Appendix 1: Information gathered from identified schools (with good progression to post-16 science by students with two B grades in GCSE sciences)

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Summary of the science curriculum and grouping structure for each of the selected schools

School	Mixed ability	Rigid setting	Flexible banding	GCSE science: Core science only	GCSE science: Core science + additional science	Triple science: Core science + additional applied science	Triple science: Biology	Triple science: Chemistry	Triple science: Physics	Triple science: BCP taught in separate option blocks	Triple science: BCP taught in time for 2 sciences	Triple science: BCP taught with additional hours after school or at lunchtime	Triple science: Numbers taking triple science	Triple science: Gender differences in uptake	GCSE science experience: Other post-16 options	GCSE science experience: Other GCSE options	Entry requirements for triple science	Specialist teachers?	Key Stage 3 GCSE?	Curriculum offer for L5+ and L6+?
G1			✓		✓											Triple science from 2008	B	40/50% lessons		L6+ do triple
G2	Set 1 = Triple Award group, Set 2 = BTEC + Core Science, Set 3 = Double Award group.				✓		✓	✓	✓	✓			5	Equal		BTEC + Core	No	If possible		
G3	?	?	?				✓	✓	✓	✓			No data	No gender data	?	BTEC 1st Nat Cert	?	No	GCSE starts in Year 9	?
G4	Put in target groups 1, 2a, ab according to ability.				✓	✓							0		Double and Single Award AL Applied Sc	Triple science & BTEC 09	No	No		L6+
G5			✓		✓										Applied Double Award		No	Where possible		
G8	Setting in 3 blocks for Core. Flexible banding for Additional.				✓	✓	✓	✓	✓			✓	3	Equal			No	Through consortium		option
G9			✓	✓	✓	✓	✓	✓	✓	✓			30	Boys	Geology AS		B	✓		L6+
G10		✓			✓		until 07	until 07	until 07	✓			0			BTEC Applied Science	No	No	Started in Sept 08	
G13		✓		✓			✓	✓	✓		✓		120	No gender data			B	✓	GCSE started Xmas Year 9	
G14				'maybe 5'	✓		✓	✓	✓			✓	30	Boys			B	✓		L6+
G15	3 bands based upon ability. 3 equivalent classes in the top band. 2 in the middle band and 2 in the lower band.			✓	✓	✓	✓	✓	✓	✓			57	Boys			B	✓		L6+ offered triple science
G16		✓		✓	✓		✓	✓	✓	✓			26	Equal	L3 BTEC	BTEC	B in Chem and Physics	yes via consortium		L6+ offered triple science
G17	Pupils in separate science groups were rigidly set, two science groups were flexible.			✓	✓		✓	✓	✓			✓	118	Equal			B in Maths	✓	Start GCSE modules in Year 9	L6+

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G18	Out of nine groups, 2 BTEC and 3 Triple Science groups removed. One of the Triple Science groups made up of students achieving level 6 in Year 9, the other two almost exclusively level 7. Of the remaining four groups, the two Applied groups are of equal and mixed ability, while the two Additional groups are set – one set comprising those students attaining grade B or above and the other grade C and below, thus loosely correlating with the Higher/Foundation tier arrangements.				✓	✓	✓	✓	✓			✓	69	Equal		BTEC 29/ Entry 9	B	✓		L6+
G20			✓	✓	✓							✓				Y10 Triple science 2008/9	Guidance	✓	GCSE starts Year 9	L6+
G23		✓		✓	✓		✓	✓	✓	In double science time with a few extra periods fortnightly			8	Equal		BTEC	No	No		L6+ pushed but L5+ allowed
G24		✓		✓	✓	✓	✓	✓	✓	✓				Equal	AS Applied Science	19 Double Applied	B	✓		L6+ offered triple science
G25							✓	✓	✓	✓	All students study BCP		96	Boys school			No	✓		
G26	Triple science students opt into triple provision. Other students are set. L6+ can opt to do triple (prior to this, we used to select the top 40 students only as we had to deliver triple in double time).			✓	✓	✓	✓	✓	✓	BCP taught in double option block and one option pool (reduced time = 12/25 periods). Double = 9 x 1 hour blocks. Triple = 12 periods per fortnight).			60	Boys > girls (last two years)		Astronomy & Entry level	No	Yes		L6+.

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				GCSE Science Experience																
				GCSE Science			Triple science													
School	**Mixed ability**	**Rigid setting**	**Flexible banding**	**Core science only**	**Core science + additional science**	**Core science + additional applied science**	**Biology**	**Chemistry**	**Physics**	**BCP taught in separate option blocks**	**BCP taught in time for 2 sciences**	**BCP taught with additional hours after school or at lunchtime**	**Numbers taking triple science**	**Gender differences in uptake**	**Other post-16 options**	**Other GCSE options**	**Entry requirements for triple science**	**Specialist teachers?**	**Key Stage 3 GCSE?**	**Curriculum offer for L5+ and L6+ ?**
G27		✓		✓	✓	✓	✓	✓	✓	✓			30	Boys> girls			No	✓		L6+ and some strong L5, two Triple sc groups set by ability
G28		✓		✓	✓		✓	✓	✓				27	Equal			B in maths and physics	Extension units	BCP started in Year 9 for Year 8 L5+	L5 Year 8
G29			✓	✓	✓		✓	✓	✓	✓			26	Equal			No	✓		L6+
G30		✓		✓	✓								0				B	✓	Sept 2009 Separate sciences	L6+ offered separate science

Case study schools

The case studies below capture the face-to-face evidence collected from each of the 23 schools visited, out of the 30 schools selected for participation in the survey. In the majority of cases, the evidence base includes comprehensive observations by the researcher as well as by students and teachers. Ofsted comments for all of the selected schools are provided in a separate appendix. Schools have been anonymised and the labels given follow on from those used to describe schools in the research published last year. (Information describing these schools is available from www.standards.dcsf.gov.uk/nationalstrategies.}

School G1

Comments from student interviews

The school has used 'student voice' activities but they are not yet embedded. In general 'students need no encouragement to say how they feel, both positive and negative'. Such advice is usually helpful, and sometimes informally given.

