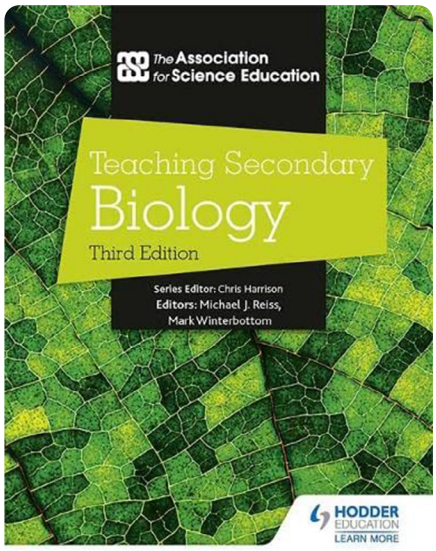
Reviews

Reviews published in *School Science Review* are the opinions of individual reviewers, and are not an official Association for Science Education (ASE) view or endorsement of the resource. Reviewers are selected to write reviews on the basis of their experience and interests. They are expected to draw attention to perceived weaknesses or limitations of a resource as well as its strengths. The reviews are written from the standpoint of someone seeing the materials for the first time and considering how they themselves would use them, or think colleagues would be likely to use them.



Teaching Secondary Biology

3rd edn. Ed. Michael Reiss and Mark Winterbottom
London: Hodder Education/ Association for Science Education, 2021
336 pp. £25.99
ISBN 978 1 5104 6256 4

Aimed mainly at newly qualified teachers and non-subject specialists, this updated edition of *Teaching Secondary Biology* aims to enhance teaching of biology to pupils aged 11–16. Written in association with ASE by both academic experts and practising teachers, it provides detailed subject knowledge and the tools needed to produce lessons that will engage pupils and enhance their curiosity.

The book is divided into 12 chapters that cover big ideas in biology, such as cells, exchange, evolution, reproduction and microbiology. Each chapter begins with a topic overview and is then subdivided into the key aspects of the topic. Each part summarises likely prior knowledge and experience of pupils, gives clear information to develop the teacher's understanding and provides a teaching sequence with key activity ideas. Opportunities to introduce mathematics and literacy are highlighted and useful snippets of interesting information are given to put the science in context, such as the pilot osmosis power plant in Norway or the rules on whether students are able to donate blood. Information is clearly set out throughout the book with very effective use of clearly labelled text boxes, such as *Science in context*, *Careers*, *Technology use* and *Cross-disciplinary links*, which are quick and easy to find.

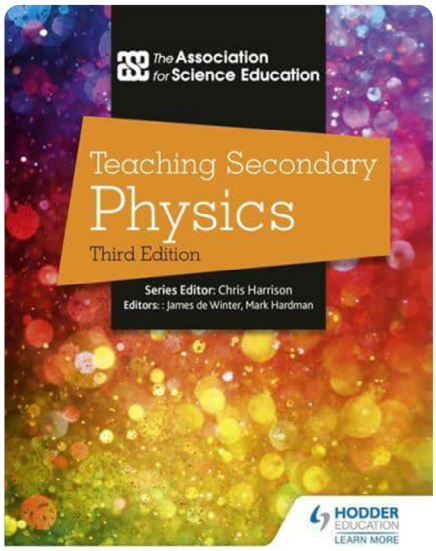
This book will be most useful for those new to teaching biology, where it can be used to deepen understanding and increase confidence. It will also appeal to the more experienced teacher, as while many of the activities are established, there were also some new ideas for activities. The clear and approachable layout makes the book ideal to use as a quick reference to update particular aspects of teaching, such as using technology or links to careers. I particularly like the *Science in context* information, which can be used to develop students' curiosity and interest or as a starting point for further research. This would be a useful addition to the bookshelf of any teacher of biology.

