

## **Chapter 6. Attitudes and values in science**

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### **1. Introduction**

Primary science has three main groups of aims:

- A) To develop scientific processes- skills,
- B) To foster the acquisition of conceptual knowledge
- C) To develop particular attitudes which are related to scientific knowledge, its ways of thinking, its ways of working and the impact that science has in our environment, culture.

#### **Why attitudes are important**

These attitudes are mainly a measure of the students' expressed preferences and feelings towards science, and for this reason, it is necessary to consider their importance and significance. They influence students' motivation and interests, and, therefore, in their behaviour.

They also influence the transcendental decision of studying science in secondary education and can help to develop their confidence in dealing with science in terms of curiosity and systematic inquiry that may foster the development of children character. Because children's interest in science is so vital for active science learning, we must pay special attention in developing then. When children reach the post-primary school, they will have experienced six years of primary schooling and by this stage will have developed their attitudes to science. Some studies reveal that most of the older pupils (10-12 years) had significantly fewer positive attitudes than younger ones (7-9 years) towards science.

#### **What attitudes?**

Attitudes related to science in the primary school belong to two main groups: a) scientific attitudes and b) positive attitudes towards science.

#### **Scientific Attitudes**

Scientific attitudes are a mixture of the willingness to know and apply a scientific approach

to face any task of problem-solving with respect for logic and critical thinking. These attitudes include curiosity, honesty in the recording and validation of data, flexibility, persistence, open-mindedness, willingness to tolerate uncertainty, and an acceptance of the provisional nature of scientific explanation. These are the features that characterise scientific thinking.

### **Positive attitudes towards science**

An early categorisation of students' affective behaviours towards science is:

- ❖ Acceptance of scientific enquiry as a way of thought;
- ❖ Adoption of 'scientific attitudes';
- ❖ Enjoyment of science learning experiences;
- ❖ Interests in science and science-related activities; and
- ❖ Interest in pursuing a career in science or science-related work.

### **More Attitudes**

Other examples of essential attitudes, but more challenging to locate in these two groups, are perseverance, originality, responsibility, independence of thinking, co-operation, self-criticism. Teachers and society try to achieve these attitudes through school activities in teaching and learning science.

## **2. Design activities**

Attitudes are manifested through behaviour. Therefore, in designing activities to promote the development of attitudes, it is advisable to consider indicators/behaviours associated with them.

The following are examples of indicators of Scientific Attitudes

### **1. ATTITUDE: WILLINGNESS TO COLLECT AND USE EVIDENCE. INDICATORS:**

- ❖ Reporting what happened, even if this conflicted with expectations
- ❖ Querying and checking parts of the evidence which do not fit into the pattern of other findings
- ❖ Querying an interpretation or conclusion for which there is insufficient evidence
- ❖ Setting out to collect further evidence before accepting a conclusion
- ❖ Treating every conclusion as being open to challenge by further evidence

## 2. ATTITUDE: WILLINGNESS TO CHANGE IDEAS IN THE LIGHT OF EVIDENCE

(Flexibility combined with open-mindedness) INDICATORS:

- ❖ Being prepared to change an existing idea when there is convincing evidence against it
- ❖ Spontaneously seeking alternative ideas rather than accepting the first one which fits the evidence
- ❖ Relinquishing an existing idea after considering evidence
- ❖ Realising that it is necessary to change ideas when different ones make better sense of the evidence

## 3. ATTITUDE: WILLINGNESS TO REVIEW PROCEDURES (Critical Reflection)

INDICATORS:

- ❖ Willingness to review what they have done to consider how to improve
- ❖ Considering alternative procedures to those used
- ❖ Considering the points in favour and against how an investigation was carried out
- ❖ Spontaneously reflecting on how the procedures might improve
- ❖ Considering alternative procedures at the planning stage and reviewing those chosen during an investigation, not just at the end.

### **How can we help children to acquire and develop attitudes?**

The problem of declining interest in school science is international. Among the main factors, influencing this problem is the content-driven of the science curriculum and the ineffective methods of science teaching. To make the children's experience of science in primary school relevant, we can propose two main avenues of action:

- a) Increasing the amount of practical, investigative work in science and
- b) Using ICT, due to the positive effect they have in their enjoyment of science.

Both will increase pupil's interest and motivation, as well as their curiosity and desire for understanding

### **3. The ethical debate**

The following are examples of possible ethical debate contexts used as learning experiences and the variety of learning opportunities that they offer to the students. They are related to social relationships, cooperation and social action that are familiar to students.

EXAMPLES OF CONTEXT	EXAMPLES OF OPPORTUNITIES FOR STUDENTS
<ul style="list-style-type: none"> <li>❖ Caring for the local and global environment;</li> <li>❖ Considering and comparing the advantages and disadvantages of different sources of energy;</li> <li>❖ Evaluating different views on a controversial topic such as the use of nuclear energy;</li> <li>❖ Analysing critically the scientific claims used to support a product in the advertisement;</li> <li>❖ Studying Government regulation about the use of pesticides;</li> <li>❖ Being involved in a project to protect their environment</li> </ul>	<ul style="list-style-type: none"> <li>✓ Gaining awareness of current scientific issues of concern to society;</li> <li>✓ Expressing their opinion about an issue related to the consequences of the application of scientific knowledge;</li> <li>✓ Listening to and acknowledging the views of others;</li> <li>✓ Being an active member of the group when collecting data as part of a study;</li> <li>✓ Gathering information of local views about a factory which is polluting your neighbourhood;</li> <li>✓ Coming to a group agreement negotiating particular responsibilities of group members;</li> <li>✓ Reach consensus for all to show their ideas and proposals about a controversial topic;</li> <li>✓ Knowing how to express concerns confidently, or to ask questions of appropriate people or organisations;</li> <li>✓ Working both independently and cooperatively with others;</li> <li>✓ Establishing the protocol before interviewing people who are involved in a particular problem;</li> <li>✓ Writing a letter to the local newspaper about a community problem (noise levels adjacent to airports)</li> </ul>