STUDENT REVIEW OF THE SCIENCE CURRICULUM

MAJOR FINDINGS

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MAJOR FINDINGS

This report presents the main findings of a student-led review of the Science curriculum in England, a project conducted as part of Science Year.

The two key reports generated by the Review are available to download at www.planet science.com/sciteach/review

These reports were produced as a working collaboration between two national groups of students and Planet Science, the Science Museum in London and the Institute of Education, University of London.

The following people contributed to this report:

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Student panel 2001/02

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Student panel 2002/03

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INTRODUCTION

The Student Review of the Science Curriculum was hosted by the Science Museum and funded by Science Year. Students were in control of the review process at every stage, including a series of nine regional meetings that identified contentious issues in the Science curriculum, the development of an on line survey of 55 questions, a national conference at which the interim findings were presented to the Government and others and the production of the final reports.

This report discusses the findings of the online survey, placing them where possible in the context of previous research. The principal authors of this report are Ian Murray, the National Project Officer for the whole student review, and Michael Reiss of the Institute of Education, University of London. However, it needs to be emphasised that students were in charge of much of the writing of this report, as well as of the analysis that led up to it. Students also helped select the quotations given in this report and drafted the conclusions and ten recommendations with which we conclude.

Full details of the process of the student review are available in the report entitled **Student Review of the Science Curriculum – The Consultation Process.** The full questionnaire is included as an appendix to this report and can also be viewed online at **www.planet-science.com/sciteach/review** as an appendix to the Consultation Process report.

Many student respondents to the online survey provided textual comments. This findings report can cite only a small proportion of the several thousand comments submitted. Many of the comments were repeated; many were penetrating. The comments cited throughout this report were identified by the students who helped with the analysis as being particularly representative or as 'ringing true'. Throughout, occasional minor edits of students' spelling have been made to aid clarity.

Obviously, the findings reported here do not necessarily reflect the views either of Planet Science or of the Science Museum. However, we are confident that they make a valuable contribution to the debate about the future of the Science curriculum and how Science should be taught in schools.

WHO TOOK PART?

Over 350 students, aged 16-19, designed possible questions for a web-based questionnaire at regional meetings held across England. They came from state schools, from sixth form colleges and from private schools. Further education colleges were under-represented at these regional meetings. About two-thirds of those at the regional meetings were female. About two-thirds were studying Science post-16.

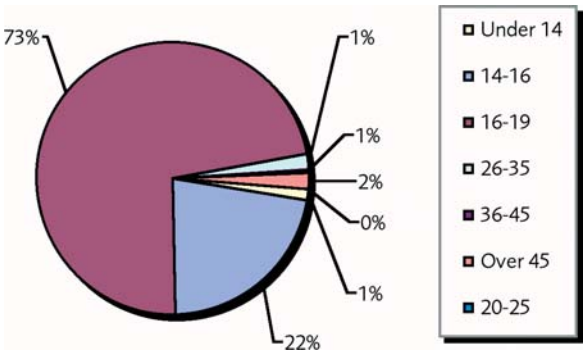
Meetings varied in size from under a dozen to over 130, with an average of around 35 students. A selection of these students made up a national group that was responsible for the final design of the questionnaire and for helping to analyse and report the interim findings. A further group of students helped complete the analyses and production of the final reports.

This report is based on the replies that were submitted between just before Christmas 2001, when the online survey went live, and 8th February 2002. In these six weeks, a total of 1,493 questionnaires were submitted. Most of the submitted questionnaires contained answers to the great majority of questions. However, not all respondents answered all questions. For this reason, sample sizes differ from question to question and are indicated by the 'n' values included throughout this report.

Analyses of the respondents' electronic addresses and the timings of submissions show that groups of students typically answered the questionnaire together. Sometimes this appeared as a tutorial activity since such groups included both science and non-science students. There were very few respondents outside school or college hours or from electronic addresses that were obviously from home computers. However, the candid nature of many of the replies suggests that schools and colleges did not normally censor the submissions.

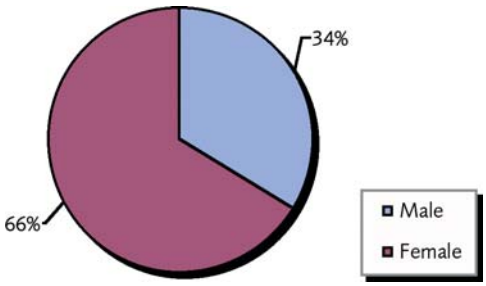
GENDER AND AGE DETAILS

The breakdown of those who submitted questionnaires by age and gender is shown below.



(n=1,479)

Fig 1.1 - Breakdown of respondents by age



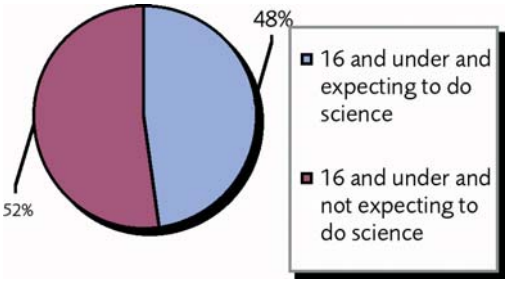
(n=1,467)

Fig 1.2 -Breakdown of respondents by gender

As can be seen, the great majority of respondents were in the main target 16– 19 age group. Just under a quarter were in the next age group targeted by the survey – the 14–16 year-olds. Analysis showed that respondent age rarely had any effect on the responses given. However, gender did sometimes correlate with responses and for this reason certain results below are reported by gender.

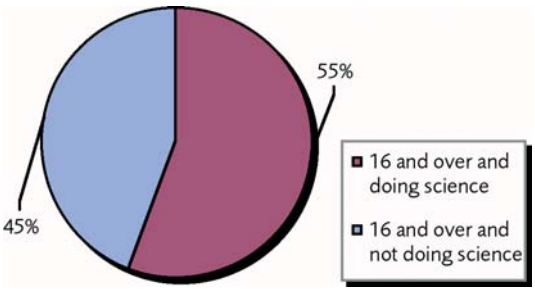
As the two following pie charts show, nearly half of the respondents were not science students or, for students who hadn't completed their GCSEs, did not expect to be science students. This shows that the review process reached a broad cross-section of students.

PROPORTIONS OF RESPONDENTS DOING SCIENCE



(n=329)

Fig 1.3 - 16 year- olds and under and science expectations

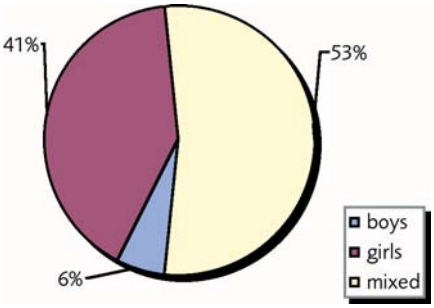


(n=1,077)

Fig 1.4 - 16 year-olds and over studying science

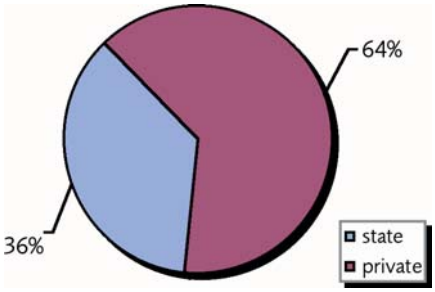
TYPES OF SCHOOL ATTENDED BY RESPONDENTS

The majority (64%) of declared respondents were from private schools. This is very different from the national picture where private schools account for only 7% of 11–16 year-olds and 20% of sixth formers. Only 53% of respondents were in mixed schools (nationally, the figure is 88%) with 41% in all-girls schools (nationally, the figure is 7%) and 6% in all-boys schools (nationally, the figure is 5%). All figures are for 2002 and from the DfES.



