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Sunderland**

Hill, Marianne C.M. (2012) A Study into the Participation and Engagement of Young People with Physics in Post-Compulsary Education. Doctoral thesis, University of Sunderland.

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## INTRODUCTION TO SECTION 9

### Where can science lead you? Careers with Science

**Aim:** To explore careers in science at different stages of education, particularly within this geographical region.

**Contents:** Introduction to Section 9  
Report  
Evaluations: Team Leader (FEC)  
Senior Connexions Adviser

**Methodology:** This report was produced after analysing the UCAS application trends in Section 8 of the portfolio. The report began with an outline of the role of Connexions and how its priority is to ensure the employment, education or training of young people up to the age of nineteen. Through my work with a senior Connexions Advisor, I investigated the range of careers in science which were available for young people without degree level education.

Through internet sources such as Prospects or Unistats, I investigated opportunities for graduates. I also explored potential opportunities in the future for careers in science within the north east of England.

**Conclusions:** The first conclusion was that careers in science without degree level education are practically impossible. There are a very limited number of jobs which are associated with science, but they are not as scientists but in low paid employment without prospects of progression.

One fact that I found most surprising indeed was that the Connexions Service do not work with the university careers

departments, and the latter operate only for graduates of their specific universities. The Prospects and Unistats agencies gather data from each university and produce over-arching reports of graduate employment. Through these websites, it was found that there are not many physics graduates who actually become professional physicists, many choose careers in business and finance instead.

While there are many varied and interesting opportunities for science graduates, it would be essential for a young person to be geographically mobile in order to take advantage of these positions. The report ended with a discussion of potential science developments that are taking within this region that could lead to greater employment opportunities in the future.

**Dissemination of this study:**

The report was shared with my team at the FEC and the team leader for Mathematics produced an evaluation of the report. The report was also sent to the Senior Connexions Advisor who helped provide information for this study.

She shared this report with the Head of the Connexions Service within the city and they believe that the report justifies increased liaison between the Connexions Service and the FEC in order to match education with employment within this region.

## Where can science lead you? Careers with Science

**Marianne Hill**

### **Introduction**

As a practising physics teacher, I enjoy conveying my enthusiasm for science to young people and hope that they will find science to be as interesting and exciting as I do! Apart from having a genuine interest in my chosen subject, I habitually inform students that choosing to study science, whether at A level or as a degree subject, will lead to excellent career prospects for the future. As a physics specialist, I am fully aware that this subject leads to a wide variety of related careers such as engineering, technology and architecture, yet also provides a strong educational foundation for a wide range of more diverse careers such as business, finance and law.

Over the past decade, the number of students who have chosen to study science A levels at the College<sup>1</sup>, particularly physics, has declined in line with the rise of the non-traditional A level subjects. The number of students who pursue vocational courses has expanded rapidly as well as the number of applicants to university. In 2009, 666 students from the FEC applied for a university place through UCAS, although from this vast amount of applicants, there were only 9 students who selected to study a pure science course (7 for chemistry, one for biology and one for natural sciences). Therefore the prospect of future employment in science does not appear to be as enticing to students as one may expect, particularly during an economic recession. In 2009, I asked if I could analyse the data relating to the UCAS applicants as I wanted to investigate which subjects were being selected by our students, as well

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<sup>1</sup> The large Further Education College where I am employed shall be referred to as the FEC in order to maintain anonymity.

as the extent to which subject choice was linked with future employment prospects.

In 2009, the most popular UCAS subject group for applicants from the FEC was social science, accounting for 102 of the 666 applicants, with creative arts as the second most popular subject group, having 98 applicants. An interesting outcome of this evaluation was that only 88 of the 666 students chose courses away from home (13.2%), with the remainder of the students opting for one of the four local universities. Of the students who stayed in the region, 314 out of the 66 (47%) chose to study at the geographically nearest university which is located within the city. This information was revealing as it indicated a particular reluctance to move away from home for under-graduate study.

Having extended this evaluation to cover several years of UCAS data for the FEC (2004 to 2009), it was clear that science as an undergraduate discipline was not very popular, despite the fact that it could, potentially, lead to a wide variety of careers. Within the college, we have enthusiastic teachers and tutors who encourage students to consider employment prospects when making decisions about their future degree course of study.

