



**Student subject decision making
aged 14 and 16**

1. Introduction

EngineeringUK's mission is to improve the supply of engineers in the UK in order to help create a prosperous UK economy. In its flagship annual report¹ Engineering UK 2011 – the state of engineering it demonstrated the shortage in the supply of students (particularly from level 3 (A levels, advance apprenticeships, S/NVQ) studying relevant science, technology, engineering and mathematics (STEM) courses) to meet the demand for technicians and engineers by the UK engineering and manufacturing sectors over the next decade.

In order to address the issue of the supply of young people, the Department for Business, Innovation and Skills and EngineeringUK came together to commission a research project, via OpinionPanel Research, to better understand student course decision making processes at age 14 and 16; key decision point milestones. The findings from this research project will be used to inform the engineering community, Government and other important stakeholders.

Understanding the decision making process and whether pupils at this age realise the impact that their subject choices will have on their own future careers was agreed as the primary point for investigation as a better insight would provide evidence to interested stakeholders as to how STEM courses could be better promoted in the future. The need to understand this decision making process is endorsed by the data from the Department for Education² who have shown that those students who study triple science are three times more likely to study physics at A Level than those who studied core and additional science, at GCSE Level. Likewise the real impact of young people's subject choices is plainly portrayed by previous analysis by EngineeringUK who highlighted the fact that 92% of female students effectively rule themselves out of an engineering career, at age 14, by not studying triple science³.

¹ http://www.engineeringuk.com/what_we_do/education_&_skills/engineering_uk_11.cfm

² Department of Education, Maths and Science A Level high achievers

³ http://www.engineeringuk.com/what_we_do/education_&_skills/research_and_briefing_papers.cfm

2. Executive summary

2.1 Main findings:

Although students are aware of the impact of subject choices on their future careers, the top influence on the subjects they choose is enjoyment.

In order to get more students to positively choose to study STEM subjects it is important to increase the number of students who enjoy these subjects. 89% of those asked said that enjoyment of a subject influenced their decision to select that subject at GCSE or A Level.

Furthermore, 91% of GCSE students and 94% of A Level students correctly identified that their subject choices at school would be important to their career choices later in life

Students are aware of the importance of A Level maths to starting a career in engineering; however, the relative perceived importance of physics, which is also a key subject, is lower.

When asked which A Level subjects young people thought they would need to study in order to begin a career in engineering straight after school or college, nearly three quarters (72%) of students said you needed to study maths, making it the most selected A Level subject. Physics was the third most selected A Level, with 64% of students saying you needed to study it. However, two thirds (67%) also thought you needed to study engineering as an A Level in order to go into a career in engineering whereas in reality the major route by far is to study the combination of maths and physics at A level. In 2011, 82,995 students studied A Level maths⁴, while 32,860 studied physics. The Joint Council for Qualifications (JCQ) doesn't publish separate figures for the number of students studying GCE A Level engineering, however just 277 students were entered for an Applied A Level Single Award in engineering in 2011.

Students studying three separate sciences are three times more likely to choose physics A Level than those who studied core and additional science⁵.

Nearly half (45%) of respondents said they are currently studying (GCSE students) or previously (A Level students) had studied three separate science subjects at GCSE Level. However, a further 23% of students were given the option to study three separate sciences but chose not to study it, meaning that potentially 68% of students could have chosen three separate sciences. Nearly a third (29%) of respondents, however, were not given the option to study three separate sciences.

⁴ <http://www.jcq.org.uk/attachments/published/1575/JCQ%20RESULTS%2018-08-11.pdf>

⁵ Department of Education, Maths and Science A Level high achievers

3. Research findings

Table 1 shows that 91% of GCSE students thought that their GCSE subject choices were important to their future career choices. Nearly half (45%) of respondents felt their GCSE subject choices were very important to their future career. There were no statistically significant differences by gender.

Table 1: How important or unimportant do you think your GCSE subject choices are to your future career choices?

