



Needs Analysis Report UK

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Chapter 1: Desk research

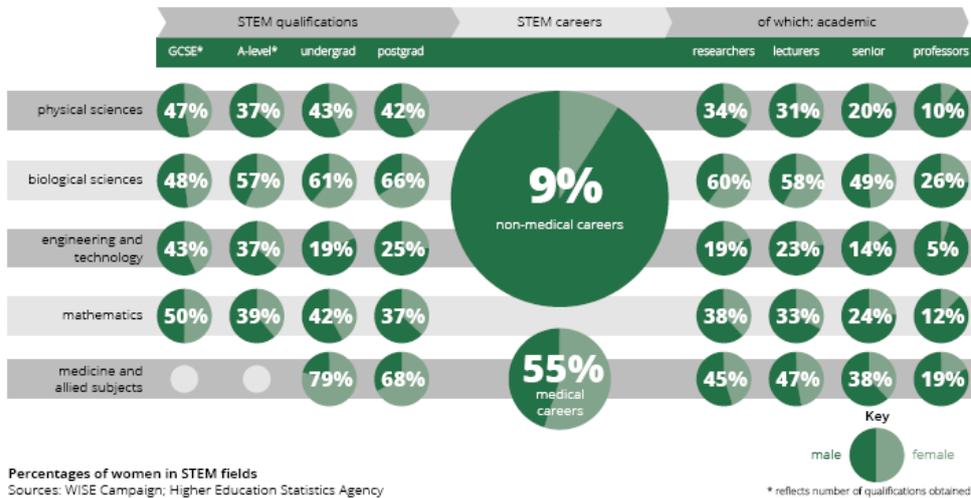
Overview

The UK faces a shortage of 40,000 skilled workers in STEM every year¹. These jobs are not only in the ‘normal’ STEM subjects like engineering or teaching but cover a wide range of areas some of which we might not even be aware of yet. This is due to STEM related subjects opening the doors for many different kinds of jobs.

Especially in engineering diverse teams made up of both males and females have shown to produce better results and to be more innovative². Since the number of girls studying STEM subjects is currently very low it is important to not only get more people to study STEM related subjects in general but especially get more girls interested.

In the UK, results have shown that many girls do like science subjects at school but many decide not to study them further when it comes to choosing A-level subjects, at the age of 16³.

Figure 9 – Participation and retention across STEM from school through to the workforce⁴
(Designed by Scienceogram)



This trend continues into higher education and professional work, especially in academia. The phenomenon of an increasing number of women dropping out of STEM as they move further along their educational and professional route is called the ‘leaky pipeline’⁴. This phenomenon can be observed in all major STEM subjects with the exception of biology.

¹ Campaign for Science and Engineering (CaSE) (2014) “Improving Diversity in STEM”

² WISE (2014) “Not for people like me? Under-represented groups in science, technology and engineering”

³ Ibid.

⁴ Campaign for Science and Engineering (CaSE) (2014) “Improving Diversity in STEM”



Possible reasons for this are strong stereotypes and attitudes from mostly male colleagues.

This leads to a very male dominated working culture in which many women do not feel very comfortable. Long working hours also pose a problem for women who try to combine work and family duties.

Clearly a discrepancy between what girls like and what they think they can do, resulting in a ‘that is not for me’ attitude exists. This is especially puzzling since girls on average achieve better results in science subjects than boys.

Girls are especially influenced by the support or view held in their family. Other factors influencing girls’ decisions are: friend’s assumptions, stereotypes and a lack of role models. Many also miss important knowledge about the possible jobs open to them and how transferable STEM knowledge is to other jobs⁵. This problem is enhanced by many teachers also being unaware of all the jobs open to students studying STEM related subjects.

Positive discrimination, for example introducing a quota to hire the same amount of boys and girls for a science related project is unlawful⁶. It is therefore better to encourage more girls to study in this field and to raise awareness in these areas, therefore making quotas unnecessary in the long run.

