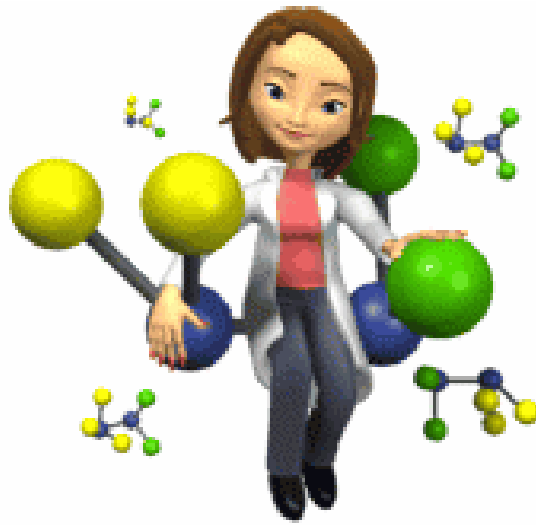


Overview, Scrutiny and Policy Development Committee

# Young Women and STEM



March 2015



North Tyneside Council

## Contents

	<b>Page</b>
1. Background to the study	3
2. Methodology	4
3. Findings	5
3.1 How are STEM subjects viewed by girls and young women in North Tyneside?	5
3.2 Has this perception changed in recent years?	7
3.3 Are more girls and young women studying STEM subjects at GCSE and into higher education as a consequence?	9
3.4 What can be done to increase participation by girls?	11
4. Conclusion	15
5. Future work	16
Acknowledgements	16
Summary of recommendations	20
Background Information	21
Useful websites	22

## 1. Background to the study

- 1.1. On 17 November 2014, the Children, Education and Skills Sub-committee agreed to establish a Sub Group to examine how to encourage young women to study STEM (science, technology, engineering and mathematics).
- 1.2. At the meeting of the Sub-committee on 20 October 2014, a report was submitted on the 14-19 curriculum. There was a wide ranging discussion at the meeting and it was suggested that the Chair of the Sub-committee, in consultation with appropriate officers, produce a scoping exercise for a Sub Group relating to an area of interest discussed by the sub-committee at the meeting.
- 1.3. STEM was the selected topic because areas of employment growth in the borough were anticipated within the technical, manufacturing, engineering and digital sectors and organisations outside the local authority were involved in its delivery. It was important that young people had the relevant skills and qualifications in the area to enable them to benefit from the expected employment growth and that these opportunities were taken up by boys and girls. Dynamo, a North East IT network, had undertaken a survey and found that while there were over 32,000 people working in the regional IT sector, there are more than 2,000 unfilled vacancies in the North East. In addition, the UK Commission for Employment and Skills highlighted the North East among the regions which will have the highest shortage of STEM skills in the country by 2020<sup>1</sup>.
- 1.4. Not only was it important for the borough but there would also be opportunities nationally. There is an estimated shortfall of 55,000 engineers and scientists every year in the UK<sup>2</sup>. Juergen Maier, chief executive of Siemens UK, in an article in *The Times* newspaper stated:

“we need roughly double the number of school leavers going into science, technology, engineering and mathematics... We need a demand based education system and there is a shortfall in engineering and science”<sup>3</sup>

The jobs available are also well paid, “the average salary six months into a job is £26,000 [for an engineer] – only medicine and dentistry are higher”, stated Steve Holliday, chief executive of the National Grid in the same article<sup>4</sup>.
- 1.5. Currently, only 7%<sup>5</sup> of the professional engineering workforce are women and 17%<sup>6</sup> of jobs in the technology sector are held by women. Widening women’s participation in these areas would benefit society as those who understand and influence important scientific and technological developments would better reflect

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<sup>1</sup> Lognonne, Ruth, ‘Carol Vorderman helps boost Girl Power at digital event for schoolchildren’, *The Chronicle*, 26 January 2015 online, available at: <http://www.chroniclelive.co.uk/news/north-east-news/carol-vorderman-helps-boost-girl-8517907> (accessed: 27 January 2015)

<sup>2</sup> Whipple, Tom (2015) ‘If you want a job, get a science degree’, *The Times*, 2 February 2015, p7.

<sup>3</sup> *Ibid.*

<sup>4</sup> *Ibid.*

<sup>5</sup> Silim, A. and Crosse, C, (2014) *Women in Engineering: fixing the talent pipeline*. Institute for Public Policy Research.

<sup>6</sup> Lognonne, Ruth, 2015

the UK population as a whole. It would also improve women's position in the labour market by improving access to better pay and progression opportunities. Women continue to be concentrated in particular industries, many of which are low paid and low skilled<sup>7</sup>.

- 1.6. The Education Secretary, Nicky Morgan, when launching the *Your Life* campaign (a three-year campaign to ensure young adults in the UK have the maths and science skills needed to succeed in the global economy) said teenaged girls must not be allowed to feel that maths and science subjects are "the preserve of men" and that only by tackling "tired stereotypes" about science careers will the gender pay gap between men and women be "eliminated", "...the subjects that keep young people's options open and unlock doors to all sorts of careers are the STEM subjects..." It was imperative, she said, that the myths around STEM subjects be tackled, adding:

"Because they're not stuffy, boring subjects for people who don't get outdoors much. Far from it - they're the keys to the most cutting edge, fast-paced areas of work and they're behind some of the most exciting new developments in this country and around the world."<sup>8</sup>

- 1.7. It was considered that the Sub Group was a suitable route for the topic; could make a positive contribution to the formulation of future plans or strategies; and would allow for community involvement.
- 1.8. Councillors Cath Davis and Joan Munby and a church representative, Rev. Michael Vine, volunteered to be members of the Sub Group and a work programme was agreed.