	Total (%)	Male (%)	Female (%)
Very important	45	50	42
Quite important	47	43	49
Neither important nor unimportant	3	3	3
Not very important	5	5	5
Not at all important	0	0	0

Base (all GCSE students) 305

Perceptions of the importance of A Level subject choices to future career choices were slightly higher than amongst GCSE students. Overall, 94% of A Level students thought that subject choices would be important to their future career choices, with 58% saying it was very important (table 2). There were no statistically significant differences by gender.

Table 2: How important or unimportant do you think your A Level subject choices are to your future career choices?

	Total (%)	Male (%)	Female (%)
Very important	58	56	60
Quite important	36	38	35
Neither important nor unimportant	3	3	3
Not very important	3	3	2
Not at all important	*% ⁶	0	*%

Base (all A Level students) 551

Students were asked if they knew what career they wanted to follow once they had completed their education (after GCSE, A Level or Higher Education). In total, 78% of respondents said they knew the career they wished to pursue once they had finished their education. 22% did not know what career they wanted to follow (Table 3). Nearly two thirds (64%) said they wanted to go to university before they started their career; this percentage is larger than the Higher Education Initial Participation Rate (HEIPR), which was provisionally calculated at 46.5%⁷ in 2009/10. These findings indicate that many students who currently want to go to university will not do so.

⁶ The percentage is greater than zero but less than one

⁷ http://stats.bis.gov.uk/he/Participation_Rates_in_HE_2009-10.pdf

Table 3: Do you know what career you wish to pursue when you complete your education?

	Total (%)	Male (%)	Female (%)	Studying GCSE (%)	Studying A Level (%)
Yes, I will start my career after I finish my GCSEs	2	4	1	6	0
Yes, I will start my career after I finish my A Levels	12	14	11	16	10
Yes, but I'm going to go to university first	64	64	63	58	67
No	22	18	24	19	24

Base (all respondents) 856

When respondents were asked, from a list, what job they would most like to have when they were older. One in ten (10%) said they would like to be a teacher, 9% said they wanted to be a doctor and 9% also said they wanted to become a lawyer. Only 2% of respondents said they wanted to be an engineer, highlighting that work still needs to be done to promote engineering as a positive career choice (Table 4).

Table 4: What job would you most like to do when you are older?

	Total (%)	Male (%)	Female (%)	Studying GCSE (%)	Studying A Level (%)
Teacher	10	8	12	8	12
Doctor	9	9	10	11	9
Lawyer	9	7	10	11	8
Scientist	7	7	7	8	6
Accountant	5	7	4	4	5
Computer games developer	2	6	*%	1	3
Engineer	2	6	0	2	3
Actor/actress	2	2	3	2	3
Vet	2	*%	3	1	2

Base (those who know what career they wish to pursue after completing their education) 667
All other listed responses mentioned by less than 2% of those answering the question⁸.

Table 5 shows that 88% of GCSE students and 90% of A Level students were influenced, in the subjects they chose, by their enjoyment of the subjects. Other factors which influenced subject choices, but were less important than enjoyment, were "to achieve my career goals", which was mentioned by 67% of students. A quarter (27%) was influenced by subjects which were difficult/challenging. Males (32%) were more likely to be influenced by difficult and challenging subjects compared to females (25%). 16% of females were likely to select a subject because their parents wanted them to do it compared to 10% of males.

⁸ 48% of respondents also selected "Other" jobs

There were also statistically significant differences by stage of education; 30% of A Level students said they were influenced by subjects which are difficult/challenging, compared to 22% of GCSE students.

Table 5: Which of the following influenced your decision to select the subjects you chose to study at GCSE/A Level?

	Total (%)	Male (%)	Female (%)	Studying GCSE (%)	Studying A Level (%)
I enjoy the subjects	89	86	90	88	90
To achieve my career goals	67	70	65	64	69
The subjects are difficult/challenging	27	32	25	22	30
My parents wanted me to	14	10	16	15	13
The subjects were cool	13	15	12	14	12
My teachers wanted me to	12	11	13	14	11
The subjects are easy	10	10	10	11	9
My friends were choosing them	4	5	4	6	3
Other answers	9	7	10	11	8

Base (all respondents) 856

Table 6 shows that the number of respondents who said that they are currently (GCSE students) or did study (A Level students) three separate sciences at GCSE was almost the same as the number who did core science and additional science (45% and 44% respectively).

