AQA GCSE Biology – Student Book Evaluation

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Introduction

The new GCSE science courses for first examination in 2018 represent a significant shift in emphasis. Well-written textbooks can provide fantastic support for students and teachers alike. They supplement great teaching; provide an accessible and practical resource for students; give a wide range of opportunities to develop the skills, knowledge and understanding of the subject and, last but not least, provide interest and inspiration for the reader. This article explores the new AQA GCSE Biology Student Book from Collins, to see how it measures up.

Structure

The student book takes us on a journey through the biology content and has been reordered from the AQA specification so that it flows in a sequence for learning and progression. Organised into chapters and double page spreads, the format might appear unadventurous but, actually, a great deal of of thought has clearly gone into the publication to ensure that it covers all bases.

The useful “How to use this book” section at the start draws the reader’s attention to the key features of each double page spread. Each spread identifies the learning objectives in clear accessible language as well as the key words. Each spread contains three sections of increasing difficulty and, after each section, questions help the student and teacher to check that the ideas have been grasped. Higher tier content appears clearly in separate boxes.

“Key concept” pages set the scene and present the core ideas for each chapter. In aiming to leave no stone unturned the book also covers all the required practicals and maths skills; it provides differentiated checklists and worked examples for answering questions. Each chapter is rounded off with a set of wider reaching questions.

A good balance is struck between accessibility and interest for talented students. The photographs and illustrations are well chosen to spark interest, although bigger ones would enhance the effect further! Once having drawn the student in, there is plenty to stimulate further thinking.

Progression

We all will have our own opinions on the best order of topics for teaching, but the approach here is sensible and useable. Decisions have been made for the reader about where key concepts appear. For example, diffusion appears as a key concept in Chapter 2 “Photosynthesis.” This provides a suitable context rather than dealing with it in an isolated

way. Opportunities are taken to revisit and build on the key concepts; for example, diffusion is revisited in Chapter 3 when osmosis is covered.

Working and thinking scientifically

The book encourages students to consider the role of evidence in our understanding of science. Uncertainties are explored; for example, data are presented about the inheritance of earlobe shape and why it cannot be stated conclusively that a single gene is involved.

The eight required practicals on the AQA Biology specification are supported by fairly open activities, which set the overall form for each practical but leave the student to make a range of decisions and think scientifically. The learning objectives for each required practical encapsulate the *Apparatus and Techniques* from the AQA Specification, but does so in simplified wording. The required practicals on their own will not properly develop and embed a full range of practical skills so most teachers will rightly have far more practical activities. The teacher guide identifies, supports and encourages many other opportunities for practical and investigative science, in addition to the required practicals, guarding against schools doing the bare minimum.

Developing higher level thinking

The learning objectives at the start of each spread include command words such as “explain”, “evaluate“ and “interpret”, and so remind the reader that there is a lot more to biology than just “knowing“. The questions ramp up in difficulty and the teacher can easily direct students straight to ones offering appropriate challenge. Teachers may wish to supplement the questions with others to further develop wider skills such as evaluating and synthesising. Many of the photographs are captioned with a thought-provoking question. The “check your progress” section in each chapter is a useful tool for students and teachers.

Preparing students for all the assessment objectives (AO1-3)

A nice touch is provided by the worked examples of exam-style questions using student-speak answers with annotations. They encourage the student to give detailed and precise answers and the tone is positive, friendly and not at all patronising.

The questions at the end of each chapter are linked to the assessment objectives (A01 to A03) and give extensive opportunity to practise different styles of questions. As the teaching profession becomes familiar with the new style of assessment, this provides a useful starting point.

AO1 (knowledge and understanding) with its 40% weighting is very well supported. Students and teachers can draw from a range of activities in the book to develop the remaining 60%: AO2 (applying) and AO3 (analysing, interpreting, evaluating, concluding and improving). However, teachers would want to ensure that their schemes of learning and plans have frequent opportunities to focus on these areas.

Development of Maths Skills

Most teachers will probably welcome the inclusion of maths skills dotted throughout the book. Rather than embedding them within double page spreads and risk them being lost, the maths skills are highlighted in their own spreads within the context of the surrounding lessons. They go a long way to supporting the student. However, the teacher will still want to help them with the language differences they may encounter compared to their maths lessons and also with the mathematical processes. The ASE publication "The Language of Mathematics in Science", available from Spring 2016, should prove to be the perfect companion for teachers in these respects.

Conclusions

We all know that there is no substitute for great teaching, but the Collins AQA GCSE Biology Student Book is an engaging and very useful resource to help teachers and to support students' learning. Please don't mechanically plod your way through one spread per lesson (as if you would!), but combine the use of this book with teaching that develops the full range of skills. Whether being used at home by a student or in class with a teacher, this book has a lot to offer.

