‘Women in STEM’

Thursday 9th November 2017

8.30am – 14.00 pm

Andrews Gallery Titanic Belfast

MATRIX

NORTHERN
IRELAND
SCIENCE
INDUSTRY
PANEL

engage - Instant Report

engage

This 'engagement' real-time e-participation engage event is facilitated by Professor Jonathan Wallace, Dr Michaela Black and Brian Cleland from Ulster University.

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While all comments and votes stored in the engage system are anonymised, the final report from the event will be distributed to all participants, and may be passed to colleagues within the participating organisations, and other interested groups.

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The Engagement

What is an 'engagement'?

An 'engagement' has evolved out of the concept of a Town Meeting. A Town Meeting is a form of participation in local government practiced in the U.S. region of New England since colonial times, when an entire community was invited by government officials to gather in a public place to formulate suggestions or provide feedback on policy actions.

In its modern version, the electronic Town Meeting (eTM) and now an 'engagement', the most fundamental features are that information on the discussion topics are provided thanks to electronic means and the stakeholders can participate in debates and express themselves individually on those issues.

The main features

The method combines the live aspect of small-scale discussion with information and communication technologies: on one hand it allows rapid transmission of work-group results to a plenary assembly; while on the other it permits surveys of individual participants' opinions through a polling system.

The 'engagement' consists of four different work steps, all aimed at facilitating the participants' discussion of the themes at issue:

- Information and in-depth investigation, allowing the participants to gain confidence with the topics of discussion;
- Discussion in small groups, allowing reciprocal listening and the confrontation between different perspectives;
- Reflection, during which the results of group work are summarised and sent back to the whole assembly; and
- An optional polling step, in which participants may be asked to individually answer questions generated during discussion.

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Contents of the engagement

Context - Setting the Scene – why was the workshop important?

An innovative and creative society where people are encouraged to fulfil their potential will mean more people working in better jobs. This is what MATRIX, a business led panel of experts formed primarily to advise government, industry and academia on the potential commercial exploitation of R&D and science and technology in Northern Ireland has regularly shown.

All of the recent MATRIX reports, on topics as diverse as Advanced Materials, Manufacturing & Engineering, Digital Creative Industries and Life & Health Sciences have stressed as one of their main conclusions the need for a continued availability of people with STEM skills. Furthermore, a cross cutting element of STEM skills is the necessity to increase the diversity of those choosing to study or begin working in STEM; an important factor if we are to maximise opportunity and meet economic need. The 2016 AMME and Digital ICT reports have both documented a continued, poor representation of women, an issue which merited further examination.

More information on the work of MATRIX can be found at the link attached: http://matrixni.org/

MATRIX commissioned a report into Women in STEM earlier this year. We are now approaching the final stages of this study where key recommendations are being formed which will go on to inform policy development within Northern Ireland government departments.

Please review progress to date, including the emerging themes and developing actions at the following link: http://matrixni.org/wp-content/uploads/2017/11/Workshop-Briefing-Document-Final-Draft.pdf

The purpose of the workshop was to address the major challenges and opportunities facing girls, when considering a career in a STEM-related area. The workshop also aimed to make recommendations to government with regards future policies and interventions necessary to address the issues identified, both in the study to date and during the workshop.

We know that if we can support and encourage women into STEM and subsequently remain in this skills pipeline, we could go a long way to solving the skills shortages. Furthermore, change is required to ensure that STEM working environments are inclusive and places where individuals have an equal opportunity to participate and advance.

The engagement discussions were divided up into six main topics:

Icebreaker – What do you think discourages women from pursuing a career in STEM?

Question 1 – Informed Choice – How do we encourage girls to consider STEM subjects as their chosen learning pathway?

Question 2 – Retention – How do we improve support for girls in STEM education?

Question 3 – Careers – How can we better support women in STEM careers?

Question 4: Let's Get Real! – What would the outcomes of a successful Women in STEM strategy look like?

Reflection – Having discussed all of this today, what would you now suggest as the top priorities for supporting the engagement of girls and women in STEM?

Format of the Engagement

The topics described above formed the basis for discussion on the day. The overall structure of the Implementation Workshop was as follows:

08.30am	Registration – Light Breakfast, Tea & Coffee and Networking	
9.00am	Welcome & Introduction – Women in STEM	Prof. Cathy Gormley-Heenan, MATRIX
09.20am	Introduction to the engage e-participation tool & process; and initial polling questions	Professor Jonathan Wallace, Dr Michaela Black and Brian Cleland – Ulster University
09.30am	**Icebreaker** – What do you think discourages women from pursuing a career in STEM?	
09.40am	Feedback on Icebreaker Discussion	Dr Michaela Black
09.45am	**Question 1: Informed Choice** – How do we encourage girls to consider STEM subjects as their chosen learning pathway? Led by: Prof Eileen Harkin-Jones OBE	
10.10am	Ranking By Table for Question 1 – Rank the top three things from your table's perspective needed to achieve the outcomes from Question 1.	
10.20am	Feedback on Question 1 Discussion	Dr Michaela Black
10.25am	**Question 2: Retention** – How do we improve support for girls in STEM education? Led by: Prof Eileen Harkin-Jones OBE	
10.50am	Ranking By Table for Question 2 – Rank the top three things from your table's perspective needed to achieve the outcomes from Question 2.	
11.00am	Feedback on Question 2 Discussion	Dr Michaela Black
11.05am	**Comfort Break / Tea & Coffee**	
11.25am	**Question 3: Careers** – How can we better support women in STEM careers? Led by: Louise Kerr	
11.50am	Ranking By Table for Topic Three – Rank the top three things from your table's perspective needed to achieve the outcomes from Question 3.	
12.00pm	Feedback on Question 3 Discussion	Dr Michaela Black
12.05pm	**Question 4: Let's Get Real!** – What would the outcomes of a successful Women in STEM strategy look like? Led by: Dr Bryan Keating OBE	
12.30pm	Ranking By Table for Topic Four – Rank the top three things from your table's perspective needed to achieve the outcomes from Question 4.	
12.40pm	Feedback on Question 4 Discussion	Dr Michaela Black
12.45pm	**Reflection** – Having discussed all of this today, what would you now suggest as the top priorities for supporting the engagement of girls and women in STEM?	
13.05pm	Feedback on Reflection Discussion	Dr Michaela Black
13.10pm	Closing Comments	Dr Joanne Stuart OBE
13.20pm	Lunch & Networking	
14.00 pm	Close & Departure	

