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Equality and Diversity

Promoting STEM learning routes and careers in a positive way to encourage under represented groups to see the benefits of STEM options

The STEM workforce is not yet truly representative, with a significant gender imbalance in many areas. To help address this, major investments have been made in STEMNET (Science, Technology, Engineering & Mathematics Network) and the SEA (Science & Engineering Ambassadors) programme with 19,000 ambassadors now acting as role models, while DCSF (Department for Children, Schools and Families) sponsors the science and engineering after school clubs run by STEMNET.

Barriers to females choosing STEM subjects and careers

An Institute of Physics report (December 2006), *Girls in the Physics Classroom*, examined how children's views of STEM develop as they grow up and why girls' participation in school science declines with age. Teaching that is not sensitive to gender may contribute to the gender gap in take-up beyond 16 of the physical sciences and maths, lessening the chances of the workforce being truly representative.

Key factors include:

- A decline in many girls' self-belief in their abilities in science, particularly the physical sciences
- Many girls reject the stereotypically masculine images of science and scientists as one they could adopt for themselves
- 42% of girls enjoyed science compared with 63% of boys
- 6% of girls reported that science was their favourite subject compared with 37% of boys
- 63% of girls said they liked biology, and this fell to 37% for chemistry and 22% for physics

To help to counteract this imbalance, a range of international studies indicate the need to change the curriculum, and the teaching and assessment methods, so as to increase girls' engagement with science.

Key recommendations include:

- Using a variety of social situations and contexts to illustrate scientific problem solving – using topics to show how science impacts on people
- Representing science as something people do and not just 'a body of knowledge'
- Using discussion as a means of showing the impact of science on life.

Other factors which influence why females do not choose the STEM option, include:

- If there is little or no actual knowledge and experience of what STEM occupations can offer, girls and women will inevitably exclude them as a realistic career choice
- For many parents their image of the STEM industries may be negative so they feel unable to support their daughters' desire to pursue a career in STEM
- Some members of various religious faiths may perceive STEM careers as being incompatible with a woman's role and religious responsibility e.g. working in a male dominated environment
- Early home life, the media and education play a crucial role in preparing children for their roles in life. Gender stereotypical roles will have been reinforced in many ways, before girls even make their career choice.

In relation to aspirations, the report concluded that girls' and boys' job ambitions across the ages reflected traditional employment patterns, and jobs traditionally undertaken by men were still those for which physics was considered most appropriate. Students' lack of knowledge of careers is a problem and increasing their awareness of physics-related careers would enable them to make informed course choices. These findings relate to the general STEM experience, and it is important that at Key Stage 3 girls should know about the wide range of careers available to them if they opt for a STEM pathway.



Gender imbalance in STEM careers

Encouraging the greater participation of females in STEM makes good business sense since by not tapping the skills potential of females, employers are reducing the pool of possible recruits.

Fewer girls choosing STEM subjects leads to gender stereotyping in education with resultant occupational segregation in the workplace. Occupational segregation is one of the three main factors contributing to the gender pay gap alongside pay discrimination and unequal impact of caring.

Without more females choosing the STEM route, occupational segregation will reinforce the current situation whereby 75% of working women are still found in just 5 occupational groups:

- Associate professional and technical (e.g. nurses)
- Administration and secretarial work
- Personal services (e.g. caring for children or the elderly)
- Sales and customer service
- Non-skilled manual work.

Occupational segregation can also be illustrated by the number of 'starts' in selected Apprenticeships, as in the table below:

Gender gaps in the number of 'starts' in selected Apprenticeships (2005/06)

Selected Sectors	Women ratio (%)
Early Years Care and Education	96.0
Hairdressing	91.3
Health and Social Care	89.8
IT Services and Development	4.5
Engineering	3.7
Plumbing	1.2
Vehicle Maintenance and Repair	1.0

The Gender Pay Gap

Pay rates in male-dominated sectors are higher than in those sectors where the majority of females work:

Mean annual pay (gross) – 2006	
Selected sectors	Mean annual pay
ICT Professionals	£39,228
Engineering Professionals	£34,839
Hairdressing and Beauty Salon Managers and Proprietors	£18,661
Healthcare and Related Personal Services	£12,108
Childcare and Related Personal Services	£9,405

The message of overall better pay in the STEM area, combined with the exciting opportunities that are available, may encourage more girls to break this cycle of occupational segregation.

