NAILS TRICK

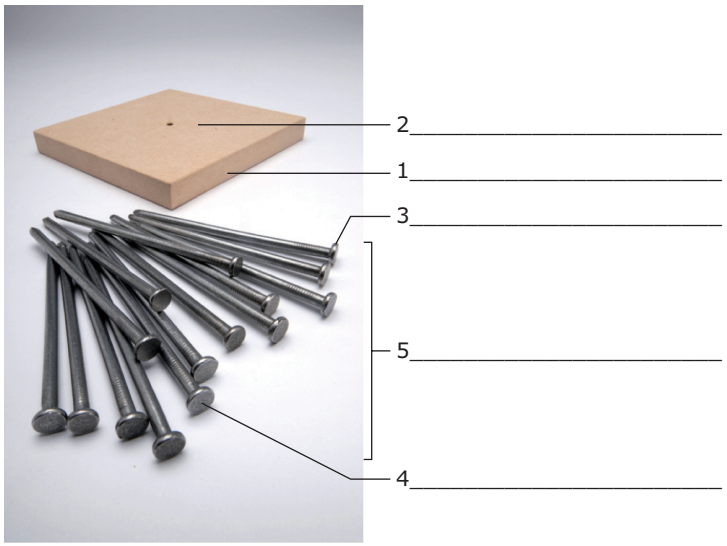
Worksheet
Keith Kelly

SCIENCE

Exercise 1 — Vocabulary: Materials

Label the diagram with the materials you used for this experiment.

flat piece of wood	flat heads	15 nails
rounded ends	drilled hole	



Exercise 2 — Vocabulary: Verbs

Complete the instructions for the experiment with the correct verb from the box.

save	use	take	lay
standing	balance	hold down	

1 _____ a nail across the one _____ up on your piece of wood.

2 _____ the balanced nail off and _____ it on the table. Try to balance the other nails on it. _____ one nail.

3 _____ the last nail to _____ the nails lying across the first nail.

Look at your experiment sheet and check your answers.

Exercise 3 — Conclusions: Speaking, Writing

What did you learn from this experiment? What is the best way to balance one nail on another nail? What's the best way to balance lots of nails on top of each other? Talk with a partner then complete the sentences together.

Use the words in the box to help you.

mass	evenly	distributed	stop	slip off

1 A nail will balance on the head of another nail if ... _____

2 Many nails can be balanced across the first nail if ... _____ and if _____

Exercise 4 — A scientific report: Writing

Now write a report on your experiment. Use the language provided to help you.

Useful Language box

Useful language for writing a scientific report

1. Say what you did

We tried to ...

2. Say how you did it

First we stood ...

Then we balanced ...

Next we took ... and laid it ...

And then we tried to balance the other ... We saved ...

Then we placed all the nails ...

3. Say what you predicted would happen

We thought the best way to balance a nail on another nail would be to ...

We thought the best way to balance lots of nails on another nail would be to ...

4. Say what happened

When we first tried, we managed to balance ...

When we followed the instructions, we managed to balance ...

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Learning objectives

Pupils learn that it is easier to balance things when their mass is evenly distributed. They also learn that they can balance many things in one place if they create a counterweight.

Content summary

A nail will balance on the head of another nail if its mass is evenly distributed (i.e. laid across it with half the weight on either side). Many other nails can be balanced across the first nail if their mass is evenly distributed and if they can be stopped from slipping off.

A nail on top will push against the heads of the balancing nails, and as gravity pulls them down this will hold them more tightly in place.

Skills

Reading, speaking, writing

Grammar

Past simple; present simple

Vocabulary

Nouns: *nail, hole, wood, heads, ends*
Adjectives: *flat, rounded*
Prepositions: *in, across, up, off, on, down, on top of*
Verbs: *stand, balance, take off, lay, save, use, place, hold down*
Connectors: *first, then, next, and then, after that, now*

Time needed

60–90 minutes

Age group

7–11

Materials needed

1 flat piece of wood or ball of modelling clay for each group.
15 nails (with ends rounded off for safety) for each group

Practicalities

If you want to assemble the equipment quickly, fix the nail upright in a ball of modelling clay or use any smallish flat piece of wood and hammer the nail into the centre. If you want to repeat this activity, cut a piece of wood or MDF approximately 10 cm square and drill a partial hole in the centre that is just wide and deep enough to accept the first nail. This apparatus can then be taken apart and stored flat when not in use.

The larger the nails, the easier and more impressive the activity is, so get the largest ones you can find (make sure you sand down the sharp points).

Procedure

1. Tell pupils they are going to conduct a scientific experiment and learn how to balance a large number of nails on one single nail.
2. Introduce/pre-teach the core nouns and verbs that pupils will need: *nail, hole, wood, stand, balance, take off, lay, save, use, place, hold down* Point to the objects, demonstrate the verbs and drill pronunciation.
3. Spend some time discussing the idea with the whole class. Ask them how many nails they think they can balance on one nail. Hand out the equipment and ask pupils to discuss in groups and try out their ideas and then collect ideas from around the room. This discussion can be carried out in the mother tongue but encourage pupils to try to express their ideas in English. (They should use *will* e.g. *We think ...x... nails will balance*).
4. Hand out the experiment sheet and have pupils read out the instructions in class.
5. They work in groups and follow the instructions on the experiment sheet. Monitor and help where required. Help them to say what they are doing in English.
6. Pupils try out their experiment. This will be noisy! Get them to record the result. They can make notes in English or in their own language.
7. Ask students to discuss in their groups these questions: What's the best way to balance one nail? How can you get the other nails to balance on this one? Again, they can discuss the answers first in their own language but should then try to express it in English. Monitor and help them explain in English.
8. At this point (if they haven't already found out how to do it), ask for a volunteer to show the way you can balance a lot of nails on a single nail. Ask how it works and encourage pupils to express their ideas in English, help them with paraphrasing, repetition along the way.

9. Hand out the worksheet and ask pupils to work their way through exercises 1, 2 and 3. They can check their answers with a partner. These exercises consolidate the vocabulary used in the experiment and get them to come to a conclusion about the number of nails they can balance on one single nail.
10. Pupils then write up their findings in the form of a scientific report – encourage them to use the language in the useful language box. This exercise could be done for homework.

Extra ideas to explore with your students

- What is the maximum number of nails you can balance in this way? Try making a second row and balance it on top of the first. How many layers can you balance in total and how many nails does this use?
- Can anyone find a different way of balancing the nails?
- Can you scale up this activity, for example using hockey sticks instead of nails?
- Can you scale down this activity using pins? (This is much harder; again, watch out for the sharp points.)

Cranes

Cranes use a counterbalance - a heavy mass at one end of the arm that stops the crane toppling over when it picks up a weight at the other end of the arm. This makes cranes very heavy and hard to transport, so some have been designed to use a refillable water tank as the counterbalance to make them lighter and easier to transport.

Nails Trick

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Exercise 1

1 flat piece of wood, 2 hole in the wood, 3 rounded end, 4 flat head, 5 15 nails

Exercise 3

1 A nail will balance on the head of another nail if its mass is evenly distributed (i.e. laid across it with half the mass on either side).

2 Many other nails can be balanced across the first nail if their weight is evenly distributed and if they can be stopped from slipping off.