Engagement Audience Demographics

What is your age group?

15-19	14%
20-24	1%
25-29	3%
30-34	7%
35-39	15%
40-44	14%
45-49	14%
50-54	13%
55-59	10%
60 and over	7%
	1%

What is your current STEM status?

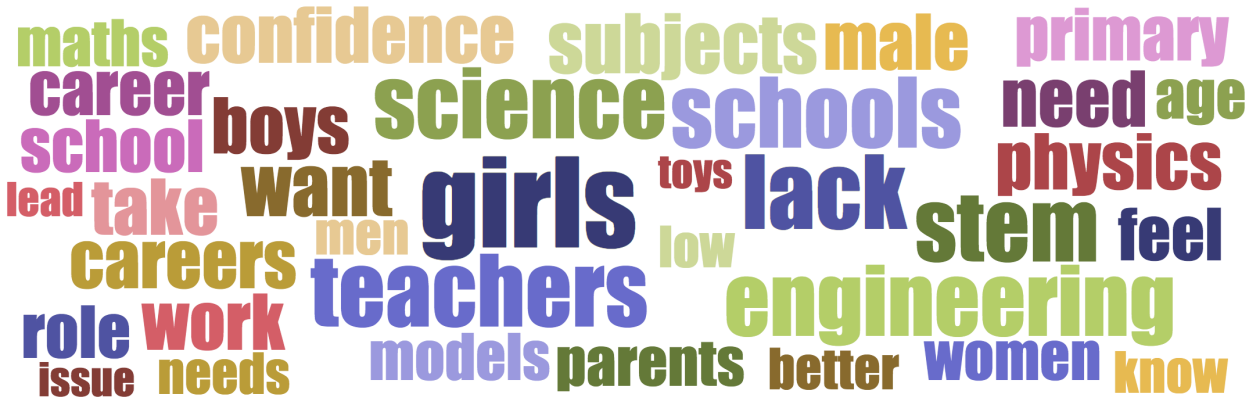
Studying STEM at school	7%
Studying STEM at college/university	0%
Academia - Science	24%
Academia - Engineering	0%
Academia - Digital/IT	0%
Academia - Medicine/Healthcare	0%
Local government/department	17%
Industry - Science	10%
Industry - Engineering	3%
Industry - IT	7%
Industry - Medicine/Healthcare	0%
Arms-length body/third party organisation	10%
Previously worked in STEM	7%
Other	14%

What is your gender?

Female	82%
Male	16%
Non-binary/third gender	0%
Prefer not to say	2%

Discussion Outcomes

Icebreaker - What do you think discourages women from pursuing a career in STEM?



- Perception of industry being male dominated, feel intimidated if only or small number of girls in a subject e.g. physics. Engineering subjects not available, not offered, therefore awareness of progression routes or opportunities in industry is low.
- Some e.g. engineering subjects only available if prepared / able to travel to local boys school to take it
- Feel intimidated if low number of girls
- Girls are more expected to go into humanity subjects - e.g. English Literature - women-based subjects
- Not taught or aware of what is possible in terms of career.
- From a young age all toys etc. are male dominated re engineering
- It's engrained that boys do science etc.
- If girls study science they are pushed to be the 'softer' caring professional e.g. nursing
- Girls are encouraged to do arts, which is the same as discouraging them from doing science
- See the numbers getting smaller and smaller for physics
- Biology popular for girls because they want to be doctors, but very low physics interest and very low number of female physics teachers.
- Doing applied engineering e.g. would limit their options - this is on the basis that a lot of girls this age don't know what career they want to enter so want to keep their options open
- People don't talk about science as a creative career - e.g. Chemical Engineering/ Design Engineering
- No work experience in companies and feel intimidated by the guys who want to apply for work placements in these environments
- Off putting being in a workplace with all men - which is what the perception / likelihood is if you are sitting in a class of all boys at school level.
- Feel more comfortable talking to girls if coming from a co-ed school; whereas girls from all girls schools feel they are more comfortable / competitive