Sarah Wood

Teaching Secondary Physics

3rd edn. Ed. James de Winter and Mark Hardman
London: Hodder Education/ Association for Science Education, 2021
272 pp. £27.99
ISBN 978 1 5104 6258 8

This is the (long overdue) third edition of an excellent resource. It is just over 10 years since the second edition launched (about



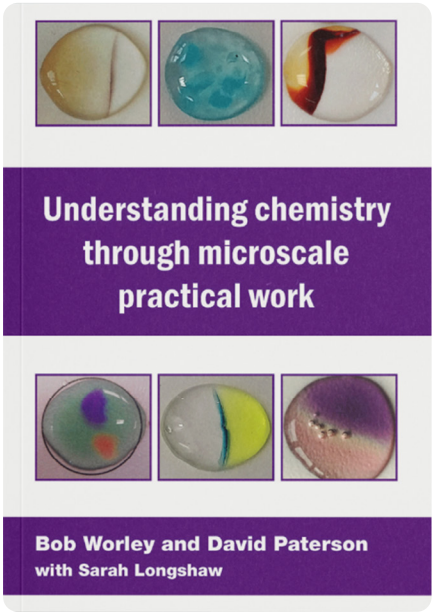
the same time a kindly soul at the ASE conference gave me the reference copy of the newly retired first edition, thanks). The new edition brings things nicely up to date, although the online references will necessarily age the least well (and the quoted cost of a kWh of electricity in GB is already out of date, overtaken by recent events). The layout is fresh and it is well illustrated. Boxed text is used for maths skills, careers info, science literacy and the like. The science literacy boxed asides are most helpful, and steer a wise course between the '*let's get this terminology correct right from the start*' to advice on where it is might be best to keep your powder dry for future battles where a pedantic line in the sand will need to be drawn. There are helpful suggestions throughout on how to sensitively steer pupils away from naïve explanations of phenomena to more reasoned, mature scientific treatments of sometimes fairly abstract concepts.

Following on from the editors' very useful introduction, each of the seven subject areas (e.g. forces, atomic physics, waves) has its own chapter and, while they share a common format, they can easily be read as stand-alone sections, perfect when scoping out a less familiar area or as a quick refresh after a break. I particularly like the way that the separate voices of authors of the individual chapters can still be heard: the precise technical voice of the Energy chapter for example contrasting with the slightly more easy-going approach used in the Earth in Space chapter.

While the resource is ideal for newly qualified teachers, or teachers of general science (or those with little prior science teaching at all), being asked to deliver a physics topic for the first time, even the most experienced of physics teachers will find something to bring to their teaching. For my part, I especially welcomed the '*Science in context*' boxed asides, which gave me useful info nuggets or craft knowledge I didn't know (or perhaps had long forgotten). Often these describe contributions from less widely known scientists of yesteryear, hopefully aiding the incremental improvement in the diversity of people 'doing physics' going forward.

Each chapter ends with a selection of resources, including online resources and references, so you can read up on the more academic research angles if you wish. Glossing over an unfortunate typo for a unit given as '*meters/second/second*', a mislabelled I–V characteristic, and a personal pet peeve of calling a 'cell' a 'battery', overall, I have nothing but praise and suggest each physics department acquires this newest edition. Then bring it to the attention of current teaching staff and be proactive in sending newer recruits to the department away with the copy for a spot of light holiday reading before the start of the next term.

Ian Francis



Understanding Chemistry Through Microscale Practical Work

Bob Worley and David Paterson with Sarah Longshaw
Hatfield: Millgate House Education, 2021
120 pp. £25.00
ISBN 978 0 86357478 8

Many familiar chemistry class practicals have a microscale version. For example, one drop of universal indicator solution is added to one drop of dilute hydrochloric acid on a laminated worksheet, or half a spatula of a mixture of iron and sulfur are heated in an ignition tube. This style of practical work received a boost 25 years ago when the Royal Society of Chemistry published a collection of mostly key stage 5 (ages 16–18) practical ideas called *Microscale Chemistry: Experiments in Miniature* by John Skinner. This new collection of 42 mainly key stage 3 and 4 (ages 11–16) experiments is written by two CLEAPSS advisers, Bob Worley and David Paterson. It is well illustrated with colour photographs and will be most useful to chemistry technicians. In the world of microscale, the chemistry technician is very much expected to improvise and innovate. The book is particularly good on those important little details such as