Collins AQA GCSE Chemistry

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Following the major overhaul of the science GCSE specifications, it is refreshing to see that Collins has responded appropriately by completely rewriting its textbooks. This evaluation of the AQA GCSE Chemistry takes a fairly detailed look at how the textbook meets the needs of the new specification with its higher demand. The book is quite lengthy at around 360 pages, but it uses these well to cover the specification content whilst giving good support for assessment, mathematics demand and required practicals.

The book is structured as ten chapters, which match the ten areas of the AQA specification. The first chapter of the book quite rightly deals with atomic structure and the periodic table, as these are fundamental concepts for the whole course. Each chapter consists of a series of spreads that cover the content of the specification and the demand builds progressively throughout each chapter. At the start of each chapter, there is a useful spread that summarises prior learning and relates this to ideas that students will meet in the coming chapter. Towards the end of each chapter, there is a 'key concept' spread, which focuses on a core idea in detail, and is highly relevant to the topic. Each chapter also has a maths spread, which addresses maths skills relevant to the chapter.

Chapters may have one or more required practicals built in, dependent on where they fall within the specification. At the very end of the chapter, there is a useful differentiated self-assessment task for students, which enables them to check their progress. This is followed by a series of questions, the first page of which provides students with worked examples. These emphasise good examination techniques and model 'good' and 'bad' answers. Each part-question has the relevant *Assessment Objective* identified and this is a very useful addition, focusing teachers and students on the need for application, analysis and synthesis skills.

Each spread is laid out with a good amount of white space and the content is arranged as broadly two columns per page. The text is readable, with relatively short sentences that avoid unnecessarily complex structures. The text generally is aimed at students of all abilities.

Following the title of the page, there are learning objectives that are phrased clearly for students. The command words are as we might expect, using words such as 'recognise', 'explain', 'describe', 'compare' and 'calculate'. Also, at the top of each page, key words for the spread are identified, which again are very useful for students. The page is split into three differentiated levels, which are clearly identified by headings in different coloured fonts. The first section heading has a green font, denoting the work as standard demand for all students. It consists of text and pictures, but also has appropriately targeted questions. The second section heading is in a blue font and is of intermediate demand. Once again, there are appropriate level questions for this section. The final section, which has a heading in maroon font, is the most demanding part of the page, targeted at the most able students

and higher tier work. The questions at this level are very demanding, requiring students to use higher level thinking skills. Each page also has a '*Key information'* section, which is highly useful to students and a *'Did you know?'* box, which gives students interesting snippets of information. Occasionally, a *'Did you know?'* box will suggest a research task for students. Also to support research, there is a suggested Google search at the bottom of each right-hand page.

The end-of-chapter questions are nicely differentiated into four levels. These are '*getting started*', '*going further', 'more challenging'* and '*most demanding*'. The '*most demanding'* questions in particular are very high demand and require the students to draw together information and ideas from across the chapter and possibly from earlier chapters. For example, students are asked to explain why the atom with the electron pattern of 2,8,6 is a non-metal and why it is less reactive than the atom with an electronic pattern of 2,6 or 2,7.

The mathematics spreads are a welcome addition to the textbook and complement nicely the maths that appears within the text itself. For example, the maths spread in Chapter One deals with the standard form and making estimates. It covers the mathematics skills well, but also explains why those mathematics skills are so important in science. Once again, there is good differentiation throughout the spread, with the final section demanding a higher level of mathematical understanding and application. For example, students are required to multiply numbers in standard form together and apply standard form numbers in an unfamiliar context: calculating the length of a mole of atoms arranged in a line, given the Avogadro number and a figure for the atomic radius in standard form.

Required practicals are addressed by separate dedicated double page spreads. The title of the required practical matches exactly with that within the specification, as might be expected. However, the required practical is treated as a learning experience for students, developing their *'working scientifically'* skills rather than acting purely as a practical activity. Each spread has its own separate learning objectives and the spread is differentiated in a similar way to other pages, very nicely avoiding a recipe-type approach to the required practicals, and requiring students to think about aspects of the investigation rather than guiding them through it step by step. Not only are they required to perform the practical, they are also required to analyse the results of the practical and suggest improvements to the investigation by applying '*working scientifically'* principles. The teacher guide also identifies support and encourages many other opportunities for practical and investigative science in addition to the required practicals, guarding against schools doing the bare minimum.

In conclusion, the textbook has much to offer students of all abilities. In particular, the most able students are well catered for as might be expected from a single subject textbook, but the differentiation of content and assessment tasks will work well for lower ability students. It consists of a good balance of information and assessment, and nicely supports key ideas in chemistry and in the mathematics that supports it.