- Being discouraged by boys in class
- Lack of confidence in girls because there are so many males and they dominate
- Pre-conception that men will be better at a career is intimidating
- Lack of visibility
- Lack of natural confidence
- Teachers' attitude influence
- Unconscious bias throughout society
- Mandatory subjects / 'forced' to take particular subject rather than choosing
- STEM not promoted to a young enough age group
- Fear of failure
- Easier to be at the "top" in other subjects
- Parental, societal and peer influence
- Lack of female role models
- Lots of negativity around STEM careers - lots of people are vocal if they have had bad experiences but not if the experience has been good
- Bad at selling the positives
- Positive messaging is really important e.g. flexibility in I.T. jobs
- Science has been taken off curriculum at primary schools and this is a major problem
- Need inspirational teachers
- Young women have a fear of failure and are therefore less likely to take on the subjects that are perceived to be more difficult
- Subjects like physics are very dry at A-level - very theoretical and maths based. Biology and chemistry are more practical.
- Project based learning is much better approach and the curriculum needs to be changed accordingly
- STEM education needs deep roots - not one off events or 'weeks'
- Academy approach would be a good way forward for women wanting to come back into careers
- Wanting to please men
- Parents perception of male domination
- Perception of own ability - not good enough
- Perceived helplessness
- Pay inequality leads to marriage breakdown?
- Cultural issues within Board and promoting women?
- Advertising starts at a young age - STEM report picture is almost all male - 70% of interesting science done by males in cartoons / TV.
- Boys naturally take the lead in primary schools Girls who take lead are called 'pushy' etc.
- Boys get more attention from teachers
- Flexibility of working needs promoted
- Midwives, nurses immediately drawn towards not in part time or in job share
- Not promoted six month teaching free period when return from maternity at QUB, but seen as 'not same as males'
- Mechanisms put in place to set up groups of children for teachers
- Primary school is a big issue
- Only 2% of Primary Teachers have A-level science
- Need to start taking about 'The Sciences'
- Imbalance in general among chemistry, biology & physics graduates. Teachers required to teach 'science' doesn't work
- Specialism and enthusiasm is lost amongst teachers.
- Skills expected to 'do practical': no longer
- Budget cuts for practicals easy to do... however it is highly valued in schools.
- Approach to science and thinking beyond questioning brain .... need to enthuse through practicality & culturally
- In mixed groups boys naturally take the lead

- Separate for practical work
- Parents not being encouraging
- Perpetuation of the myth that girls don't belong in STEM
- Lack of showing opportunities
- Lack of connecting the subject studied with a career
- Branding issue - male image
- Perceived as a difficult route
- Subject difficult and pressure to do well
- Teachers under pressure to obtain good results, which then don't encourage their students
- Lack of practical application - to the real world
- Don't encounter engineering, maths, chemistry
- Physics, engineering, I.T. - girls feel less encouraged
- Confidence in these core subjects
- Complex
- Primary - stereotypes exist e.g. Lego for girls pink/blue - perpetuated
- Stereotypes a more recent phenomenon
- Environment at home - STEM is normal
- Pink - Blue is as big issue
- Society and family need to be behind this
- Culture - very safe - medicine etc. entrepreneurial pathways are high risk
- Science capital - environment matters - science part of the everyday
- Can visualise what medicine is but don't understand engineering roles
- Lack of understanding of STEM occupations - over simplified - engineering - mechanics
- Technology moving so quickly - challenge for teachers to have access to and keep up with this fast moving area - confidence
- Lack of teacher confidence - training
- White coat - not sexy - perception of science – it's like marmite - either hate it or love it
- Interface/perception of working with other people - more social occupations are attractive
- Some careers - not clear how you would make a difference - societal impact is important for girls
- Working conditions - need to be attractive - work / life balance
- STEM - not a nurturing environment? Don't want to be isolated,
- Gender pay gaps and perception of sexism - reinforcing
- Careers advice not relevant and not supporting girls
- Girls still want to be girls - wants to see attractive girls - women role models
- Parent and family are key influencers
- Culture - if you want to get on you need to work excessive hours
- Maths
- Difficult to celebrate STEM achievement in comparison with arts / sports
- STEM careers can be hierarchical, if you take a break make it hard to slot back in
- Girls focus on a means to get to a career that they deem to be better
- Role models tend to be in medicine / dentistry, fewer female engineering role models
- There is an understanding of what a doctor is, less so of engineers
- We don't see the results as easily
- Schools not coming to events - can we scale better?
- How do we get the breadth of opportunities out to schools
- Careers teachers from humanities background, unaware of STEM based careers
- Students studying STEM feeling forced into medicine rather than having their horizons opened
- Male dominated
- Lack of education
- Digital TV sector parents not aware of opportunities
- Imbalance at younger age genders

- If asked to draw a fire service person and pilot of 30 people asked only 4 draw females - gender specific roles?
- Own experience 24 in team only 3 women
- Conversations at home and in school how are we talking to children re gender issues, roles etc. careful re language
- Choice of toys
- Building blocks, toys, etc.
- Unconscious bias
- Male dominated; lack of education
- Lack of role model
- Mixed views encouraged into more general careers
- More roles in it now such as UI and UX development for creative side
- Parents do not know about careers advice this advice and role models in schools are essential
- Expectation is that teachers should know
- Should the education system stop creating silos and change of approach 'siloing'?
- Lack of connection in classroom; industry / technology moves so fast schools can't keep up; so fast students don't know what they will want to apply for
- Last 20 years massive changes; lack of curriculum at primary level impact on years to come
- Brilliant curriculum in NI but how do we choose if the emphasis right? Should we focus on parents or schools
- Massive changes in last 20 years
- Welcome the ideas of connecting how do we do this?
- Responsibility on all of industry - they need to get into schools
- Balance not being critical of education system but meaningful connections bring teachers along and we have excellent teachers but need support for their work within the system, which is out-dated.
- How do we make changes with regard to qualifications
- Girls that have no GCSE maths no confidence to go into coding
- Strong science background radiography nursing health sector none into it barriers competitiveness genders/ confidence with maths in high schools girls' perception of difficulty of subject.
- All girls schools perceptions: ambassadors; girls go to work placement workshops; workshops targeted at engineering; early interventions taking place but are they the right ones? Doing the same means same results