Data from the Department for Education⁹ has shown that those students who study triple science are three times more likely to study physics at A Level than those who studied core and additional science at GCSE Level. Increasing the number of students who study triple science at GCSE Level will increase the number of students studying physics at A Level.

EngineeringUK has also shown in its International Gender research that the combination maths and physics, at A Level, was critical if students were to progress onto engineering degrees¹⁰.

⁹ Department of Education, Maths and Science A Level high achievers

¹⁰ http://www.engineeringuk.com/db/documents/Int_Gender_summary_EngineeringUK_04_11_.pdf

Table 6: Which of the following GCSE courses are you currently taking/did you take?

	Total (%)	Male (%)	Female (%)	Studying GCSE (%)	Studying A Level (%)
Three separate sciences (biology, chemistry and physics)	45	49	43	49	43
Core science and additional science	44	39	46	38	47
Core science and applied science	3	2	3	2	3
Core science only	4	4	4	5	3
Other	3	5	3	4	3
Do/did not do GCSE science	1	1	1	2	1

Base (all respondents) 856

Of those students not doing three separate sciences, 41% said they were given the option to study three separate sciences (table 7); and half (53%) said they were not given the option to study three separate sciences.

Looking at stage of education it can be seen that half (52%) of GCSE students said they were given the option to study three separate sciences while only a third (36%) of A Level students were given the same option. Encouraging evidence from the national STEM centre¹¹ shows that the number of students studying triple science grew significantly in 2010 with the number of students studying GCSE physics rising by 32.1%, compared to the previous year. However further work needs to be done to ensure that as many students as possible get the option to study triple science and, when given the option, choose to study triple science.

Table 7: Did your school offer you the choice to study three separate sciences (biology, chemistry and physics) at GCSE?

	Total (%)	Male (%)	Female (%)	Studying GCSE (%)	Studying A Level (%)
Yes	41	41	42	52	36
No	53	56	52	42	59
Don't know	5	4	6	6	5

Base (all students not doing three separate sciences/did not study three separate sciences at GCSE) 470

For over half (54%) of all students studying/studied a GCSE science course(s), the course they study/studied was compulsory (table 8). Over a quarter (28%) of students chose their GCSE science course(s) because they thought it would help them in their future studies; one in five (20%) said that they thought it would be harder/more challenging than other GCSE science options and the same proportion said it was because their teacher wanted them to do it.

¹¹ <http://www.nationalstemcentre.org.uk/news/2010-gcse-results---triple-science-continues-to-grow>

Table 8: Why did you decide to study three separate sciences (biology, chemistry and physics)/core science and additional science/core science and applied science/core science only/other science?

	Total (%)	Male (%)	Female (%)	Studying GCSE (%)	Studying A Level (%)
It was compulsory	54	53	55	49	57
I thought this particular course would help me in my future studies	28	29	27	33	25
I thought it would be harder/more challenging than other GCSE science courses	20	20	20	21	20
My teacher wanted me to	20	20	19	16	21
My parents wanted me to	7	7	6	9	5
I thought it would be easier than other GCSE science courses	5	3	6	7	4
My friends chose to study it	3	4	3	2	4
Other	14	13	14	17	12

Base (all students studying/study a GCSE science course) 846

Table 9 provides a breakdown of reasons why students chose the GCSE science course(s) they selected. Two thirds (66%) of students studying core science and additional science did so because it was compulsory. However, for those studying three separate sciences nearly half (47%) said they thought three separate sciences would help them in their future studies and a third (36%) said they thought three separate sciences would be harder/more challenging.

Table 9: Why did you decide to study three separate sciences (biology, chemistry and physics)/core science and additional science/core science and applied science/core science only/other science?

