

Example of a TDTScience Crafted Lesson

Lesson Topic: Lift the load

Focus and Principles: *Crafting a lesson based on TDTScience strategies.*

Before this lesson, pupils could be asked to find out about the different ways people throughout history have used levers as tools and weapons, including the shaduf (or shadoof) invented in ancient times to irrigate land (research using secondary sources).

Possible Learning Objectives:

- To recognise that some simple mechanisms, including levers, allow a smaller force to have a greater effect.
- To investigate how the position of the fulcrum affects the effort (force) required to lift a heavy load.
- To plan and carry out a pattern seeking investigation.
- To make their own decisions about what measurements to make, whether to repeat them and how to record them.
- To report and present findings from enquiries, including conclusions and causal relationships.

Equipment per pair/group:

- Wooden plank or board
- Tape measure fixed along length of wooden plank with blu tac
- 1kg weight (load) fixed to one end of wooden plank with blu-tac
- Rolling pin (or similar) for fulcrum
- Push meter (can be purchased from tts-group.co.uk)
- Table of results (created by pupil)

Bright Ideas Time

Related discussion prompts which encourage Higher Order Thinking include:

- **PMI:** A world without levers?
- **Odd One Out:** different types of lever (e.g. scissors cutting paper, see-saw in the park and bottle opener)
- **Practical Prompt for Thinking:** Pushing a door open closer or further away from the hinge using only one finger.



Practical: Investigate levers

Use the materials provided to explore levers. Investigate how the position of the fulcrum affects the effort (force) required to lift a heavy load (pattern seeking).

Suggested pupil group size: 2-3

Time: 30 mins (in addition to Bright Ideas Time discussion)

Science: Simple machines are mechanical devices that are used to make work easier. A lever is a simple machine which uses the basic principles of force, pivot and load. The pivot or fulcrum supports the action so that when an effort is applied to one end of the lever, a load is applied at the other end and this will move a mass upward. If the fulcrum is closer to the load, then less effort is needed to move the load a shorter distance.

Levers comprise many common items used every day such as scissors, pliers, nail clippers, wheelbarrows and bottle openers.

Practical Tips:

- Attaching the 1kg weight to one end of the plank or board using masking tape allows the load to stay in one place throughout the investigation.
- Securing a tape measure (disposable paper tapes work well) along the length of the plank or board allows pupils to move the fulcrum an agreed amount each test, e.g. 10cm. This enables patterns in data to be identified and discussed more easily.
- Using push meters enables pupils to make an actual measurement of the force required to lift the 1kg load rather than relying on a subjective opinion of how hard or easy it felt to the individual.
- Pupils in upper KS2 should make their own decisions about how to record data from a choice of familiar approaches, therefore could devise their own simple table to record: distance of fulcrum from load (cm) and effort required to lift load (N).

Focused Recording:

Link to your chosen learning objectives. Examples could be:

- Photograph or drawing of the investigative approach, labelled with relevant scientific vocabulary: lever, load, effort/force, pivot/fulcrum and additional equipment used.
- Table of results with accompanying comparative statement linking cause and effect.

Other Links:

<https://www.britannica.com/technology/shaduf>



Health & Safety:

- Teachers need to risk assess practical activities for their children following the advice of their health and safety advisor.
- Teachers always need to defer to their health and safety advisor for the most up-to-date source of health and safety guidance. This training cannot be relied upon as a source of health & safety guidance.

