

Gold prospectors Panning for 'gold' in river sediment

Set up one or more tubs, about half full of clean water, as shown in the first photograph. The tub contains some washed sand, with a sprinkling of crushed pyrite ('fool's gold') scattered throughout. (Brass filings may be used in place of pyrite, so long as there are no jagged edges). Pupils should take turns at panning for 'gold', to see how much they can extract in a given time. Credit is given for clean samples, with no sand remaining in the pan. If you have enough, pupils may wish to keep their 'gold' to show their parents: otherwise, they should return it to the tub.

You may need to show them what to do, by pouring a small jug full of sand/'gold' into the pan, with plenty of water. The pan is gently swirled round with a circular motion, or jiggled from side to side, to discard the sand, whilst retaining the denser 'gold'. Water is added repeatedly and the process continued until all the sand has been washed back into the tub, leaving the dense 'gold'. Encourage your pupils to experiment to find the most effective method.



A young prospector in action

Peter Kennett



Gold nuggets in the pan, Alaska, USA

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A gold prospector in Madagascar, using a home-made pan

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The back up

Title: Gold prospectors

Subtitle: Panning for 'gold' in river sediment

Topic: Investigating how prospectors use the property of density to search for gold in river sediments.

Age range of pupils: 5 – 85 years

Time needed to complete activity: 10 minutes

Pupil learning outcomes: Pupils can:

- develop motor skills as they experiment with the best method of separating materials;
- explain why density is a useful property in the separation of materials;
- use their imaginations to visualise a real gold prospector in the field.

Context: This activity may be used in the context of sedimentary processes in a geology lesson, or as an application of a physical property in a physics lesson. The technique is still actively used across the world where minerals are exploited, on a wide range of scales, and is not limited to bearded 19th Century prospectors in the backwoods of the USA or Australia!

Following up the activity:

- Try the Earthlearningidea activity, 'Riches in the river' to demonstrate how the gold may have become concentrated in the river sand in the first place: also to investigate other ways of separating ores from sand.
- Carry out a web search for the techniques used by mineral extraction companies to separate an ore from the waste. This will include the process known as froth flotation.

- Carry out a web search to find the average concentration of gold in the Earth's crust and to find examples of major gold deposits, where it has become many times more concentrated in sedimentary deposits.
- Find out the current price of gold from a financial newspaper. (In California, in 1852 it was around \$15 per ounce).
- Gold panning is used as a small scale commercial activity, but is also invaluable when prospecting for large scale deposits where machinery will later be used to extract the gold.

Underlying principles:

- Gold originates in veins, usually in association with other minerals such as quartz. It may be mined directly from such veins.
- Erosion of gold-bearing veins results in the gold being carried down rivers until it is deposited along with the river sediment.
- Ores such as gold, which become concentrated by moving water, are called **placer deposits**.
- Because of its high density, the gold is concentrated in favoured areas of the river bed, such as on bends and in the trough areas of ripple marks.
- Prospectors concentrate the gold much further by panning.
- The density of pure gold is up to twenty times that of water, whereas quartz sand has a relative density of only 2.7.
- Pyrite has a relative density of about 6 – much higher than that of sand, but very much less than real gold.

Thinking skill development:

Pupils develop the best technique for panning for 'gold' (construction).

They reason why the 'gold' remains behind (metacognition) and apply their findings to the commercial world (bridging).

Resource list:

- gold pan – either a commercial one as shown, or a shallow pan, such as a frying pan
- washed medium-grained sand
- particles of crushed pyrite or brass turnings. The pyrite is crushed between two hammers, followed by sieving through a kitchen sieve to remove the larger fragments, which are re-crushed. Aim for a particle diameter of 2mm or less.
- small jug for scooping sand/pyrite mixture
- large tub, e.g. half of a wooden barrel or a large plastic container
- water

Source: This version by Peter Kennett of the Earthlearningidea team. The activity is commonly used at educational activity centres connected with mining museums.

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