In the media, there are campaigns such as [scienceandmaths.net](http://scienceandmaths.net), which promotes the study of science and maths to young people using television, cinema and poster advertising. The advertisements showed a range of careers that utilised science and maths in various capacities and had a very distinctive logo as shown below, with the caption: 'Science and Maths – see where they can take you'



**Image taken from [scienceandmaths.net](http://scienceandmaths.net) website**

In my capacity as a tutor at the college, I have found that many students choose the subject they enjoy the most at A level and intend to defer career decisions for a further three years. They are aware that there are a range of employment opportunities where the actual discipline is not as important as having the graduate qualification. I found this rather surprising as most of the students were the first generation from their families to enter higher education and one may have expected these students to be more focussed upon the outcomes of their degree studies.

Within the college, we have Aim Higher officers and dedicated tutors who encourage our students to apply to university, yet I was concerned as to whether there were any over-arching monitoring procedures in place to evaluate which courses our students were applying to study, where they were applying and what trends existed in the applications. I spoke to the Head of Academic Registry at the college (January 2010), who explained that the college has to report on the total number of applicants, as a percentage of the total cohort, but they do not have to report on which subjects are being selected.

It became immediately obvious that we have a potential issue, where students appear to be applying for university courses without giving serious consideration to employment opportunities in the future. The number of universities who interview applicants has declined over the years, with only Oxbridge and the Russell group universities requiring students to attend an interview. This means that the vast majority of our students at the college do not have to attend an interview where they would need to justify their choice of subject for higher education.

With clear objectives from my dual role within the college of science teacher and a tutor, I became increasingly concerned that students required stronger careers advice when making decisions about going to university and to give more serious consideration to the fact that education is an investment for future employment. I contacted the local Connexions Service (2009) to find out what support they could offer our

students in making the right choice about higher education, particularly with an emphasis upon careers in science.

I was particularly concerned with focusing students' UCAS choice with future employment prospects. I was also interested in determining the extent of the career opportunities that existed within science, particularly within this region, and the actual truth of whether the study of science would lead to better employment opportunities.

## **The role of the Connexions Service**

There is an obligation for all schools to offer impartial and professional careers advice to all pupils, according to the Education and Skills Act 2008 (Office of Public Sector Information, 2008, p.10). This Act transferred the Connexions Service into the responsibilities of the Local Authorities, rather than being a separate body, so that it can work with other local services and agencies to provide a more coherent support for young people. The progression of pupils from school to employment or further education is strictly monitored. All schools must outline the quality and accessibility of careers information, advice and guidance on their Self Evaluation Forms (SEF). They must also report upon the extent to which pupils have developed knowledge of the world of work. According to the Impartial Careers Education: Statutory Guidance document which was issued by the DCSF:

'Effective, impartial careers education underpinned by high quality personalised information, advice and guidance is a key pillar of the Government's plans to raise the age of participation in learning.'

DCSF (2008, p.2)

The Connexions Service has a wide responsibility for all sectors of society, incorporating guidance for vulnerable young people and those with disabilities, as well as pursuing the 'NEET' (not in Education, Employment or Training) cohort. Therefore mainstream pupils generally have one formal interview with a Connexions Adviser. Information, advice and guidance is always available if a pupil visits the Connexions

Office, however once the formal interview is completed, this may in some cases be the only time that a young person discusses their career aspirations with an impartial professional.

The mandatory interview for a school pupil with a Connexions Advisor will usually take place when the pupil is in year eleven of their education. This will help them to decide upon their general direction for the future. However, once a young person has completed their compulsory schooling and progressed into employment or further education, there are no more mandatory interviews to assess the progress or needs of the individual.

The FEC provides sixth form provision for all of the city's secondary schools, apart from the three Roman Catholic schools. The college provides a strong tutorial system and each centre has a nominated liaison person with the local Connexions service. There is usually an introductory talk to each class so that students are aware of whom the link person is and how to make contact, but the responsibility is mainly on the part of the student.

The Connexions national website, as well as the Tyne and Wear site provides excellent resources to help young people make the best decisions about their future. However, I would argue that this support needs to be strengthened with a formal mandatory interview for all students at the end of their first year at college. As a tutor with many years experience, I have found students may select courses at university without realistically assessing possible employment opportunities in the future. This would not necessarily be a problem if a student has a genuine interest in the subject, for education in its widest sense does not have the sole purpose of employment, however there are a number of students who apply to university as a means of delaying a decision about employment and in some cases, selecting the A level subject that they find 'easiest' to study.