Topic One: – Informed Choice – How do we encourage girls to consider STEM subjects as their chosen learning pathway?

- Introduce / make aware of full range of engineering etc.
- Need to start talking about perceived engineering difficulty
- Girls care about making a difference, so don't think about civil or environmental engineering - where there are many options to combine making a difference with engineering
- Need to know more about the different types of engineering - only know about civil, electrical or mechanical
- Need more open days - invite girls, during school days
- Offer engineering or pure sciences - not all schools have the opportunity to do this
- Work with other schools to make more subjects available
- Open days are too late - year 13 or year 14
- How are girls supposed to pick STEM subjects when they haven't even been to a career day yet?
- Not exposed to engineers during daily life - know what doctors and dentists do - but never meet engineers
- Awareness levels are far too low even at 14 and beyond
- Nothing attractive about careers in engineering
- University open days are too late - by that stage subjects have already been chosen so limited at early stage
- Science is really abstract to girls
- Can't envisage using what is being taught - e.g. can relate biology to human body, but with physics - no connection to anything we know about
- School focuses on biology based science - limited knowledge of separate disciplines and their application within 'general' or 'combined' science
- Schools should not generalise science to single award/double award - need to teach core subjects, distinctly
- Medical physics does not expose girls to physics sufficiently - need to do core subjects from year one onwards.
- Change the system. Schools say they are trying to encourage it - they're really not, or if they do - they're doing it in the wrong way - telling you it's a hard subject / pushing you towards medicine
- Curriculum shouldn't be allowed, by government, to be so vague
- Needs to start far earlier - in primary school - but as specific science subject, not 'world around us', so that girls know what they want to do before they hit secondary school.
- When you picture a primary teacher you picture a woman, but thinking of a university lecturer, more inclined to think of a man.

- Perception is still that "we've let you out of the kitchen - now are you happy!!" - Don't need to do any more
- Reinstate science subjects into primary schools
- Confidence is key at a young age and starting with basic choices i.e. school uniform, choose to wear skirt/trousers
- Support from government for training, CPD etc., to be available to all of the teaching environment
- Awareness and understanding of STEM within schools is needed
- Project-based learning is key to addressing this issue
- There is a perception that STEM subjects are not creative and this should be drawn out more
- The outcome/impact of STEM careers needs to be drawn out more for girls e.g. impact on patients
- Skills Barometer is a useful tool for highlighting where the skills deficits exist - but it could be improved by becoming a signposting tool for careers
- Difficult for teachers to influence choices as they aren't in a position to advise due to lack of experience and expertise in industry
- Teachers don't know what to ask for when engaging with companies
- Female role models are really important for schools
- Signposting to the variety of careers is important
- Girls' confidence needs addressed. Looking at leadership skills.
- Amount of abuse women take on Boards when in a minority; when/where does it begin to change?
- We take home out of the equation.
- European studies; engineering given same kudos as medicine, law etc.
- All Primary school teachers to have A-level science and A-level English
- Teaching college; Maths and English are small part of the pathways in those colleges.
- Not enough Science teachers; so primary teachers drawn into post primary
- At home - teacher what is level of engagement?
- PTA - could parents learn science at those events
- Lads and Dads days; focused on science or sports; not for women?
- Active engagement in science talked about at home
- Make science generally accessible
- Evaluation of interventions important
- Fragmented approach
- Science has been removed; not compulsory
- Girls seem to develop negative perceptions at an early age
- Teachers not trained well at an early age to engage with science
- We can change what's being taught; pedagogical approach needs addressed.
- Once 11plus removed; science becomes an add on
- KS2 still taught science
- Primary School in England; Primary Science Quality mark rated good or better
- Teacher training will take a long time to come through
- Therefore address CPD for teachers for quick fix
- Primary science provided by post primary science teacher? This would be support for feeder primaries.
- Lending equipment might be an option
- World around us is not compulsory content
- Inspection gets through teaching no science
- We need to resource this properly?
- At Primary; Science can be quite broad...
- Primary teacher comfort zone is not science
- How do you build their confidence
- Require teachers to have an A-level in science