STEM Apprenticeship Opportunities

To combat the skills shortages in STEM processing and technician roles, a major expansion in Apprenticeship opportunities is taking place which may also encourage more girls to consider the STEM route. To exemplify this, the Advanced Apprentice category at the 2008 National Employer Service (NES) Learners First Award was won by Rachel Hoyle, an apprentice with BAE Systems in Lancashire. To underline the attraction of STEM opportunities and of Apprenticeships in particular, Rachel commented – *'I wanted a career where each day would be different and I could problem solve and continue to develop my skills. What was more I could continue to learn while I worked'*.

STEM Degrees

There is still some way to go before students taking STEM Degrees (with the exception of medicine, chemistry and biosciences) are truly representative of all young people.

Traditionally only a small proportion of STEM graduates have been female, and although this position has slightly improved, the gender gap in STEM graduates is still considerable. Since 1997 women have formed an increasing proportion of STEM graduates in all subjects apart from mathematical sciences. Overall the female proportion of the stock of STEM graduates has increased from 27% to 36% between 1997 and 2004. However, the female proportion of STEM graduates still falls well below the non-STEM figure of 53%. In particular, the proportion of mathematical sciences has fallen by 2% to 25%, but the weakest female representation occurs in engineering where, despite an increase of 3%, only 7% of graduates are female.

STEM Degree



Improving Equality and Diversity Practice

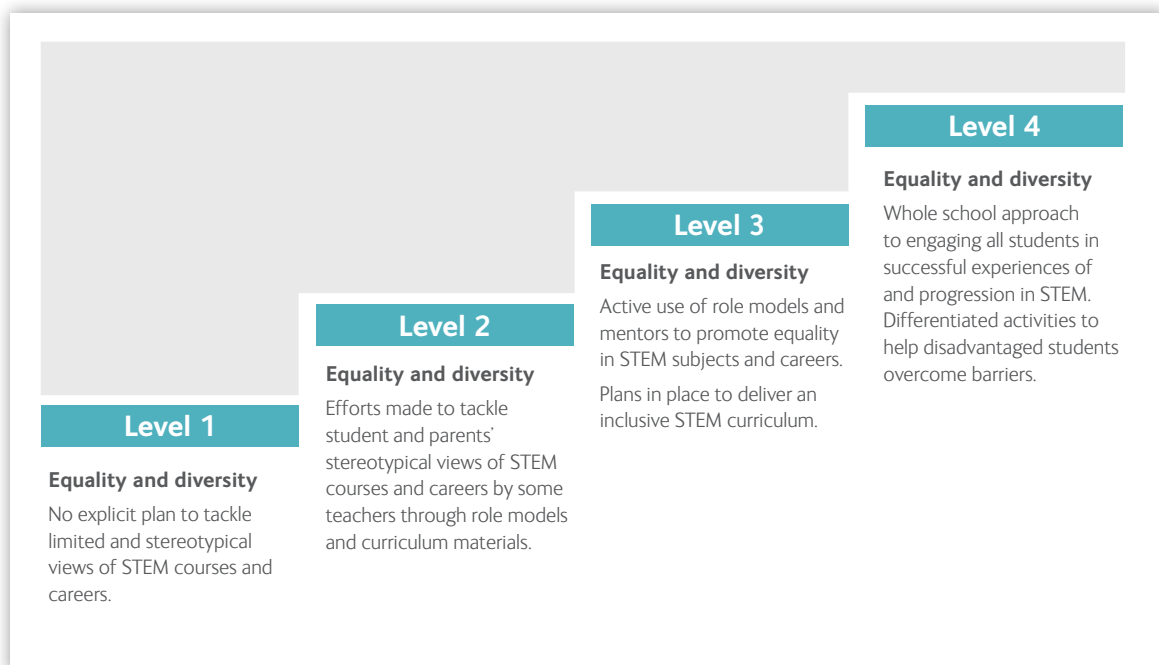
In order to measure the effectiveness of work in relation to promoting equality and diversity in STEM the following framework sets out four different levels of performance and provides a ladder of progression

Level 1 – low level impact

Level 2 – some awareness and use of STEM activities

Level 3 – widespread knowledge and use of STEM activities

Level 4 – whole school approach to supporting STEM activities



20 ways to make STEM careers advice women friendly:

Gender equality training materials can be found on www.ukrc4setwomen.org/html/education/careers-professionals. An example, '20 ways to make STEM careers advice women friendly' follows:

1. Referral

Careers advisers may not know all available information about careers that are less common than traditional areas of work.

