

King's College, University of London

Ideas and Evidence in Science Project

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Introduction

The primary aim of the project at King's College was to produce resources for teachers and pupils in order to facilitate the teaching and learning of ideas and evidence in science at Key Stage 3. The development of the materials was based on the knowledge gained through research-based initiatives about formative assessment, scientific enquiry, argumentation and scientific literacy conducted at King's College London. The university-based tutors produced the materials and collaborated with school-based mentors to refine the materials and trial them with trainee teachers.

The project team consisted of five university-based tutors working with nine school-based mentors and the eleven trainee teachers that they were working with in school. The school-based mentors were instrumental in helping trainee teachers in using these resources and implementing lessons in the classroom.

The schools, mentors and trainees were as follows:

School	Mentor	Trainee
Hampstead School	Caroline Ellis Matt Wharf	Adrian Woodman Natasha Checkley
Grey Coat Hospital School	Melissa Glackin, Rachel Thomas	Stephanie Macleod Rachel Petty
Raynes Park High School	Lisa Luckhoo	Colin Bell
Sydenham School	Matthew Rees	William Keat Patrick Roche
Sydney Russell School	Maechi Dhesi	Clare Malloch Beth Grainger
St Angela's Ursuline School	Mahesh Patel Rachel Smith	Katherine Low David Hancock

Two meetings were held where the mentors and tutors had the opportunity to discuss and refine the materials. The mentors then worked with the trainee teachers, who implemented the lessons. Mentors and trainees provided feedback on the materials, which were subsequently revised.

A particular emphasis was placed on the role of evidence in scientific ideas – that is, how we know what we know in science and how we justify scientific knowledge. The resulting materials are organised as activities that consist of guidance for teachers and materials for pupils.

Overview of activities

Lesson Activity H: Changes in Matter

Sibel Erduran

This activity uses “competing theories”, where alternative explanations about a particular phenomenon are evaluated. This activity requires pupils to evaluate two competing theories, in this case, explanations about the differences between chemical and physical changes. Pupils are presented with two alternative theories and they are asked to evaluate a list of evidence that can support one theory, the other or both theories. They are expected to provide justifications for their choice of theory as well as evidence.

Lesson Activity I: Cells

Christine Harrison

Pupils usually find it easy to locate information about scientists and the work that they have done in books and on the Internet. However, they often find it difficult selecting relevant information and tend to extract description about the scientist rather than explanations of the importance of the scientist's work in taking ideas forward. This activity gets pupils to construct questions, thereby having to look at work more deeply. This activity also utilises modelling of the idea before pupils improve a first attempt at devising questions, and also incorporates peer assessment.

Lesson Activity J: Chemical Reactions and Measurement

Rod Watson

Pupils can learn how to carry out enquiries by simply doing them. A much more focused way of learning how to investigate is to teach specific aspects of enquiry explicitly. This can be done either in the context of whole enquiries or as small tasks targeted at teaching specific aspects of enquiry. These materials focus on teaching pupils about range, interval and repeat readings.

Lesson Activity K: Examining a Scientific Argument

Jonathan Osborne

This activity is based on a version of a well known thought experiment originally developed by Galileo. Pupils are asked to provide a written argument for their choices. Justifying reasoning and linking an idea to the evidence that supports it is central in science. Pupils' writing, however, needs to be supported and this activity uses a writing frame.

Lesson Activity L: Quality evaluations?

Rod Watson

Pupils can learn how to evaluate by simply doing them. A much more focused way of learning how to evaluate is to make explicit the qualities of good evaluations so that pupils acquire criteria for judging quality. In this activity, pupils observe a simple demonstration and then look at the evaluations from ten different groups and highlight good and poor points of evaluation. Pupils then take part in a whole class discussion focused on the quality of evaluations.