**ACTIVITY: The extra piece**

**Activity idea**

In this activity, students assemble a tangram as a square and then reassemble the tangram incorporating an additional piece they are given. Parallels are drawn to particular aspects of the nature of science.

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

* use this tangram activity as an analogy to describe aspects of the nature of science such as the tentative nature of scientific knowledge
* explain several courses of action scientists may take when confronted with an unexpected finding
* give one real-world example of the tentative nature of scientific knowledge.

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**Introduction/background notes**

The activity is designed to explicitly teach ideas about the nature of science. It contains no specific science content knowledge. This means that the students can learn about the nature of science without having to try to understand new science content at the same time. Activities like this could be used as part of a unit on the nature of science or they could be incorporated throughout a science programme.

Although it is reliable and durable, scientific knowledge is neither set in concrete nor perfect. Rather, it is subject to change in the light of new evidence or new interpretation of existing evidence. Because of its tentative nature, we cannot claim ‘absolute truth’ in science. The tentative nature of scientific knowledge also means that laws and theories may change.

**What you need**

* Copies of the [tangram template](http://link.sciencelearn.org.nz/resources/431-student-activity-the-extra-piece) – cut out one template for each student

**What to do**

1. Give each student their tangram pieces – all pieces except the small square marked with an X. Explain that the pieces represent current scientific data Ask them to arrange the pieces into a square. (See image for solution.)
2. Once all the students have arranged the pieces into a square, give them each their additional small square marked X. Explain that a new scientific discovery has been made or a new piece of data has been found or a new idea has been presented. Students must somehow incorporate this new information to their tangram. (See image for solution.)
3. Encourage students to work individually at first, and then to collaborate in groups if the frustration level rises. Hints can be given if needed (e.g. you can tell the students to make the Superman logo shape first.)
4. Once all or most of the students have arranged the pieces correctly, ask them to brainstorm and share how this activity is similar to ‘doing’ science. Some examples:
	* Assembling the pieces into a square shape can represent scientists assembling data into evidence, ideas into an explanation or coming up with a model, theory or law.
	* The students assumed the pieces fitted together into a square. Scientists assume that patterns, explanations, theories, laws and models can be made.
	* Trial and error can be an essential ingredient to science.
	* New information may require the old thinking to be modified or discarded.
	* Our current information may be incomplete and therefore scientific knowledge, while durable, is always tentative and subject to change.
	* Sometimes, we get lucky and find the pattern or ‘answer’.
	* Collaboration may be helpful.
	* Once we arrive at ‘the answer’, it makes perfect elegant sense.

**Extension ideas**

The concept of the tentative nature of scientific knowledge can be explored. See [Tenets of the nature of science](https://www.sciencelearn.org.nz/resources/413-tenets-of-the-nature-of-science) and [Myths of the nature of science](https://www.sciencelearn.org.nz/resources/415-myths-of-the-nature-of-science).

Scientific paradigm and paradigm shifts such as germ theory, theory of evolution or atomic theory can be discussed.

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