In recent years, I have found that very few university admission teams interview students before offering them a place on a degree course. Students are offered a place based upon their predicted grades, an 'open' reference and the student's personal statement. Apart from



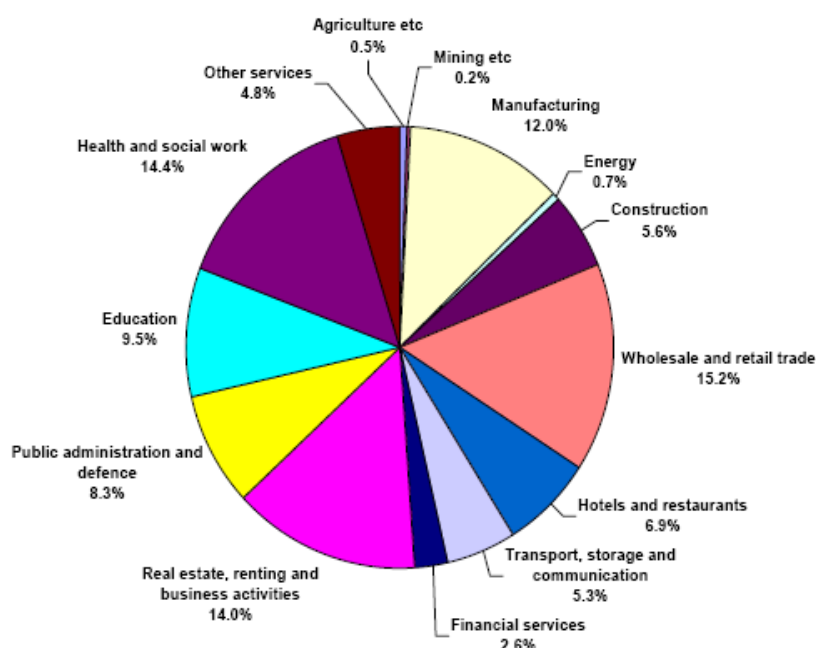
very selective universities, or specialist courses such as medicine, there are no opportunities for a student to face formal questioning over their decisions.

Whilst I strongly believe that education should be accessible to all members of society, I believe that students should have the opportunity to formally discuss why they would like to study a particular subject. Without formal university interviews, or mandatory Connexions interviews during the post-compulsory phase of their education, many students are simply progressing without having really thought of the long term consequences of their decisions.

The Education and Skills Act 2008 offers a strong support for young people in order to engage, encourage and develop a more educated workforce for the future. It makes excellent reference to those students who are 'at risk' and for whom provision had previously been marginal. However, I would argue that many students need greater information, advice and guidance in order to make decisions about their future. Particularly since the change of government (2010), higher tuition fees and fewer university places should encourage students to think carefully before embarking upon a university degree course of study.

The North East Skills Priorities Statement (2011/12) was produced by Skills North East with the Regional Skills Partnership. This report assessed current and future employment demand in the region, with particular interest in closing the gap between this region and the rest of the country. The report illustrated the current employment market with a pie chart (Chart 1 below), showing that retail and health are the most prominent employment sectors.

The report claimed that there is not a very high demand for higher level skills in the region, at this time, due to the lack of employment opportunities in the region. Apparently there are more people with level 4 (graduate) qualifications than meets the demand of employment. The report also states that because of the lack of opportunities, it is difficult to attract highly skilled people to this area (p8).



**Chart 1: The major employment sectors of the north east region**

(North East Skills Priorities Statement 2011/12 p.6)

## **Opportunities for science careers (non-graduate)**

The opportunities for young people to pursue careers associated with science in this region are fairly limited and tend to be aimed at engineering rather than science. A Senior Advisor with the Connexions Service provided a valuable insight into the range of positions available for sixteen year olds. During 2008/9, there were only three employment opportunities for sixteen year olds that were advertised by Connexions which were directly related to science.