## 2. Methodology

- 2.1. The remit of the Sub Group was to examine the attempts at increasing the numbers of girls and young women studying STEM subjects; to consider the success of these attempts; and to consider other actions which could also increase the numbers of girls and young women studying STEM subjects.
- 2.2. Key questions to be answered included:
- How are STEM subjects viewed by girls and young women?
  - Has this perception changed in recent years?
  - If yes, what has caused the change?
  - Are more girls and young women studying STEM subjects at GCSE and into higher education as a consequence?
  - Is this enough?
  - What can be done to increase this further?

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<sup>7</sup> Silim, A. and Crosse, C, (2014) *Women in Engineering: Fixing the Talent Pipeline*. Institute for Public Policy Research.

<sup>8</sup> Richardson, H., *Science careers not 'the preserve of men'* 10 November 2014, [online, BBC News Education & Family available at: [www.bbc.co.uk/news/education-29990639](http://www.bbc.co.uk/news/education-29990639)] (Accessed on 21 November 2014)

- 2.3. The Sub Group met on a number of occasions to receive information and discuss their findings and also:
- a) Met representatives from TyneMet College, George Stephenson High School and Marden High School to discuss how they approached STEM.
  - b) Met Penny Remfry from North East Women's Network and North Tyneside Women's Voices to discuss how her organisation was trying to address the small number of women taking up careers in STEM areas of work.
  - c) Visited Marden High School, Queen Alexandra College and the Coast Road campus of Tyne Met College to view their facilities and speak to female students who were studying STEM subjects.

### **3. Findings**

#### **3.1. How are STEM subjects viewed by girls and young women in North Tyneside?**

- 3.1.1. In their conversations with the students at all of the establishments they visited as part of the study, the Sub Group was surprised to find evidence that perceptions of STEM subjects being unfeminine and not for girls still prevailed and that the girls and young women spoken to all had to be resilient and determined to move past this and study the subjects they were interested in.
- 3.1.2. Family support appeared key in the decision to continue with their preferred subjects. All of the students spoken to stated that their families supported their choices and if there had been some doubt at the beginning it had been removed by their parent seeing how happy she was in her choice. The parents with doubts were both mothers and fathers; there appeared to be no gender divide on who thought this. When asked what the doubts had been, the students replied that they:
- thought it wasn't a job for girls
  - wondered why she did not want to do hairdressing or travel and tourism
  - thought she was 'mad'
- 3.1.3. Friends and peer groups also made comments to the students, both positive and negative. Examples of negative statements included:
- It's just not for girls
  - I want to do a job that's for women
  - If you work in chemical engineering you'll just be cleaning toilets in hotels
  - You'll be on your own

When asked what they thought had led to this attitude, the girls and young women said 'prejudice'.

- 3.1.4. The Sub Group believe that this attitude is also accounted for by the lack of knowledge and understanding about what varied roles and opportunities

qualifications in the STEM subjects can lead to, both for parents and other influential family members. They themselves were unaware of the many different types of 'engineer' there were and enjoyed a video, *Engineering Happiness*, produced by the Institute of Civil Engineers which demonstrates exactly how varied and interesting the field has become [the video can be viewed at this link: [www.youtube.com/watch?v=z4zymdaEJIA](http://www.youtube.com/watch?v=z4zymdaEJIA)].

3.1.5. The world has changed dramatically with technological developments and many engineers go to work in a suit and never 'get their hands dirty'. Another video, this time produced by Tees Valley Unlimited entitled *21<sup>st</sup> Century Careers in the Tees Valley – Here Come The Girls!* showed what jobs young women had found after studying STEM [the video can be viewed at this link: [www.youtube.com/watch?v=JLM6GHYgz2k](http://www.youtube.com/watch?v=JLM6GHYgz2k)].

3.1.6. The role the heavy industries of mining and ship building has played in North Tyneside's history and its decline in recent years may lead people with influence over young people (e.g. parents and grandparents) to view the field as a precarious and 'hard' sector. The importance of updating these views and getting the message across that in the North East Engineering and Manufacturing sector:

- Enterprise Zones are creating 7,000 jobs by 2020;
- renewables are creating 16,000 jobs by 2019 and 9,000 support jobs; and
- manufacturing will create 8,500 additional jobs by 2018<sup>9</sup>

was paramount in ensuring that those of influence were coming from a position of recent knowledge and not from their experience of 30 years ago. This would help in encouraging girls (or at least not actively putting them off) to pursue these subjects into further and then possibly higher education or apprenticeships.

3.1.7. The North East Women's Network informed the Sub Group that by the ages of 11-14 girls were buying into the stereotype that STEM careers were not for them and they would be 'against men'; this stereotype was fuelled by the media and gendered consumerism and then peer group pressure to conform. The lack of challenge to patronising attitudes and feeling intimidated in male-dominated environments can make it difficult for girls if they are the only one; those who do show an interest in STEM subjects need to be very strong to continue onto A-Level and further. Ms Remfry informed the Sub Group of one young woman from outside the borough who had dropped out of a course because she was the only woman and felt intimidated.