- Encourage students at the right age level, put science back on the exam
- Partner with industry at primary school
- Develop a scheme to give talks in primary schools
- Train teachers to encourage girls into STEM
- Make STEM fun and playful
- Too few male teachers in primary - need male role models too - likely that the males are post-primary or principals and then perceived as smart
- Culture - male teachers not comfortable working with younger age groups - protection issues
- Role models from industry into schools
- Industry visitors to school - no training - can have negative affect on young people
- STEM needs to be brought into the everyday - e.g. galaxy app
- Role model - need to see what an engineer looks like - could be done by role play - imaginative play
- Needs to invest in people - 95% of teachers not having STEM A-level
- Bioengineering - still dominated by males. Girls in bio - girls not clever enough - need investment and support to change perceptions
- Application of maths is the key - same for chemistry / I.T. / physics
- Early years intervention - science capital
- STEM for everybody - inclusivity
- Visitors - can displace teachers - need to invest in teachers / careers teachers to make this sustainable
- Teachers - experience of industry
- Projections need to be visible - in terms of occupations & sectors
- Great maths from early years - stands everyone in good stead
- Inventive teaching - learning by stealth
- Leakage at A-level - can't do A-level STEM with double award - curriculum - not fair as too big a jump
- Reason for double award - don't have science teachers available in schools
- Too big a gap between GCSE and A-Level.
- Mathematics is critical for all STEM - need investment in teachers from early years right through
- Mathematics is a confidence issue - early years is key
- NI schools do well in maths at primary - need to invest in technology post-primary
- ICT - technology
- Inspectorate not looking at ICT, ability to problem solve, or investigate, enquiry based learning
- Do mothers feel supported in helping their children with STEM? Don't ask me your daddy will do your maths
- Role of transfer test
- CPD for primary teachers is needed - under resourced in Northern Ireland
- NI CPD for STEM is funded by STEM England and by shared education, lack of direct NI government support
- Examples of using shared education funding for STEM in Derry / Strabane - lack of resources
- Need support for parents regardless of the middle class resourced areas
- When do adolescents encounter engineering?
- It needs to start at primary school and it needs resourced properly
- Industry needs to be involved with schools - 2500 STEM ambassadors are there, but how do you get the schools engaged? Risk that we only engage with the proactive schools, what about the ones who don't?
- Fear of failure - how do we address this, failure can be an achievement
- Embedding role models into teaching materials
- Need to address unconscious bias to help change attitudes from very early age
- Schools policy STEM leakage

- GCSE math compulsory
- Ad-maths GCSE gender imbalance
- Personal experience daughter chose Ad-maths producing reaction from others
- Science capital
- Careers advice needs to be sound and in-depth not just part of a teachers role
- Entry into some STEM subjects has been increasing such as biology but resistance in certain areas. Perhaps leakage starting to level out
- Obligation on careers teachers they need to be trained
- Resources required
- Careers piece not right different organisations doing different things in many cases misses the mark
- Learning pathway is important supporting GCSE teachers
- Where there are deficits how do we support school collectively at each point
- Dedicated careers teachers required
- Industry plays a big part. Schools need to be reaching out. Role models in industry e.g. Allstate IGNITE project
- How do we measure impact?
- Consistency of approach
- Schools different approaches re career information
- Same from feeder primary schools different levels of science in different primary schools
- Want student engaged when they move to higher level after primary
- The ideal is for all children to have same access to opportunities
- Engage with teachers especially maths, underpinning subjects to enable interest in STEM
- Programme to move maths students into other related STEM subjects
- W5 constantly informing primary and post primary re STEM ambassador programme. Time needs to be made available
- Funding and resources to allow time

Topic 1: Ranked Priorities

Table 1

1. Need to start at primary school with pure science not world around us type topics
2. At secondary school - less generalisation, more science subjects and not advised to just pick a subject you like or one you are good at
3. Improved awareness, learning more about actual science careers before you pick subjects - career days / open days much, much earlier. Professionals coming in to schools e.g. at prize days etc. only a small element of the school actually get to hear about the speaker. Often the speakers coming into school are doctors, lawyers.

Table 2

1. Reinstate into primary schools with the correct level of training provided for teachers
2. Understanding of STEM and potential career choices
3. Role models and exposure to STEM industries

Table 3

1. Female role models
2. Signposting to the diverse range of STEM careers
3. The curriculum must change to facilitate STEM careers

Table 4

1. Teacher training and or CPD
2. Enhanced links between home and school
3. Perception amongst girls as to what science is; creativity and breadth

Table 5

1. Partnering
2. Teacher requirement
3. Reduction of entry subjects for university

Table 6

1. Confidence in maths - investment in people - teachers
2. Promotion of diverse range of careers available – teachers / family. Right narrative and accessible for teachers - designing. Back to 1990s
3. Creativity - not just numeracy and literacy – STEM / maths imbedded in curriculum. Applied learning

Other points:

- Change perception of what teachers role is
- Schools autonomous - priorities set based on assessment - results driven. This needs to change
- Primary school teachers - must have STEM qualification a-level

Table 7

1. It needs to start at primary school and be resourced properly - the teachers need CPD and support
2. Need to get all schools to engaged in a scalable way with industry,
3. Needs embedded in the curriculum in a partnership with industry - can we populate the curriculum with industry examples [CCEA STEMWorks ....]
4. Support for parents is essential

Table 8

1. Resources funding
2. STEM consistency of delivery essential in Key Stage 2 and 3
3. Specialised careers teachers and training improved links - external orgs, brownies, guides etc. as a way of linking science communication skills.

Topic Two: Retention – How do we improve support for girls in STEM education?

