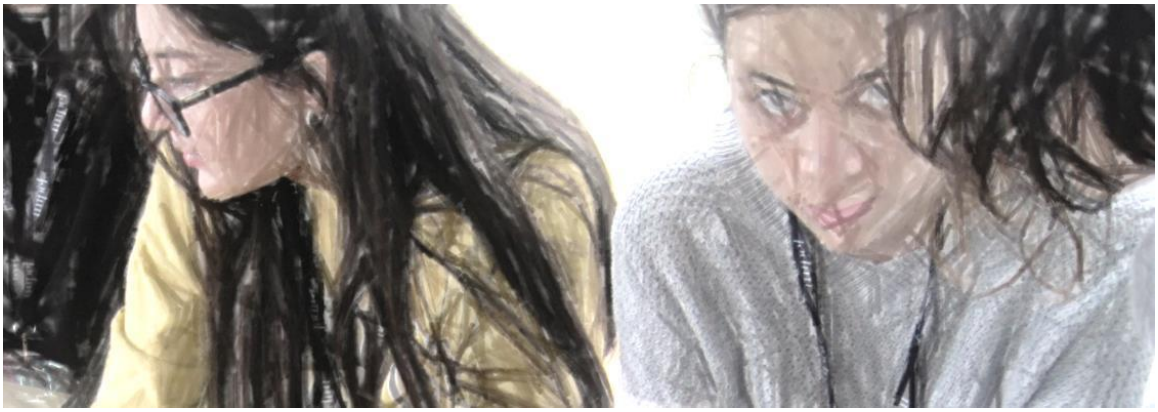

GENDER-SENSITIVE SCIENCE LEARNING RESEARCH QUOTATION MOSAIC-PART 1

For study and capacity building

Guidance for Partners

WwEU February 2021

Nothing has worked! Despite more than 30 years of focus on 'enthusing, fascinating or encouraging' girls into STEM, there has been **NO CHANGE** in the proportion of girls choosing physics A-level. It is clear that one-off interventions don't work. Initiatives that seek to 'encourage' girls into STEM by implying that girls must change to fit into the science world are misplaced. Competitions are also a risk. Girls do not need competition to motivate them and are often more inspired by co-operative activity. And simply being a woman who works in STEM doesn't make someone an effective role model. Some role models are 'too perfect' and are therefore off-putting. For a girl, enjoying, being interested or being good at a subject isn't enough to persuade her to continue studying it – she has to be convinced that it has a value for her future and that it doesn't limit her future options.

"Not for people like me?" WISE, UK 2014

Yet there is still a lack of women in STEM careers across Europe, particularly Western Europe. While a few (mainly ex-Soviet) countries have around 20% women in STEM, Western European countries such as France and Spain (17% each), Denmark (16%), Germany (15%), Finland (15%), and UK (9% - the lowest) all bring the European average down to 17%.
Women into Science & Engineering (WISE), 2012
https://www.wisecampaign.org.uk/

Girls are being turned away from STEM careers by a perception of greater sexism in the workplace. For example, the 2011 Girlguiding UK survey found that 30% of girls thought that worries about sexism in the workplace put girls off a career in science or engineering.
Women into Science & Engineering (WISE), 2012
https://www.wisecampaign.org.uk/

Use role models from diverse backgrounds to appeal to the whole spectrum of the student population. Show women working with diverse groups of colleagues, rather than a single talking head, because most girls do not want to be the odd one out… Role models should be promoted from primary school age…
Women into Science & Engineering (WISE), 2012
https://www.wisecampaign.org.uk/

Actively promote examples of how employers are making real changes to the working environment, supply chain and partnerships in order to ensure that women, men and women with families, and other under-represented groups are welcome and will progress on merit.
Women into Science & Engineering (WISE), 2012
https://www.wisecampaign.org.uk/

Interestingly, the most strongly gendered trait – caring – comes among the top three qualities that the majority of girls of this age group say they admire in other people when asked to choose from a list. The qualities that girls admire the most in other people are being **fun** (65%), **caring** (64%) and being **honest** (61%), with around three in five girls choosing these over other qualities. The least important qualities were power (13%), looks (21%) and success (22%). Qualities rated in the middle, in descending order, were bravery, humor, talent, inspiring, says what they think, intelligence and bouncing back after hard times.
Girlguiding UK – Survey 2015