3.1.8. The Sub Group noted that all of the young women studying STEM spoken to were all determined and some had described themselves as such when explaining the reaction of their friends and families about their choices.

3.1.9. The comments of the girls and young women the Sub Group spoke to are also reflected in the report published by the Institute for Public Policy Research (IPPR) on *Women in Engineering: fixing the talent pipeline*<sup>10</sup>. It has been demonstrated

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<sup>9</sup> Information supplied to the sub group from Council officers.

<sup>10</sup> Silim, A. and Crosse, C, 2014, p10, 11, 12, 15 & 16.

by research that gender, ethnicity and social class all shape what careers are perceived as 'normal' and desirable among particular groups. Gendered attitudes towards science continue to limit women's progression in scientific careers which are still largely perceived as masculine. These stereotypes influence subject choice at school, with STEM subjects still seen as 'boys' subjects', despite girls' higher attainment in them; female students who self-identify as feminine are likely to feel that STEM subjects are 'not for them', even if they enjoy them. ASPIRES research, a longitudinal study exploring the attitudes of students between the ages of 10 and 14 towards science-related careers, has shown that at age 12/13, girls tend to be more interested in pursuing a career in the arts, while boys were more likely to say they aspired to a career in engineering. Girls who define themselves as 'girly' (highly feminine) are particularly unlikely to aspire to a career in science, and 'girly' girls who aspire to science careers tend to change their science aspirations or drop them altogether at age 10/11. Girls who do aspire to science and STEM-related careers are not only more likely to describe themselves as 'not girly', but they also tend to be highly academic<sup>11</sup>.

- 3.1.10. Silim and Crosse's recommendations included one to address the unhelpful perception of STEM and engineering careers among both girls and their families, as 'masculine' or 'brainy' and also one on the poor understanding of engineering careers and the engineering pathway. Because many still believed that most science-related careers are masculine or reserved for the brainy few, key influencers such as teachers and families believe that a career in engineering will be inhospitable and undesirable for women. The institute of Employment Studies has found that parents, teachers and advisers (as well as the young women they influence) have outdated views on STEM occupations.
- 3.1.11. Taking into account what they heard from the girls and young women they spoke to the Sub Group believes these recommendations should be adapted for North Tyneside. A teacher admitted to the group that they were not aware of all the careers that a degree in any of the STEM subjects could lead to and also not necessarily what A-levels or other qualifications would be required to access these careers. The Year 10 girls when asked what they wanted to do as a career had done their own research into what jobs existed and what they needed to do to become qualified. While this was commendable, gaining this knowledge should not be hard work for any student.

## **3.2. Has this perception changed in recent years?**

- 3.2.1. Taking all of the above into account it appears not and it was particularly shocking for the Sub Group to hear, as some of the attitudes expressed the Sub Group considered 'old-fashioned'. Attempting to address wider cultural influences on girls and young women would be beyond the remit of the Sub Group; however some of the girls spoken to did comment on the lack of high profile role models in the media.

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<sup>11</sup> ASPIRES (2013) *Young People's Science and Career Aspirations aged 10–14*, London: Kings College, London, in Silim, A. and Crosse, C, (2014) *Women in Engineering: Fixing the Talent Pipeline*. Institute for Public Policy Research, p11.

3.2.2. Whilst this report was being written the actress Emma Watson (who played Hermione Granger in the Harry Potter films) caused a, mainly positive, Twitter storm when she replied to a fan who asked a question during a Q&A for the *He for She* campaign (A United Nations Women solidarity movement for gender equality of which Emma Watson is an ambassador). The exchange is below. The reply from Ms Watson was retweeted 7,600 times and ‘favourited’ 12,000 times and illustrates that the perception of STEM careers, particularly engineering, are still seen as the preserve of men.



3.2.3. The North Tyneside Women’s Network believed a contributory factor to the stereotype continuing was that gender stereotyping was not part of the school curriculum. This meant it was not a subject discussed in the classroom or brought to the students’ attention for challenge and analysis so many students just accepted the viewpoints as the norm.

3.2.4. A member of the Sub Group who was a former governor at a primary school in the borough had visited their school with a ‘STEM hat’ on and reported back to the Sub Group. No gender specific rules appeared to apply to games played (boys could dress up as fairy princesses, girls could play with toy hammers etc.) and all co-ordinated STEM activities with external organisations were open to all and all took part.

3.2.5. The difference in perception between primary schools and secondary schools was troubling for the Sub Group and the only explanation appeared to be prejudice, cultural stereotypes and a lack of up to date information. If it is in the first years of secondary school (Years 7 and 8) where these opinions are fixed and where girls switch off from studying STEM subjects this is the area where initial effort and resources should be concentrated.

**Recommendation 1 – Cabinet requests the Head of Children, Young People and Learning to organise a programme of events/resources for teachers, particularly for teachers of Years 7 to 9, with up to date information on what**



**opportunities and careers can be expected by anyone with STEM qualifications and an understanding of how to access these, including the vocational route.**

**Recommendation 2 – Cabinet requests the Head of Children, Young People and Learning to ask all schools to review existing information for parents of children aged 11-14 to provide increased focus upon what opportunities and careers can be expected by anyone with STEM qualifications, but particularly for women, and an understanding of how to access these, including the vocational route.**

**3.3. Are more girls and young women studying STEM subjects at GCSE and into higher education as a consequence?**

3.3.1. Anecdotally the picture seems to be improving year on year with both Queen Alexandra and TyneMet reporting an increase in the number of young women applying to do courses in STEM subjects. The Sub Group did not speak to students who were not studying STEM subjects so it is not possible to comment on how much the perception of STEM influenced their choice not to study these subjects.