One of these positions was a trainee laboratory assistant required to calibrate instruments for a firm in a city ten miles away. This post asked for 'some GCSEs with a physics/chemistry based science'. The job involved a 40 hour week with a wage of £141.20, depending on the age of the candidate. The second position was an apprentice dispenser for a pharmacy in a small town eight miles away, which was offered at the more generous starting wage of £240 per week. The only other

science related opportunity for non-graduates was for a laboratory technician, located within this city. It was clear from the advertisement that preference would be given to those candidates with 2 A levels. If appointed, it was expected that the candidate would undertake further education up to degree level. This position was for forty hours per week and the pay was £141 – 200 for a person aged 16 to 17 years old.

There were approximately 38 employers in the north east region who were seeking to appoint sixteen year olds in engineering related disciplines. Most of these positions were apprenticeships, which incorporated further study leading to BTEC qualifications (level 3). All of these positions stated that GCSE mathematics was essential. The starting salary for these positions ranged from £6,682 to £12,580.

Whilst clearly not science, the next range of job vacancies for sixteen year olds (somehow allied to science) were those for technical positions. This section included several positions formerly known as car mechanics but now referred to as 'vehicle technicians'. There were several positions for IT technicians under this section.

The final section of opportunities for sixteen year olds that could be linked with science is the Merchant Navy. These posts clearly offer the greatest opportunities for career progression, leading to officer positions after suitable training. One prominent company were recruiting at the time of the report and they required a minimum of four GCSEs (Grades A-C) from for trainee deck and engineer officers. All board and lodging is paid for whilst at sea and the pay starts at £160 per week.

As a result of the current economic recession, there has been a significant decrease in the number of employment vacancies, as well as jobs in the region. This has resulted in an increase in the competition for jobs, with adults having to consider re-training through apprenticeships to get back into the workforce. The increase in adults seeking employment has repercussions on the opportunities for school leavers, resulting in higher demands and expectations from employers.

To conclude; the opportunities for young people (non-graduates) wishing to work in science are extremely limited, with only three positions related to science in the whole of the north east. Whilst there

are other areas to pursue, such as engineering and technical work, these may not necessarily appeal to female school leavers who are interested in science. The extremely small number of vacancies compared to the number of potential applicants gives a strong indication of why the number of young people in full time education has increased rapidly over the past decade, as there are very few opportunities for school leavers. Most of these vacancies for school leavers do offer further training opportunities, but it is clear that career progression for non-graduates is going to be far more difficult than for graduates.

### **Opportunities for science careers (Graduate)**

Careers advice and guidance for graduates is provided by specialist professionals within a particular academic institution, for example, the team at the local university within the city help their graduates only. I was surprised to learn that there does not appear to be any organisational connection between university careers advisors and the local Connexions team. Each university careers department is independent, although national information is collected and evaluated through the PROSPECTS organisation.

Each January, a national survey is conducted with the students who graduated the previous summer to ascertain their progress with employment or training. This survey is known as the Destinations of Leavers of Higher Education (DLHE), which is then submitted to the Higher Education Statistics Agency (HESA). There are many general websites for graduates, such as the Prospects Job Search and [gradjobs.co.uk](http://gradjobs.co.uk), however for specialist scientific vacancies, the Prospects site suggest New Scientist Jobs as a strong source for national scientific vacancies. The prospects website claims that:

'The types of work that physics graduates entered were perhaps more like their counterparts in mathematics than chemistry or biology. Physics graduates were much more likely to enter a role in the finance industry than science. Nearly one in five (19.2%) physics graduates went into business or finance jobs, in a range of roles such as accountants, auditors, analysts and actuaries. This displays

the adaptability of many science degrees and shows that there are more jobs than the traditional science occupations that scientists can enter.' (Prospects, 2009)

The same page of the website also claims that in 2007, physics graduates were earning an average of £21,278 six months after graduating, compared to other averages salaries of Chemistry (£19,209), Biology (£17,147) and Sports Science (£16,836).

The Prospects Directory is produced each year, which is essentially a handbook for helping graduates to find careers. It contains advice about applications, interviews, voluntary work and the employment market before the main body of the book, which provides information about graduate employers. There are lists at the back for specific subject disciplines and which employers would actively recruit graduates of a particular subject.

The employers listed in the directory as recruiting physics graduates in some cases, simply need candidates who can demonstrate numerical ability, particularly for careers in finance or computing-related businesses. There are other companies that are more concerned with engineering, such as Bur Happold.