(n=1,317)

Fig 1.5 -Types of school attended by respondents



(n=866)

Fig 1.6 -Types of school attended by respondents

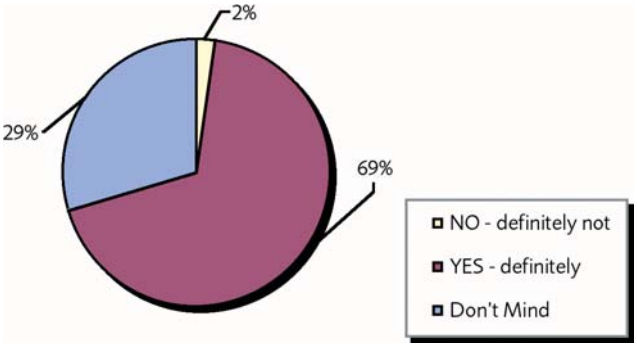
These patterns were not intended and reflect the greater difficulties in attracting involvement from the state sector (excepting sixth form colleges) and from mixed schools. Only 60% of respondents declared whether their school was state or private and examination of school names showed that non-responses were more likely to come from state schools (including sixth form colleges). No attempt has been made to 'normalise' the data reported below; all figures refer directly to the actual data obtained.

THE CONTENT OF SCHOOL SCIENCE

WHAT TOPICS SHOULD BE INCLUDED?

Whether school science should include controversial issues and, if so, how these should be taught is still a matter of debate among science educators (Levinson & Turner, 2001). However, it was very clear from the responses to question 12 on the survey 'Is it right to include CONTROVERSIAL issues such as genetic engineering or cloning in the science syllabus?' and from the regional meetings that students feel that the answer is 'yes'. Indeed, it is notable that only 2% of survey replies said that controversial issues should definitely not be in the science syllabus. This conclusion held up equally strongly in state schools (1% saying 'no') and in private schools (2% saying 'no').

CONTROVERSIAL ISSUES



(n=1,471)

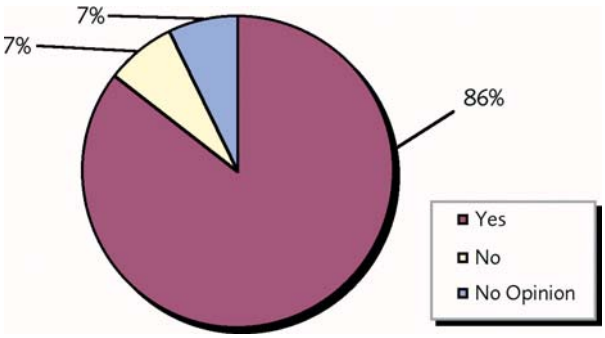
Fig 1.7 - Should controversial issues be included in science?

Students were asked **'What do you think about the amount of facts you have to learn in Science?'** (Question 44). The answers to this question flooded in, and a representative sample were picked out by the students:

- Too many facts have to be learnt without a full explanation of them.
- There are more facts than theory, it would be more interesting to understand why than how.
- I think that the GCSE is not geared to rewarding those who can understand and apply scientific knowledge but just to those who are able to remember the most facts.
- They are generally useful and are quite relevant but they are very exam based.
- Far too many irrelevant facts that I have now forgotten, in fact I forgot them about a week later, need to focus more on applying facts to situations so that they will be useful in real life and for the coming years.
- There are too many. To get a good grade you do not have to be a good scientist – just have a good memory.
- The facts are made easier to learn if they are applied to each other. The facts are necessary to move on to higher level science.
- I think that there is an awful lot to remember for the final exam which deters students from actually understanding science as they just aim to learn the syllabus off by heart.
- There is too much emphasis on rote learning – I think we should be asked our own views more.

DOING DISSECTION IN BIOLOGY

Dissection produced a hot debate at some of the regional meetings – some students wanted to do it in their schools and it was forbidden; others loathed dissection but said they had had to do it. In the end the students agreed simply to ask of each other **'Should you be given the choice to do dissection in biology?'** (Question 15). The answer was clear.



(n = 1,469)

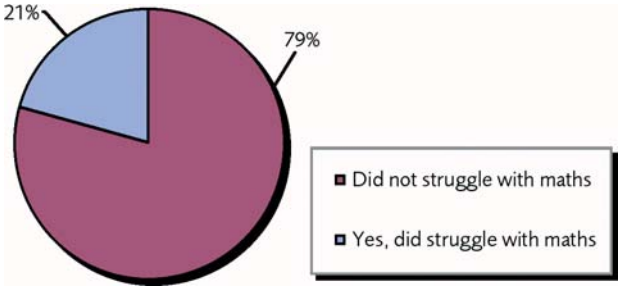
Fig 1.8 - Should students be given the choice to do dissection?

While a strict use of the term 'dissection' would include plant dissection, there is little doubt that animal dissection was meant here. Over the last 30 years, animal dissection in schools has become less common (Reiss & Beaney, 1992). Suggestions on dissection are provided in an Institute of Biology publication by Lock and Reiss (1996) who review arguments for and against animal dissection in schools. Here it is clear that what students definitely wanted was the option to choose whether or not to do dissection. This was particularly the case for females, 88% of whom voted 'yes' as opposed to 80% of males.

MATHS AND SCIENCE

Struggling with maths?

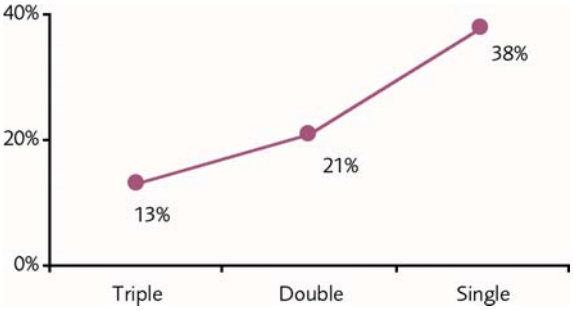
The issue of 'maths and science' proved to be nearly as hot a topic in discussion at the regional meetings as cloning and genetic engineering, and the students generated many questions around the issue of maths. At its simplest, the students were generally confident that their mathematics didn't cause them to struggle with their Science GCSEs.



(n=1,462)

Fig 1.9 - Did you struggle with your school Science due to a lack of understanding in maths?

Once the data had been further analysed, it was clear that, as one might expect, students taking triple award Science are the most confident about their ability in maths and students taking single award the least.