3.3.2. The following paragraphs provide data on the number of students studying STEM subjects in North Tyneside for the last five years and their breakdown by gender. The gap measure is presented in the following format:

- +ve percentage gap shows more boys than girls have entries in the subject. For instance a gap of 100% shows only boys took that subject.
- -ve percentage gap shows more girls took the subject. For instance -100% shows only girls took the subject.
- A 0% gap shows parity of entries between genders.
- As a further example a 33% gap shows that twice as many boys took the subject as girls: For instance 2014 Vocational Sports Science had 15 entries; 10 boys and 5 girls. The gap is calculated as the proportion of boys' entries ( $10/15 = 66\%$ ) minus the proportion of girls' entries ( $5/15 = 33\%$ ) which equals  $66\% - 33\% = 33\%$ .

3.3.3. Maths (including Further Maths)

The local authority's own figures indicate that in North Tyneside the gender gap between boys and girls for A-level Maths is variable over the last five years but on average is 19-20%, although it is smaller than the national gender gap, which is increasing.

	Full LA				
Gender	2010	2011	2012	2013	2014
Boys	101	122	110	117	124
Girls	68	59	74	94	81
Gap	19.5%	34.8%	19.6%	10.9%	21.0%

### 3.3.4. Biology

Both locally and nationally more girls take Biology A-Level than boys so the gender gap is a negative figure for biology. Again, the local authority gap is smaller than the national gap.

	Full LA				
Gender	2010	2011	2012	2013	2014
Boys	62	74	60	78	54
Girls	90	84	75	102	67
Gap	-18.4%	-6.3%	-11.1%	-13.3%	-10.7%

### 3.3.5. Chemistry

The local authority has a larger gender gap than the national gap in Chemistry and the national gap appears to be closing. In North Tyneside in 2013 the trend was reversed with more girls than boys taking the subject (-6.7%), the position had returned in 2014 with a 13.5% gender gap in North Tyneside against a 4% gender gap nationally. Not including 2013, the percentage gender gap is consistently in the mid teens.

	Full LA				
Gender	2010	2011	2012	2013	2014
Boys	60	62	63	63	63
Girls	44	45	44	72	48
Gap	15.4%	15.9%	17.8%	-6.7%	13.5%

### 3.3.6. Physics

Both nationally and locally the gender gap in Physics is greater than the other subjects, although the gap between North Tyneside and the national figures are generally marginal, the national figures are better.

	Full LA				
Gender	2010	2011	2012	2013	2014
Boys	56	65	54	65	71
Girls	14	15	15	15	15
Gap	60.0%	62.5%	56.5%	62.5%	65.1%

### 3.3.7. Sciences Combined

This includes Geology as well as Biology, Chemistry and Physics. Combining the different gender biases for A level science shows that more boys take A level science than girls both nationally and locally, despite the alternate gender bias in Biology. When combined, the local gender gap is greater than the national gap (excepting 2013) and it could be argued is increasing; whereas the national gap appears to be decreasing. This trend needs to be addressed to ensure we have enough young people from the area to fill the positions which are expected in the years up to 2022 (see paragraph 3.1.6).

	Full LA				
Gender	2010	2011	2012	2013	2014
Boys	178	201	177	207	201
Girls	148	144	134	189	131
Gap	9.2%	16.5%	13.8%	4.5%	21.1%

### 3.3.8. Technology

Technology A-levels appear to indicate gender bias. Girls entries are over-represented in Art and Design (photography); Art and Design (textiles); Art and Design; and Textiles Technology with boys being over-represented in Design and Technology (product design); Design and Technology (systems and control); ICT; and Applied ICT.

### 3.3.9. Vocational Technology Qualifications

Subjects in this category include Appliance Service, Art and Design, Computer Use, IT and IT Practitioners. Nationally and currently for North Tyneside, only Art and Design show more entries for girls than boys.

### 3.3.10. Vocational Engineering Qualifications

These courses are only offered at Key Stage 5 (post GCSE) in North Tyneside. In the last five years the subjects which had 10 or more entries were engineering studies, maintenance engineering and mechanical engineering. Engineering studies has had 8 girls' entries over the last 3 years compared to 392 boys' entries.

### 3.3.11. Overall summary

Considering all possible STEM subjects and qualifications, boys enter more STEM subjects at Key Stage 5 (post GCSE) and the gap does not appear to be closing, and is greater than the national gap. The technology and engineering entries are broadly similar to national and suffer from predictable gender bias.

	Full LA				
Gender	2010	2011	2012	2013	2014
Boys	785	828	820	924	886
Girls	549	574	547	586	583
Gap	17.7%	18.1%	20.0%	22.4%	20.6%

## 3.4. What can be done to increase participation by girls?

### 3.4.1. STEM in primary and first schools

- 3.4.1.1. A number of schools were working towards the Primary Science Quality Mark and had good links with high schools and TyneMet, which had facilities to support experiments and STEM weeks. For example a teacher from TyneMet was visiting Amberley Primary School on the day of the Sub Group's visit and the following week Marden High School was hosting Monkhouse Primary school for a STEM

week. These opportunities need to be available to all primary and first schools in the borough.