- Careers need to be taught more
- Need much better careers advice - 'learning for work' does not teach you about prospects
- Careers only ask you 'what do you want to do?... as opposed to actually educating or informing girls about what you MIGHT do - what's possible
- They are not giving us the information we want, we are told to go home and research what we want to do - how do we know where to start?
- Girls need to be more aware of successful role models - both in press and at home
- Difficult to improve at secondary level if everything has been ingrained for years from primary school
- Need to not undermine women
- Would it help for women to see men as relevant role models as well?
- Encourage girls to take more risks and not stick to safe options
- Need to remove stereotypes and remove the influence of teachers in picking subjects- because they only ever pick your strongest subject - not on what you actually want to do.
- Only allowed to do a specific subject if you get a certain grade - not fair - why not support everyone to carry on with the subjects they actually want to do, rather than be forced down a route which is dictated by your highest grade
- Schools just push you into university - scare you into getting grades
- Apprenticeships awareness in some cases - but 'there are other options - but you should do this...' and continue to push them into apprenticeships
- Need to get an 'A' at GCSE to do 'A' level - that attitude is really discouraging e.g. in relation to physics
- 'Teacher chooses for you'
- 'Forced' to do subjects based on grades
- Having "recent" role models, those that are still studying or just started to work within the STEM industries
- Encourage incentives within ALL schools in the way of awards etc. in relation to STEM to encourage 'good practice' and recognition
- The ECO-schools model - certain criteria for each year, embedded into the school curriculum
- More education and understanding of career pathways within STEM that do not involve further academic requirements
- Appropriate industrial Placements for students is important

- Better support for teachers via CPD in order to help students
- Mentoring of girls via older female students or industry reps etc.
- Support to the mentors e.g. STEM Ambassadors also needs to be improved
- Build a community of women encouraging women
- Careers education needs not to be one person's job
- Needs to be done by the person in the classroom
- NISCA on their site
- Teachers cant get out of school to go to conferences
- Schools are infrequently monitored with regard to careers
- Careers need to extend to the parents
- Parents have a large influence
- Skills-NI at Careers Exhibition; very few parents came
- Parents need an appropriate time.
- Mentoring and leadership required; female only groups required.
- Mentor female / male to female student
- Tracking Female STEM in their careers.
- Making personal pathways.
- Seeing what its like in another persons shoes.
- Girls Grammar schools; 950 students, only 3 may do physics.
- Needs to look at proportions of those who do STEM subjects
- OFSTED will actively look at A Level sciences for proportionality; not done in NI
- Analyse where STEM Girls drop out.
- Where is dip 16-17, there is a lot happening socially, culturally etc. Needs confidence support at that time.
- Not really cool to do science;
- Social media has such a negative impact.
- Do we need a social media Czar for science for STEM promotion?
- Facebook QUB use appropriate platforms to attract females.
- Use Social Media for positive effect.
- There is a natural assumption that men will take the lead.
- Important that interventions are multi faceted
- Society norms and cultural; where women are objectified...
- Instructions on being a good housewife from the 1950's; we have thankfully come a long way, but still a long way to go.
- Importance of diversity... success of diverse Boards etc.
- Business case for diversified workforce
- Why is it important to have diverse workplaces
- A loud feminine voice can be overbearing
- Improve confidence
- Empowering and promoting female teachers
- Teach coping with life skills
- Do away with diverting to other subjects to obtain results
- Change reward system
- As an example business in the community - industry coming into read.... bring an industry rep to mentor a teacher / careers teacher
- Industry need to invest in this - aspirational placements, mentorship, teacher placements, out to shadow meaningful projects in schools
- Need for sustainable initiative - not one offs
- Further develop initiatives that are shown to work e.g. curriculum development - STEM resources for real life.
- How do we get over the pressure of exam results - can do longer reaching initiative that will work but pressure of instant results
- Content development - need good foundations. Need time for practicals, creativity. Not ready for university

- Unconscious bias - training developed with Athena Swan - lessons learned. Challenge feature in schools to be brought into teacher training, primary and secondary.
- Engaged training
- Inclusive initiatives will benefit all
- Unconscious bias - look at ourselves first then call out within organisations. Look at all materials, teacher / trainer
- Recruitment and marketing strategies need to be appropriate
- Naming conventions - male midwife? Other example engineering courses - link to healthcare or other benefit - attractiveness
- Marketing - realistic and inclusive
- Initiatives to build confidence - e.g. girls feel they need to tick all the boxes
- Need to make career choices attractive in terms of flexibility - also inclusive
- Supportive working and career environment
- Women's networks can be counterproductive - need to support women but needs to be inclusive
- Are we placing too much emphasis on careers teachers when the subject teachers are key?
- Signposting within curriculum, but needs sustained funding / resource
- Need to be careful not to treat girls as a homogenous group - the five tribes
- Too much choice at 16 with too much pressure on top? Too much focus on recall rather than deep learning
- More focus on practical learning and understanding rather than rote learning
- Issue of access to subjects due to timetabling and resource pressures
- Initiatives industry get more involved with initiatives, structured initiative
- STEM learning e.g. people like me
- How to link whole way through education levels
- Get role models into schools
- Role models being able to talk to the audience at the right level
- Role models educated as well on level
- Primary school cannot be too industry focused at that age
- Softer touch at primary level to give awareness
- Coordination of what schools are being asked to do
- Need to look at global economy and how technology affects that
- Progression is very rapid world is smaller place. Need to make students aware of opportunities outside NI
- Sign posting for children to role models and opportunities but needs to be balanced and avoid over exposure
- More structured approach how to bring together many of the things that are already in existence - e.g. an audit of what is available
- Science support database
- Need something for schools which does not increase work load - streamlined
- W5 event with School of Pharmacy - event made students realise they had chosen the wrong subjects, were able to go back and change choices
- Perception STEM is boring. Need to make it attractive

