Aim

A student wanted to investigate how the depth and velocity of a river changes across a meander.

Method

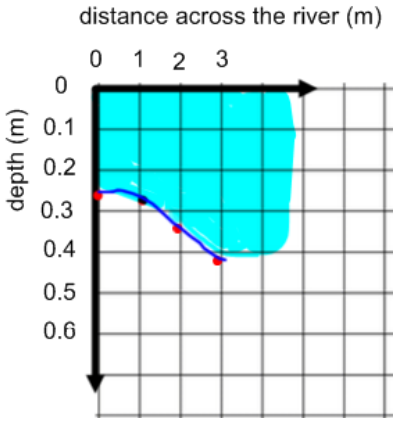
To measure the river depth, students held a measuring tape across the river and measured the depth using a metre stick at one metre intervals across the river, from the left hand bank.

The students used an orange to measure the velocity of the river. They released the orange at one metre intervals across the river and used a stopwatch to measure the time taken for the orange to travel 10 metres downstream.

Data

Metres from the bank	Left hand bank	1	2	3	4	5	6	7	8	9	10	11	12	12.7
depth in m	0.27	0.28	0.33	0.42	0.68	0.71	0.65	0.72	0.79	0.80	0.82	0.71	0.67	0.65
velocity (m per second)	0.51	0.64	0.66	0.73	1.14	1.22	1.13	1.31	1.37	1.38	1.40	1.10	0.8	0.56

Student Tasks



Using data collected, complete the following:

1. Draw an accurate cross section of the river.
2. Draw a graph to show the data on velocity. You could do this on tracing paper to create an overlay for your cross section.
3. Compare the cross section to the velocity graph. What pattern do you notice?
4. Use your geography knowledge to explain the pattern. Use the words from the word bank below in your answer:

abrasion	attrition	bedload	deep	deposition
erosion	friction	river bank	river bed	shallow

Extension tasks

- The students always released the orange 30 cm behind the measuring tape. Suggest reasons to explain why they did this.
- Identify any further difficulties with the methods used and suggest how you might improve the data collection.

Teaching notes

River velocity generally increases with depth, although the velocity is usually less near to the banks. The velocity is less near the banks due to increased friction with the riverbed and the banks of the river.

Where water flows faster, it has more energy and can erode more material. The abrasion deepens a meander on its outside edge. Material is deposited on the inside bend of a meander giving the shallow depth where water has less velocity.

On the riverbed, water loses energy due to friction with the bedload.

Friction with air at the surface also reduces velocity.

River Ashes Hollow, UK.

The depositional slip-off slope is on the left and a small river cliff to the right.

The orange is released 30 cm behind to tape to achieve the same velocity as the river before the timing begins. However, this method only measures surface velocity. The fastest velocity of water in the river is below the surface and can be measured with a flow meter.

Human error – the students must stand behind the orange as it is released. The orange could be affected by the wind. Repeating the measurement several times will obtain a more accurate average velocity. Standard deviation could also be used to determine the significance of any differences.

The following websites provide additional information for river fieldwork:

www.rgs.org/OurWork/Schools/Fieldwork+and+local+learning/Fieldwork+techniques/Rivers.htm

www.geographyfieldwork.com/River%20Discharge%20Methodology.htm

www.geography-site.co.uk/pages/skills/fieldwork/fluvial/vel.html

A possible homework or additional extension task could be to ask the students to suggest a method to investigate how bedload changes across the meander. They could be provided with prompts such as ‘size’ and ‘shape’ and asked to comment on the advantages and disadvantages of their method.