	Three separate sciences (%)	Core science and additional science (%)	Core science and applied science (%)	Core science only (%)	Other (%)
It was compulsory	42	66	64	62	39
I thought this particular course would help me in my future studies	47	13	4	0	18
I thought it would be harder/more challenging than other GCSE science courses	36	7	4	3	14
My teacher wanted me to	28	13	16	9	11
My parents wanted me to	13	*%	4	0	7
I thought it would be easier than other GCSE science courses	1	8	16	12	14
My friends chose to study it	6	2	0	0	4
Other	9	15	24	26	36

Base (all students studied/studying a GCSE science course) 846

Students were asked to select from a list which subjects they are studying at GCSE Level (GCSE students) or what subjects they did study (A Level students). Both of the two top courses selected by nearly all respondents were English (97%) and maths (96%), which are compulsory, (table 10). The most popular non-compulsory subject was religious studies¹², which was studied by three quarters (73%) of respondents. A third (36%) studied design and technology.

2% of students said they had opted to study engineering; boys (4%) were statistically more likely than girls (1%) to choose engineering. In addition GCSE students (4%) were statistically more likely than A Level students (1%) to have chosen to study engineering.

¹² Whilst not compulsory, Religious Studies is a statutory subject.

Table 10: Which other GCSE subjects are you doing (GCSE students) or did you choose (A Level students)?

	Total (%)	Male (%)	Female (%)	Studying GCSE (%)	Studying A Level (%)
English	97	95	98	95	97
Maths	96	97	96	96	96
Religious Studies (RE)	73	69	74	73	72
Languages	69	61	74	65	72
ICT	64	69	62	63	65
History	45	40	47	46	44
Geography	37	47	31	33	39
Design and Technology	36	38	35	32	39
Physical Education (PE)	27	26	27	31	24
Art and Design	25	15	30	25	25
Music	17	21	14	17	16
Engineering	2	4	1	4	1
Other	47	39	52	48	47

Base (all respondents) 856

Students were asked which A Level subjects they had chosen (A Level students) or would choose (GCSE students)(table 11). 41% of students said they would/did choose maths, however, the results highlighted a significant gender divide; nearly half (48%) of men would/did choose maths compared to only a third (36%) of women. Similarly for physics, a fifth (19%) of students said they would/did choose physics, but amongst males this rose to 30% while for females it declined to 13%. This shows that the engineering community, Government and other stakeholders need to work together to encourage more females to study maths and or physics.

Table 11: Which of the following A Level subjects are you doing (A level students) and which A Level subjects would you like to do (GCSE students)?

	Total (%)	Male (%)	Female (%)	Studying GCSE (%)	Studying A Level (%)
Maths	41	48	36	41	40
English	36	24	43	39	34
Biology	29	21	34	33	27
Chemistry	26	26	26	27	26
History	20	15	23	25	18
Physics	19	30	13	20	19
Languages	19	15	21	22	17
ICT	12	22	7	12	12
Geography	11	14	9	11	11
Further Maths	11	16	7	11	10
Art and Design	9	8	10	11	9
Religious Studies (RE)	9	5	12	10	9
Design and Technology	5	7	5	8	4
Music	5	5	5	6	5
Physical Education (PE)	4	5	3	4	3
Engineering	1	2	0	2	0
Other	63	58	67	55	68

Base (all respondents) 856

GCSE and A Level students were given a prompted list and asked which GCSEs they thought people would need to study if they wanted to go into an engineering job straight after school or college. Looking at table 12, 85% of all respondents thought that you would need maths; however this rose to 88% amongst A Level students and declined to 79% amongst GCSE students. Two thirds (67%) of students thought people would need engineering; amongst GCSE students this rose to three quarters (78%), while for A Level students it was 61%. Two thirds (68%) of students also thought that people would need physics to go into an engineering job straight after school or college.

Half (51%) of students thought that people would need design and technology to go into an engineering job straight after school or college; amongst male students this rose to 57%, compared to 48% for women. 58% of GCSE students also thought you would need design and technology compared to just under half (48%) of A Level students.