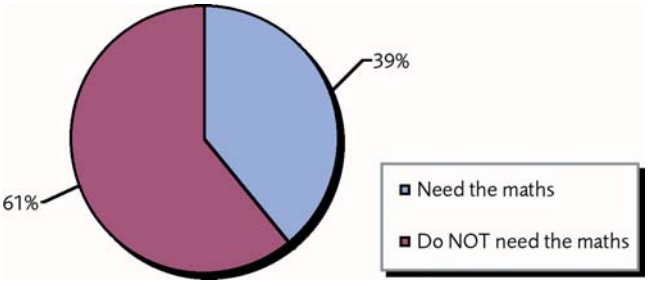
(n= 1,412)

1.10 - Percentage of students struggling in maths by course type

Another way of viewing these data is to say that single award students are three times as likely to report problems with maths as are triple award students.

SCIENCE WITHOUT MATHS

Interestingly, most students think that it is possible to do well in Science without maths. This seems counter-intuitive and may say something about the nature of the Science courses at KS3 and KS4 taken by the students.



(n=1,462)

1.11 - Can you do well in Science without maths?

STUDENT CONFIDENCE IN DIFFERENT AREAS OF MATHS

When the students looked at the specifics of certain features of maths – graphs, making equations, using formulae and basic calculations – overall confidence in maths seemed even more marked, with triple award students again being most confident.

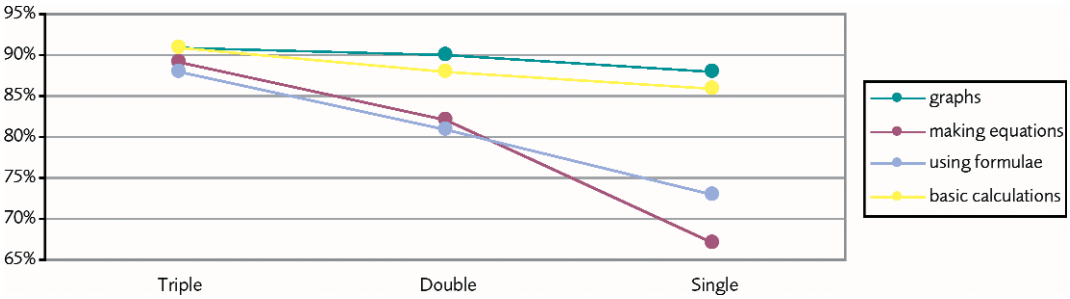


Fig 1.12 - Confidence at different aspects of maths in science

Percentages shown above are of students who felt prepared by their maths syllabus for different aspects of the maths used in science. Sample sizes are as follows:

	TRIPLE	DOUBLE	SINGLE
GRAPHS	342	995	77
MAKING EQUATIONS	344	987	76
USING FORMULAE	345	988	78
BASIC CALCULATIONS	342	987	76

THE TEACHING OF SCHOOL SCIENCE

STUDENTS' TEXTUAL COMMENTS

As discussed above, students' comments reveal a strong feeling that there is too much emphasis on the learning of facts in Science and that this emphasis is partly to fulfil examination requirements. When they were asked 'Do you feel that what you learn is exam-led?' (Question 4), 85% said 'yes' and only 15% said 'no'. There was little difference (just 3%) between state and private schools. When prompted by the questionnaire to comment further, students wrote about both the syllabus and how they would like to be taught:

- Smaller syllabus but with more detail into fewer topics.
- I think students will relate more to science if they understand how things work or are explained in everyday life.
- Being asked to put forward our own theories instead of just being told what was right.
- Varied and interactive lessons.
- Though smaller class sizes help, being taught in an enthusiastic manner works best.

THE NEED FOR BETTER TEACHING

The review did not explicitly ask about the quality of the teaching that the students had received. (Indeed, the facilitators of the regional meetings had specifically been briefed to exclude this issue.) However, in their textual responses to **'Do you feel that what you learn is exam-led?'** (Question 4), a large number of responses talked about the need for better teaching, whether through enhanced subject expertise, teacher continuity or teacher enthusiasm:

- A certified subject teacher.
- Teachers who know what they're talking about.
- Better teaching methods.
- A better teacher.
- A regular teacher.
- Teachers who are enthusiastic about science.
- Having just one teacher for physics instead of 7 over 2 years.

EFFECTIVE WAYS OF LEARNING

The students asked **'Which THREE of these methods of teaching and learning do you find the MOST USEFUL and EFFECTIVE in helping understand your school science?'** (Question 10), immediately followed by **'Which THREE of these methods of teaching and learning do you find the MOST ENJOYABLE as part of your school science?'** (Question 11). In each case, the same 11 possibilities were provided. Respondents were clear that what they most enjoyed wasn't always what was most useful and effective.

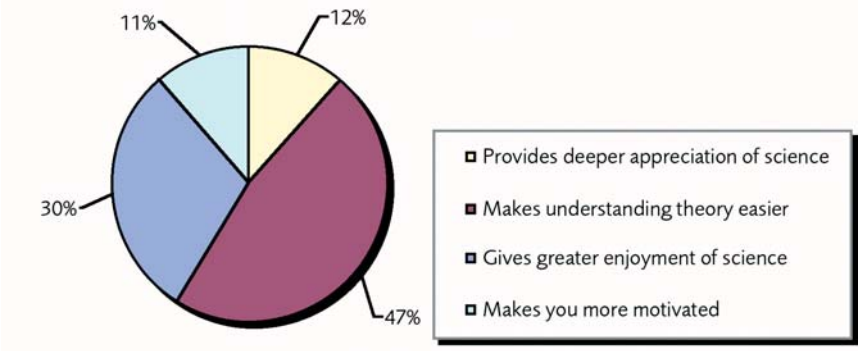
WAYS OF LEARNING	USEFUL AND EFFECTIVE (%)	ENJOYABLE (%)
TAKING NOTES FROM THE TEACHER	45%	15%
LOOKING AT VIDEOS	27%	75%
READING THE TEXTBOOKS	17%	18%
TAKING MY OWN NOTES FROM BOOKS ETC.	24%	13%
COPYING NOTES FROM THE BOARD	23%	17%
DOING A SCIENCE INVESTIGATION	32%	50%
MAKING A SCIENCE PRESENTATION IN CLASS	17%	43%
RESEARCHING SCIENCE ON THE INTERNET	8%	4%
GOING ON A SCIENCE TRIP OR EXCURSION	30%	85%
DOING A SCIENCE EXPERIMENT IN CLASS	38%	71%
HAVING A DISCUSSION / DEBATE IN CLASS	48%	64%

(n=1,450)

Students felt that while the three most enjoyable teaching and learning methods were (i) going on a science trip or excursion, (ii) looking at videos and (iii) doing a science experiment in class, the three most useful and effective teaching and learning methods were (i) having a discussion/debate in class, (ii) taking notes from the teacher, and (iii) doing a science experiment in class. The two methods that scored highly on both questions were having class discussions / debates and doing science experiments in class. It is interesting to note that by far the least effective method was identified as researching science on the Internet. This finding is important because government policies have been directing students towards online learning for a number of years (Frost, 1998), yet students are obviously not finding it effective at the moment.

It is clear that students enjoy doing practical work and find it an effective way of learning, as other researchers have found (e.g. Osborne & Collins, 2000; Reiss, 2000). When respondents were asked **'If the practical content of the course was increased, how would it MOST improve the learning experience?'** (Question 27), the most widely cited answer of the four options was that it would make it easier to understand theory.