Topic 2: Ranked Priorities

Table 1

1. Better careers system, providing insight to actual jobs
2. Remove labels - i.e. not boys/girls jobs - just engineering jobs
3. More open days - industry open their doors - especially for placement
4. Industry promote opportunities for girls

Table 2

1. Recent role models still studying or just staring to work within STEM environment with attachments to particular community
2. Encourage incentives within all schools i.e. eco-school model in way of awards and recognition
3. Understanding of other career path choices within STEM that do not require further academic qualifications i.e. apprenticeships

Table 3

1. Support girls through the GCSE to A-level transition to avoid drop off in subject choices - coaching
2. Group mentoring - this allows the process to happen across schools not just isolated within schools
3. Utilise online facilities to support teachers

Table 4

1. Equality of opportunity for women in STEM;
2. Appropriate use of Social Media to engage with females
3. Specific targeting of schools who have disproportionate numbers within Physics, ICT, & Technology.
4. Sharing of best practice across education system

Table 5

1. Confidence
2. Empowering
3. Shift focus from league table to competencies

Table 6

1. Loss of girls significant at post-primary. Too big a gap between GCSE and A-level - exacerbated by too much content at A-level.
2. Mentoring - supportive networking with inclusive diverse networks, including inspirational placement opportunities in STEM industry
3. Removal of unconscious bias - awareness raising through all levels - training for teachers/trainers etc. challenge function in organisations - may not remove unconscious bias but raise awareness is the key and embedding in organisations top down

Table 7

1. IGNITE - example that should be scale
2. Access to subjects - timetabling and resource pressures
3. Need to be careful not to treat girls as a homogenous group - the 5 tribes

Table 8

1. Enthusiastic ambassadors.
2. Effective use of technology
3. Better PR for STEM subject
4. Mid range technician level needs to be targeted, different skills for different types of careers - where are the jobs?

Topic Three: Careers – How can we better support women in STEM careers?

- Having more paternity leave - shared responsibilities
- Many options around re-entering workplace after maternity leave
- Address gender pay gap issues
- Ensure women have same opportunities to progress with regard to promotion etc. when returning following maternity leave
- Trail blazing - encourage women to break moulds
- Addressing issues around proportion of women in STEM professions to begin with and then make sure women are more represented on panels in the business etc.
- Improved female self confidence - driven from an early age at school
- Employers need to be more proactive in supporting women
- There needs to be a cultural shift in how women in careers are supported in general via societal education e.g. division of childcare responsibilities
- There is still a perception that women are given certain jobs due to positive discrimination and this needs to change
- Need to think about design of jobs and design of workplaces
- Introduce and roll out best practice across industry - something akin to Athena Swann.
- Introduction of gender clauses into government social contracts?
- Introduction of childcare on-site or convenient to workplace
- Address concerns at pre-employment phase i.e. before recruitment
- Flexibility
- STEM Equality Commission Charter
- Not mandatory for flexibility
- There's a balance to be struck with flexibility with the business needs
- Encouraging work life balance; not just nodding to it
- Child minding availability is an issue
- Childcare may limit the type of job one may take
- There is an assumption that the women are the main child carer.
- There may be issues around types and natures of family relationships
- In NI there may be more of a family network.
- The corollary is that there may be a need to release men for child caring.
- There needs to be a gender balance in terms of equal share of childcare.
- There may be a culture shift towards greater flexibility for childcare.
- Unusual to see single man at parent teacher engagement
- Women's networks within organisations.
- 'Women in Business' is a good example.

- 15,000 employees in Civil Service yet not one female Perm Sec.
- Mentoring network for females.
- Developing leadership programmes.
- Actively support junior managers.
- Performance appraisal systems can be male orientated.
- If we are going to make a dent in this; we should focus on women with families
- Used to be married women had to leave; one generation ago.
- You cannot have quotas for roles, but you can increase the number of applications.
- There is an issue of quotas - that people only get there because they are female.
- Under represented females in roles (bursaries for female only) can be made available.
- We can take positive action but not allowed to discriminate.
- Self-awareness, and unconscious bias may be issues.
- This would be reflected in appointment panels etc.
- Superwoman perception.
- Draft policies of inclusion and ensure resources are available to implement policies
- Research the best practice in place in other companies and draft a plan to implement
- Flexibility in working hours
- Train men to understand their own bias
- Athena Swan - focused minds with the development of action plans and senior level commitment. Developing mentoring programmes / leadership programmes - gives a framework and impetus.
- Need to ensure naming of interventions are positive. Athena Swan perhaps negative - moving towards broader diversity and across the university
- Inclusive - flexibility of hours - caring responsibilities for all.
- Need to embed change of culture - not ticking boxes. Needs to be inclusive - good environment for everybody. Equal opportunities for recruitment / promotion / flexible hours and pay. Transparent policy / strategy
- Women and men need to feel empowered to challenge within organisations
- Workplace structures and culture to encourage back to work - initiatives to support back to work
- Job share is seen as very challenging to industry / employer - competing priorities for employer / employee
- Childcare - subsidised
- Who is in the caring role at home - impacts on career progression of either partner
- Supportive back to work - level of skills returning - supporting so that confidence is not an issue and individual feels supported
- Phased return / in academia - no teaching, time to concentrate on research
- Flexible supportive environment for all
- Trust - working from home - works both ways. Rewarding achievement not attendance
- Use of technology - make use of what is available to us to encourage flexible working
- Introducing flexibility into the workplace
- Understanding subconscious bias in areas such as recruitment and progression
- Culture still values longer hours, anti-social hours
- Mentors who provide support (not just female mentors)
- Support to get back into work after a break - larger companies understand, but what about the smaller companies?
- Part time often results in part time pay, but full time workload
- Whatever we do should benefit males and females - good practice is good practice
- Mentoring upwards or two way mentoring
- Role for regulation to protect return to work
- Sharing best practice
- Do we seek to amend 'Investors in People' to better embrace diversity
- Need numbers, need people to sign up
- Training continuous development and support and mixed teams