When asked 'What influenced your choice of subjects?' students explained that they chose science because they were interested, they were good at it and science was necessary for course and career requirements. Boys also indicated that A Level sciences helped keep wider career options open.

Comments from teacher interviews

'It's a small department that works well together as a team. We feel that this has a positive impact on post-16 uptake. Students always know where they are in science; they have continuity and are able to talk to staff. The team shares a lot, especially informally at the end of each day. The agenda of departmental meetings always has a 'bring and brag' session. Peer lesson observation is well established and the 'Learner walk' initiative supports us in visiting lessons systematically to explore what is happening.

When asked 'To what do you attribute your good uptake of post-16 science?' teachers attributed their success to revisions to the programme of study for Key Stage 3 and the greater emphasis on *How science works* (HSW).

Students in Key Stage 3 would recognise lessons with a typical structure in which learning objectives are recalled, followed by a starter. Mainly in four parts, lessons will 'connect, activate, demonstrate, consolidate' with students actively involved in their learning. Students would recall a range of teaching styles, good resources and plenty of practical work. In Key Stage 4 they would experience more material, harder work and less practical work than at Key Stage 3.

Strategies described as being influential in promoting post-16 science:

- promoting *How science works*
- positively encouraging university as an option
- A Level taster classes through invitation from local colleges
- steady drip-feed in lessons of the importance of science
- good teaching, high standards/expectations
- teachers being positive about science.

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Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school:

- steady drip-feed about the importance and value of science
- good teaching and high expectations
- teachers good at their subjects
- keeping students' options open.

School G2

Comments from student interviews

When asked 'What influenced your choice of subjects?' the boys explained that they chose science because:

- of family influences
- they know that science is going to be important in the future
- they like and enjoy the subject
- their chosen careers require science
- they were good at science subjects.

They felt that students who didn't choose sciences did so because it required too much commitment and science subjects were considered too hard.

Girls highlighted the careers that interested them. They wanted to help people and felt that science-related careers do this. They felt that science offered reasonably good career prospects. They too were interested in science and enjoyed the subjects they studied. Like the boys, they felt they were good at science.

Students' experience at Key Stage 3 included 'thorough teaching', a balance between practical and theory and good teachers, 'who were prepared to give extra help if needed'. Science was 'fun, interesting'. Key Stage 4 topics were more interesting and led to a better understanding. Sometimes links were made to post-16 topics.

Comments from teacher interviews

When asked 'To what do you attribute your good uptake of post-16 science?' teachers attributed their success to:

- a personal approach – 'we know our students well', motivate and challenge them
- good relationships with our students
- clear boundaries for teaching and learning
- triple science groups – well streamed; groups of like-minded students who stimulate and challenge each other
- friendly small school – proportionately students get more of your time.

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Strategies influential in promoting post-16 science:

- Aimhigher sessions (in Year 9) with the local university
- Connexions interviews
- discussions with science teaching staff
- 'taster' sessions at local colleges and universities.

Summary of the key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school

This is a small 11–16 comprehensive with about 320 students on roll and a small department committed to tailoring its curriculum to individual students. The management of the curriculum variety is 'remarkable' and takes a good deal of organisation and effort on their part. Science teachers work as a team and share experiences and expertise. They obviously concentrate on children with higher ability but it pays off in terms of their success and uptake. They use external contacts, with the university for instance, to provide extra stimulus and information.

School G3

The key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school are:

Students' background

- a strong inclination towards science – the bulk of subjects studied, and students' main career intention is science-oriented with a strong emphasis on medical science (except boys in Year 12 tending towards economics, law, mathematics)
- girls tend more towards science careers than boys
- fourth A Level subjects such as Psychology, Religious Education, English Literature, Sociology, History, Geography, Economics (boys) tend to be dropped at A2; Mathematics uptake is more common than Physics
- some students had a science-based family background.

Students' aptitude

They:

- feel they are good at science
- got good results at GCSE
- like science
- are highly motivated.

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Parents' attitudes

- career prospects – a feeling that science is desirable in a wide range of careers
- the credibility and marketability of science subjects
- study – they 'push'.

Vocational aspirations

More girls than boys 'want to help' – strong bias towards medicine and medical science as distinct from subjects generally useful for careers (above). Less emphasis on other science-oriented careers was explained as being due to a lack of information.

Teachers

- good relationships
- exceptionally supportive, and also pushy but encouraging
- ambitious for students – high aspirations accompanied by inclusivity
- passionate about subject and good at it
- effective
- motivating.

Teaching and learning

- interactive
- imaginative
- dynamic
- well structured.

Experience of science and science lessons

- hard
- interesting
- relevant
- practical
- challenging
- high credibility –'wow', people and universities are impressed, being part of the 'club'
- fun
- good at it – easy to understand
- proud of being able to do it.

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The curriculum

- choice of subjects (until recently science was not compulsory) is important 'with students who want to learn'
- visits and visitors make learning relevant
- keeping options open.

Leadership

- absolute determination to put science on the map when it is not part of the compulsory curriculum – 'raising the stakes' and 'marketing' the subject – perhaps under competitive pressure because of selective schools – market forces
- support by new science line manager (mathematics teacher well established in the senior leadership team)
- recruitment of the right staff
- core of long-standing members and new blood – stability of team
- establishes professional expectations – e.g. though observations
- clear sense of purpose, enhanced by evidence from self-evaluation including student voice, open learning culture and teachers
- good technical support – orderly environment
- knowing the importance of teacher/student relationships (and respect) and working strategically to establish positive classroom relationships – e.g. ensuring science teachers are sixth-form tutors
- good team leader and effective teamwork.

School G4

Comments from student interviews

When asked 'What influenced your choice of subjects?' students explained that they chose science because:

- they liked science at GCSE and looked forward to in-depth study
- studying science keeps options open, useful for careers
- science is necessary for well-paid jobs – doctors, dentists, engineers
- science is seen as important
- they enjoy the practical aspects of science
- they enjoyed science at GCSE, it was interesting and they desire to take it further
- it's very well taught at GCSE (and A Level) – interactive whiteboards (IWBs) are very helpful and make science easier to understand.