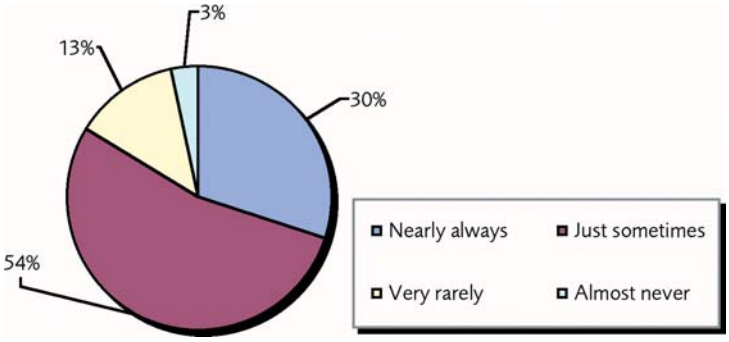
THE IMPORTANCE OF PRACTICALS



(n=1,451)

Fig 1.13 - How does practical work help?

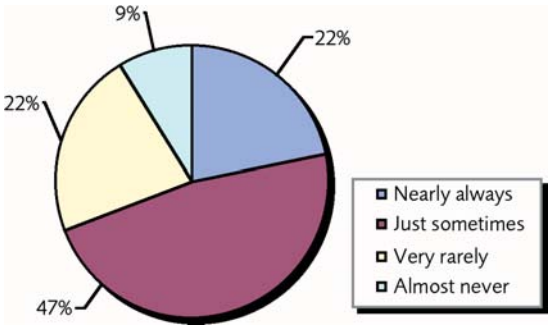
However, when they were asked **'Currently (or when you did your GCSEs), when you learn new theory is it backed up by practical experiments?'** (Question 28), the most frequent response was 'Just sometimes'.



(n=1,460)

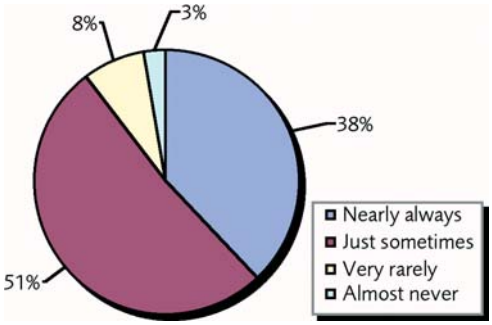
Fig 1.14 - Is/was your GCSE Science theory backed up by practical experiments?

Breaking down these replies by triple, double and single award Science shows that it is single award Science students who get the least practical work.



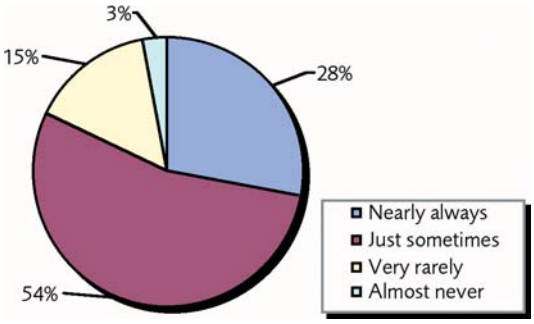
(n=78)

Fig 1.15 - Single award-doing practicals



(n=344)

Fig 1.16 - Triple award doing practicals



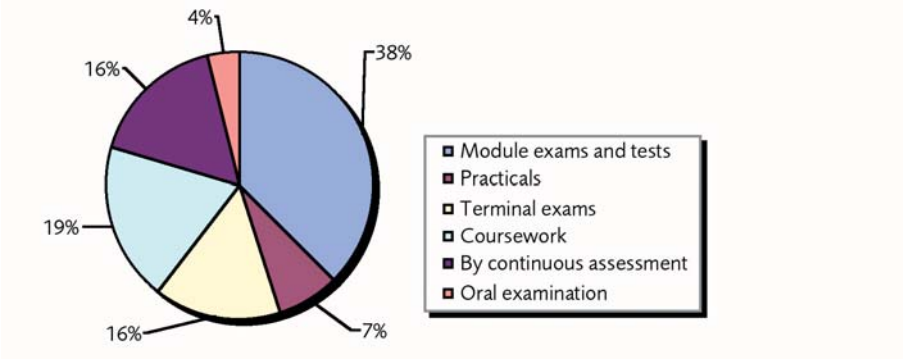
(n=989)

Fig 1.17 - Double award doing practicals

Overall, just 11% of the triple award students reported very rarely or never having practicals. However, this figure grew to 18% of the double award students and 31% of the single award students.

MODES OF ASSESSMENT

The students also asked of each other **'How do you MOST prefer to be assessed / examined in science'** (Question 8) and the replies are perhaps interesting in their 'conventionality'. The students did not seek any major change in the modes of assessment. It can be seen that module exams and tests get the largest endorsement. In the light of the views reported earlier about practical work, it is noteworthy how small the proportion of students is that would wish to have practical-based assessments.



(n=1,475)

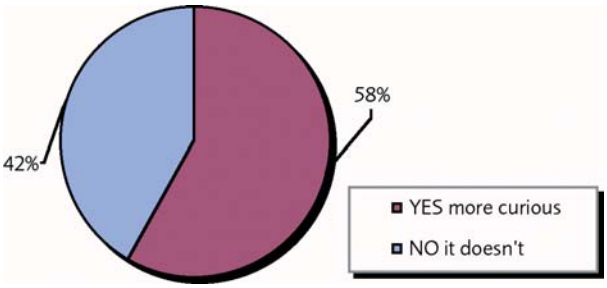
Fig 1.18 - How do you prefer to be assessed?

In the regional meetings, students frequently reported on the pressure to get the right results in practicals for GCSE coursework. Indeed, students frequently described how their own implausible or wrong practical results were substituted by the teacher's 'better' results. This is a far cry from what investigative work in school science is meant to consist of (Watson & Wood-Robinson, 1998). It may be these experiences which make students wary of extending assessment further into practical work, and more research would probably clarify these points.

GCSE SCIENCE

ATTITUDES TO SCIENCE

A number of the questions in the survey focused specifically on GCSE Science. One question asked 'Do you feel that GCSE Science lessons make you curious about the world and interested in finding out more?' (Question 51). Rather dishearteningly, 42% felt that GCSE Science does not encourage curiosity.



(n=1,434)

Fig 1.19 - Does GCSE Science make you curious about the world?

Further analysis reveals that among students taking double award Science, nationally by far the most frequently taken form of GCSE, the figure was 57%.

There have been many academic studies on students' attitudes to Science (e.g. Osborne et al., 1998) though such studies don't tend to suggest the wonderful range of adjectives that the students came up with in their possible responses to **'Do you find GCSE Science?** [tick all that apply]' (Question 50). It is extremely encouraging to note that the most frequently used of the 11 adjectives was 'interesting', followed by 'useful', 'relevant' and 'thought provoking'. It is important to keep this in mind when considering the criticisms the students make of GCSE Science.