When asked to choose their top three potential careers for when they grow up, fewer than one in ten girls chose engineer or architect (3%), scientist (6%) or lawyer (6%). This seems to correlate with the feeling that girls have that boys are better at some activities than girls.
Girls' top choices were singer or dancer (34%), teacher (29%) and vet (26%), with artist or designer (24%) and beautician or hairdresser (23%) close behind. A significant minority defy stereotypes in their choices, with one in ten choosing becoming a sportswoman (12%), or being a doctor in their top three careers (11%), and 2% of girls placing being the Prime Minister in their top three jobs.
Girlguiding UK – Survey 2015

Girls take action to make a positive impact on their communities – and harness the power of the internet to raise awareness of campaigns that matter to them. At the same time, many more girls than last year say that they don't feel their voices are being heard by the people in power.
Girlguiding UK – Survey 2015

Over 80% of Y6 and Y8 see scientists as 'brainy'
• Science careers as only for the exceptional few
• Those who see science as "interesting, but..." tend to be 'middling' pupils
"She [daughter] said 'oh, you have to be really clever [to study science], you have to be a geek'... She says 'I'm not clever enough to be good at science'" (Sandra, mother).
• Dominant notions of 'cleverness' (gender, class ...)
"It's always seen as … geeky men" (Shelley, mother)
"It's not very girly ... it's not a very sexy job, it's not glamorous' (Ella, mother).
Professor Louise Archer, King's College London

"I would say there are like two types of people that are into science – either there are the really like geeky people...or there are like people who are like me who aren't like geeky but they have a knack for it ... I play the guitar and do rowing and obviously the girly stuff that other normal girls do" (*Davina, Y8 girl*).
Professor Louise Archer, King's College London

"I said [to my daughter] why can't you do science? She said 'oh no it's a boy thing'. They had an after school science club and she said 'I'm not going because it's all boys'. I said well you should at least go along and see if you enjoy it. She went twice and then she stopped going because it was all boys and she had no girls to talk to" (*Sandra, mother of Danielle*).
Professor Louise Archer, King's College London

The research found that even though most children aged 10/11 years enjoy science, the majority already see science careers as "not for me." Using a feminist poststructuralist theoretical lens, this paper explores the identity work undertaken by the minority of girls who *do* identify with science and who express science aspirations at this age. It is argued that dominant associations of science with "cleverness" and masculinity pressurize girls to balance their science aspirations with performances of popular heterofemininity to render them "thinkable" (and that this occurs only within narrow parameters, through identity performances as either "feminine scientists" or "bluestocking scientists").
"Balancing Acts": Elementary School Girls' Negotiations of Femininity, Achievement, and Science, 2012 (Archer et al)

Evaluations suggest that while many interventions aimed at encouraging more girls into science may improve girls' attitudes to science, they frequently have little effect on girls' actual subsequent choices.
"Balancing Acts": Elementary School Girls' Negotiations of Femininity, Achievement, and Science, 2012 (Archer et al)

Gender differences can also be produced and reinforced through the education system, resulting in the "othering" of girls within science/mathematics and hindering their progression. For instance, critiques have been made of how the mainstream science curriculum tends not to represent the interests and values of girls, and hence holds less relevance for them.
"Balancing Acts": Elementary School Girls' Negotiations of Femininity, Achievement, and Science, 2012 (Archer et al)

The role of teachers has also been highlighted, demonstrating how both explicit and implicit gendered expectations and messages are frequently communicated within classrooms. Often these practices occur at the "micro" level, as illuminated by the work of Carlone and colleagues in the United States, which shows powerfully how even within reform-based classrooms, the values and practices of individual teachers can profoundly shape (and restrict) the extent and nature of scientific identities that are available for children, with the result that many girls (and students from minority ethnic and/or low socioeconomic status backgrounds) cannot access or perform a viable "science identity."

