe and explain the formation of a drumlin using a 'hands-on' practical task which involves producing an annotated table-top model. Talk is used to present the model to the rest of the group. It is a good technique for groups where there is a wide range of ability. This approach can be used with a variety of landforms including fluvial, aeolian as well as glacial.

Resources required: A3 card as a base, builder's sand, blank cards for labels, digital camera, chunky pens, written instructions for building their landform.

Procedure: Have students working in pairs or groups of three. Provide them with a set of written 'instructions' that are basically a description of the landform split into several bullet points. They have to create a fully annotated table-top model of a drumlin. They need to read the bullet point descriptions before they start and make their model out of the 'poorly-sorted' builder's sand. They then use the blank cards to label their model by writing key points clearly on them using the chunky pens. These are placed in appropriate places on the A3 card. Labels can also be drawn on to the A3 sheet itself. The work is recorded using the digital camera (different views can be useful i.e. plan and long profile) and printed out for students.

Teaching Points:
The level of challenge in this task can be varied by changing the level of detail in the descriptions. Students enjoy building landforms and discussion is promoted throughout. It is an activity that engages the students and encourages them to think about how the glacier creates the feature. It is possible for students to peer assess the table-top models and it is very easy for students to remould their attempts before the final versions are photographed for their notes. Using the digital camera means that there is no need for students to write individual notes following the group task therefore time is saved. Different coloured cards labels could be used to show the explanation of how the feature is formed and an additional photograph taken. This reinforces the difference between describing and explaining.



A completed table-top model drumlin (Year 12)

Application: This approach can be used for a range of different glacial, fluvial and aeolian landforms. For example, by varying the sand to a better sorted, finer grade it is possible to create barchan dunes.

Workshop activity devised by Rachel Atherton.

DIY DRUMLINS - INSTRUCTION SHEET

Below are the instructions to designing your own drumlin.

1. Drumlins are smooth, elongated mounds of till.

2. They are longer than they are wide.

3. Their long axis is parallel to the direction of ice movement.

4. They may be over 50 metres in height.

5. They can be over 1 km in length.

6. Their maximum width can be 0.5km.

7. They have a steep end known as the stoss which faces the direction from which the ice came.

8. The lee side is a more gentle streamlined slope.

9. The highest point is near to the stoss end.

10. They are usually found in groups or swarms and are called a 'basket of eggs' topography.

Use the coloured paper to create labels of the key features to **describe** what a drumlin is like.
Take a photograph of your work for your notes.

.