- 3.4.1.2. Members of the Sub Group wondered whether Mechano was still used in primary and first schools and if not, why not? The Sub Group considered an approach to its manufacturers to provide some sets for each first and primary school in North Tyneside.
- 3.4.1.3. The Sub Group did not have time to examine fully the role gender plays in teaching at primary schools but what they did see gave no cause to consider that the stereotypes were being fixed in the primary classroom.
- 3.4.1.4. Primary and First schools could make a positive contribution to the change in perception of what a STEM career is and who can do it by involving families in tasks on jobs and employment, paying particular attention to using examples of 'modern jobs' which require STEM qualification or inviting them to events when a STEM Ambassador is speaking.
- 3.4.1.5. Having a member of staff with the responsibility for STEM was found to be significant in having an impact on participation in the secondary sector. Having a lead to organise these types of events and co-ordinate with other schools across the borough was an effective way to have a more cohesive and comprehensive approach to events and all schools should be encouraged to have at least a STEM lead with consideration given to creating a STEM governor.

#### 3.4.2. **STEM in secondary and middle and high schools**

- 3.4.2.1. In 2014 North Tyneside Council conducted an audit on the current position of STEM within the secondary school system. The audit focussed on the position, role and impact of the STEM co-ordinator in school; senior leadership links; STEM governance and their role; use and impact of STEM ambassadors; careers information and advice related to STEM careers and the range of STEM activities across the curriculum.
- 3.4.2.2. Significant extracurricular activities relating to STEM had been organised (see appendix A). In the academic year 2013-14:
  - 45 businesses engaged with schools.
  - Over 85 partners have supported 68 STEM events in schools.
  - A Primary Engineer programme has enabled 20 schools to link up with engineers and engineering companies.
- 3.4.2.3. The audit had found that all North Tyneside secondary schools offered wide and exciting STEM opportunities within the school curriculum and through a range of extra curricular enrichment. Where schools had a named STEM co-ordinator to take the strategic lead, the impact across all the STEM subjects was more effective. In some schools the coordinator was either on the senior leadership team or reported directly to them. This has enabled work related STEM activities to be given a high profile within the school. Some schools have appointed a

governor with responsibility for all STEM subjects; others have them for science and technology.

- 3.4.2.4. Postgraduate university students and those in the early stages of their career are utilised as “STEM Ambassadors” in schools. They deliver experiences, support and key messages to inform young people of related careers and options for study, as well as providing taster sessions of exciting activities to inspire pupils. Where students are well informed they are more likely to take STEM subjects to a higher level and progress into STEM careers.
- 3.4.2.5. Use of independent STEM Ambassadors varies from school to school and generally has a positive impact. This approach is particularly good for encouraging young girls to think about STEM careers as the ambassadors are really effective role models when they are women.
- 3.4.2.6. It is the intention of the Children, Young People and Learning (CYPL) service to support all schools to:
- have strategic coordination within a school
  - strengthen and further develop employer links in schools
  - increase independent information, advice and guidance for young people, their parents/carers and teachers in supporting them making informed decisions regarding their future pathways
  - encourage and support young people to continue studying maths and science post 16 in order to strengthen economic growth and development in our region
  - enable schools to embrace every opportunity to participate in STEM activities and to embed STEM within the curriculum for example through the Science Learning Partnership and the Maths Hub.
- 3.4.2.7. The CYPL service had made significant attempts in recent years to improve the awareness of STEM and the opportunities it presents for students but it was difficult to measure the impact of these attempts, especially as it didn't appear to be making a difference to those taking the subjects into Key Stage 5 (post GCSE).
- 3.4.2.8. At Marden High School a conscious decision was taken to push STEM subjects and a senior leader was given the responsibility to raise its profile and encourage girls to take the subject. STEM is taught as a subject in its own right, i.e. is on the timetable as a lesson in STEM and the intention is to introduce it as a GCSE. All lessons take place in the STEM Hub and the school has links with Cullercoats and Monkhouse primary schools so they can utilise the facilities, which could also be made available to other primary schools who don't have the required facilities. Speakers were organised on a fortnightly basis and attempts were always made to have a woman speaker.
- 3.4.2.9. Participation in external events, for example the North East Digital Girls Event held at The Sage in Gateshead on 26 January 2015 and the Science Expressway and the 'Zombie Apocalypse' at Queen Alexandra College in association with Northumbria University all help inspire and convince girls that they can do these subjects and do them well.