They felt that peers who do not choose science are more arts inclined and see science as hard; they are 'looking for easier options'; or feel they are not good at science.

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Their advice to students planning to take science post-16 is:

- you need to be prepared to work harder, more independently and to be self-motivating
- work to your strengths and interests
- think about your future/career when choosing
- ask A Level students for their views
- use the internet to research the course and subject
- be prepared to put in the hours
- use time wisely
- learn to be independent
- take care with choices – science is not easy
- make sure you pick subjects you enjoy (and are good at)
- don't just follow your friends.

Comments from teacher interviews

When asked 'To what do you attribute your good uptake of post-16 science?' teachers attributed their success to:

- staff training in department, sharing expertise and resources
- shared department materials are on the virtual learning environment (VLE)
- small teams meet to plan and deliver modules
- good teamwork and high levels of commitment
- every Monday staff meet to discuss Applied Science (GCSE and A Level) through portfolio scrutiny – optional, but all attend.

Teachers described students' experience of science by remarking that students were 'less keen on' PowerPoint, textbook work and board work. They further explained that at Key Stage 3 students would usually have a three-part lesson with experiments, active engagement with learning (including ICT), enthusiastic teachers, lots of resources, IWB use, games, individual, group and whole-class work. The use of Assessment for Learning (AfL) teacher and peer assessment would be usual and work would be differentiated within sets. Unusually they felt that Key Stage 4 would not be very different but there would be more emphasis on why students are there, what science is for, what is in it for them and how they might progress. They would use more exam-style materials to prepare them for modular tests.

Strategies influential in promoting post-16 science:

- taster sessions
- teachers making students aware of courses in science
- actively engaging students through practical work and *How science works* HSW
- out-of-school visits to scientific places, visits to universities, inviting speakers/university lecturers
- work closely with universities to promote HE, displays within school/department and the use of ex-students.

Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school:

- AfL has positive impact
- teaching and learning focus
- relationships with students (the headteacher described the subject leader/Year 13 relationship in a lesson observed as 'outstanding')
- teachers have a similar background to the students and provide good role models
- early intervention with 'struggling students' who are 'lazy not stupid!'
- enrichment activities
- well-chosen courses and good advice to students
- good resources well used – good technicians
- good use of ICT
- good team and teachers who care – lunchtime, after-school, weekend and holiday sessions (now looking to involve parents more)
- parents' view of science, telling their children it is important for a good career
- students enjoy their science and see that they can achieve
- teachers have high aspirations and are enthusiastic.

School G5

Comments from student interviews

The department evaluates its effectiveness by asking students for their views through a questionnaire.

When asked 'What influenced your choice of subjects?' sixth-form students explained that they chose science because they enjoyed it and had had an early interest in science. They felt that how good you are at the subject plays a part. Their views about sixth-form science were that it was a lot harder than GCSE and that you studied in more depth, were expected to work a lot more out of class and hence needed 'lots of commitment'. It was still some fun and interesting and built on GCSE. Most students would still choose the same subjects but would do more work from the beginning, although two students would not choose science if they had to choose again. They suggested, like most sixth-formers, that you should only do science 'if you really want to do it' because it is 'definitely not a "doss" subject!' Their view was that people who don't choose science have a perception that science is very hard.

Comments from teacher interviews

When asked 'To what do you attribute your good uptake of post-16 science?' teachers attributed their success to the overall school environment which is a 'place where students are happy to be'. The enthusiasm generated and good relationships teachers have with high-ability students inspires students to study science post-16.

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Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school:

- the department was seen to work as a team, share a love of the subject and talk to each other
- they have good uptake from GCSE B grade students because the higher-attaining students go to the local grammar schools and the school encourages the students that are there to stay for the sixth form
- students staying on genuinely enjoy science.

School G8

Comments from student interviews

The department has different means of gauging students' response – from formal 'student associates' to exit tickets after the lesson.

When asked 'What influenced your choice of subjects?' students explained that they chose science because 'teachers were alright', they're 'humorous' and 'interact with you informally'. They will 'push you to achieve your potential' even 'if you don't believe in yourself'. Some students were quite heavily influenced by their parents' view that 'science opens up opportunities'. 'They convinced me' one said. A very diverse student population, they had equally diverse views about science. One purist was interested in physics because it was hard and complemented mathematics where he thought his future lay. Another wanted to 'think about the way things worked'. Yet others, mostly girls, wanted a career in science e.g. forensics, because of TV programmes.

Comments from teacher interviews

When asked 'To what do you attribute your good uptake of post-16 science?' teachers attributed their success to:

- lots of enrichment activities such as STEM, student ambassadors from HE, science clubs
- teachers are enthusiastic and creative and most lessons are practical
- teachers pay attention to pathways and opportunities for science, providing good-quality information because of their own experience outside of the classroom.

Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school:

- teachers care about students' progress, they don't give up, are dependable and always pushing and providing encouragement
- teachers 'explain clearly', use lots of practical work and make science relevant to everyday life and are 'passionate' about their subjects
- they take continuing professional development (CPD) very seriously and are well supported by the LA
- teamwork is good with plenty of sharing going on in the small staff room which is the hub of the department
- one particular physics teacher was inspiring
- the school has a good relationship with the local sixth-form college where both teachers and students spend time, teaching and learning.

School G9

Comments from student interviews

When asked 'What influenced your choice of subjects?' students explained that they chose science because they liked it and were good at it, their ('best subject') and they liked it – 'favourite subject' since primary school in one case. For some it was inconceivable that they would be studying anything else. They favoured science as 'respected subjects' with which you could do 'anything' and most planned to study science at university. As for the importance of science in this school, 'a lot of it is about enjoyment' and the school 'is a community'.

Comments from teacher interviews

When asked 'To what do you attribute your good uptake of post-16 science?' teachers cited:

- 'staffing'; enthusiastic teachers
- the atmosphere in the department and 'quality, inspirational teaching'
- 'no hard sells'.

Strategies influential in promoting post-16 science:

- introduction of triple science by previous curriculum leader
- new, current curriculum leader has recently altered provision to have triple science as option block to allow increased teaching time.

Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school:

- teachers who are effective, knowledgeable, ask questions, go beyond the spec, inspire curiosity
- practical work, challenging, space to ask as well as answer questions
- teachers 'have heart', they don't just see you as statistics; relationships good, respectful, humorous
- good physicists
- ethos of school and commitment to sixth form (head of sixth form a physics teacher)
- half of students intrinsically attracted to science, would do it anyway; rest vocational
- good leadership, sense of purpose and direction
- science has an identity, students get a sense of achievement in studying something perceived as difficult
- science is enjoyable, students like finding out how things work and how science works and that there are still things to discover
- accommodation dreadful
- triple science is popular and offered in option blocks.

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School G10

Comments from student interviews

When asked 'What influenced your choice of subjects?' students explained that they chose science mainly because of their career options. Science subjects kept options open for a variety of careers. They were also influenced by how good they were at the subject, not being bored and finding it interesting. They felt that science subjects lead to well-paid careers and some were following family advice. Some had specific careers in mind. They felt that they had been influenced by good teachers. Students who didn't choose sciences 'found them too hard probably'.

Experience of Key Stage 3/4 science was variable, depending on the way it was taught and who was teaching it. 'Science was interesting but lessons not always so'. Some parts were more interesting than others. Students enjoyed biology the most, followed by chemistry, followed by physics. All found physics the least interesting because of the topics and the way it was taught. Key Stage 3 was much more fun and interesting with much more practical activity which, like many other schools, decreased during Key Stage 4. Post-16 science was equally variable and followed the same pattern with students having a mixture of experiences. The amount of practical work involved varied according to the subjects – chemistry had the most and physics the least. Students found AS much harder than they thought it was going to be and felt that they walked through GCSE and then had a shock in Year 12. They needed to be much more independent than during their pre-16 courses, but they felt that individual help was available if needed both in and out of lessons. They would still make the same choices but would work harder from the beginning. Their advice to others is to encourage them to take the subjects but to be clear that if they are half-hearted about the subject it won't work. They must keep on top of the work all the time and be organised. 'Go for it if it's what you want to do' and above all 'you must enjoy it'.

Comments from teacher interviews

When asked 'To what do you attribute your good uptake of post-16 science?' teachers answered:

- 'teaching relationships would be the primary reason'
- 'obtaining good grades in science and now building on our reputation as a successful department.'

Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school

An interesting curriculum structure at both Key Stage 3 and now at Key Stage 4. The organisation is interesting as well, with the intention of allowing groups of students to proceed largely at their own pace through the two key stages – possible because of the way science is totally blocked in half-year groups. The department work as a team in important areas; they discuss what they teach together and are seen as a caring team by the students.

School G13

Comments from teacher interviews

When asked 'To what do you attribute your good uptake of post-16 science?' teachers said:

- good continuity between GCSE and A Level because so many students (120) do triple science
- the ethos of science is important, especially with respect to university entrance
- parents believe it is a credible subject and it enjoys some prestige and leverage insofar as university entrance is concerned
- students' awareness of career pathways
- teachers are passionate about their subjects and help and encourage students.

Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school:

- teaching, according to students, is 'engaging', 'interesting', 'bubbly', 'exciting', 'fascinating', 'consistently good', 'capturing', 'interactive', 'practical', 'hands on' (games, etc) – you 'learn a lot' and 'are not just copying'
- teachers are 'nice', 'dedicated', 'hard working'; they 'don't let you fall behind', 'push', 'enjoy teaching you' so 'you want to do it too'
- 'the school has high standards and the teachers help you to reach them.'

School G14

Comments from student interviews

The school is trying to improve arrangements for gathering students' views. The school has a review day which is general and a Creative Council which includes some feedback from students. The science department has a questionnaire which is used for feedback.

When asked 'What influenced your choice of subjects?' students explained that they chose science because it was their favourite subject and because it was interesting and enjoyable. Science is also associated with successful career prospects and lifestyle. What students felt they were good at was an influence, but not the overriding factor. The students felt that their choices were not influenced by parental expectation, and that they had all made their own decisions. All students found at least one science subject that was much harder than they thought it was going to be, but it wasn't always the same science subject. They found they had to work much more independently in the sixth form. They still enjoyed the practical activities and all would make the same choices again except for one who wouldn't take physics.

'It's a lot harder than you think. You must be prepared to put the work in and there is a need to be continually revising what you are doing.' 'Only choose science subjects if that's what you really want to do and not just because your friends are doing it.'

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Teacher voice

When asked 'To what do you attribute your good uptake of post-16 science?' teachers attributed their success to:

- career aspirations of ethnic minority students
- many students looking ahead to future career choices, particularly in medical and related fields, having already mapped them out before GCSE examinations
- increase in biology numbers linked to requirement now for medical routes
- increased interest elicited by a range of enrichment activities such as extra-curricular visits/courses
- triple science consolidates motivation
- a good learning environment which encourages the aspirations of students.

Summary of the key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school:

- strong traditional department in a selective environment with a good reputation for achieving success;
- high Asian population which has an effect on uptake through parental aspirations into traditional science professional careers.

School G15

Comments from teacher interviews

When asked 'To what do you attribute your good uptake of post-16 science?' teachers attributed their success to:

- quality of teaching at Key Stages 3 and 4
- staff retention
- extra-curricular activities offered.

Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school:

- teachers are passionate about the subject, have their own way of doing things, are specialists who go off the subject ('we need more risk'), are lively, dynamic, colourful, eccentric, imaginative, purposeful, challenging, rely less on book work and emphasise enquiry
- good relationships – 'rapport', humour, inclusiveness, good support, options kept open and then choices guided (all have opportunity to do science, no GCSE limit)
- triple science
- good physicists
- parental support and influence (science in background), students 'good at science', have always been interested in how the world works , natural disposition
- consistent quality across science department and school

- AfL
- extra-curricular science – astronomy club, science club – leading to GCSE astronomy
- well led by previous and current subject leaders
- stable team but new blood.