Collins GCSE Physics for AQA

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To match the new GCSE specifications, Collins has worked in close partnership with AQA to produce its new series of textbooks. Dedicated and bespoke pupil books have major advantages over generic textbooks, and this becomes apparent as one works through the Collins-AQA physics textbook. Firstly, the content exactly matches the specification and, more subtly, but just as importantly, the terminology used by the textbook is also an exact match. For example, the specification refers to '*energy stores'* (rather than stores of energy) and uses the energy transfer model in preference to the energy transformation model throughout. This terminology is rigorously applied throughout the textbook. With these points in mind, we can explore the book in more detail.

The book is divided into eight chapters, which match the eight sections and the order of the AQA physics specification. This feature is helpful for planning learning routes through the course, making the process a little easier to develop and audit. Of course, this means that classes will move backwards and forwards through the book rather than following the book sequentially spread by spread.

The structure of the book matches the style of the biology and chemistry books in the same series. Each chapter in the book begins with a spread that reminds students of previously encountered ideas and serves as a taster for new ideas that they will meet within the topic. The spread provides a useful road map for the coming chapter, breaking it down into separate, smaller sections.

Content spreads are appealing with a good amount of white space. They follow a two-column format with writing on the left of each page, and diagrams, photographs and additional information in a narrower column on the right. The content of each spread is neatly differentiated into three different levels distinguished by green and blue and purple coloured fonts for the section headings. All pupils should be able to access the green section, most should access the blue and the some students the purple. Each coloured section has questions that are targeted at the appropriate level. The physics concepts and vocabulary are similarly differentiated in these different sections. This differentiation is helpful for directing students to the relevant sections, and also provides students with an element of challenge. The photographs and diagrams are clear and stimulating, although at times one wishes they were a little larger. In saying this, the overall impact of larger illustrations would make each spread more crowded and less accessible.

Each content spread begins with the title, learning objectives and key words. These key words are emboldened where they appear within the text and this focuses students on the most important vocabulary in the spread. Learning objectives are clear, using command words such as '*explain*', '*identify*', '*describe*' and '*calculate*' although, occasionally, less useful command words such as '*understand', ' know'* and '*find out'* creep in. However, most teachers will use the learning objectives to derive useful and differentiated learning outcomes for the students within their classes.

There is an interesting mix of historical and highly topical information. For example, on several *key concept* spreads, there are historical references to scientists who make significant contributions to physics. Another page makes reference to the use of a hay-box for cooking as a fuel saving measure recommended by the War Office during the Second World War. However there is also contemporary and topical physics referenced, such as the smartphone accelerometer chip and the shale gas debate.

Each chapter contains one or more *Key Concept* pages, which address areas of highest importance, greatest confusion and identify and tackle common misconceptions. This is particularly helpful for both students and teachers. For example, within the electricity chapter, the *Key Concept* page addresses the difference between potential difference and current. As with other content pages, *Key Concept* pages have learning objectives, key words and are differentiated by colour.

Required practical tasks are addressed through dedicated spreads that guide students through the tasks rather than prescribing methods. They are carefully designed to stimulate students' *working scientifically* skills and would work well as formative assessment tasks.

Each chapter contains one or two maths spreads that address the maths skills required within the chapter. These serve to remind teachers and students of the importance of the mathematics aspects within the new GCSE specifications and their inclusion is most welcome. The maths spreads focus on the skills most associated with physics, such as drawing and interpreting graphs, rearranging equations ratios, variable and estimation. Some, such as graph skills, are visited more than once.

The concluding pages to each chapter provide students with a self-assessment matrix, worked examples and questions. The self-assessment page is differentiated by colour to match the colours within the spreads and supports students in assessing their progress within the chapter. I suppose the important thing is that pupils have a particular idea that tracks across from green to blue to purple. The worked example is effectively an exam-style question with specimen answers, but also contains a commentary. For example, some sample answers are deliberately wrong, but the commentary explains to students *why* the answers are wrong, perhaps giving examples of better answers. End-of-chapter questions are differentiated into four levels: '*Getting started*', '*Going further*', '*More challenging*' and '*Most demanding*'. As one would expect, questions increase in demand with the *more challenging* and *most demanding* questions requiring students to explain quite complex ideas: for example, '*A star has a core of nickel and iron. Describe what will happen to the star',* a question demanding knowledge of the star life cycle and an understanding of how the starting mass of a star affects its final demise.

In conclusion, the textbook covers the content and delivery of AQA physics GCSE well and supports assessment throughout. It addresses the increased maths demand, conceptual demand and working scientifically in an efficient and effective manner.