Key Statistics: Gender and STEM in the UK

- | |
|--|
| <ul style="list-style-type: none">• According to estimations 1.28 million new science, technology and engineering professional are needed by 2020⁷ |
| <ul style="list-style-type: none">• Currently 5.8 million people (20% of total workforce) are employed in STEM related occupations⁸.• Only 13% of those are female⁹ |

⁵ Ibid.

⁶ WISE & Royal Academy of Engineering (2014) “University Technical Colleges. Opening up new opportunities for girls”

⁷ Ibid.

⁸ House of Parliament (2013) “STEM education for 14-19 year olds”

⁹ WISE & Royal Academy of Engineering (2014) “University Technical Colleges. Opening up new opportunities for girls”



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- The UK has the lowest participation of women in the STEM workforce in Europe¹⁰¹¹



- Only 10% of STEM managers are female¹².

Table 4 FTSE 100 STEM and non-STEM companies with women on their Board

	STEM companies	Non-STEM companies
Number of companies	57	43
Companies with no women on their board	11 (19%)	0
Companies with one woman on their board	22 (39%)	17 (39%)
Companies with two or more women on their board	24 (42%)	26 (61%)

Source: The Female FTSE 100 Board Report 2012. Cranfield University School of Management.

- In 2013 11% less girls studied Physics at A-levels in Wales compared to the last survey¹³

¹⁰ WISE (2014) “Not for people like me? Under-represented groups in science, technology and engineering”

¹¹ WISE & Royal Academy of Engineering (2014) “University Technical Colleges. Opening up new opportunities for girls”

¹² Campaign for Science and Engineering (CaSE) (2014) “Improving Diversity in STEM”

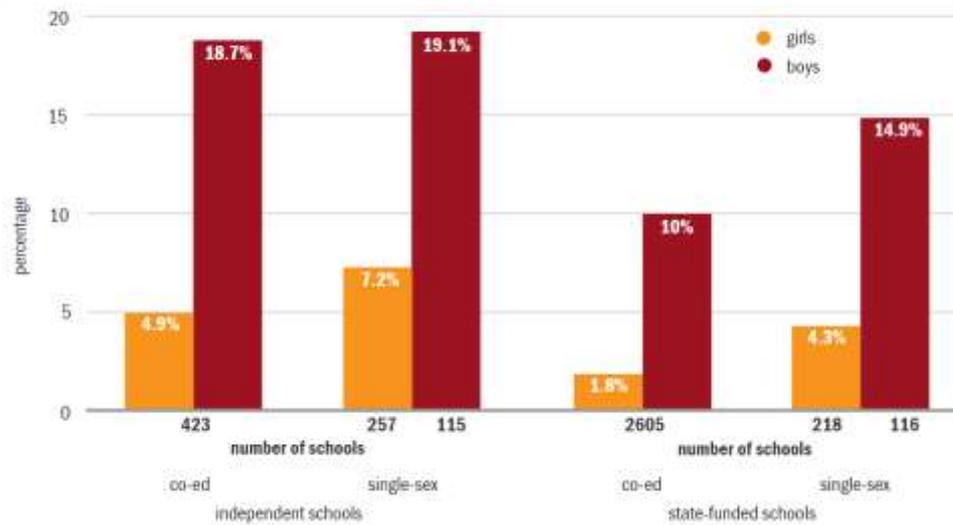
¹³ Ibid.



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Figure 1: Percentages of girls and boys who went on to take A-level physics in 2011 by type of school (*It's Different for Girls*, IOP October 2012)



- Just around 11% of STEM business owners are women¹⁴

Figure 12 Comparison between females and males self-employed who are STEM managers (business owners) and non-STEM managers (business owners) 2012.



Source: Labour Force Survey, April – June 2012. Notes: Males aged 16-64 and females aged 16-59.

