**ACTIVITY: Danger – quicksand!**

**Activity idea**

In this activity, students explore a concept cartoon related to escaping from quicksand and test their ideas by planning and carrying out an investigation.

By the end of this activity, students should be able to:

* create a non-Newtonian fluid (oobleck) and explore its properties
* make a hypothesis based on their knowledge of the properties of a non-Newtonian fluid
* plan and carry out an investigation based on their hypothesis.

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**Introduction/background**

Quicksand can be dangerous. It can grab hold of victims and drag them down.

In this activity, students make and study the properties of their own quicksand – a non-Newtonian fluid that changes in viscosity when stress is applied such as agitation or movement. They then examine a concept cartoon related to escaping from quicksand. After deciding what the best option of survival may be, they test their ideas.

Modelling is well suited to this activity as it allows students to simulate the scenario, and from this modelling, explore ideas of non-Newtonian fluids. Although the cornflour and water mixture is not real quicksand, it behaves in a similar fashion.

***About quicksand***

Quicksand is a soupy mixture of water and sand and is found around beaches, springs, wetlands, lake shorelines and river banks. It may look solid, but when stepped on, a person quickly sinks in. If a person struggles and thrashes their arms and legs around to free themselves, the force makes the fluid thicken or become more viscous and traps the person.

The best way to get out is to turn on to your back and stay still so that the fluid becomes less viscous and you float to the surface. Then you can quickly roll across the quicksand to escape. If you are pulling a person out, you need to pull them out very slowly so that stress is not put on the quicksand, which increases its viscosity.

Both the cornflour-water mixture and real quicksand are suspensions (a liquid containing small solid particles that separate easily out of the mixture) – under different conditions, they can act as a solid or a liquid. The quicksand (and cornflour-water mixture) are examples of non-Newtonian fluids because their viscosity changes when a force or stress is applied.

***About concept cartoons***

Concept cartoons are a visual representation of science ideas. The simple cartoon style drawings put forward a range of viewpoints about science ideas in situations that are designed to motivate and engage students and stimulate discussion of their ideas.

They take in to account constructivist views of learning and have human characters putting forward various alternatives, which invites students to justify their own ideas and clarify their scientific thinking as well as to consider others’ ideas. The purpose of the alternative ideas is for learners to experience uncertainty and cognitive conflict.

The ideas being put forward are based on research of common areas of misunderstanding in science, with the scientifically correct idea included in the alternatives.

A typical approach to using the concept cartoon:

* Provide a concept cartoon to focus on a particular situation.
* Short period of individual reflection.
* Small group discussion – ask if they can reach consensus.
* Brief feedback.
* Discussion of how the situation could be investigated to find out which alternatives are most acceptable.
* Small group investigation/enquiry.
* Share outcomes of investigation/enquiry.
* Whole class discussion.
* Consider how relevant theory applies to the situation.
* Draw ideas together to provide explicit summary.
* Consider how learner views have changed and what has led to a change in their ideas.

***More information***

* Keogh, B. and Naylor, S. (1999). Concept Cartoons, teaching and learning in science: an evaluation. *International Journal of Science Education*, *21*(4), 431–446.
* [www.millgatehouse.co.uk/concept-cartoons-research](http://www.millgatehouse.co.uk/concept-cartoons-research)

**What you need**

* Newspaper to spread on benches or tables – this activity can be messy!
* Mixing bowl
* 1 cup cornflour
* Food colouring
* 1 small container
* ½ cup water
* Paper clip
* Scissors
* Copies of the [concept cartoon](#concept)
* Plastic/wooden figures to represent people

Remind students not to put cornflour-water quicksand down the sink as it will block the drains.

**What to do**

1. Organise the class in to small groups (3–4 students). Demonstrate how or assist students to make their own quicksand:

* Spread newspaper on bench/table.
* Put 1 cup cornflour into a mixing bowl.
* Add a few drops of food colouring.
* Slowly add ½ cup water, a little at a time, mixing it with your fingers until it is the consistency of honey.

1. Encourage students to play around with their quicksand:

* What does it look like?
* What happens if you squeeze it? Shape it into a ball then let the ball sit on your hand? Punch it? Pour it into another container and try cutting it with scissors? Put a paper clip on top of it?

1. Provide each group with a copy of the concept cartoon – preferably A3 size – and ask each student to examine the cartoon, take some time to think which character they agree with and write this down on a piece of paper.
2. Ask each group to discuss the cartoon and try to reach consensus about which character they agree with.
3. Ask each group to discuss how the situation could be investigated to find out which of the alternatives would be best. Students should then plan their investigation and have it checked before proceeding to carry it out.
4. Have groups use their quicksand and model people to test their hypothesis.

**Discussion questions**

* What did you find out? What would be the best way to pull someone out of quicksand?
* Have your ideas changed? If so, what has led you to a change in your ideas?
* How could you explain the science behind your findings?

**Extension idea**

Students could make ‘slime’, which also behaves as a non-Newtonian fluid. It shares some of the properties with cornflour-water quicksand but not all. It requires some more chemicals (borax and PVA glue) and involves a chemical reaction. Slime is shiny, less sticky and messy, flows easily and bounces. Instructions to make slime can be found at [www.wikihow.com/Make-Slime-with-Shampoo](https://www.wikihow.com/Make-Slime-with-Shampoo)

**Concept cartoon**