- 3.4.2.10. All girl clubs could help to break down barriers and maintain interest for girls who are shy or think that boys will judge them. Computer Club for Girls (CC4G) at schools has proved successful in Newcastle and it would be interesting to see whether the establishment of all girl STEM clubs in schools (of all levels) could improve the take up of the subjects at GCSE and A-Level.
- 3.4.2.11. During discussions with teachers of STEM subjects the idea of holding girl only classes on STEM subjects was raised. As the approach was to be inclusive it was not something which had been considered and although there were logistic and practical difficulties, one teacher did think it might be worth examining it as an option at their school.
- 3.4.2.12. Research undertaken by the Institute of Physics in 2011 and published in 2012 showed that there was a marked difference for girls in single-sex and co-ed schools progressing to A-level physics. Independent girls' schools sent four times more girls to do A-Level physics than maintained co-ed schools, compared with only twice the percentage for boys. In maintained schools, single-sex schools send 2.4 times more girls and 1.5 times more boys to study A-Level physics than co-ed schools do.
- 3.4.2.13. Pupils at all girls' schools in whichever sector were more likely to study subjects such as physics and maths to A-Level and achieve a "disproportionately large share of the top grades in Sciences, Maths and Languages". At schools in the Girls' Schools Association over 55% of students take a STEM subject at A-Level, with just under two fifths taking maths and just over two fifths taking at least one science.
- 3.4.2.14. The Sub Group want to encourage schools to consider organising the timetable to allow for all girl classes in STEM subjects. Any school which would like to have all girl classes for STEM subjects should be supported by the local authority with advice and practical support on how to do that.
- 3.4.2.15. The intentions of the CYPL service outlined at paragraph 3.4.2.6 for their next steps is wholeheartedly endorsed by the Sub Group and every support should be provided to the team to enable them to achieve these goals. The Sub Group particularly think the role of a STEM lead/co-ordinator should be introduced at each school in the borough and that a network should be established so there can be a co-ordinated approach to events and the use of facilities.
- 3.4.2.16. A significant part of the role of the co-ordinator/lead would be the focus on changing teachers' and families' perceptions of what opportunities studying STEM opens up to all students but with a particular focus on 'normalising' an interest in these subjects for girls. This could include simple tasks like reviewing books in the library to ensure there are books which feature women doing STEM related jobs (see [www.lettoysbetoys.org.uk](http://www.lettoysbetoys.org.uk)) or displaying the WISE (a campaign to promote women in science, technology and engineering) postcards showing what STEM qualifications in Physics, Mobile Technology, Engineering and the Natural World can lead to (accessible at: [www.wisecampaign.org.uk/women/mind-maps](http://www.wisecampaign.org.uk/women/mind-maps), the engineering postcard is attached at appendix B).

**Recommendation 3 – Cabinet requests the Head of Children, Young People and Learning to ask each school in the borough to assign the responsibility for promoting STEM to a named member of staff and a governor. These people will have the responsibility to promote STEM as a subject and particularly focus on ensuring the participation of girls and young women.**

**Recommendation 4 – Cabinet requests the Head of Children, Young People and Learning to improve the existing school and local authority STEM network for the STEM leads/co-ordinators and ensure it meets regularly to share practice, co-ordinate ideas and organise regular events.**

**Recommendation 5 – Cabinet requests the Head of Children, Young People and Learning to ask all schools to consider holding girl only science, maths and IT clubs or if this is unfeasible advertise the girls only clubs which are held elsewhere.**

**Recommendation 6 - Cabinet requests the Head of Children, Young People and Learning considers what support and advice would need to be offered to all middle/secondary schools to enable them to pilot single sex classes for STEM subjects and to explore these options at a meeting of the STEM Network.**

### **3.4.3. Further Education Colleges**

3.4.3.1. The engineering department at TyneMet College has seen a significant growth in recent years. In December 2013, 95 learners enrolled on HNC courses, 161 learners were enrolled across the three main strands in the 2013/14 academic year and for 2014/15 there were 271 learners in total. The success rate for 2013/14 was 98.8%. It was noted by the Sub Group that the two girls on the engineering course for 2014/15 had been offered jobs at the completion of their courses by the end of September.

## **4. Conclusion**

4.1. The Sub Group was impressed and reassured that the education providers in North Tyneside had responded to the need to address the low take up of STEM subjects and that girls and young women were not being prevented from accessing these opportunities. The sticking point appeared to be the young women themselves thinking it was not a career path for them and choosing alternative routes. Those that do choose to study the STEM subjects are the exception and have to do a lot of the research and work themselves to achieve their aims. We need to give these girls more support and empower those less determined and resilient to have conversations with their teachers and families and ask about these opportunities and see for themselves what can be achieved. Girls should not have to be brave or be seen as brave to study the subjects which interest them.

- 4.2. The Sub Group considers that its five recommendations will begin to break down the barriers that girls and young women face which will lead to an increase in participation in STEM subjects by girls and young women. This in itself will break down more barriers and encourage more girls to do the same until women studying and being interested in STEM subjects is not seen as noteworthy.

## **5. Future Work**

- 5.1. After the first meeting of the Sub Group it was clear that the subject of STEM and young women's engagement with it was a very wide reaching and complicated area of investigation. The Sub Group have restricted their formal recommendations to the questions posed in their original remit but do want to request that further consideration be given to the following:
- a) STEM Hubs for each tier (primary, secondary and higher) created at schools with the facilities to be used by all schools in the borough. There are already excellent facilities in the borough at Marden High School and Norham High School and these will be added to by the STEM Innovation Centre being established by TyneMet College at the former Skills and Enterprise Centre on Embleton Road. Having a place to go to do STEM events and meet others will be a great motivating factor for young people and allows all to have the opportunity to use the best equipment.
  - b) An evaluation of the information available in careers' libraries and the understanding of those giving careers advice of the current and future possibilities that STEM subjects open up for students.
  - c) Working with the North Tyneside Learning Trust to ensure a co-ordinated approach is essential and their role engaging with the business sectors should be used to its full potential.

## **6. Background Information**

The background papers and research reports listed in Appendix D have been used in the compilation of this report and copies of these documents are available from the contact officer.