If we consider the employers who specifically employ physics graduates to work as physicists, then the list reduces to Her Majesty's Government Communication Centre or the Transport Research Laboratory. Sellafield was recruiting engineers, environmental scientists, project managers as well as various business roles. The engineering and scientific careers asked for specific qualifications, whereas the business roles simply asked for a related discipline.

Therefore assessing the Prospects handbook for 2008/9 it seems that there are very few opportunities for physics graduates to actually work as a physicist. However, there are a wide range of opportunities available for numerate graduates and a physics degree can open doors to careers in computing, finance and banking.

Whilst assessing the opportunities for physicists, it is clear that there are no opportunities whatsoever within the north east region.

Compared with physics, however, there are far more opportunities for engineering graduates.

It is important that school pupils are aware of the range of career opportunities for engineers and that A level physics is an important pre-requisite for engineering. Most of the engineering companies require employees to be flexible, not just in the UK, but to be able to work anywhere in the world.

The UNISTATS website (2009) provides information on the employment of graduates from different disciplines, compiled from a survey conducted with 220,000 graduates which is generally conducted six months after graduation. The physics (and astronomy) degree course at the nearest Russell Group university indicates that 83% of graduates have found graduate level employment or pursuing further qualifications and 90% of the students were satisfied with their degree course (UNISTATS, 2009).

**TABLE 1: The types of employment found by graduates of physics (and astronomy) from the nearest Russell Group University (2008)**

Type of employment	Percentage of all respondents
Business and statistical professionals	18%
Elementary occupations, sales assistants, administration jobs	12%
Research	9%
Information and Communication Technology	8%
Business and Finance	8%
Teaching	7%
Science professionals	6%
Functional managers	6%

By evaluating graduate employment opportunities, it is clear that physics opens the door to a range of opportunities, although work as a pure physicist is far more limited than applying the subject towards other careers. The transferable skills acquired lead to employment in other fields such as finance or business. It must be stressed, however, that

whilst we are encouraging young people to raise their educational aspirations, we ought to be encouraging them to look farther than the north east of England, for students who are not geographically mobile are seriously restricting their future career options.

## **Employment prospects for the future**

The North East Skills Priorities Statement (2010) explored current economic trends in order to anticipate future economic growth in the region. It was pleasing to see that the predictions are for greater employment opportunities for science, technology and engineering within the region.

- 1) Biotechnology – the National Industrial Biotechnology Facility in Tees Valley is ‘well placed to drive and deliver a sustainable industrial biotechnology agenda’. (p.12) This will require graduates as well as post-graduates to drive the industry forwards.
- 2) Plastic Electronics – NETPark in County Durham will be developing electronics for energy, defence and medical technologies, with the potential to create up to 1,500 jobs for high level skills in this field.
- 3) Offshore Wind – The National Renewable Energy Centre (NaREC) is based in Blyth and could potentially create up to 16,000 jobs in the North East, of which 7,000 would be for high level skills in engineering and technical fields.
- 4) Ultra-low Carbon Vehicles – Nissan in Sunderland is currently pioneering these new cars, although the majority of jobs created will be at operative and technician levels.

(North East Skills Priorities Statement, 2010, p.12)

It is important that this region invests in STEM education and training now, in order to prepare for the employment trends in the near future. It

is anticipated that we will need more engineering graduates for this region in the next ten years, and we are currently not training enough young people in these skills. Unless we encourage more young people within this region to study science and engineering, employers will have to recruit from wider areas to fill these positions. The report states:

‘To meet this demand will require a significant increase in the participation and attainment in STEM subjects throughout the educational pipeline. The North East has seen good progress in this area with pre-16 pass rates at level 2 rising by over 14% in the last 4 years to just above the national average. Further work is required post -16 however, with only 4% of the total A level entries in Maths, Chemistry, Biology and Physics taking place within the North East and pass rates sitting between 4.1% (maths) and 6.3% (biological sciences) below the national average.’

(North East Skills Priorities Statement, 2010, p.13)

## Conclusions

The report began by questioning why young people were not choosing to pursue careers in science, particularly in an economic recession where finding employment is becoming increasingly difficult. By analyzing the data from the FEC, it was found that a very small number of students were choosing to study science at university, with many students choosing to delay the choice of employment until after graduation. Despite the fact that the FEC is a widening participation college, employment is not the main consideration for our students when choosing a degree subject. As the number of students in post-compulsory education increases, there is a strong argument for extending the provision of the Connexions Service to include a mandatory interview with all year 12 students prior to making decisions about higher education. Whilst education is not for the sole purpose of finding employment, it is essential that students are fully informed about future employment possibilities, particularly within this region.