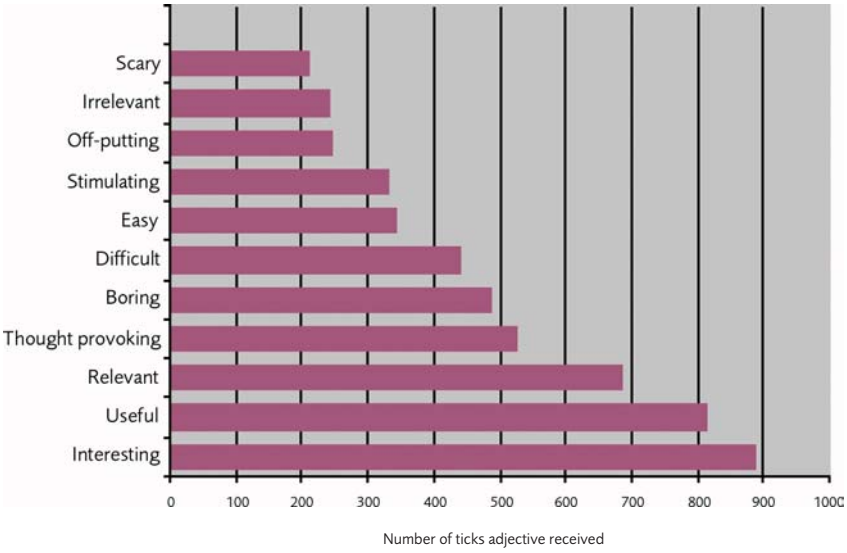
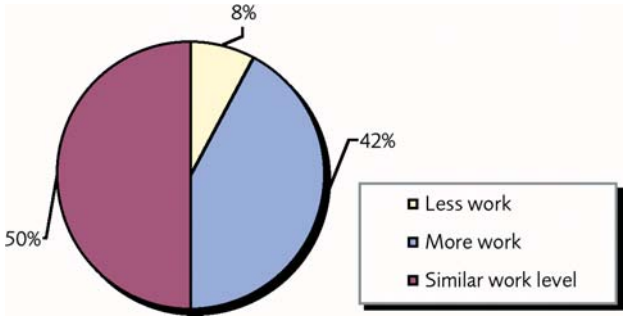


Fig 1.20 - Attitudes towards science

Cross-tabulating the responses to this question against those to the question that asked whether or not GCSE Science encouraged curiosity suggests internal validity. For instance, the most frequent adjective used to describe GCSE Science by students who wrote that GCSE Science does not encourage curiosity was 'boring'.

GCSE SCIENCE WORKLOADS

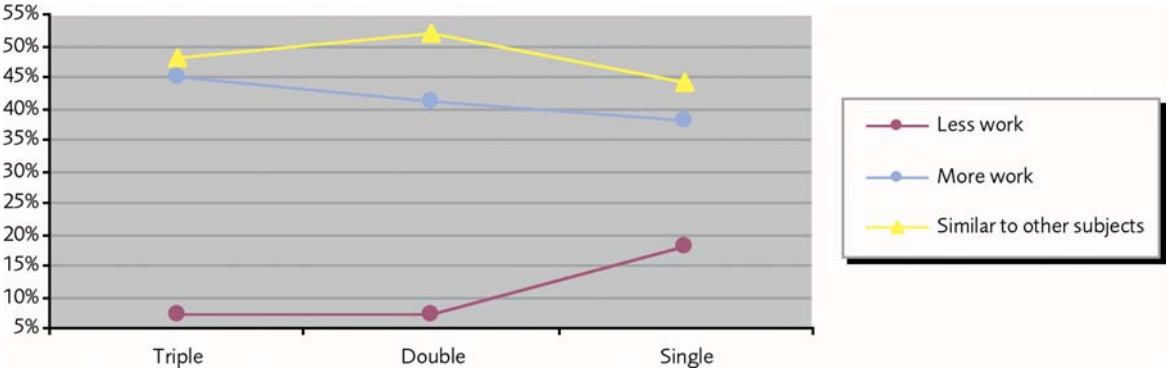
When students asked **'Do you think the workload in your GCSE Sciences is less than, similar or more than other subjects?'** (Question 49), it was clear that the workload in Science is felt to be either similar to or more than that in other subjects.



(n=1,440)

1.21 - The workload of GCSE Science compared to other subjects

Perhaps unsurprisingly, those doing triple award Science are most likely to find the workload heavier than in other subjects. Indeed, there is anecdotal evidence that in many schools, triple award Science receives proportionately less lesson time than double award does.

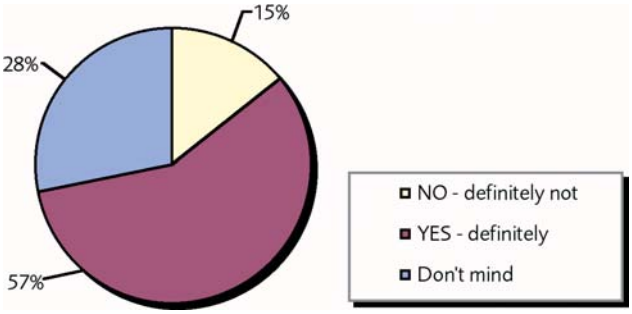


(n=1,401)

Fig 1.21 - Perceived workload compared by study award

ETHICS AND SCIENCE

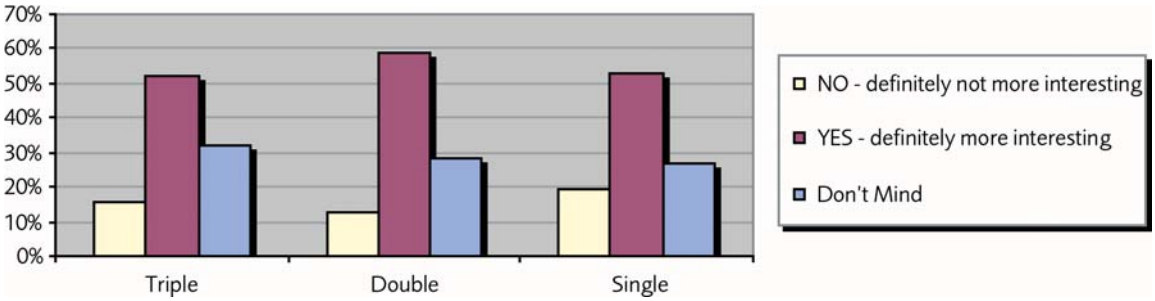
When it came to whether philosophy and ethics should be taught in GCSE Science, students were clear. Asked **'Do you think the introduction of discussions about philosophy and ethics (such as animal testing) would make GCSE Science more attractive as a subject?'** (Question 14), most answered 'yes'. However, it is noticeable that the demand for philosophy and ethics in GCSE Science is not as strong, as discussed above, as the demand for controversial issues in science generally (cf. Donnelly, 2002).



(n=1,467)

Fig 1.22 - Would discussions about philosophy and ethics make GCSE Science more attractive?

Interestingly, this request for more philosophy and ethics held up pretty evenly across triple, double and single award Science.



(n=1,414)

Fig 1.23 - Would discussions about philosophy and ethics make GCSE Science more attractive?

The results seem to indicate that students at all levels have a desire to understand and explore the moral issues of science as part of their course.

This question produced one of the few gender differences on the survey. 61% of females answered 'yes' and 11% 'no', whereas only 49% of males answered 'yes' and 21% answered 'no'. It is well known that males, especially adolescent males, are more likely to favour objective certainty than females, who are more likely to favour discussions (e.g. Head, 1997).

TEXTUAL COMMENTS ON GCSE SCIENCE

WHAT IS INTERESTING?

