

Activity 1: What is Science?

This activity allows students, working in groups, to explore their criteria for considering whether an activity is part of science.

'Everything's related to science. It's just a question of how much.' (Student comment during ASCEND activity 1)

Rationale

The purpose of the activity is not (necessarily) to find or agree on a definition of science, nor a single demarcation criterion. Rather, it is designed to encourage active discussion. The philosophy of science is one aspect of the nature of science, and is considered to provide a suitable basis for challenging the most able (see Chapter 4).

Activity 1 concerns the fundamental question of 'What is science?'. Whilst a basic question, it is certainly *not* a trivial one. In the philosophy of science, this is called the 'demarcation' question, i.e. distinguishing science from non-science, and there is neither a simple clear distinction, nor a consensus!

Despite studying science through their school years, many students are not able to offer very convincing responses to the question 'What is science?'. I know from interviewing students, that often they never seem to have even considered the question. Although students may have a 'feel' for what is or is not science, they are often unable to explain this.

Sadly, many students seem content to just accept that whatever is taught in school science must be science. Clearly, from what we know about gifted students (see Chapter 2), we would expect the most able to have better notions of what science is, or at least to have formulated the question.

For something to be science:

B1: 'it has to involve... finding a solution to a problem by experimentation...'

B2: 'test and analysis of results ...'

G: 'involving reaching a conclusion by a process of... based on . . . gathering proper data . . .'

B2: 'planned experimentation . . . having science intrinsic . . . anything else?'

B1: 'it must involve an understanding of how . . . and why . . . the process being observed happened'

(ASCEND delegates exploring their ideas of what makes something science)

This activity used in ASCEND was based upon asking students, working in groups, to explore just this question.

'electronics . . . is more of a science than it is not a science . . . do you agree that it's more a science than not a science?'

'no'

'why not?'

'mostly electronics is just, like assembling, putting things together ...deciding which resistor to use . . .'

'yes, but you've got to know why you need to use it'

...

'I think electronics is ...'

'pseudo-science'

'no ... no ... it's a technology'

'at what point do we draw the line between technology and science?'

'technology is making things from science ...'

'it's using it ... like ... practical work'

(Some dialogue from one group discussing whether electronics should be classed as science)

The activity

The activity is based on a card sort, which allows students to classify activities as 'science' or 'not science' (or 'not sure'), and through this process make their tacit criteria (and prejudices!) explicit. It is expected that although some of the cards should offer fairly uncontroversial activities, there is likely to be lively discussion about others.

Archaeology; Architecture; Aromatherapy; Astrology; Astronomy;
Butterfly collecting; Bird watching; Biology; Chemistry; Chess;
Computer programming; Cookery; Cosmology; Criminal investigations;
Crystal healing; Dowsing (Water divining); Economics; Engineering;
Electronics; Feng shui; Forensic investigations; Gardening;
Geography; Geology; History; Homeopathy; Market research;
Mathematics; Medicine; Pharmacy; Photography; Physics; Plumbing;
Psychology; Psychoanalysis; Psychiatry; S.E.T.I. (Search for Extra-
terrestrial Intelligence); Sociology; Stamp collecting; Town planning;
UFO spotting; Web-browsing

A set of activities that *may* be judged scientific.

The activity has three stages:

Part a) sorting the activity cards

Part b) making criteria explicit

Part c) comparing with another group

It would be possible to just run the first two stages, but students are likely to gain more if they complete all the parts of the activity. In the third stage the group is asked to resort the activities using the criteria developed by another group. (If time allows, groups should be allowed to compare their sorts with that of the group offering that set of criteria.) The tasks require students to evaluate activities according to both their own criteria, and by applying criteria that another group has attempted to make explicit.

Debriefing points:

The main value of the activity is in the quality of the discussion generated. However, a teacher may wish to debrief the activity by considering the following points:

- It is not always easy to put into words the basis of the decisions we make;
- It is easy to take familiar things for granted, and not question them;
- There is no clear way of distinguishing scientific from non-scientific activities;
- There is disagreement about whether some activities deserve to be called science;
- It is difficult to define science in terms of its subject matter;
- We may have to look at how someone goes about an activity before we can decide if it is science.

Note: If the teacher does not wish to leave the activity ‘open’ (although this might be quite appropriate, and gifted students may appreciate this), it would be possible to talk about science being characterised by ideas related to evidence – the interplay of theories, models; conjectures; and investigations. However, this theme is developed in the second activity.

Resources

The following resources are included on the CD:

Resource	Description	Filename
Activity cards	a set of 'activities' to be classified	Act 1 ActivityCards
Place cards	cards for 'science', 'not science' and 'not sure', to act as place-markers for the piles	Act 1 PlaceCards
Instructions	Instructions for groups carrying out the activity	Act 1 Instructions
Forms	Set of forms for groups to complete: Summary sheet Demarcation criteria Applying demarcation criteria	Act 1 Forms