- Girls make up less than 3% of engineering apprenticeships and 2% of construction¹⁵
- In 2012, in 49% of all state mixed schools, no girls did A-level physics¹⁶

¹⁴ WISE (2012) “Women in Science, Technology, Engineering and mathematics: from Classroom to Boardroom”

¹⁵ WISE & Royal Academy of Engineering (2014) “University Technical Colleges. Opening up new opportunities for girls”

¹⁶ Ibid.



- The number of females obtaining mathematical science degrees rose by 27% from 2008 to 2011¹⁷. But the overall number of girls studying this subject is still very low.

UK Networks Supporting Women in STEM ¹⁸

National	
BCS Women	Provides networking opportunities for all BCS professional women working in IT around the world. The Group's main objective is to provide support for female IT professionals, as well as mentoring and encouraging girls/women to enter IT as a career.
ScienceGrrl	A network of (mainly) female scientists who are passionate about passing on their love of science, engineering, technology and mathematics to the next generation.
Stemettes	Being one of 3 girls in a class of 70 students studying Mathematics and Computer Science at university Anne-Marie Imafidon decided to set up Stemettes. The mission - to help combat the problem of a lack of women in STEM, in a new way.
The Women's Engineering Society	Founded in 1919, the Women's Engineering Society (WES) is a professional, not-for-profit society offering inspiration, support and professional development.
Women in Telecoms and Technology	Informal networking group focused on education and enhancing women's careers by sharing experiences and lessons learned in members' career development. They encourage mentoring and provide networking opportunities.
Mums in Science	Established in 2005 to support parents who work, have worked or want to work in any aspect of science. They form part of the Euroscicon group and in collaboration with Euroscicon they have run workshops for WOMEN IN SCIENCE.
Women in Rail	Created to improve diversity in the UK rail industry through providing networking opportunities and support for all women within the sector.
East England	
Cambridge Association for Women in Science and Engineering (CamAWiSE)	Regional network established to help retain and improve the representation of women in science, engineering, technology and mathematics (STEM) fields in both industry and academia.
North West	
Manchester Girl Geeks	They meet on the second Tuesday of every month , from

¹⁷ WISE (2012) "Women in Science, Technology, Engineering and mathematics: from Classroom to Boardroom"

¹⁸ From: <http://www.wisecampaign.org.uk/women/networks> (accessed: 19.01.2015)



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	6.30pm.
Scotland	
Interconnect	Network for women studying science, engineering, technology and the built environment across Scotland. They help students to develop personal networks, build links with industry and enhance career prospects.
Others	
<u>Girl-friendly Physics</u> http://girlfriendlyphysics.co.uk/	Side for teachers to help them engage more girls during class and get them interested in physics after the age of 16.
<u>Science: It's a people thing</u> http://www.iop.org/education/teacher/support/girls_physics/people-thing/page_61998.html	Discussion workshop for KS3-4 female students
<u>Consulting girls – dos and don'ts</u> http://www.iop.org/education/teacher/support/girls_physics/action_pack/file_41741.pdf	Dos and don'ts for consulting girls to encourage their increased take-up of physics

Gender Awareness Training for Teachers

The Oxfam Gender Training Manual http://policy-practice.oxfam.org.uk/publications/the-oxfam-gender-training-manual-141359	Resource for gender and development trainer with information and activities. Could be used for training VET teachers
One size fits all? Enhancing Gender Awareness in Teaching http://www.the-twist-project.eu/media/dyn/TWIST-Onze_size_fits_all.pdf	Programme for the professional development of qualified and student teachers, to ensure that they are better equipped to deal with stereotypes and prejudices regarding gender issues and career opportunities.



Chapter 2: Focus Groups

Description of target group

Both the focus group for VET teachers as well as girls studying a STEM related subject took place on the 30th of January 2015. Both were around 1,5 hours long and had a 15 minute break between them. They were led by Carolyn Usher, a staff member of Inova Consultancy with years of experience in leading focus groups and discussions. She was supported by Laura Broß (Inova), Liz Kettle (WEST, The Sheffield College) and Angela Bradley (TSC). The latter was only present at the VET teacher focus group due to other commitments.

