

## Teachers Guide to *How Science Makes Money*

The *How Science Makes Money* series of assignments provides teachers with a resource specifically designed for the new GCSE in Applied Science and for the updated Science AVCE. *How Science Makes Money* helps the student to develop a broader knowledge and understanding of the science sector, and how science is applied in commercial situations. 'Money and Medicine' to name just one example, shows students the huge importance of the UK pharmaceutical industry. The assignment develops the student's ability to *record and analyse scientific data* (GCSE in Applied Science unit 1.4) and specifically addresses *Science in the workplace* (GCSE in Applied Science unit 3.1, AVCE unit 1). *How Science Makes Money* can also be used to enrich other science courses and as a resource for General Studies, Business Studies and other courses.

### Resource overview

The table below shows *How Science Makes Money* assignments mapped against vocational science specifications. Please note that additional vocational science specifications are likely to be approved shortly while specifications from the WJEB are waiting for a decision by the Welsh Assembly to 'dis-apply' the National Curriculum Order for Science in Wales.

How Science Makes Money assignments	GCSE in Applied Science			Advanced VCE		
	AQA	Edexcel	OCR	AQA	Edexcel	OCR
What Scientists do	3.1	n.a	3.1	1	1	1
The purpose and success of a science based business	3.1	n.a	3.1	1	1	1
Local science-based organisations	3.1	n.a	3.1	1	1	1
Investigating a science-based Organisation	3.1	n.a	3.1	1	1	1
Science Based Business: Size, Scope and Moral Science	3.1	n.a	3.1	1	1	1
Money and Medicine: the Pharmaceutical Industry	1.4, 3.1	n.a.	1.4, 3.1	1, 6	1, 6	1, 6
Johnson Matthey: world leader in advanced material technology	3.1	n.a.	3.1	1 (16)	1 (16)	1 (16)
BAE Systems: largest defence company in the world	3.1	n.a.	3.1	1 (9,16)	1, 21	1
GlaxoSmithKline: dissecting a multinational	3.1	n.a.	3.1	1 (16)	1 (16)	1 (16)
BASF: the 'Verbund' philosophy	3.1	n.a.	3.1	1 (16)	1 (16)	1 (16)

### Using *How Science Makes Money* in the classroom

The *How Science Makes Money* assignments are designed to be stand-alone activities. The overview of the assignments shows that they are particularly useful for approaching unit 1, Investigating Science at Work, of Applied Science AVCE and unit 3, Science at Work, of the new vocational applied science GCSE.

Within some of the assignments under the heading, **Notes for Teachers**, are additional suggestions for how you can adapt and extend the student activities given in the main text of the assignment. Details of **resources**, such as the Institute of Physics CDRom - *Scientists in Business* - are also listed where appropriate.

### A warning about web addresses

All web references were correct at the time of developing this resource (January-February 2002). URLs for home pages rarely change. However, pages within a website sometimes do.

From GCSE in Applied Science (unit 3)

#### ***Science in the workplace***

*Vocational science is the science and skills used by people in a wide variety of jobs. Those with a major job role in science may classify things, obtain or make things, and monitor and control changes. The more scientists know about the materials and equipment they work with, the more effective they can be. Scientists tackle problems, sometimes straightforward, often complex. This requires employing scientific skills and knowledge, coupled with imagination and curiosity. However, there are many people, who use science in their work, that we do not think of as scientists. For some it is a significant part of their work (eg nurses, engineers), for others it plays a smaller part (eg photographers, chefs, gardeners).*

*You need to:*

- *identify local, national and international businesses and service providers that use science*
- *put their employees into one of three classes: major; significant; and small users of science*
- *find out where the organisations are located and why*
- *identify the types of scientific activity that are carried out and the job titles and qualifications of the people who perform them*
- *find out what skills scientists need in addition to their qualifications*
- *find out what careers are available in science and science-related areas (VGCSE unit 3)*

### An overview of the assignments

#### ***What scientist do***

This is a single lesson session to define what scientists do. Following a brainstorming exercise, the students draw up categories and sub-categories defining what scientists do.

***The purpose and success of a science-based business***

Specified Web resources provide the student with the necessary information to answer the question: what are the criteria for running a successful science-based business? The student is guided through a number of steps and team based activities to arrive at an answer.

From AVCE in Science (unit 1)

***You need to be able*** to identify local organisations that obtain, manufacture or process products for sale. (If they cannot be found locally you should identify regionally based organisations.) Examples of how organisations obtain, manufacture or process products might include

- *obtaining products from plants, animals or micro-organisms*
- *extracting resources, for example water, gas, oil, gravel, clay, stone or minerals*
- *producing chemicals or products derived from chemicals, for example paints, dyes, fertilisers, plastics*
- *producing pharmaceuticals, for example medicines*
- *producing mechanical or electrical devices*
- *refining materials used as energy resources*

***Local science-based organisations***

The student is required to identify local science based organisations and businesses. The information resulting from this research is represented in the form of a poster, database or audio-visual presentation.

From AVCE in Science (unit 1)

***You must also be able to*** identify local organisations that use science in providing services. Examples of services might include

- *promoting the health of individuals*
- *using and conserving the environment*
- *monitoring of environmental conditions*
- *animal welfare*
- *analysing materials and substances*
- *providing means of communication*
- *providing education in science and technology*
- *distributing and selling food and other products*
- *distributing energy resources*

***Investigating a science-based organisation***

Students conduct a case study of an individual science-based organisation (such as a hospital or a manufacturer) in order to produce a report that details the type of scientific work carried on and the relationship of the organisation with its local community.

From AVCE in Science (unit 1)

*Scientific knowledge and skills may be applied in many different ways within an organisation. Sometimes the processes used require scientifically qualified people to carry them out (for example analysing samples in a hospital laboratory). Sometimes the processes or products may*

*have been developed by scientists, but the people who use them do not need to be scientists (for example production workers in a bakery).*

***Science based business: size, scope and moral science***

The student is shown how to produce an illustrated report describing the history and present condition of a large science based multinational company such as Syngenta or Unilever.

***Money and Medicine: the pharmaceutical industry***

This assignment is a data comprehension exercise that looks at drug sales and the impact of pharmaceuticals on health in the UK. Working through the questions reveals a number of surprising facts about the pharmaceutical industry and the NHS.

***Johnson Matthey: world leader in advanced material technology***

Students are guided around the Johnson Matthey website, collating information for a PowerPoint presentation.

***BAE Systems: largest defence company in the world***

In this assignment the student investigates a multinational, science-based business. A scenario is painted of the company responding to 'bad-press'. The student is given the task of working on behalf of the company and investigating the company in order to counter the negative press with some good news. The PR news story has to be backed up with real evidence.

***GlaxoSmithKline: dissecting a multinational***

In this assignment the student investigates a multinational, science-based business. Taking on the role of a public relations writer allows the student to represent and promote the company to an indifferent or even hostile public.

***BASF: the 'Verbund' philosophy***

This assignment guides through the BASF website – a German-based 'trans-national chemical company'. The company is guided by the all important "Verbund" philosophy. Students are asked to write and give a presentation about the company for school and college leavers.

**And finally ...**

This is the first edition of this particular resource and the authors will be very happy to receive your feedback and suggestions for improvements. They can be contacted at

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