When asked **'What topic do you find MOST interesting in GCSE Science?'** (Question 54), Biology topics were by far the most frequently mentioned, followed by Physics, with Chemistry third, for reasons which students were often happy to volunteer:

- Biology – because this is to do with everyday life and your body, and the things that happen around you.
- Human biology because I can relate to what I'm learning.
- Biology, the brain. I love to find out how and why we think of things and what the other part of our brain is used for.
- Animal Biology – the human side, learning how the body works and dissecting hearts and lungs. The plant side was also fascinating.
- How the human body works and regulatory systems in it ...oh and, dissecting a human heart in Human body (sic) – useful & interesting.
- Cloning – that's all I can remember, which must mean I enjoyed it.
- About the human body and brain it is interesting to find out how the body works, and chemistry is interesting with all the experiments and learning about bonding and structures of atoms etc.
- Many physics topics, relating to everyday life, 'pressure' for example.
- Physics – radioactivity, it was new and different from a lot of the other topics on the syllabus.

WHAT IS BORING?

When asked **'What topic do you find MOST irrelevant or boring in GCSE Science?'** (Question 53), physics topics were mentioned the most often, followed by chemistry, with biology topics the least. To give just a few quotes:

- "I don't really care how you work out how fast a ball falls if it weighs 10 kg and is falling 4 metres, it's not stimulating and I'm never going to use that information again."
- "Physics. I have never, nor will I ever, either see the point in or understand physics. It always seemed pointless spending hours of experimental time proving what was already proven, or that black wasn't a colour, or whatever."
- "Equations in bonding (chemistry) – for a person who KNOWS that she will not ever go into chemistry, that was pointless, difficult to grasp, and boring."
- "Chemistry – learning how chemicals are used in industry is very boring – chemicals in the body and used in drugs are more interesting and relevant."

This question proved one of the most popular ones on the survey. There was a big gender difference. Amongst the males, there was only a 3% variation between Biology, Chemistry and Physics. However, females were over three times as likely to mention Physics topics as Biology ones, and more than twice as likely to identify Physics topics than Chemistry ones. It is well established that girls are more likely than boys to criticise school Physics as being impersonal and detached from daily life (Vlaeminke et al., 1997).

PRIMARY SCIENCE

Question 29 asked: **At primary school should science:**

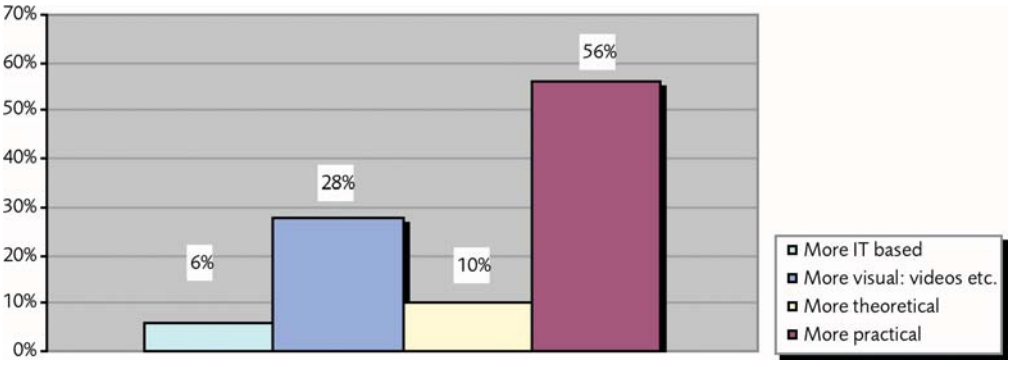
Be more practical?

Have more theory?

Be more visual (videos etc.)?

Be more IT based?

The interesting point shown by the responses is not just the rejection of Information Technology but also the belief of the students that they must see what is going on in science – either actually in practice or at least in something like a video. The Primary Assessment, Curriculum and Experience (PACE) project which ran from 1989 to 1997 found that Year 6 pupils were particularly critical of the amount of time they had to spend writing in science (Pollard et al., 2000).



(n=1,464)

Fig 1.24 - How should primary school science have been different?

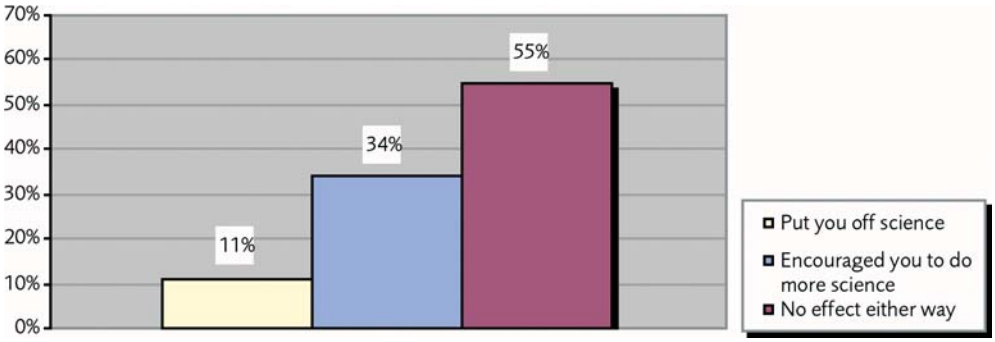
Question 30 asked: **At primary school did science?**

Put you off science?

Encourage you to do more science?

Not influence you either way?

The results showed a mainly neutral or positive effect.



1.25 - How did primary school science affect you later?

THE IMPORTANCE OF THE PRIMARY EXPERIENCE

Primary school science only had a negative impact on 11% of students while 34% were encouraged by their primary science experiences to do more science. However, the students also asked of each other **'In GCSE Science, did/do you understand the majority of information?'** and 22% of the minority who felt that they did not understand the majority of GCSE Science information felt that they had been put off science at primary school. This proportion is exactly twice that of the sample as a whole and bears witness to the importance of good primary science experiences (see Sherrington, 1998; Galton, 2002).

Closer analysis of the data suggests that a strong negative or positive primary science experience carries through for the next six or seven years. These results can be interpreted alongside the widespread belief that primary science education has been one of the success stories of the National Curriculum in England and Wales as measured by both teacher confidence (Bennett et al., 1992) and international comparisons (Harris et al., 1997). At the same time, it is important to note, first that the primary Science curriculum has changed considerably since the 14-19 year-olds in this survey were in school, and secondly that what is reported here is people's interpretations of events that happened years previously.

WHAT WAS MISSING FROM THE PRIMARY SCIENCE EXPERIENCE?

When asked **'If something was missing from your primary science, what was it?'**, quite a variety of responses were produced, including some that talked about curriculum pressures on science and some that talked about a shortage of experiments:

- Science wasn't our main focus, we mostly focused upon English and Maths.
- The lack of facilities made experiments and visual aids difficult and therefore I didn't really experience science as a subject until secondary school. The primary years are the ones in which I think you should be motivated to continue.
- We barely did any, due to people talking and the teacher having to cope with them before teaching us.
- Fun experiments to hold the child's attention.

The importance of primary science was summed up thus by one of the students involved in the production of the final reports:

- "From my experience with primary science I know for a fact it is a lot easier to grasp concepts at an earlier age and then move on to the complicated things in secondary science, after all at a young age you are excited to learn something new and as you get older you like to know you understand something in great detail."