## **7. Acknowledgements**

The Sub Group would like to place on record its thanks and appreciation to the following individuals for their assistance to the group:

### **North Tyneside Council**

Shona Duncan, Principal Manager, Employment and Skills, CYPL  
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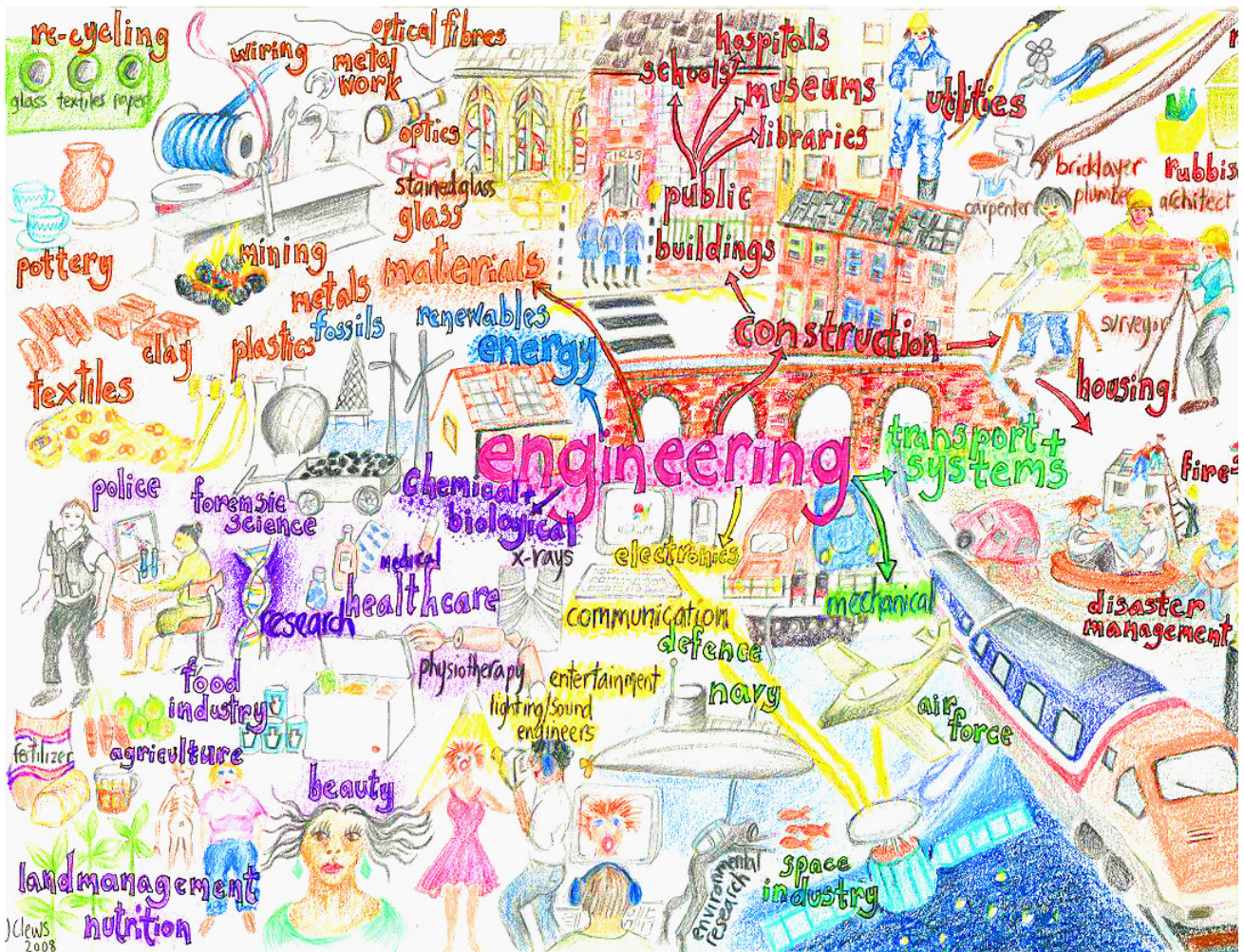
The four Year 10 students from Marden High School

The engineering students at TyneMet College

The further maths, chemistry and physics AS students at Queen Alexandra College.

### STEM extra curricula activities in schools 2014

- STEM weeks- a focus week when all teaching is carried out through a STEM project.
- Year 6 STEMtastic – event at Tyne Met where pupils get opportunities to engage in different activities.
- Primary Engineer project - linking engineering companies with primary schools to introduce pupils to engineering.
- Year 8 Climbing ladders – selected programme for more able students with a STEM career pathways focus.
- Year 9 Dragonfly – Girls into Engineering – Newcastle University event to encourage females to think about engineering as a career pathway.
- Year 9 Maths master classes at Newcastle University – Saturday classes to support more able mathematicians through the Royal Institute of Science.
- Year 9 Engineering master classes at Northumbria University – Saturday classes for students interested in engineering through the Royal Institute of Science.
- Leading the Way Year 8 Newcastle University –whole school activity with post graduate students and young science academics.
- Leading Edge Year 9 Newcastle University – small groups of students working alongside leading academics on their research.
- GO4SET - engineering project.
- Step into STEM Learning Trust – a three year project with the Smallpeice Trust.
- Crest and Discovery Awards – awarded for science project work.
- Year 5, 6 ,9 &12 Medicine and Dentistry days Newcastle University – pupils visit the medical faculty and find out what it's like to study there and the different subjects on offer.
- Tyneside Trackers year 9, Newcastle University Dove Marine – a project run by the university looking at opportunities available as career pathways.
- Think Physics Northumbria University – a three year project to encourage more young people to think about taking Physics at A level.
- 6th Formers into Primary Schools – students studying STEM A levels, visit schools to help with science lessons and projects.
- STEM Ambassadors into schools through STEM NET.
- Student STEM Ambassadors – recently graduated students who do activities with students in school and on campus.
- Big Bang fair- held regionally and nationally every year.
- Maths days- schools run days where pupils work on maths challenges in different contexts.
- ICE bridge- institute of Civil Engineers have a mini bridge which schools can borrow.
- Clubs- schools run a variety of clubs at lunchtime and afterschool for interested students.
- University days- our local universities run a variety of STEM days and events that schools can take part in.
- Smallpeice Trust Summer Schools- the trust run a series of summer schools each year. Students have to apply for places.