The VET teacher group was made up of 12 VET teachers from The Sheffield College. 9 were male while 3 female teachers were present. Their subjects included for example sign making, mechanics, plumbing, construction and technology.

10 girls signed up for students focus group, however snow on the day meant that many were prevented from attending and only 4 girls were able to make it.: two girls from sign making, one future plumber and one girl studying mechanical engineering. In order to gain a more varied view, Carolyn Usher also met with a 5th girl (Laura) on 9th February 2015 for a face-to-face meeting.

Resources available:

Both focus groups took place within The Sheffield College facilities. This made it easier for both teachers and girls to attend before or between going to classes.

The room used was a classroom set up for participants to sit in a circle to better facilitate discussions. A short presentation about the project and the session was shown on a screen while notes were taken down on a flipchart.

It was decided not to record the focus groups as there was concern that this would prevent participants speaking openly and honestly about their experiences. However, extensive notes were taken by the facilitators to ensure that findings were recorded accurately. Pictures were also taken to record the event, after ensuring that all participants were informed and agreed to this.



Findings of the focus groups

VET teachers

After a general introduction to the project, the partners and what the focus group aimed to achieve, several questions from the guide were asked. Due to the natural flow of the discussion the facilitator chose to ask the questions when appropriate and not stick too strictly to the guide, some questions were also added to help bring out some points more and clarify meaning.

Most teachers agreed that they are affected by stereotypes, mainly due to many examples of workers (in text books, case studies etc) being very male oriented and it therefore being easy to fall into using these kind of examples in their class. But because most do not have many or even any girls in their classes, this is not always seen as an obvious problem.

All teachers, especially the few female ones, stressed the importance of family when deciding on which subjects to study or which career to pursue. Especially the support or discouragement of parents is seen as having a big impact on young girls. The teachers pointed out that most girls and their parents have the wrong idea about what STEM subjects really entail. They have an incomplete picture that is often based on false stereotypes and make a decision based on this. One way to tackle this would be to give career counsellors at schools better information and a clearer picture what the subjects really teach and which kind of jobs girls can work in after studying these subjects. Another possibility brought forward by the focus group participants was to offer taster weeks in which girls can try out the subject they are interested in. Normally institutions only offer taster events that last one day if at all. All teachers agreed that this is not enough time to give girls a full understanding of all aspects of a subject.

In conclusion the VET teachers agreed that the two main problems keeping girls from studying STEM related subjects is a lack of information about the subjects and what they can do with them career wise and the lack of support, especially from parents.

When asked about the retention rate of girls in their classes, the teachers said that once girls decided to study their subject they normally stuck with it and completed the course. Problems arise when they start looking for a job, due to many STEM employers having reservations



against hiring girls¹⁹.

It was felt that, if girls decide to quit their studies they do not do so because they are not good in the subject, since they normally have better grades on average than boys but because they have trouble finding their place in the classroom or because they disagree with the classroom culture. This is due to most girls being more mature than their male classmates and more focused on their studies.

This difference between how boys and girls study is also the reason why some of the focus group participants do in fact, admit to teaching them differently. Male teachers especially admit that they behave differently towards their male and female students, but this is not due to them not believing in the girls' skills but because they generally treat males and females differently, including their colleagues. As long as girls still have the same chances than boys, the teachers did not see a problem in different treatments. Some of the male teachers admitted to giving more help to girls which they admitted could be due to a stereotype that they would have less knowledge than the boys, when in fact very often they perform better than their male colleagues. When asked to reflect on this they realised that probably they were singling girls out unnecessarily and that this was probably bad practice.