These results demonstrate that improved Careers Information, Advice and Guidance is required to inform students before they make their GCSE options of the importance of studying maths and physics if they wish to pursue a career in engineering.

Table 12: If you were going to get an engineering job straight after school or college, which of the following GCSEs do you think you would need to have studied?

	Total (%)	Male (%)	Female (%)	Studying GCSE (%)	Studying A Level (%)
Maths	85	85	85	79	88
Physics	68	69	67	64	69
Engineering	67	65	68	78	61
Design and Technology	51	57	48	58	48
Science	48	42	51	44	50
ICT	35	33	36	36	35
Further Maths	29	32	28	26	31
English	29	26	30	29	28
Chemistry	22	21	22	15	25
Art and Design	14	15	13	20	11
Biology	9	9	8	6	10
Geography	4	7	3	6	4
Languages	4	5	3	3	4
Physical Education (PE)	2	2	2	4	1
History	2	3	1	2	1
Religious Studies (RE)	*%	*%	1	1	*%
Music	0	0	0	0	0
Other	1	2	1	2	1
Don't know	2	2	3	4	1

Base (all respondents) 856

GCSE and A Level students were asked which A Level subjects they thought people would need for a job in engineering. Nearly three quarters (72%) of students thought that they would need maths; amongst A Level students this rose to 78%, but for GCSE students it declined to 62% (table 13).

The second most frequent answer was engineering, which was selected by two-thirds (67%) of all respondents engineering. GCSE students were more likely to choose engineering (76%) than A Level students (62%). In 2011, 82,995¹³ students studied A Level maths, while 32,860 studied physics. The Joint Council for Qualifications (JCQ) doesn't publish separate figures for the number of students studying GCE A Level engineering, however just 277 students were entered for an Applied A Level Single Award in engineering in 2011.

Nearly two-thirds (64%) of respondents chose physics; amongst GCSE students the comparable figure was 58%, while for A Level students it was 68%.

These results emphasise the importance of good quality Careers Information, Advice and Guidance which is provided to students prior to their GCSE choices in order to inform them of the importance of studying maths and physics if they wish to pursue a career in engineering.

¹³ <http://www.jcq.org.uk/attachments/published/1575/JCQ%20RESULTS%2018-08-11.pdf>

Table 13: If you were going to get an engineering job straight after school or college, which of the following A Levels do you think you would need to have studied?

	Total (%)	Male (%)	Female (%)	Studying GCSE (%)	Studying A Level (%)
Maths	72	73	72	62	78
Engineering	67	65	68	76	62
Physics	64	68	62	58	68
Further Maths	34	37	33	28	38
Design and Technology	32	34	30	38	28
ICT	19	16	20	23	16
Science	19	18	19	19	18
Chemistry	14	11	15	11	15
Art and Design	7	7	7	9	6
English	4	5	4	6	3
Biology	3	4	3	2	4
Geography	1	2	1	2	1
Languages	1	1	1	2	1
Physical Education (PE)	*%	*%	1	1	0
History	*%	*%	*%	1	*%
Religious Studies (RE)	*%	1	0	1	0
Music	*%	*%	0	*%	0
Other	1	2	1	2	1
Don't know	4	3	4	5	3

Base (all respondents) 856

4. Appendix

Table 14 shows the profile of students who took part in the research project. 10 respondents were studying either GCSEs or A Levels plus another qualification and so have been counted twice in table 14.

Table 14: Sample profile

	Total	Male	Female
Year 10	91	29	62
Year 11	214	72	142
Year 12	216	73	143
Year 13	335	137	198
Other	10	4	6
Total number of responses	866	311	545

Base (all respondents) 856.

Fieldwork for this research project was conducted by OpinionPanel Research between 7 and 22 June 2011. The sample consisted of 856 interviews with GCSEs and A Level learners in England.

When looking at gender, stage of education and GCSE science course breakdowns, all differences mentioned in the commentary are statistically significant at the 95% confidence level.