Be aware that you don't know the whole picture and ensure you know someone who does or where it can be found. Keep an up to date list of women role models / organisations / support networks to help give the real picture.

Put together a network of "Women's Support Resources Register" in your area – "Women friendly" courses, employers, support networks, taster courses etc.

Expand the basic information you have in a useful way e.g.

(a) Develop a database of "women friendly" employers in the area and keep it up to date. Contacts can move on.

(b) Develop a register of women role models in your area.

2. Promotional Material

Ensure literature/posters have positive images and are not exclusively male dominated and unimaginative. Many resources are available e.g. UKRC, WiSET at Sheffield Hallam University, or set up your own with your own students and past students. Challenge those organisations that send stereotyped literature for you to use in a positive way to help them change. Many do not realise what they are doing. Real examples help to show it is possible.

3. Stepping Stones

Ensure you have information on stepping stones and routes, so that young women can see a progression and are not steered to a dead-end situation.

Colleges and universities are keen to widen participation to education and training, and a number of new routes to becoming qualified are opening up. There may be ways to work with those without qualifications to find a suitable pathway.

4. Employer Visits

Preparation and debriefing for visits and employer visits is essential. The impressions made on a single visit can harm or help the image gained of a profession by impressionable young women who might lack confidence. Ensure the employer is encouraging and not going to reinforce stereotypes. If something goes wrong, then a good debrief with the group can help debate the issues and an alternative could be arranged to give a different perspective. Ensure you have back up material/alternatives to counteract negative input from guest speakers. A panel can help to balance views rather than relying on a single perspective.

5. Selling Trips

Think of creative ways to sell trips and visits to technical workplaces to the girls. Try and make them interesting. A number of universities are keen to welcome girls onto non-traditional courses, and will go out of their way to make you welcome. If there are major construction projects going on in your area, find out about potential visits – and if they already have women working on the site. Find out how pupils are chosen for trips from classes/schools. Try and be involved to ensure equity and that girls get offered the trip to the “construction site” in an appropriate way.

6. Different Ways

Work in youth clubs with theatre groups or invite theatre groups into school to challenge stereotyped career choices, and have back up information to provide advice. Look for ways of using different materials in different parts of the curriculum, not just careers, taster days, role play or What’s My Line.

7. Support and Encouragement

Always leave them with a clear idea of how they can be proactive in achieving their goals, making use of action plans and a step by step approach can support this, e.g. a taster day, talk to a mentor, talk to teacher or family, know the academic requirements etc.

For every negative, think of a positive, e.g. ‘being cold – great pay’.

In a ‘one to one’ interview, be clear about difficulties that may be faced when entering a non-traditional career area. However ensure that you confirm their right to be in that area, and give them the links and safeguards to handle any difficulties.

Organise group sessions to cover issues that are important, e.g. equal opportunities in the workplace – difficulties can be discussed. Make use of women only group sessions to discuss certain issues, e.g. feeling isolated in workplace/support. Work with boys only groups can also tackle stereotyping and challenge attitudes that inhibit girls’ choice.

8. Staff Development Training

Staff Development Training/INSET can be helpful to work with staff to challenge often unconscious barriers in attitude and language which can put off prospective entrants to the career before they start. Staff development training can also raise awareness of staff in other subject areas that will influence student choice. Let’s TWIST / UKRC can provide purpose delivered sessions, or you may wish to run some workshops yourself, with some help from others who are interested.

9. Parents

Think of ways of involving parents – girls who are interested in a non-traditional career on a taster day are influenced by attitudes of parents and without support / knowledge might be reluctant to get involved. Parents who are involved can offer support to their daughters.