School G16

Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school:

- leadership, determination, vision, putting science on the map, purposeful approach
- building team, sharing
- recognising students' legitimate aspirations and building on that ethos
- wide-ranging curriculum, appropriate programmes to meet wide need (BTEC as well as GCSE triple science)
- building a stable team
- LA contribution to results provided an important baseline
- Senior leadership team support and recognition of potential
- Year 11 boys were 'genuinely interested', enjoyed science in Year 9 and like to know about the 'real world'
- teachers are good and help them understand and make it easy to learn; students know what lessons are going to be like – confidence in quality of provision, some science memorable
- Year 11 girls are doing science for pragmatic reasons, a means to an end (careers) and most are going to a different school for post-16 because of a bad experience with one teacher and because the subject leader is about to go on maternity leave
- department is well run.

School G17

Comments from student interviews

Student questionnaires are used from time to time – Year 7 on new courses and Year 10 on revision days.

When asked 'What influenced your choice of subjects?' students explained why they chose science:

- interest and enjoyment
- what they are good at
- good teachers who are enthusiastic
- they chose biology because it is more relevant to them
- practical activities, finding out things, a 'hands on' subject
- variety of ways to learn – not repetitive – so you don't switch off.

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At Key Stage 4, the provision changes to separate subjects as the 'material is more advanced'.

Students commented on:

- balance of practicals and other lessons
- good teachers who explained things
- mixture of ways of learning
- Key Stage 4 more interesting, better practical activities/application of sciences.

Post-16, students commented that: they would make the same choices. Biology is much as expected. There is more hard work and it is much more difficult. This was a bit of a shock – chemistry involves a lot more mathematics. Learning is much more dependent on individuals – self-learning is required.

Doing something that you enjoy is important as well as something you are good at. Don't be put off by what you hear about the amount of work – if you enjoy it you try harder. Think hard about choices. Don't take science to fill the space. You have to be interested and motivated to put in the work required.

Students are not taking science because of career choices or because it's considered harder.

Comments from teacher interviews

There has been some external training regarding changes in exam syllabuses. Arrangements have been made for exam boards to come in and give training in school. Newly qualified teachers (NQTs) are encouraged to undertake training.

There is a move in the department to translate teaching strategies from Key Stage 3 into post-16 to improve teaching and learning. There is currently a perception among some staff that A Levels should be taught in a strictly academic way.

For NQT there is general training on teaching strategies. The school does a lot of staff training on in-service training (INSET) days. It isn't teaching post-16 at the moment but believes the attitude of learners is different post-16 because they have chosen to take it. Less differentiation is needed because they are all bright.

Teachers hope that students would refer to the amount of practical activities as part of the good teaching they experienced. Students would probably say that they found physical sciences hard at Key Stage 4.

There is a variety of teaching approaches and activities. Key Stage 4 – still includes practical activities but there is more emphasis on learning and understanding.

When asked 'To what do you attribute your good uptake of post-16 science?' teachers responded:

- giving a large number of students the opportunity to do well at GCSE
- use of separate sciences
- heads of subject areas have worked hard to improve
- a lot of students want to go on to professional careers – expectations of parents in above-average catchment area
- other things that are difficult to quantify – change of exams, brighter students now have a much better idea of what grades they are going to get, refurbished labs provide a better learning environment
- students see importance of having science subjects on their CV
- teachers have good relationships with students.

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Strategies influential in promoting post-16 science:

Open-access policy in allowing students to do subjects post-16 is probably positive in encouraging students – but this needs to be balanced by realistic advice to both students and parents regarding individual expectations, especially in a catchment area like this one.

Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school

This is a large school with a large science department operating on a split site but it is effectively managed by a good head of department who got teachers working together well. It had enthusiastic teachers who cared about their subjects and talked to each other about what they taught and how they taught it – using a variety of teaching and learning strategies. This was confirmed by students.

All the students interviewed achieved grade B at GCSE and were quite clear that although they didn't get the best grades, the fact that they had enjoyed their science and had been taught in an interesting way was a main reason for choosing it post-16. Because of this they were motivated and prepared to work hard at it and didn't feel they were disadvantaged in any way.

The school has an open-access policy into the sixth form, which has its advantages in encouraging students to stay on and choose subjects post-16 but has the disadvantage in this above-average catchment area of not always having parents with realistic expectations in terms of achievement, which can create tensions.

School G18

Comments from student interviews

The department is still developing the use of student interviews and surveys.

When asked 'What influenced your choice of subjects?' students explained that they chose science because:

- careers featured highly – physics to do engineering, biology and chemistry for medicine
- enjoyed subject most at GCSE
- good at sports science, good at subject at GCSE
- most universities looking for core subjects
- biology teachers good – make subject enjoyable
- wanted a science subject to balance English study.

Those not choosing science did not enjoy it or found it hard.

Students' experiences at Key Stage 3

Lots of practical work, more basic topics, some science games. Lots of experiments (science not separate sciences), enjoyable, no notes but information in little booklets. Games using IWB.

Lessons not challenging/stretching (middle-set syndrome?) – one liked National Curriculum tests because they 'stretched you' and aided revision strategies.

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Students' experiences at Key Stage 4

Lessons were less practical, contained more detail and more facts and were easier than at A Level. Students were told what notes to take or were needed from teacher presentation.

Lessons were made more interesting – influenced students to take A Level. Easier than AS, though several found GCSE Physics hard. There were fewer practical activities, more videos ('Teacher cannot be bothered!'), and lots of subjects to cover (12), so revision for exams was difficult.

Advice to potential A Level students was:

- try a taster lesson (not available) making sure it reflects the real thing
- talk to current A Level students to get a view of what the course it is like
- check on which teacher will be teaching you (better and worse teacher)
- take the subject if you are really enthusiastic about it and feel you can stick at it (quite a few drop out after the first term)
- you need to be clever to take science and be prepared to work hard
- homework load is much greater than GCSE
- don't leave revision until the last minute.

Comments from teacher interviews

The subject leader was well aware of insufficient differentiation within sets.

At Key Stage 3

Students enjoy practical work (lots of it)and think its fun. Those in top set are challenged and stretched. Use of games, etc. is patchy (when the department started, it had not adopted much of the Secondary National Strategy materials). Verbal feedback to students is good, written feedback poorer.

There is a seating plan and the lesson is in three parts. Students enjoy practical work and feel they are learning, particularly where they are actively engaged. Some students are possibly not stretched and homework provision is variable.