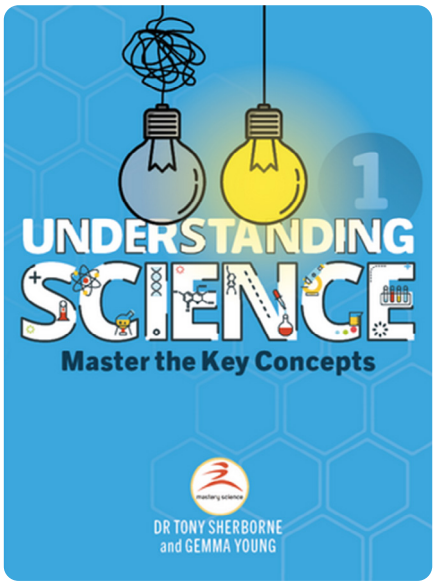
how to convert beer bottle caps into tiny crucibles or convert a plastic pipette into a miniature burette.

As well as microscale, this book also harks back to the educational philosophy of Alex Johnstone, Professor of Science Education at the University of Glasgow before he passed away in 2017. Johnstone's 'chemistry triplets' help teachers map out the cognitive demand of various ideas in each topic. The three corners of the triangle correspond to macrochemistry (the things learners see in experiments or in real life), sub-microchemistry (concepts used to explain real life such as atoms, molecules, energy, etc.) and symbols (representations such as chemical formulae, balanced chemical equations or valencies). Johnstone underlined how learners often enjoy the 'fun side' of chemistry (doing experiments and relating things to everyday life) but come unstuck when manipulating the more abstract theoretical ideas involving tiny particles, moles and chemical formulae. Topic by topic, this book discusses how teachers can adopt a meaningful discovery-learning approach and overcome this barrier to understanding chemistry.

There is a chapter on electrolysis, but I am surprised that they insert the electrodes horizontally. Artur Liszka and Peter Cuss, two excellent chemistry technicians at my school, insert very short (1 cm) pieces of graphite rod vertically into a Petri dish lid (which dip conveniently into a tiny plastic tray containing sodium chloride solution) to generate small quantities of chlorine gas. A piece of damp litmus paper inside the dish gets bleached white. It's the quickest and easiest way for a class to carry out the test for chlorine; quite often, the microscale method is best.

This book is an authoritative, carefully written, up-to-date guide on all things microscale. Chemistry technicians will be motivated by the top tips and inspiring ideas. Chemistry teachers will be drawn to the Johnstone triangles for various GCSE chemistry topics. It is an essential practical guide for all school science departments.

Anthony Hardwicke



Understanding Science: Master the Key Concepts

Tony Sherborne and Gemma Young
Milton Keynes: Mastery Science, 2021
145 pp. £11.99
ISBN 978 0 95668107 2

With a bright, engaging cover, I was happy to investigate this book further as soon as I opened it. Billed as '*more than a textbook*', it aims to improve pupils' deeper knowledge of concepts in science, in order to allow them to access higher grades. Excellent idea and one that is notoriously difficult to address. Just how do we deepen pupil's understanding, and how can we make sure that the learning can be accessed and applied later down the line?

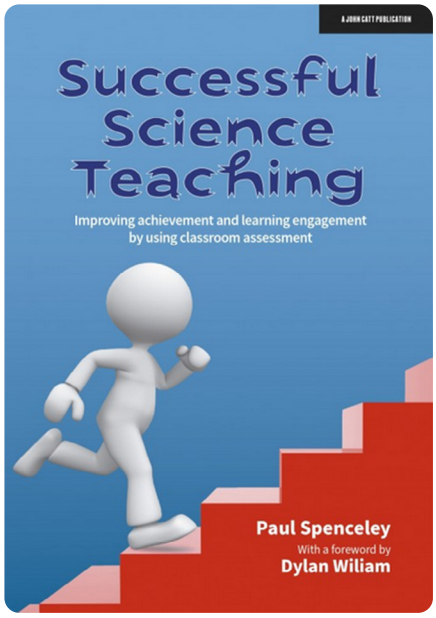
The book states that it covers all the key concepts in year 7 (ages 11–12), which gives a broad range of curriculum coverage, ranging from cells to forces; however, it does assume that you are teaching these things in year 7. With such a multitude of schemes of work currently being used at key stage 3 (ages 11–14), it is very hard to find resources that match your requirements exactly, so this wouldn't necessarily completely fit the bill, but the fact that each double-page spread can stand alone is very useful indeed. The first spread in each chapter reviews what the pupil might know already, being described as '*activated knowledge*'. Each of the following spreads are then about one idea, with main ideas and linked ideas easily identifiable. This is followed up with around five review questions (answers not included), and the title of each spread contains a key question/puzzle, which is concluded in the review questions. Recall and application questions follow each section, although again answers are not included.

