

## JAF03 Lesson 11 Describing Processes and Experiments

### I. In pairs, discuss the following questions:

1. What processes do you need to describe in your field of research? Who do you describe them for?
2. How much detail do you need to include in your descriptions?
3. What do you think are the most important points to remember when describing a process to other scientists?

### II. 1. The scientific method is a process in which experimental observations are used to answer questions. Complete the collocations for describing the stages in the scientific method using the words and phrases in the list below.

*A hypothesis an experiment (x2) conclusions data (x3) the question*

Analyse \_\_\_\_\_

Design \_\_\_\_\_

Collect \_\_\_\_\_

Draw \_\_\_\_\_

Conduct (or run) \_\_\_\_\_

Form \_\_\_\_\_

Define \_\_\_\_\_

Interpret \_\_\_\_\_

### 2. Number the stages above in the order you would normally do them.

### 3. Read this extract from a student website and check your answers to ex. 2.

The scientific method is a process in which experimental observations are used to answer questions. Scientists use the scientific method to search for relationships between items. That is, experiments are designed so that one variable is changed and the effects of the change observed. While the exact methodologies used vary from field to field, the overall process is the same. First, the scientist must define the question – what exactly they are trying to find out. Next comes the formation of a hypothesis, which is an idea or explanation for a situation based on what is currently known. The next stage of the method is the design of an experiment which will allow this hypothesis to be tested. Usually a primary run of the experiment is conducted, and any changes to the experimental set-up made. In each experimental run, data collection takes place, followed by data analysis. Finally the data is interpreted and from this, the scientist is able to draw conclusions.

### 4. Read the extract again to find the nouns forms of the verbs below. Which word/s use/s the same form for the verb and the noun?

*analyse – collect – design – explain – form – observe – relate – run – vary*

**III. Below are the summaries of five investigations. Read each summary and then choose which word in the heading is more suitable.**

**1. *Practical/ Theoretical* research**

Murray Gell-Mann and George Zweig proposed that particles such as protons and neutrons were not elementary particles, but instead were composed of combinations of quarks and antiquarks.

**2. *Field/ Laboratory* experiment**

Mark-and-recapture models were used to measure seasonal and habitat changes in house mouse densities on sub-Antarctic Marion Island.

**3. *External/ Internal* validity**

The students were carefully matched for social status, subject area, ethnicity, education level, parental smoking, and exposure to targeted advertising.

**4. *Descriptive/ Experimental* study**

The amount of soy products eaten by each participant was assessed at the start of the study. During the 30 years of the study, the women's incidence of breast cancer was recorded.

**5. *Qualitative/ Quantitative* research**

To investigate the effect of eating dark chocolate on stress levels, a blood sample was taken and the levels of stress hormone measured. After eating the chocolate, a second sample was taken and hormone levels measured again.

**In pairs, can you think of an example of an experiment which describes the alternative heading in 1-5?**

(Tasks I. – III. Adapted from Armer, T. *Cambridge English for Scientists*. Cambridge University Press, 2011.)

**IV. Devise an experiment**

**Look at this statement:**

*Male birds sing to attract female birds.*

**Working with a partner, try to devise an experiment to investigate this claim.**

**Note briefly the method you would use.**

**An experiment conducted by researchers in Sweden involved setting up nest-box traps and dummy male birds. What do you think they were used for?**

## V. Language focus

**A) Some prize-winning scientists are talking about their achievements. Rewrite each sentence including the conjunction in brackets and making any other necessary changes.**

1. We were worried that we would not be able to continue with our research because funding cuts were threatened. (since)
2. To make sure there was no risk of losing any data, we worked on two sites and two computer networks. (so that)
3. Although two valuable team members left mid-way through, we managed to meet our deadlines. (in spite of)
4. We were exhausted, but the final two months were the most productive of all. (though)
5. The whole team worked hard, so we succeeded. (due to)

**B) Now the scientists give some details about their experiments. Match the sentence beginnings (1-7) with the endings (a-g).**

1. The material was quite unusual in that it was strong, ...
  2. The success of the experiment was largely due to ...
  3. We wondered if the colour had changed because ...
  4. Owing to the massive weight of the material, ...
  5. Difficult though the conditions were, ...
  6. It was such a minute particle to detect that ...
  7. Because this method had not been tried before, ...
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- a) ... the equipment had to be extremely precise.
  - b) ... careful preparation.
  - c) ... it proved impossible to construct strong enough equipment to measure it accurately.
  - d) ... we managed to retrieve over 50 samples.
  - e) ... we were unsure how the results would come out.
  - f) ... of the presence of a gas.
  - g) ... but extraordinarily light.

(Haines, S., Nettle, M. *Advanced Grammar in Use*. Cambridge, 2007)

## VI. Video – Parallel Universes

<http://science.discovery.com/videos/brink-news-multiple-universes.html>

**Watch the video and answer the questions below.**

1. What is the name of the show's guest? What is the title of his book they are mentioning? Have you heard about it?
2. What is the latest theory on the origin of multiple universes presented in the video?
3. What does the physicist compare multiple universes to?
4. Why do we accept the possibility of "parallel worlds" if there is no evidence for it?

**Watch again and complete the phrases:**

We can test the \_\_\_\_\_ that give rise to the strange idea through astronomical \_\_\_\_\_. And then, we gain \_\_\_\_\_ in the theory and we can cherry-pick. If the theory says that there are other universes, we have to accept that \_\_\_\_\_ .