There is a variety of activities – book work, practical, games, good use of IWB, work with a partner or small group. Lessons are teacher-led rather than student-led.

At Key Stage 4

Experience varies noticeably from course to course – range of pathways.

Lot of practical work though some teachers say not enough (but then are not creative) – the traditionalists. Less practical work with more material to get through. Less cooperative learning than at Key Stage 3. A more traditional approach – which some students expect.

When asked 'To what do you attribute your good uptake of post-16 science?' teachers said:

- good staff, history, culture within the school and influence of parents
- forward-looking department with good teachers
- sufficient chemistry and physics specialists (as well as biology)
- really good staff who are positive about science from Year 7
- lots of support for and feedback to students; one-to-one discussions after 'milestones'
- students feel valued/that staff care
- Year 10 project work helps.

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Strategies influential in promoting post-16 science

Science A Level subjects at the school have enjoyed a lasting reputation among parents and students for several years that, one could argue, would take a prolonged period of failure to erode. This reputation was built on, and sustained by, good-quality specialist science teaching from a supportive and collegiate science faculty. Many factors combine to perpetuate the success of the department: a wide range of enrichment activities, support from parents, confident and engaging teaching, availability of specialist teachers, courses appropriate for the needs of learners, extremely competent and well-qualified support staff, energetic and forward-looking teaching staff, good quality accomodation/resources and good management and leadership of the department.

Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school:

- good staff, history, culture within the school and influence of parents
- enrichment activities
- lots of support for and feedback to students (one-to-one discussions after 'milestones')
- students feel valued/that staff care
- enjoyed subject at GCSE
- need for career and valued by HE.

School G20

Comments from student interviews

The department has a number of ways in which it consults learners and these discussions indicate an improvement in the learners' attitude to science and their interest in further study/careers in science.

In Key Stage 3 students said they 'enjoyed but didn't learn much science' – 'we burnt stuff, messed about'. It was all one science and not split into biology, chemistry and physics. Students said they did lots of practical work and some games (e.g. Splat) and by Year 9 there was some group discussion. Science was enjoyable, less stressful and 'we were laid back'. Students felt they were spoon fed. Games, such as Splat, helped them to learn and creating posters was a valuable way of organising and presenting their ideas.

In Key Stage 4 students said it was harder and teachers pushed them – 'You learn more and at a faster pace'. But there was less practical at Key Stage 4, more discussion, no games. These experiences varied from teacher to teacher but in general Key Stage 4 was more focused, there was greater pressure, students were more rushed, it was harder work and there were deadlines to meet so that they needed to ensure students did not fall behind, particularly if they missed a lesson. Advice to others was 'Have high expectations about what you can achieve'.

When asked 'What influenced your choice of subjects?' students explained that they chose science because the teachers helped them with their choice and provided support, though some 'tell' more than others. Enjoyment and prospects of a well-paid job are important factors, too.

Peer group pressure also influenced the decision, as did the fact that science was seen as interesting, is linked to life, explains how things work and is enjoyable, though sometimes difficult. Science is essential for some career options; 'vital for medicine', for instance. Teachers and family influenced choice to some degree.

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Interestingly, feedback from the headteacher and subject leader indicated that feedback from sixth-form providers showed that students from this school coped better than others with independent study and knew how to learn effectively (influence of Learning to Learn was evident at this school).

Comments from teacher interviews

When asked 'To what do you attribute your good uptake of post-16 science?' teachers cited:

- specialist status
- wide range of enrichment events, outside speakers, etc. to promote learning and engagement in science
- enthusiasm of Asian girls for science
- enthusiasm of staff teaching science.

Key factors influential in achieving high levels of take-up of science subjects post-16 in this school are:

- specialist status
- wide range of events, enrichment, outside speakers, etc.
- enthusiasm of Asian girls for science
- enthusiasm of staff teaching science
- enjoyment, prospects of well-paid job and good career options
- students understand that everything relates to science – it is important to life and how it works
- external speakers are inspirational and 'you see what you could do!'.

School G23

Comments from student interviews

Students described their experiences of science at Key Stage 3 as being better than Key Stage 4, again, typical of most students. It was more practical and they recalled science games like bingo and round robin Q&A as well as more conventional questions answered from textbooks and slide shows. Years 7 and 8 built well on primary school studies and the work was easy to understand. It became harder in Year 9, leading up to GCSE (two students did not enjoy the option choice).

Key Stage 4 was a 'big leap from' and harder than Key Stage 3 – 'we made notes by making key points from information on slides and often finish off classwork for homework'. Students 'enjoyed the project on buckyballs' (having to find and present information). Teachers, however, said they had no time for 'that', they were behind schedule and it just wasted more time. BTEC students enjoyed their course – there was lots of practical work and discussions. There was some debate among students about whether BTEC was easier than core science plus additional science or triple science. 'It's just different!' said a triple science student.

When asked 'What influenced your choice of subjects?' students explained that their choice was largely determined by:

- 'what you are good at and enjoy'
- what you might need for a future career
- the influence of older friends and relations.

Comments from teacher interviews

The teachers' view was that the experience of science depends on the student and the teacher(s) they had but that science lessons were generally well organised – three-part lessons with a variety of activities such as games, quizzes, practical work – and were enjoyable. Science skills permeated lessons at Key Stage 3 with graphs, fair testing, reliability, etc. but learning scientific skills was more of an issue at Key Stage 4 when trying to cover content. They thought that Year 10/11 students would view science as stressful, with lots to get through, lots of information given out very quickly, few games and less practical work than at Key Stage 3.

When asked 'To what do you attribute your good uptake of post-16 science?' teachers said:

- their own personal enthusiasm and being very positive with students about what they can achieve
- they provide courses to cater to the abilities of students and their needs and great care is taken with advice to students at option time
- students enjoy the science club after school too
- the school is supportive and this increases teachers' confidence in the classroom, they 'enjoy the job more and the enthusiasm rubs off'.

Strategies influential in promoting post-16 science

One teacher said, 'I have always promoted science in a very positive way to students in my classes and assured students that they are capable of science A Levels'.

Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school are:

- subject leaders' personal enthusiasm; being very positive with students about what they can achieve
- courses cater to abilities of students and their needs
- good experience at GCSE
- subjects felt to be useful for the future.

School G24

Comments from student interviews

Students' advice for those thinking about pursuing science is: 'do a science post-16; it's 'not easy but worthwhile'; 'practical sessions are good'; 'pick the subjects you like and are good at'; 'try it even if you think it might be difficult'; look at all the options available; 'college may be better for some' though one advantage of staying at the school is that you know the staff and different teachers have different styles. Essentially, 'do what you want to do'.

When asked 'What influenced your choice of subjects?' students explained that:

- some had chosen science somewhat randomly though they had enjoyed science at Key Stage 4
- some students chose what they knew they needed post-16 for a preferred career in science
- some opted to stay at the school as they knew staff and the routines and had been well supported at GCSE
- one did chemistry at another school in the consortium but could still get support in their own school.

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Comments from teacher interviews

When asked 'To what do you attribute your good uptake of post-16 science?' teachers cited:

- good results – if students get good results they are more likely to stay on and do science at A Level
- interesting/exciting science lessons – e.g. applied science has recruited extra students to A Level (cohort increased from 5 to 12 students)
- parental influence – Asian parents particularly have high aspirations for their children though they are not 'pushy'.

Strategies influential in promoting post-16 science

A teacher commented: 'For the last two years we have taken part in the stimulating physics project with the Institute of Physics which was targeted at Year 9, so we will not see the major benefits on AS numbers until 2010. We also started the girls into Physics which was targeted at a Year 9 top set all-girl group taken by a female physics teacher. The impact on numbers at AS will be seen in 2010. At the same time we also produced a Year 9 all-boy top set which produced excellent results in the Key Stage 3 National Curriculum test results. We have seen an increase in these two sets of numbers in the triple award group from 14 in 2007 to 26 in 2008.'

Summary of key factors influential in achieving high levels of take-up of science subjects post-16 in this school:

- good results
- parental influence (Asian)
- science seen as useful for future careers
- staff known by students.

School G25

Comments from student interviews

Students' advice to those thinking of doing science was to 'make sure that you are 100% determined to do what you want to do' and get good grades from GCSE. 'Your interest in the subject must be genuine' and 'you can't afford to slack off'. 'Do your research into what is involved at AS before you decide' and 'choose carefully, make your own decisions and do what you enjoy. Prepare to work hard'.

When asked 'What influenced your choice of subjects?' students explained that they chose science because:

- it is what they were good at
- they were influenced by their career choice and interest in subjects which 'are to do with why stuff happens'
- although the group had mixed combinations, they pointed out there is a high proportion of students in the year who take triple science and mathematics and want to go into medical-related careers – largely to do with parental expectations they thought
- the reputation of sciences is 'good'.

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Comments from teacher interviews

Teachers characterised science lessons as being practical, with investigations and 'hands-on' work. They had 'relevance to the science students' world'. Science gets more technical and demanding as time goes on and students experience a range of teaching and learning styles. Key Stage 3 is 'fun, loud, with lots going on'. Key Stage 4 is also fun with 'active teaching but less practical'. There is little 'worksheet activity' and 'plenty of discussion about what they are learning'. The Key Stage 3 course is being rewritten and will involve skills-based practical activities.

When asked 'To what do you attribute your good uptake of post-16 science?' teachers cited:

- good teaching by well-qualified and enthusiastic teachers
- parental expectations of classic science careers by many ethnic majority parents
- enjoyment of science.

Strategies influential in promoting post-16 science:

One teacher said, 'Unlike some departments we do not try and sell ourselves in any overt way or target individual perfect students. I believe our growth is largely due to good old-fashioned teaching with plenty of interest and enhancement. Many of our students are very bright and are perhaps put off by hard-sell tactics and pleading!'

Summary of key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school

This is a selective boys school taking students from other schools into the sixth-form, with large numbers taking sciences post-16 including girls from the equivalent girls selective school in the city. Large numbers take sciences post-16. The girls were quite clear that they moved to get a better science education post-16. The department is organised on traditional lines into separate subject teams that look after their own area but these teachers are enthusiastic, knowledgeable, know their stuff and obviously transmit their enthusiasm and enjoyment to the students. This is particularly true of the physicists. The students also make it clear that the lessons are challenging, have variety and are interactive. Being an inner city school, with a high percentage of Asian students, one of the main suggested reasons for high uptake was parental expectations.

School G26

Comments from student interviews

Student voice questionnaires are used across the department. The aim is to make the students reflective about practice. In addition there are more informal arrangements for getting student feedback, and the science department is involved in a project about the impact of feedback on motivation at the end of lessons with a group of teachers from other departments.

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When asked 'What influenced your choice of subjects?' students explained that they chose science because of:

- enjoyment
- interest
- variety of subject content and relationship to other subjects outside science
- high currency as far as future career prospects
- stability of science department and good teachers.

Boys added 'careers choice' and 'how good you are at it', though this is not considered to be the most important reason.

Comments from teacher interviews

When asked 'To what do you attribute your good uptake of post-16 science?' teachers responded:

- stable staff in the department
- the department has made progress and is now more flexible in its teaching approach
- teachers are good at taking on new ideas and keen to improve and make things better for their students – they are looking at collaborative learning situations in the new buildings
- good spread of subject knowledge
- staff enjoy their science and transmit this to the students
- staff are dedicated to their subject and their students
- this is a rural school where it is probably easier to stay on post-16
- the school benefits from specialist college status.

Strategies influential in promoting post-16 science:

- open evening, post-16 students talk to Year 11 students
- speed 'dating' (Year 11 and Years 12/13)
- visiting speakers, including ex-students
- university taster days, Year 10
- visits to universities
- Gifted and Talented events.

Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school

There is an extremely well-managed and organised department of enthusiastic teachers who are keen to improve, and who spend much time concerned about what they teach and how they teach it, sharing the information on a regular basis with each other. Staff come from a wide range of backgrounds, which helps both in the variety of courses they offer and the help that they can give to students with careers. There is a good supportive programme for making choices of subjects post-16, which is appreciated by the students and also links with the world outside.

