Activity 3A: Socio-scientific issues

1. **a.** Explain what is meant by a *socio-economic issue*; support your answer with examples.
   b. State the two conditions that must be met for a report to be biologically valid.
2. Distinguish between the following pairs of terms:
   a. facts and beliefs
   b. biased data and unbiased data
   c. objective and subjective.
3. The following concepts are relevant when analysing a socio-economic issue. Explain what each means:
   a. anecdotal evidence
   b. intuition
   c. preconceived ideas
   d. beliefs
   e. confirmation bias
   f. a vested interest
   g. cherry-picking
   h. peer pressure.
4. Provide ways in which you could try to determine where a source of information was trustworthy.
5. Provide reasons why the website www.pce.parliament.nz (see page 32) would be trustworthy.
6. Some scientists have become celebrities. One of these 'celebrity scientists' was the physicist Stephen Hawking, who died in March 2017. One of his colleagues, Peter Higgs, stated of Hawking that 'his celebrity status gives him instant credibility that others do not have'. Provide reasons as to why this statement might be true, not only of a celebrity scientist like Hawking, but also the opinions of celebrities in general.

Stephen Hawking and his daughter Lucy, NASA's 50th anniversary

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7. The *National Geographic* had a cover called 'The War on Science' with the following associated statements:
   - Climate change does not exist
   - Evolution never happened
   - The moon landing was fake
   - Vaccinations can lead to autism
   - Genetically modified food is evil

   Despite the scientific facts available, many people believe in the above statements. Suggest reasons for this.

Activity 3A answers: Socio-scientific issues

1. **a.** A socio-scientific issue is one that is science based but provokes controversy within society, with individuals/groups holding conflicting opinions on the issue. These conflicting opinions may be the result of preconceived opinions, beliefs, anecdotal evidence, etc. Examples include the use of 1080 poison in pest control in New Zealand, the use of the MMR vaccination, the use of the HPV vaccination, climate change.

   b. For a report to be biologically valid it must be scientifically accurate (based on significant amounts of data that is able to be repeated by others) and unbiased (the data is not slanted and/or some data is overlooked) in order to support a preconceived opinion and/or the demands of groups that have vested interests in the issue.

2. **a.** Facts are objective and are the result of measurements or records that can be validated or repeated by others. Beliefs are subjective and are based on feelings or anecdotal evidence – they cannot be validated.

   b. Biased data is cherry-picked with the emphasis placed on some aspects of it and/or other aspects omitted – analysis ends up supporting a preconceived opinion or a prior view. Unbiased data is *all* the data accurately recorded, presented and analysed.

   c. Objective refers to facts (which are measurable), while subjective refers to feelings and emotions (which are not measurable). Analysis of data needs to be objective (not subjective).

3. **a.** Anecdotal evidence is based on someone's personal experience; often anecdotal evidence makes links between two unrelated events. (It is distinctly different from scientific evidence – proof based on findings from systematic observation, measurement and experimentation.)

   b. Intuition is based on unexplained feelings you have that something is true even when you have no evidence or proof of it being true – e.g. the intuitive evidence from observation suggests the sun orbits the Earth, whereas scientific evidence from measurements is that Earth orbits the sun.

   c. Preconceived ideas are those that developed over a period of time from intuition/beliefs/personal experiences/feelings/emotions. Such ideas tend to bias against accepting scientific data.

   d. Beliefs become preconceived ideas; beliefs are often based on religion or culture. Beliefs tend to affect the way people will or will not accept scientific data.

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e. Confirmation bias is the tendency to look for and accept evidence that conforms to what we already believe – e.g. 'cherry-picking' results, selecting only those results that support our bias/preconceived ideas while discarding results that do not support what we already believe.

f. A vested interest refers to an individual or group who has put in time, money, etc. into the scientific research and therefore *wants the results to support their standpoint/product/interest* – e.g. if a drug company funds scientific investigation into a drug that it manufacture it, it has a vested interested in the results being favourable as to the effectiveness of its drug (this may put pressure on scientists to bias the results).

g. 'Cherry-picking' occurs when individuals or groups select only that data that supports their viewpoint and overlook/discard data that does not support their viewpoint.

h. Peer pressure is the direct influence exerted on you by the peer group you associate with. The effect of this is that you may get encouraged (directly or indirectly) to change your attitude/beliefs/stand on an issue to conform to those of your peer group. It can be very difficult to withstand peer pressure.

4. A trustworthy source will be well written and well referenced, the website/organisation as well as the author will have credible credentials, the data in the source is likely to be shared with that of credible mainstream sources such as BBC News (refer pages 33, 34).

5. The information in the reports is based on analysis of scientific data from a wide range of sources and is written by the Commissioner for the Environment who is independent of the Government of the day, i.e. the Commissioner has no bias or vested interest in the issue; their analysis based entirely on scientific data and not on any preconceived ideas.

> Dr Jan Wright, Commissioner 2007–2017, was described as being 'known for her fiercely independent reports'.

6. Celebrities are well known for their endeavours or achievements. Hawking became a celebrity as a result of his scientific findings coupled with his motor degenerative condition that resulted in his need for a wheelchair and speaking device; people respected him for his courage as well as his findings. Because of this, people were more likely to know of and positively respond to his pronouncements than to another scientist who is not in the public eye. However, this does not make Hawking's findings any more valid than those of another scientist. *If data is accurate and unbiased, then it is scientifically/biologically valid*.

> Be wary of 'celebrity endorsements'. Organisations with a vested interested in, or particular viewpoint for, an issue will often try and attract celebrities to support their cause as the celebrity is more likely to be reported in the media and listened to by members of the public. However, because a person is well known for their sporting or acting prowess, etc. does not make them an expert on a particular issue; they are just as prone to preconceived ideas as any other person (and they may be getting paid for their endorsements, especially in advertisements).

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7. Many people find scientific ideas much more difficult to accept than their own preconceived opinions. For the five issues listed, the acceptance of scientific data for each issue is likely to be undermined; for example, by beliefs (evolution does not exist), conspiracy theories (the Moon landing is a fake), preconceived ideas or based upon 'intuition' (genetically modified food is evil), vested interests (climate change does not exist), anecdotal evidence (vaccinations can lead to autism).

   Peer pressure can also influence people to not accept scientific ideas.

   The supposed link between the MMR vaccination and autism was based on a so-called scientific report by Dr Andrew Wakefield published in the *Lancet* in 1998. This report has been completely discredited and *Lancet* subsequently published a formal retraction. Wakefield was discredited and in 2010 was struck off the medical register for serious professional misconduct. Unfortunately, there are many people who believe that this is now a conspiracy … this has been recently reinforced by a film called *Vaxxed: From Cover-Up to Catastrophe*. The film starred and was directed by ex-doctor Andrew Wakefield …

   Meanwhile, there is a huge body of reputable evidence which shows the unmistakable effectiveness of vaccination in controlling diseases.

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