"Balancing Acts": Elementary School Girls' Negotiations of Femininity, Achievement, and Science, 2012 (Archer et al)

The girls' encounter with a desirable ("cool") "science femininity" seems particularly important for enabling them to see science as a "thinkable" identity that is also an intelligible gender identity.
Indeed, as Buck et al. (2008) discuss, young women (eighth graders) were only able to value female scientist role models when they were also able to relate to them as women on some level.
"Balancing Acts": Elementary School Girls' Negotiations of Femininity, Achievement, and Science, 2012 (Archer et al)

Moreover, while the girls in our study are still very young, it is interesting to consider their performances of femininity and engagement with science in light of Ong's (2005) findings that some minority ethnic female physics undergraduates purposefully limit their performances of heterofemininity to appear credible and competent scientists (e.g., wearing trousers and no makeup). It is perhaps unsurprising, therefore, that the middle-class, academic science-aspirant girls in our study all performed sexually "restrained" versions of desirable heterofemininity. That is, their performances of femininity were not excessive, sexually provocative or "vulgar" (Skeggs, 1997, 2004).
"Balancing Acts": Elementary School Girls' Negotiations of Femininity, Achievement, and Science, 2012 (Archer et al)

We thus conclude that science aspirations sit in an uneasy tension with femininity and must be continually carefully negotiated and defended against challenges from wider popular discourses which align science with masculinity. The root of continued gender inequalities in girls'/women's participation in, and experiences of, science is, therefore, complex, multiple, and highly resistant to change—and is especially problematic for girls who are not middle class and who do not occupy "clever" learner identities.
"Balancing Acts": Elementary School Girls' Negotiations of Femininity, Achievement, and Science, 2012 (Archer et al)

Our research points to the potential value of schools and science educators engaging in activities and approaches that enable teachers and students to deconstruct popular gender discourses and stereotypes.
"Balancing Acts": Elementary School Girls' Negotiations of Femininity, Achievement, and Science, 2012 (Archer et al)
Most of the school children we interviewed felt that the science they practised in school bore little or no relation to the science practised in the 'real' (grown up) world. Indeed, criticisms of the gap between school science and 'real' science are not new – and calls continue to be made to increase the 'real world' relevance of science in order to better engage young people.
'Doing' Science versus 'Being' a Scientist, 2010 (Archer, Osborne, et al)

Int: Couldn't [girls] care about fashion *and* science?
Boy 2: No they wouldn't, because fashion and science don't mix.
'Doing' Science versus 'Being' a Scientist, 2010 (Archer, Osborne, et al)

This may point to the need to work with multiple visions of science – a position that in itself suggests a need to disrupt dominant discourses around science and the identity of the scientist.
'Doing' Science versus 'Being' a Scientist, 2010 (Archer, Osborne, et al)

What works and what doesn't?

• One-off interventions don't work – consistent approaches are essential.
• Initiatives that seek to 'encourage' girls into STEM are misplaced.
• The evidence is that girls are making entirely logical careers choices based on the information available.
• There should be NO implication that girls must change.
• The needs of girls and young women, including supportive employment conditions and the ability to progress while working part time, must be consistently embedded into all messaging from the STEM sector.
• Above all, girls need to be able to self-identify that **'science is for people like me'.**

"Not for people like me?" WISE, UK 2014

Although it is clear that the problems facing engineering are not easily resolved, not one of the past or current initiatives has had the game-changing effect necessary to truly shift perceptions and stimulate a much needed influx of young people into the profession.
Whilst many initiatives are innovative and well received, most are only chipping away at the problem, arguably appealing to too small an audience, often among those young people already receptive to the profession.
"Not for people like me?" WISE, UK 2014

Many of the current STEM interventions are based on a very limited range of activities and types of careers, for example the archetypal scientist in a lab or the archetypal engineer building bridges or things that fly. However this misrepresents the range of activities undertaken by people with STEM qualifications in the STEM workforce.
It also only really engages those who self-identify as doers – using verbs – and seek an output of their occupation (on average males). It doesn't engage those who seek to understand and identify with the sort of people who do those jobs – those who self-identify using adjectives – and seek job satisfaction from the impact of their work on others (on average females). Only by enabling students to reconcile their self-identity with a STEM identity will they see STEM as 'for people like me'.
"Not for people like me?" WISE, UK 2014

To engage under-represented groups, particularly girls, we need to:
• Give students messages that allow them to resolve the conflict between their self-identity and their perception of the STEM-identity.
• Use adjectives to describe the sort of people – their aptitudes – who work in STEM, as well as explaining what engineers 'do', using verbs.
• Talk to parents and students about the wide range of careers in STEM-based businesses – the 10 types of scientist – and not just the standard engineers and scientists.
"Not for people like me?" WISE, UK 2014