Invite parents to presentations after taster days. Invite parents to hear from women role models.

10. Mentoring

Mentoring projects can help show that women exist in many non-traditional areas. Set up a mentoring project in school, you can make links with a local college, university or employer. There are a number of established schemes that are running to draw on for advice. UKRC can help. The mentors will of course need training, and evaluation of the scheme will ensure it actually works.

11. Taster Days

Taster days can be exciting when seen as something different. They need to be active, so they are not seen as routine and boring. Make them attractive by including some excitement and lots of activity, rather than passive listening e.g. design a nursery, survey a house, build a bridge. Colleges and universities are keen to make contact with groups of under-represented students.

12. Technology and Terminology

Research indicates that girls are often put off by what they see as hard words that seem unattractive. The creative side of non-traditional areas of work should be stressed.

Think about aspects of activities that will appeal to girls who are put off by the macho image of science and technology. Sometimes the words 'technology' and 'technical' turn them off, but designing / making things, helping people, making a difference to the environment can be more attractive.

Be aware that there are a wide range of careers in these areas that are mainly about communication and people – traditionally seen as feminine skills.

13. Relating Careers to Interests

Tracking young people through interests and activities can be helpful to identify interests in non-traditional areas which can then be nurtured and encouraged e.g. an interest in drawing can be developed to architecture or painting and decorating, or engineering. Taster days can be linked to interests e.g. sports and leisure tasters with careers in non-traditional areas.

14. Confidence Building

There is a need to be supportive to students who lack confidence in taking the plunge to try something different. Support systems need to be set up not just to encourage young women to try things, but also to support them when they are challenged by others. This could mean staff being ready to challenge stereotypical views, or just having group work or sessions to deal with issues. Research shows that this initial confidence building is key to success.

Positive encouragement is always important. Be careful not to reject any career idea out of hand that the girl has, e.g. pop star, footballer. Just explore them and have a realistic back up plan, e.g. sound engineer, sports scientist.

15. Labour Market Information

Ensure your labour market information is up to date with skill shortages in your area, to make the chance of career accessible, e.g. construction skill shortages, IT and electronics shortages. These shortages provide an ideal market for working with employers who may not have considered women trainees. Have real examples available to show success e.g. "Sally 42 has 6 children and was engineer of the year, you can talk to her about it."

16. Work Experience

Research shows that entry into non-traditional careers by women is often initiated by a positive experience in work shadowing. Likewise a number of professional institutions and training organisations are keen to provide suitable work experience to promote their work areas to women and girls e.g. NHS Careers. Contact these institutions to find local employers who can provide work shadowing experience.

17. Broadening the Issues

The wider issues around work may be barriers to women entering non-traditional areas. Ensure that these barriers can be discussed and ways to overcome them can be provided. Barriers include flexible working hours and carer and childcare responsibilities (can equally apply to men). Use the experience of employers who tackle these barriers and are comfortable with them e.g. Jaguar, Leicester City Council, Connaughts.

18. Feedback

One of your best resources is your own success stories. Ensure you follow up your referrals and keep track of those who have gone on to a successful career. By using feedback sheets and getting informal feedback, you can find out any additional barriers, and seek out any problem areas or employers that can be avoided or sent information about improving their practice.

19. Racism and Sexism

The construction industry has had a reputation for being sexist and racist, and this has often acted as a barrier for careers advisers in suggesting this area of work. There is a wide ranging set of initiatives that are tackling the image and the reality of construction. Check out <http://www.bconstructive.co.uk/> website to find out more. Check out locally funded projects and groups that support others like Architects for Change and Women in Property.

20. Exercises

A questionnaire sent out to careers advisers and teachers suggests that there is a need for additional exercises in working with groups to challenge stereotyping of career choice for girls. One exercise produced by a teacher for a sixth form group provides background material on related issues and gives some issues to consider e.g. "employers have a right to choose who they want for jobs," "the problem starts much earlier – it's too late by the time we get them." These are relatively simple to set up, but there is a need for sharing information and pooling of resources. If you have a good idea – and are willing to share it – contact Let's TWIST/ UKRC.