

WORKING 

Scientifically

A GUIDE FOR PRIMARY SCIENCE TEACHERS



A David Fulton Book

KEVIN SMITH

Working Scientifically

With the changes that have taken place to the National Curriculum for science, the investigations that children should experience have broadened and become a key part of the curriculum necessary for the development of knowledge and understanding. *Working Scientifically* is a comprehensive guide that will help primary teachers develop their skills, improve their practice and nurture 'Working scientifically' in the classroom.

This guide provides teachers with some tools and resources that are necessary for teaching science in a fun and exploratory way. Focusing on individual skills, it provides scientific activities in a number of different contexts. It explores each skill multiple times to help pupils progress through the age-related expectations and emphasises teaching through exploration, questioning and dialogue.

Using the analogy of a journey to space as the central concept, with each step of progression related to a step in the journey, chapters include:

- What is 'Working scientifically'?
- Raising questions, predictions and planning
- Observations, measuring and recording
- Interpreting, analysing and concluding
- Reflecting and evaluating
- Assessment.

Full of practical resources such as planning materials and assessment sheets, *Working Scientifically* will be an essential guide for all qualified and trainee primary teachers wishing to develop their practice in this essential area of the science curriculum.

Kevin Smith has worked in science education for 26 years and is Assistant Head Teacher in a cross phase special school. He is also a Consultant and Lecturer on Primary Science Initial Teacher Training courses in a number of universities in London, UK.

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Working Scientifically

A guide for primary science teachers

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Contents

<i>Acknowledgements</i>	vi
Introduction	1
1 What is 'Working scientifically'?	3
2 Raising questions, predictions and planning	12
3 Observations, measuring and recording	34
4 Interpreting, analysing and concluding	58
5 Reflecting and evaluating	80
6 Assessment	101
<i>Bibliography</i>	107
<i>Appendix 1: Self-assessment sheets</i>	111
<i>Appendix 2: Teacher assessment sheets</i>	140
<i>Appendix 3: Planning mats</i>	150
<i>Appendix 4: Launch pad activities</i>	159
<i>Appendix 5: Support sheets</i>	172
<i>Index</i>	186

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Introduction

So, why this guide? There are plenty of publications out there, plenty of schemes of work and plenty of academic texts that you may remember or you may be using at the current time. Surely there isn't a need for *another* book on how to teach science?

There is! And my reasons for writing one are simple:

- 1 As a trainer of teachers I see many student teachers and new or inexperienced enthusiastic teachers who understand the value of practical work as an engaging activity that children love and are excited about, but haven't yet grasped the pivotal role that investigative work plays in progression within science. I want to help you understand that role so that a practical activity becomes meaningful for both you and the children you teach. As Ofsted (2013) note, 'For pupils to achieve well in science, they must not only acquire the necessary knowledge, but also understand its value, enjoy the experience of working scientifically, and sustain their interest in learning it.'
- 2 There seems to me to be a disconnect between the formalised training of teachers and practice in the classroom. On the one hand, we have Initial Teacher Training/Education routes delivering very relevant and meaningful training, which is essential for the teacher to understand how their children learn. On the other hand, the reality is that many teachers necessarily leave this theory, this academic world, at the door when it comes to practice. It becomes part of their fabric yet ultimately becomes 'lost' in the day-to-day life of a busy teacher. I want to help you bridge that gap.
- 3 The National Curriculum in England: Science programmes of study (DfE 2013 and subsequent updates 2015) has changed again (see [Figure 0.1](#)). This has implications for *all* primary teachers. First, for the progress of your pupils, and second for your development as a teacher able to deliver an effective broad and balanced curriculum. I want to help secure your understanding of this curriculum area and how the skills contained in the curriculum progress over the year groups.

This guide is primarily concerned with the part of the National Curriculum in England: Science programmes of study known as 'Working scientifically'. However, since it is best practice to contextualise this part of the curriculum all activities will explore aspects (old and new) of the new 2015 curriculum. It is not meant to be an academic piece of work nor is it meant to be a scheme of work. My intention is for this to be a companion guide for you, a sharing of and source of ideas (and a few techniques), and finally an exploration of a very topical issue, that of assessment in primary science.

So, who is this guide written for? This guide is primarily for teachers in training or who are right at the beginning of their career. However, I am aware that there are teachers out there with plenty of experience who are nonetheless confused with the changes in the National Curriculum or else want to consolidate their experiences thus far. If that is you, then it is for you, too!

- Seasonal changes new at KS1.
- Evolution and inheritance, fossil formation, digestion, the digestive system, gears, levers and pulleys in KS2.
- Sound, light and forces have been moved from KS1 to KS2.
- Greater emphasis on: identifying and classifying and naming plants and animals.
- Terminology of 'Working scientifically' now used to describe scientific processes.
- Increased range and scope of 'Working scientifically' to include more investigations than fair testing, including observing over time, identifying and classifying, seeking patterns, and researching using secondary sources in order to answer scientific questions.

Figure 0.1 Main changes in the primary science curriculum.

In conclusion what will this guide do? It will:

- introduce you to the changes in the National Curriculum in England: Science programmes of study and the age-related expectations (ARE)
- develop your understanding of progress within 'Working scientifically'
- develop your skills and confidence in 'Working scientifically' and show you how to develop them in context of the content from the new National Curriculum
- suggest a variety of investigations to develop the skills
- suggest some approaches to developing the children's skills
- provide an example of a mastery assessment scheme based on formative assessment that can be used as a starting point to develop your own assessment system.

It will not:

- tell you the definitive way to develop these skills
- tell you the definitive way to assess this area of the curriculum or how frequently to do it
- give you prescriptive lesson plans but provide enough structure for you to create, innovate and do what you do best.
- give you risk assessments for each practical activity. It is the responsibility for the teacher to carry out a full risk assessment before they carry out any practical activity with the children.

I hope you enjoy it and it proves useful to you.