I like the appearance of the pages, and keeping a section to a double-page spread always works well. There were too many graphics on some pages, which might leave some learners thinking they are lacking detail. One of the strategies described at the beginning of the book is to check your understanding by answering the questions, which is obviously difficult if the pupil can't access the answers and doesn't support use of this book as an independent resource. As a teaching resource I could see myself using the spreads as and when required in a number of ways: as a literacy tool, as a revision sheet, or as a summary at the end of a topic. I would not use it as a textbook as I need something that matches my scheme exactly; however, I would recommend it as booster material for pupils who need to secure their basic understanding.

Pupils who looked at this book with me were very positive, and really liked the suggestions of how to memorise things, and information on how science

concepts are relevant to everyday life. A useful addition to your textbook collection should you teach at key stage 3.

Kate Power



Successful Science Teaching: Improving Achievement and Learning Engagement by Using Classroom Assessment

Paul Spenceley
Woodbridge, Suffolk: John Catt Educational, 2022
240 pp. £15.00
ISBN 978 1 913622 96 1

In the foreword of this book, Professor Dylan Wiliam says, '*I found much that was new, with great insights into the practicalities of formative assessment in real classrooms*'. The book is full of ideas based on the author's years of experience in the classroom, combined with his involvement in the King's–Medway–Oxfordshire Formative Assessment Project, led by Paul Black, Dylan Wiliam and Christine Harrison. The aim of the book is to make any science teacher reflect on their teaching from an unfamiliar perspective and I think that the author has achieved this. Although the target audience is all science teachers, the content and examples make it a more suitable resource for secondary colleagues.

The book is divided into six chapters: Planning and learning; *Questions and discussions*; *Feedback*; *Peer- and self-assessment*; *Linking summative and formative assessment*; and, finally, *The proof of the pudding*. It focuses on classroom-based assessment for learning, and there is a helpful clarification of what this term (along with summative assessment and formative assessment) means to the author and how he has employed it.

As someone who has taught science for about 20 years, I found lots to reflect on and consider in terms of my own practice. When reading the chapter on lesson planning, for example, starting to plan by focusing on what successful learning will look like, and sharing this with students, is planning for learning rather than planning for teaching. Focusing on the learning that takes place in your classroom, rather than teaching approaches, gets the reader to think about how to approach lesson planning and the learning activities for successful learning. Throughout the book there is a focus on assessment for learning and how to get students more involved and responsible for their learning. Readers will be familiar with the approaches and techniques described, but the ideas on how to use them represent a slightly different approach. At the time of writing this review, most schools are in the 'revision season', so the chapter on linking summative and formative assessment is particularly relevant. The use of smart revision sheets, the MARCKS concept for marking summative assessments, and the small-steps techniques are certainly ones that I will be recommending to my colleagues to help support our students as they approach external exams for the first time since the COVID-19 pandemic.

Successful Science Teaching is different from other available books on assessment for learning. It is not a checklist of ideas to try out and tick off as 'done', but more a handy collection of ideas worth trying out or revisiting. Each chapter reads like a conversation in your head, as though the author is talking you through each of the ideas in turn. In doing so, the book would be very useful for newly qualified teachers as well as experienced colleagues, and would be a good title to study and discuss during departmental CPD. It is great to have a book that focuses on science learning rather than trying to apply generic examples to the science classroom or lab. Highly recommended.

Gill Clarke

Reviewers

Gill Clarke teaches biology and physics to A-level and is studying part-time for a doctorate in education.
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Anthony Hardwicke teaches GCSE and A-level chemistry at Bradfield College.
Kate Power is a head of science in a school in north-west England.
Sarah Wood teaches biology in north-west London.