**ACTIVITY: Scrambled sentence**

**Activity idea**

In this activity, students try to assemble a meaningful sentence by successively turning over a set of word cards. Parallels are drawn to particular aspects of the nature of science.

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

* describe aspects of the nature of science such as the self-correcting nature of science, the tentative nature of scientific knowledge and science as an on-going endeavour
* give one real-world example of science as an on-going endeavour
* give one real-world example of the tentative nature of scientific knowledge.

**Acknowledgement**

This activity is based on ‘Dogs and Turnips’ written by Al Janulaw and Judy Scotchmoor (University of California Museum of Paleontology). [www.ucmp.berkeley.edu/education/dynamic/session4/sess4\_act1.htm](http://www.ucmp.berkeley.edu/education/dynamic/session4/sess4_act1.htm)

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**Introduction/background**

This 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.

In this activity, students gather information and work towards a closer approximation of the actual sentence. There is a built-in ambiguity in the sentence, and several reasonable ‘correct’ answers are possible.

Despite the artificiality of this activity, some aspects of the experience closely resemble real-life science. It can be used to teach students about the self-correcting nature of science, the tentative nature of scientific knowledge and science as an on-going endeavour. For example, as the students turn over more cards, they will change their ideas of what the story may be about.

The parallel here to the way science works is that scientists will change their ideas, explanations, hypotheses or theories as they gather more information.

**What you need**

* One set of cut up [Word cards](#words) for each group
* Copies of [What do you think the story is about?](#story) for groups to record successive hypotheses

**What to do**

1. Divide the class into groups of 3–4 students. Give each group a set of cut up [Word cards](#words) and [What do you think the story is about?](#story) and have each group spread out their cards face down on the table. Tell the class the words form one long sentence that also tells a story. The goal is to figure out the story from the words they turn over. Encourage students to keep their ideas within their group until the class discussion at the end.
2. Ask the groups to turn over five cards at random and then write down what they think the story is about. (Hypothesis 1). Ask if it would help to have more information.
3. Have each group turn over five more cards. What do they think the story is about now? Have each group record their idea and their 10-word sentence (Hypothesis 2). Ask if their idea of the sentence changed with more information. Discuss briefly but don’t share sentences yet.
4. Have the groups turn over five more cards and record the sentence (Hypothesis 3). Allow groups to share with the class what they think the sentence says. Discuss the possible reasons why groups have different answers. Ask them how this might be similar to a paleontologist digging up fossils. (Scientists may not have all the information.) Ask why scientists might not agree on explanations of things. (Scientists may have different information or interpret things differently.)
5. Allow all groups to turn over all the cards and to revise their hypotheses (Hypothesis 4). Have groups share their ‘final’ hypotheses. It is most likely that the groups will not have exactly the same sentences – even though they all had the same data to begin with.
* Why don’t you all have exactly the same sentences?
* Why might scientists not have the same explanations for things even though they may have exactly the same information. (They may have come with different background information or interpret the same information differently and so on.)
1. Have groups brainstorm parallels between this activity and how scientists work. Share back to the class. Here are some examples of the parallels they may draw:

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| --- | --- |
| **Possible student responses** | **Parallels to the work of scientists** |
| We tried to make sense of the cards. We had data and tried to make sense of it. | Scientists try to make sense of the natural world. Scientific ideas are developed through reasoning. Scientists develop explanations using observations and what they already know about the world (scientific knowledge).  |
| As we gained more data, we revised our hypotheses. We changed our ideas. | Science is on-going, tentative, subject to change with more evidence or with the re-interpretation of existing evidence. Science corrects itself. |
| More data made it easier to make a hypothesis. | The more data scientists have, the easier it is to devise a hypothesis. |
| We all had different ideas in our group. | Based on the same data, two scientists can have different hypotheses or explanations. |
| There was more than one possible sentence that fitted the data. | Science does not prove or conclude; science is always a work in progress. |
| We used our existing knowledge to help make the sentence. | Science is socially and culturally embedded and theory laden. Someone who didn’t know keas are green could not assemble their sentence that way. Scientists bring existing theories and background knowledge to any investigation, and this will affect how they interpret the data. |

**Word cards**

|  |  |  |  |
| --- | --- | --- | --- |
| **THE** | **SMALL** | **FAT** | **GREEN** |
| **KEA** | **CARRYING**  | **A**  | **CAR**  |
| **KEY**  | **JUMPED**  | **ONTO**  | **THE**  |
| **LITTLE** | **WOODEN** | **TABLE** | **ON** |
| **THE** | **GRASS** | **AND** | **ATE** |
| **THE** | **BOWL** | **OF** | **CHIPS** |

**What do you think the story is about?**

|  |  |
| --- | --- |
| **People in group:**  |  |
|  |
| Hypothesis 1  |
|  |
| Hypothesis 2  |
|  |
| Hypothesis 3  |
|  |
| Hypothesis 4  |