CONCLUSIONS

The full list of survey questions can be found as an appendix to this report. The following conclusions and recommendations were reached by the student panels who analysed this data. See 'The Consultation Process' report for further details.

This is the first time that such a student-led review of the Science curriculum has taken place. The review is particularly valuable because at all stages students were in charge of the key decisions.

The results of the review show that there is a need for the Science curriculum to change. School science could be so much better than it is now. Currently there is great potential but school science fails to convey the extent to which science is related to everyday life and affects all of us. Space needs to be made to allow controversial issues to be included and to allow topics to be studied in more depth.

For this review of the Science curriculum to succeed further, changes need to happen. Some of these changes should take place by September 2004. Responsibility for making these changes ultimately lies with the Government and the DfES, but science teachers and students need to be allowed to take responsibility too. A system needs to be put in place to ensure that decisions that affect students cannot be taken without taking students' views into account.

There are lessons here for other subjects to take away too.

RECOMMENDATIONS

1. ETHICAL AND CONTROVERSIAL ISSUES

The Science curriculum should include more ethical and controversial issues. These should not be hived off into occasional discrete topics but included throughout the curriculum.

2. PRACTICAL WORK

Practical work should be strongly encouraged and relevant to the syllabus. The practicals need to be supervised, they need to work and they need up-to-date equipment.

3. DISSECTION

Schools should provide students with the opportunity to do dissection but individual students should have the choice as to whether or not they do dissection.

4. SCIENCE AND MATHS

The fundamentals of maths should be covered in maths lessons but science lessons should explicitly include a coherent treatment of the maths needed for science. Better communication is needed between science and maths teachers.

5. SCIENCE TEACHERS

Good science teachers are crucial. Science teachers should be qualified to teach science and should have the appropriate subject specialism within science, if possible.

6. SLIMMING THE CURRICULUM

The science curriculum should cover fewer topics to allow for more in-depth treatment and for more detailed explanations.

7. DISCUSSIONS IN SCIENCE

There should be more discussions in science classes. Discussions provide students with the opportunity to learn from someone other than their teacher and, healthily, to disagree with teachers and develop their own ideas.

8. GOOD SCIENCE TEACHING

Learning is helped by having a teacher who can engage with students and by the use of visually stimulating material.

9. MAKING CHEMISTRY AND PHYSICS MORE POPULAR

The popularity of Chemistry and Physics would be raised if they connected more with real-life situations, as Biology does, and included more ethical issues.

10. PRIMARY SCIENCE

In primary school, integration between science and other subjects is important. Primary science should be placed at the same level of importance as English and Maths. Better equipment is needed for primary science teaching.

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APPENDIX 1. THE SURVEY

This is the survery as it appeared on the Science Year website.

Lets jump straight in with the more controversial questions!

Take your time - be honest - we students are processing the answers.

1. At GCSE, did / do you find that the Science you learn?

Tests your understanding of Science	O
Tests your memory of the subject	O

2. Should GCSE Science MOST be? [tick just one]

Based on real life	O
Taught for the sake of general knowledge	O
Be based on relevant issues	O
Taught with a view to post-16 studies	O
Don't care	O

3. Which of these would you like to see included in GCSE Science?

Astronomy	O
History of Science	O
Ethics of Science	O

Here is my suggestion: >>>>>>>>

4. Do you feel that what you learn is exam led?

Yes	O
No	O

Please comment>>>>>>>

5. In Science would you rather learn?

A little about a lot of different topics	O
A lot about fewer topics	O

6. Which of the following below will (or would have) improved your GCSE grade in Science?

Smaller class size	[ ]
More practical experiments	[ ]
Better text books	[ ]
Relating the Science to everyday life	[ ]
None of these	[ ]

Please add your suggestion: >>>>>>>>

7. Does / did practical and experimental work help you to UNDERSTAND your Science topics?

Yes	O
No	O

8. How do you MOST prefer to be assessed / examined in Science

Module exams and tests	O
Through practicals	O
Through 'terminal' exams at the end of the course	O
Through coursework	O
By continuous assessment	O
Through an oral examination	O

9. Which of the following would MOST interest you, if introduced into the pre-16 Science curriculum?

Diet	O
Science and the environment	O
The history of Science	O
A wide range of personal health issues	O
Controversial theories: e.g. GM Foods	O
Topical issues such as cloning	O

Please add your suggestion: >>>>>>>>

10. Which THREE of these methods of teaching and learning do you find the MOST USEFUL and EFFECTIVE in helping understand your school Science?

Taking notes from the teacher	[ ]
Looking at videos	[ ]
Reading the text books	[ ]
Taking my own notes from books etc.	[ ]
Copying notes from the board	[ ]
Doing a Science investigation	[ ]
Making a Science presentation in class	[ ]
Researching Science on the Internet	[ ]
Going on a Science trip or excursion	[ ]
Doing a Science experiment in class	[ ]
Having a discussion / debate in class	[ ]

11. Which THREE of these methods of teaching and learning do you find the MOST ENJOYABLE as part of your school Science?

Taking notes from the teacher	[ ]
Looking at videos	[ ]
Reading the text books	[ ]
Taking my own notes from books etc.	[ ]
Copying notes from the board	[ ]
Doing a Science investigation	[ ]
Making a Science presentation in class	[ ]
Researching Science on the Internet	[ ]
Going on a Science trip or excursion	[ ]
Doing a Science experiment in class	[ ]
Having a discussion / debate in class	[ ]

12. Is it right to include CONTROVERSIAL issues such as genetic engineering or cloning on the Science syllabus?

NO - definitely not	O
YES - definitely	O
Don't Mind	O

13. When studying Science at school, is there enough emphasis on the MORAL AND ETHICAL IMPLICATIONS of Science?

TOO LITTLE emphasis	O
ENOUGH emphasis	O
TOO MUCH emphasis	O

14. Do you think the introduction of discussions about philosophy and ethics (such as animal testing) would make GCSE Science more attractive as a subject?

NO - definitely not	O
YES - definitely	O
Don't Mind	O

You're quarter of the way through!

Going a little crazy and want to take a break?

Try our Crazy Custard experiment…

In this section we drop in a few questions about Maths.

We know already that some find Maths easy - others find it impossible. What do you think?

15. Should you be given the choice to do dissection in Biology?

YES	O
NO	O
No opinion	O

16. Would your Physics learning benefit from practical engineering examples such as how a motor car works or how a computer is made?

NO	O
YES	O

17. Does the Science syllabus have too much overlap between Physics, Chemistry and Biology - or is the balance about right?

Too much overlap	O
Correct balance	O
Not enough overlap	O

18. Did / do you struggle with your school Science due to a lack of understanding in Maths?

NO	O
YES	O

19. Should your Science teachers cover Maths in their lessons?

NO	O
YES	O

20. Can you do well in Science without doing much Maths?

NO	O
YES	O

21. Has your Maths syllabus prepared you for the following in Science?

Graphs	YES O	NO O
Re-arranging equations	YES O	NO O
Using formulae properly	YES O	NO O
Calculations	YES O	NO O

22. Do you think the Science curriculum should contain less or more theory?

Less theory	O
More theory	O
Correct balance	O

23. Do you think the Science curriculum should contain more or less real life practical examples?

More real life practical examples	O
Less real life practical examples	O
Correct balance	O

24. Do you think issues concerning the para-normal should be included in GCSE Science - such as telepathy or phantoms?

NO	O
YES	O

25. Would you like to see more emphasis on the practical USES of Science and Technology?

NO	O
YES	O

26. In the past students were given more opportunities in Science to use and apply technology (such as making radios) Would this approach help / have helped or encouraged you to study Science?