In the last part of the focus group the facilitator talked about the Mind the GAP project in more detail and invited the teachers to give their input. They all seemed very interested in potentially taking part in this type of training. and the male teachers raised the point that it would be best if one of their peers would actually deliver the training (rather than an outsider) since they would have more respect from the older teachers who may be less open to the ideas being put forward and because they would know best what is needed from the teachers point of view. Due to the boys behaviour being so important in making the girls feel welcome some teachers questioned if it would be possible to also give some kind of training to the boys. This could be something which could be worked into the training course, providing a section training the teachers to discuss the issue openly with all students in their classroom, to ensure male students are also aware of the gender gap in STEM.

When talking about practical issues, the teachers pointed out that it is important to contact The Sheffield College very early on to make sure the teachers are given the time to go to the training sessions, as it is often difficult to get time for training.

¹⁹ It should be remembered that the majority of teachers participating (with the exception of 1) are delivering very vocational subjects and students would not follow an academic route after College but go straight into the labour market.



Girls studying STEM subjects

Again the focus group started with the facilitator giving a short overview of the project, the partners and the goals for the session.

A short quiz about girls in STEM was then used to get the girls to begin discussing the topic and to raise their awareness of the gender gap. The participants were surprised about the low number of girls in STEM since they know some girls who study it, including themselves and were not aware that they were in a minority.

Many had a passion about STEM subjects from an early age and had always been aware that they wanted to do something in that area. While two girls had allowed themselves to be talked into studying something else first, they had then later switched to mechanical engineering or construction. The other three girls had followed their dreams continuously. The girls all had experienced that it could sometimes be difficult to study in a classroom where they were the minority (all the girls were on courses where they had been the only girl in the room at some point), as they often felt that the boys did not take them seriously, but most participants said that this just encouraged them to show the boys that they could do it.

While all participants learned to get along with the boys in their classes over time, the beginning was very difficult and they all stated that they would have liked to have more girls in their course to share the experience with. One girl though said she consciously chose a subject with more boys since they do not create so much drama and because she generally gets along better with them.

The girls had also experienced a feeling of being treated differently by their male teachers which was interesting as this had not been recognised as strongly by the teachers themselves. The girls did recognise (as some of the teachers had) that they were often given more attention than the boys. The girls did not like this since they do not feel as if this behaviour is warranted and also felt that it made them stand out more. They were very keen to be treated as equal to the boys and not given more support unless it was needed (not just because they are female).

While many stated some disbelief or confusion on the side of their parents and friends in terms of the subject they had chosen, the girls in the group said that most of the time their



choice was respected. . Especially, friends soon realised the positive effect it can have to have a friend who studies a STEM related subject. One girl even said that one of her female friends decided to study sign making after seeing how much fun the participant had with it which was a good example of how much peer support and having someone set an example can affect the choices young girls make in their study/career.

3 out of the 4 girls present already had concrete plans for their future, either doing an apprenticeship, continuing their education at university level or, for one in particular, joining the navy. Only one girl was still unsure but was thinking about doing an apprenticeship.

When asked about the kind of help or support the girls would like to get in order to help them continue on this path, they mentioned more work experience would be important in order to get a better idea about what working life is really like. In terms of soft skills they agreed that it would be good to be more assertive so that they could talk with their teachers and fellow classmates about the issues they do not like and would have more confidence to stand up for themselves in a male-dominated environment.

They liked the concept of Career Circles™ especially if it would bring together older and younger students to share experiences. This was a new idea which had not been originally thought of for the project, however there was a strong feeling among the focus group participants that they would have needed this support more at the beginning of their course (they were all in their final year), whereas now they had “been through it and we could help the younger ones”. It could therefore be beneficial to organise the Career Circles™ to allow older students to begin mentoring new students as they begin their courses. One participant especially said that she would have benefitted from such an offer since one of her main problems was to envisage a career after finishing her studies. For the participants itself it would not have made a difference to be introduced to more role models since they already knew what they wanted to do but they agreed that it would be helpful for girls who are still undecided about their future career.

According to the girls, teachers should be more aware of the girls in their class. Although they do not want special attention (see above) they felt that more awareness was needed by male teachers to ensure that inappropriate topics (which made the girls uncomfortable) were not discussed in class which many had experienced.