Career opportunities for science in the north east is currently rather restricted, both for graduate and non-graduate applicants. There



are many exciting science opportunities open to graduates, but it is imperative that young people are prepared to travel in order to develop their careers. There are opportunities within this region for graduates who have studied science at university yet wish to diverge into careers with finance or business.

Graduate positions offer attractive salaries, conditions and prospects yet for many young people, moving away from home is the main problem, as shown by the proportion of students who stay at home for their university education. It could be argued that making a geographical move is harder at the age of 21, when students generally graduate, than making the move away from home at 18.

If we anticipate the potential growth in industry and technology over the next decade, the North East region is well placed to make significant expansions with several major companies located within the region. Developing STEM skills in young people will ensure that they will be able to find employment in the region, providing careers for non-graduates, graduates and post-graduates.

There is a clear need for stronger careers education, particularly as the current government wish to increase the tuition fees in future years. We must ensure that all young people have access to good advice and guidance, as we would not wish to see students deterred from a university education by the cost of tuition fees. A bridge between the Connexions Service and university careers teams may be worth investigating to ensure that young people have the best advice possible about future graduate careers.

Education in its widest sense should incorporate the development of independence and the confidence to travel. We should encourage young people to embrace the vast range of careers and opportunities available and consider life outside of the region.

## References

DCSF, *Impartial Careers Education: Statutory Guidance* (2008) [Online] Available at:

<http://www.dcsf.gov.uk/consultations/downloadableDocs/CE%20Statutory%20guidance%20final%20draft.doc> (Accessed: 20 March 2010)

Office of Public Sector Information, *Education and Skills Act* (2008) [Online] Available at:

[http://www.opsi.gov.uk/acts/acts2008/ukpga\\_20080025\\_en\\_1](http://www.opsi.gov.uk/acts/acts2008/ukpga_20080025_en_1) (Accessed: 20 October 2010)

Prospects, (2009) [Online] Available at:

[www.prospects.ac.uk/cmcs/showPage/Home\\_page/What\\_do\\_graduates\\_do/Science](http://www.prospects.ac.uk/cmcs/showPage/Home_page/What_do_graduates_do/Science) (Accessed: 27 July 2010)

Scienceandmaths.net (2010) [Online] Available

at: <http://www.futuremorph.org/scienceandmaths/#/intro> (Accessed: 15 December 2010)

Skills North East (2010) *North East Skills Priorities Statement* (2011/2012) [Online] Available at:

<http://www.skillsnortheast.co.uk/page/skillsandthenortheasteconomy.cfm> (Accessed 13 December 2010)

UNISTATS (2009) [online] Available at: <http://www.unistats.com>

(Accessed: 20 October 2010)

## Report Evaluation Form

**REPORT: Careers in Science**

**Position of Reviewer:**

Team Leader for Mathematics, FEC

**Comments on the report:**

An interesting report, outlining the possibilities for careers in science within this area.

**Are there things that could be added or removed to improve it?**

The report highlighted a need for more structured careers advice for students.

**In what way could the contents of this report influence the wider profession?**

There is a good progression rate for students at the college to apply to university, but as Marianne has shown, the vast majority of students choose to stay at home for their university degree course. This means that by the time students graduate, it will be even more difficult for them to leave the area in order to find employment.

Within tutorials, we should be encouraging students to become more independent, and to consider geographical mobility for future employment. While students claim they need to live at home for financial reasons, some of them may be using this as an excuse. Many of our students come from families that have been in this area for generations and do not understand the concept of moving out of the area.

**Signature:**

**Supplied**

## Report Evaluation Form

**REPORT:**

Careers in Science

**Position of Reviewer:**

Head of Connexions

**Comments on the report:**

Hi Marianne,

I have had a look at your interesting piece of work.

I agree that it would be good practice to offer an interview to all students at the end of year 12 but this would have significant resource implications.

**Are there things that could be added or removed to improve it?**

On page 4 the "mandatory interview" takes place in year 11 not year 10.

**In what way could the contents of this report influence the wider profession?**

We have used this report in meetings to discuss how we can improve our provision for this age range.

**Signature:**

Supplied