Definitely	O
Maybe	O
Definitely not	O

27. If the practical content of the course was increased - how would it MOST improve the learning experience?

Provide deeper appreciation of Science	O
Make understanding theory easier	O
Give greater enjoyment of Science	O
Make you more motivated	O

28. Currently (or when you did your GCSEs) - when you learn new theory was it backed up by practical experiments?

Nearly always	O
Just sometimes	O
Very rarely	O
Almost never	O

You're now half way through the questions !

Don't think that's funny? See if you can do better with Laugh Lab...

Its back to Primary School for a few of the next questions ....

The years of sweet innocence - or were they?

29. At primary school should Science?

Be more practical	O
Have more theory	O
Be more visual (videos etc)	O
Be more IT based	O

30. At primary school did Science?

Put you off Science	O
Encourage you to do more Science	O
Not influence you either way	O

31. At primary school, do you think there was enough Science to prepare you for the work you do at secondary school?

Too much Science at primary school	O
Too little Science at primary school	O
About the right amount of Science	O

32. If something was missing from your primary Science - what was it? >>>>>>>>

33. At primary school, do you think there is enough Science on the curriculum?

Too much	O
About right	O
Not enough	O
Nowhere near enough	O
Can't remember doing Science at primary school	O

34. Would you have benefited from a more challenging Science GCSE course?

YES	O
NO	O
Don't care	O

35. In Biology which of these areas of study do you MOST prefer?

Study of animals	O
Human biology	O
Plant biology	O
Don't care	O

36. Which of these BEST describes how relevant GCSE Science is to your everyday life?

It helps me understand current affairs and news stories	O
It just helps my further studies in Science	O
It helps to find out how things around me work in an understandable level	O
It is totally irrelevant to my everyday life	O
It will prepare me for my career	O

37. In GCSE Science, did/do you understand the majority of information?

YES	O
NO	O

38. In GCSE Science, should more emphasis be on understanding WHY or on learning HOW things work?

More on WHY	O
More on HOW	O
Don't care	O

39. There should be more scope for topics of personal interests in the GCSE Science syllabus

Strongly agree	O
Agree	O
Unsure	O
Disagree	O
Strongly disagree	O

40. Is revisiting Science topics from year to year?

Interesting	O
Useful	O
Neither	O

41. There are too many facts to remember in GCSE Science

Strongly agree	O
Agree	O
Unsure	O
Disagree	O
Strongly disagree	O

Well done - you've finished seventy five percent of the questions !

To bring you back down to earth, check out our update on the earth-shattering Giant Jump...

Get your brains in gear for the final push to the finish....

Now its time to put GCSE Science fully in the spotlight ...

42. When learning something in Science (eg plant growth or moles or atomic structure) do you understand?

usually understand how the process or system works and can describe it	O
usually understand why the process or system works and can explain it	O
sometimes understand how the process or system works and can roughly describe it	O
sometimes understand why the process or system works and can sort of explain it	O
seldom understand how or why the process or system works	O
never understand how or why the process or system works	O

43. In GCSE Science, do you usually understand?

How Science formulae are formed	YES	O	NO	O
When to use Science formulae	YES	O	NO	O
How to use Science formulae	YES	O	NO	O

44. What do you think about the amount of facts you have to learn in Science?

Put your opinion here >>>>>>>>>>>

45. Were you given the choice of exams in studying for GCSE Science?

Three separate Sciences (triple award - Biology, Chemistry, Physics)	YES	O	NO	O
The double award Science	YES	O	NO	O
The balanced Science (single award)	YES	O	NO	O

46. Which (with hindsight) would you have preferred to study?

Triple award	O
Double award	O
Single award	O

47. With hindsight would you like students to have the choice of which award to study?

YES	O
NO	O

48. You are sometimes presented with an independent project you must do (like coursework). Can you usually use your current knowledge and previous understanding to?

Get working easily and quickly to apply what I've already learnt	O
After being stuck for a while work out the resources to research and then work independently	O
Get stuck, remain stuck - wouldn't know where to start	O

49. Do you think the workload in your GCSE Sciences is less than, similar or more than other subjects?

Less work	O
More work	O
Similar to other subjects	O

50. Do you find GCSE Science? [tick all that apply]

Relevant	[ ]
Interesting	[ ]
Off putting	[ ]
Stimulating	[ ]
Scary	[ ]
Easy	[ ]
Difficult	[ ]
Boring	[ ]
Thought provoking	[ ]
Useful	[ ]
Irrelevant	[ ]

51. Do you feel that GCSE Science lessons make you curious about the world and interested in finding out more?

YES	O
NO	O

52. If you chang(ed) teachers during your GCSE Science studies do you experience?

No change	O
A welcome change (fresh start)	O
Benefits from covering the same work from a different perspective	O
Wasted time due to repetition of the work	O
Pressure on finishing the syllabus and coursework	O

53. What topic do you find MOST irrelevant or boring in GCSE Science?

Please comment>>>>>>>

54. What topic do you find MOST interesting in GCSE Science?

Please comment>>>>>>>

55. For those that have taken their GCSEs and NO LONGER study Science

or

For those taking their GCSEs who already know they NO LONGER wish to study Science after GCSEs.

Your feelings about Science subjects after GCSEs, is due to? [Tick up to three that may apply]

The GCSE Science lessons are/were boring	[ ]
The choices of your friends	[ ]
The influences and experiences of your teachers	[ ]
The GCSE Science subjects are/were difficult	[ ]
Your future career thoughts don't need Sciences after GCSE	[ ]
You have other subjects you enjoy more	[ ]

Almost there - just one page to go!

But what will you do when its all over. Take one last break with some hot career tips...

You've done the survey - you want the freebies ?

Seriously - we need a little about you if we are going to make the curriculum planners sit up and take notice of us.

Give as much background as you can.

Your Name:

Your Email Address:

Country:

Your Postcode:

Your Age:

11-13	O
14-16	O
16-19	O
26-35	O
36-45	O
over 45	O

Your Gender:

M O F O

Are you studying GCSE science at the moment?

Yes O No O

Which GCSE award did/do you study?

Single	O
Double	O
Triple	O

Name of your school (if you are still a student):

Type of school:

Boys	O	State	O
Girls	O	Private	O
Mixed	O		

For those who have not yet finished GCSEs - are you considering studying Science after GCSEs

Yes O No O

For those who have finished GCSEs - are you still studying or working with Science subjects

Yes O No O

Hundreds of us students throughout England helped design this questionnaire - see all the schools and colleges where we all came from. We hope we have covered quite a lot about our GCSE studies - please tell us how we did:

A really good survey that hopefully people will pay attention to	O
An enjoyable survey that ought to give useful results	O
A reasonably fun survey but not serious enough	O
Not bad, could do better	O
Boring - yuk	O