**Summary of recommendations**

1.	Cabinet requests the Head of Children, Young People and Learning to organise a programme of events/resources for teachers, particularly for teachers of Years 7 to 9, with up to date information on what opportunities and careers can be expected by anyone with STEM qualifications and an understanding of how to access these, including the vocational route.
2.	Cabinet requests the Head of Children, Young People and Learning to ask all schools to review existing information for parents of children aged 11-14 to provide increased focus upon what opportunities and careers can be expected by anyone with STEM qualifications, but particularly for women, and an understanding of how to access these, including the vocational route.
3.	Cabinet requests the Head of Children, Young People and Learning to ask each school in the borough to assign the responsibility for promoting STEM to a named member of staff and a governor. These people will have the responsibility to promote STEM as a subject and particularly focus on ensuring the participation of girls and young women.
4.	Cabinet requests the Head of Children, Young People and Learning to improve the existing school and local authority STEM network for the STEM leads/co-ordinators and ensure it meets regularly to share practice, co-ordinate ideas and organise regular events.
5.	Cabinet requests the Head of Children, Young People and Learning to ask all schools to consider holding girl only science, maths and IT clubs or if this is unfeasible advertise the girls only clubs which are held elsewhere.
6.	Cabinet requests the Head of Children, Young People and Learning considers what support and advice would need to be offered to all middle/secondary schools to enable them to pilot single sex classes for STEM subjects and to explore these options at a meeting of the STEM Network.

### List of Background Papers

The following background papers have been used in the compilation of this report and copies of these documents are available from Elizabeth Kerr, Democratic Services, e-mail: [elizabeth.kerr@northtyneside.gov.uk](mailto:elizabeth.kerr@northtyneside.gov.uk) Tel: 0191 643 5322

- Girls' Schools Association, *Girls can do well in maths and physics*, December 2014. [available at: <https://gsa.uk.com/2013/12/girls-can-well-maths-physics/>] (Accessed: 9 March 2015)
- Lognonne, Ruth, 'Carol Vorderman helps boost Girl Power at digital event for schoolchildren', *The Chronicle*, 26 January 2015 online, [available at: <http://www.chroniclelive.co.uk/news/north-east-news/carol-vorderman-helps-boost-girl-8517907>] (accessed: 27 January 2015)
- Richardson, H., *Science careers not 'the preserve of men'* 10 November 2014, [online, BBC News Education & Family available at: <http://www.bbc.co.uk/news/education-29990639>] (Accessed on 21 November 2014)
- Silim, A. and Crosse, C, (2014) *Women in Engineering: Fixing the Talent Pipeline*. Institute for Public Policy Research (<http://www.ippr.org/publications/women-in-engineering-fixing-the-talent-pipeline>)
- Whipple, Tom (2015) 'If you want a job, get a science degree', *The Times*, 2 February 2015, p7.
- Institute of Civil Engineers *Engineering Happiness* video [available at: <http://www.youtube.com/watch?v=z4zymdaEJIA>, published 19 September 2014] (Accessed: 21 November 2014)
- The Institute of Physics, *It's Different for Girls: The Influence of Schools*, October 2012 [available at [http://www.iop.org/education/teacher/support/girls\\_physics/file\\_58196.pdf](http://www.iop.org/education/teacher/support/girls_physics/file_58196.pdf)] (Accessed: 9 March 2015)
- Tees Valley Unlimited *21<sup>st</sup> Century Careers in the Tees Valley – Here Come The Girls* video [available at [21st Century Careers in the Tees Valley - Here Come the Girls! - YouTube](http://www.youtube.com/watch?v=z4zymdaEJIA), published 5 November 2014] (Accessed: 12 February 2015)

## Useful Websites

- He for She [www.heforshe.org](http://www.heforshe.org)
- Institute of Physics [www.iop.org](http://www.iop.org)
- Let Toys be Toys [www.lettoysbetoys.org.uk/ten-ways-to-challenge-gender-stereotypes-in-the-classroom/](http://www.lettoysbetoys.org.uk/ten-ways-to-challenge-gender-stereotypes-in-the-classroom/)
- Science: It's a girl thing! [www.science-girl-thing.eu/en](http://www.science-girl-thing.eu/en)
- The Smallpeice Trust [www.smallpeicetrust.org.uk](http://www.smallpeicetrust.org.uk)
- Think Physics [www.northumbria.ac.uk/about-us/academic-departments/physics-and-electrical-engineering/think-physics/think-physics/](http://www.northumbria.ac.uk/about-us/academic-departments/physics-and-electrical-engineering/think-physics/think-physics/)
- Wise Campaign [www.wisecampaign.org.uk](http://www.wisecampaign.org.uk)
- Your Life [www.yourlife.org.uk](http://www.yourlife.org.uk)