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School G27

Comments from student interviews

Most students found Key Stage 3 interesting and enjoyable, with memories of finding out for themselves through practical activities. Key Stage 4 elicited more variable memories, with some physical science subject areas perceived as boring and characterised by lack of practical activity and much traditional theory.

They were impressed by teachers' confidence and how they worked together, and seen as, a team, a 'whole department'. Almost all of the students interviewed had studied triple science at Key Stage 4.

When asked 'What influenced your choice of subjects?' students explained that they chose science because:

- they like it and it is 'what you are interested in'
- it is what they are good at
- it helps them with the career they might possibly follow
- they have always wanted to do it – in many cases thoughts on subject combinations appeared to have been relatively fixed since Key Stage 3.

They thought that many students who hadn't chosen sciences were put off by perceived difficulty. They also pointed out that it's not good enough to just increase the numbers if you don't also make sure that students are fully aware of what they are taking on and have realistic information about what they can do afterwards, otherwise as with some of the girls, the sciences will be the subjects they drop at the end of AS.

Comments from teacher interviews

When asked 'To what do you attribute your good uptake of post-16 science?' teachers said:

- enthusiastic teaching
- good student–teacher relationships
- a presentation to Year 11 students is given prior to the open evening
- good relationships between teachers
- the department as a whole is keen for students to achieve the best possible and let them know this; science is made interesting for students
- quality of teaching
- approachable department; happy to give time on a one-to-one basis
- continuity of teachers
- the school assessment policy has a positive effect for teachers who know where students are and are therefore able to move them on; there is a similar motivating effect for students
- there is an open evening prior to sixth-form choices where courses are discussed, with Year 12 students present to talk about their experiences and displays shown
- no significant amount of extra-curricular activities.

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In addition, the school has a significantly higher uptake from B grades than the national average for two reasons. Firstly, the LA operates a highly selective system in the area, with the local grammar school creaming off the top 40% of the ability range. This, coupled with the push by the school to increase sixth-form numbers for reasons of viability, means that the intake into courses has to come from below the very highest ability group. Despite this, the department is doing reasonably well with the intake it has. Teachers work effectively as a team, have good relationships with students and are prepared to put the time in to make sure that students achieve their best. They talk regularly about what they teach and how they teach it. The subject leader knows that there are areas for improvement and has an awareness of what they are.

School G28

Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school:

- boys cited science as enjoyable, with few other influences on their choice – some mentioned careers (pharmacy), one mentioned the 'influence of mum' but otherwise it was the experience of science in school that had urged them towards science post-16
- science 'respected' by employers
- girls tended to have other reasons – 'curiosity', parental pressure, caring, 'wanting to influence the lives of others'
- good teaching by 'teachers who explain clearly', use artefacts, and resources as illustrations are practical ('breaking it down so everyone understands') make links, 'connect' and are 'charismatic'
- this is a science specialist school with a good reputation (quite a few come from other schools)
- good facilities, with good resources, despite poor accommodation
- great deal of extracurricular science – visits, visitors, events, challenges, down days, trips to Imperial College, robotics, Alton Towers, bouncy castle – science is seen as being vibrant
- careers fair, clarity and advice about possible career options
- one of top most improved science colleges in top five
- science has status in school and there is a reputation for quality provision – students know what they're going to get
- trust, expectations met
- good leadership, teamwork, sharing ideas, creative approaches, adventurous department 'fantastic dept to work in'
- a thoughtful, well-structured science curriculum with a range of options, schemes of work and resources all on a shared site
- teachers 'listen to students' and involve parents and Year 6
- science specialism has an impact through the subject leaders' vision.

School G29

Comments from student interviews

The school has used a Year 7 questionnaire in the past to gauge students' views and there is a three-year whole-school rolling programme involving students, staff and parents to get feedback. The headteacher and deputy headteacher follow up with stratified student interviews on which there is informal feedback to staff – students are 'not backward' on this. There is also feedback via the school council and a suggestion box in the school's foyer.

When asked 'What influenced your choice of subjects?' students explained the reasons why they chose science:

- a career path was clearly identified for several (navy, welder, doctor)
- interest
- they wanted to keep options open
- the career of a sibling or parent
- money
- personal interest and doing subjects they like
- parents' views and experience
- a change in teacher – one student hated science (teacher effect) but with a different teacher has been inspired.

Comments from teacher interviews

When asked 'To what do you attribute your good uptake of post-16 science?' teachers suggested:

- teacher interest, commitment and enthusiasm
- science activities out of the classroom, including theatre
- a yearly visit to Newcastle University (Year 9/10)
- courses and activity days at the Centre for Life at Newcastle University
- avisit to the University of Northumbria for a day on science-based industry – displays, presentations and discussions
- interesting lessons.

Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school:

- teacher commitment and enthusiasm
- science-related visits out of school
- personal interest and being good at the subject
- options for future careers
- staff make a difference.

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School G30

Key factors that are influential in achieving high levels of take-up of science subjects post-16 in this school:

- teaching is lively, exciting, enquiry-based and driven by the new secondary curriculum
- 'big', unpredictable science; little use of books or worksheets
- dedicated teachers 'make you dedicated'
- good quality, trust 'what it says on the label', students know what to expect from teachers – syllabus covered, coursework planned well ahead, etc
- teachers are reliable, 'not away', know their subjects, make you work hard, 'you can't just dawdle away'
- strong pastoral support from all science teachers – 'you can go to any science teacher', high aspirations, high expectations, strong belief in students' ability to learn, conveyed successfully to students who have confidence in themselves and teachers
- options are open to all – very inclusive
- a stable team but it includes new blood
- good links with HE (for recruitment and events)
- students take up science because of their experience in school
- extra-curricular, taster sessions, open evenings
- good technical support and well resourced (prep rooms small, however)
- good teamwork, well led, clear vision and purpose
- attention to recruitment
- LA CPD influential
- girls are influenced by career choice, boys by their interest in science
- no schemes of work in Key Stage 4
- the curriculum is straightforward, now offering triple science, but the emphasis is on enquiry hugely important across the board
- good physicists (three women).

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