They also felt that it would be nice to have better communication between teachers and students concerning career aspirations. But this is a problem not only for the girl students but also for boys. One older participant agreed with this, pointing out that it would be good if career counsellors would listen more to what the girls really want to do and then offer the necessary information in an encouraging manner, rather than imposing stereotypes or pushing all students to go on to university which is not appropriate for all.

When asked about the best ways to contact the girls concerning information on Mind the GAP, they agreed that they do not care about old fashioned flyers but are more receptive to online communication in particular emails. . This should not necessarily include Facebook though since they are not as active there as they have been in the past. In fact the majority were keen to receive information by text message which could be useful to know when it comes to delivering the pilots.

Conclusion and evaluation of the focus group sessions

Both focus groups managed to get information from the relevant target groups concerning their opinions on the lack of girls in STEM as well as hints on how to improve the situation. The collaboration between The Sheffield College and Inova Consultancy worked out very well. The Sheffield College organised the facilities and recruited the participants while Carolyn from Inova, with the help of Liz from WEST, led the discussions.

Both focus groups were very successful. We talked with teachers and girls from different subjects and, concerning the girls, in different stages of their studies. Everyone freely talked about the issues and shared their opinions.

A few days after the sessions we got feedback that the teachers especially liked the meeting since they could share their opinions and had the feeling we really valued what they had to say.

The only weak point was the small number of girls participating. This was due to heavy snow and ice in Sheffield on that day which kept many girls from coming to the College.

The main findings were:

- lack of role models influences teachers' stereotypical thinking & behaviour
- Family support is the most important factor influencing young girls when they decide to study a STEM subject or not



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- Many people have a wrong or stereotypical idea of a STEM professional
- Many teachers admit to treating girls and boys differently while the girls all agreed that they would prefer not to receive special treatment
- Both teachers and girls are very interested in the Mind the GAP programme and potentially participating

Follow-up activities and dissemination

The Sheffield College representatives are in regular contact with some of the teachers and keep them up-to-date with the project. We hope to bring one or two to the next meeting in the Netherlands so that they can be trained in delivering the GAP training to their colleagues. Several of the girls expressed interest in being kept up-to-date with information on the project and potentially taking part in the Career Circles™.

Chapter 3: Online Survey

VET Teachers

The online survey has been distributed through The Sheffield College to their teachers. 29 were filled in at the time of writing.

Participants were mostly male with $\frac{1}{4}$ being female and British. Both young and older teachers took part in the survey. They represented a variety of different subjects and saw different reasons for why fewer girls choose to study STEM subjects. They agreed on the lack of role models and the majority would be interested in attending the Mind the GAP training course.

The concrete results can be found in Annex 1.

Girls

The link to the online survey was distributed through The Sheffield College and the Mind the GAP and Inova Consultancy social media platforms. A paper version was also distributed to college teachers who then asked their female students to fill them out and then brought them back to Inova Consultancy where they were inserted into the online platform to make comparison possible.

$\frac{2}{3}$ of the collected 48 responses were originally paper based. A problem with the online



survey itself was that many girls started to fill it out but never finished and stopped after giving their name, age and nationality. The paper based surveys received a better response, most likely because they had been asked to complete them by teachers in class, rather than in their own time.

The nationality of the girls is more varied compared to the teachers but this could also be due to the higher number of participants.

Due to most surveys being handed out by specific teachers in their classes some subjects are more represented than others.

The main findings were:

- Teachers and parents had the biggest positive outside influence but many girls also said that they encouraged themselves without any outside help.
- The most negative influence came from friends, followed by teachers but many girls said they haven't encountered any negative influence at all.
- Around 75% would like to receive further information on Mind the GAP but a lower number is interested in actually taking part in the Career Circles™.
- Interestingly not many want to receive information through social media. Most girls prefer to get contacted by phone (per text) or through email.

The concrete results can be found in Annex II.