- Within HR make women aware of their rights and make it not seen as negative impact
- What are the things that prevent young woman from excelling?
- Provision support of work life balance e.g. compressed hours
- In-job mentoring on return to work or new starts
- Provide time for employees to catch up on e.g. return from maternity leave
- Need to get girls / women in the door identify and share good practice e.g. through Charter Mark
- How does this transfer into a smaller company?
- Creative industries - how to attract women and keep them e.g. Lean In
- Larger companies reaching out to smaller companies but need appetite amongst smaller companies
- Support on interview technique
- How are posts marketed? Can be done in a patronising way
- Best practice e.g. talks on arrival in the organisation regarding woman in STEM
- Give women access to training to keep current.

Topic 3: Ranked Priorities

Table 1

1. Instilling confidence in women from a very early age - home, school etc. to instil drive and thirst for success
1. Better representation of women across panels in the workplace
2. Change society
3. Find a different way of having children.....the girls have some suggestions, but that's for a different workshop ☺

Table 2

1. Family, friendly policies and procedures widely available via website etc. to both external and internal employees and without prejudice dependent on seniority
2. Meetings / conferences discussions groups are held within core working hours
3. Females in STEM forums available online etc. to allow advice / questions / help to those who may have concerns or struggle within the STEM industry working environments

Table 3

1. Design of jobs and the workplace
2. Recognised quality / charter mark
3. Companies need to celebrate their success in attracting and retaining women through their working practices

Table 4

1. Flexibility in terms of work/life balance.
2. Support network within organisation / mentor / networks / addressing unconscious bias etc.
3. Positive outreach measures - positive action (but not discrimination).

Table 5

1. Flexible working hours
2. Improve work place culture
3. Train men and women to understand their own bias

Table 6

1. Modernising the workplace e.g. flexible, supportive environment for all.
2. Reward achievement rather than attendance
3. Mentoring programmes - return to work schemes for all
4. Need to accept that men and women bring different things to the table and embrace differences to benefit organisation/projects etc.

Table 7

1. Two way mentoring (across genders)
2. Role of regulation in protecting return to work - including flexibility
3. Seek to amend 'Investors in People' to better embrace diversity, (Athena SWAN Model)

Table 8

1. Accommodating work life balance providing choice
2. Training support and mentoring
3. Sharing industrial best practice
4. Remote working should be promoted

Topic Four: Careers – Let's Get Real! – What would the outcomes of a successful Women in STEM strategy look like?

- Even if it isn't proven, there is a belief that women and men's brains are different
- Combination of nature and nurture
- More young people enthusiastic about science
- An engineering day established for primary schools
- Need to raise the issues on a bigger agenda
- Have STEM school assemblies which are more informative
- Help girls understand the pay gap better
- Better technological advances - because more women have been involved in product design and development
- Everything would just run better because there would be more women involved
- Something needs to happen to make it a natural thing - need to retrain subconscious
- Experience of play shouldn't be stereotyped - children should be allowed to select their own toys based on choice - not what they are 'perceived' to want / prefer to play with
- Training programmes for teachers, parents, youth club leaders,
- Don't segregate play or sport etc. based on gender
- STEM events for primary school to capture imagination but build into curriculum, not just one off or ad-hoc engagements
- Subjects at secondary level related to careers in STEM industry
- Technology and design integrated with science - not removed from 'pure STEM' subjects
- Parity of esteem for design and technology subjects
- More practical work within 'A' level to help engagement with subjects and inspire career choices
- Less demonstration - more hands-on
- Better economic opportunities for jobs and society if women and men collaborate more - improved wellbeing
- More people involved, STEM ambassadors within school - who are girls
- More advancement, improved economic and health / wellbeing
- Success would be 50 / 50 across the STEM board!
- As a 5 year goal ideally it would be doubling the number of females within STEM
- There is no nature vs. nurture, this is an excuse to pigeon-hole why there is a lack of females within STEM
- A STEM matrix to be incorporated in to School League tables
- Society's awareness and priority would be to promote STEM alongside softer subjects equally

- Nature vs. nurture - how will we know until there is equal opportunity at a societal level?
- It's not a women vs. men issue - it's about choice being available to each individual so that we can encourage women into STEM education/careers
- Need to have a STEM strategy in the first place - whether its built into a wider Skills Strategy or as a stand alone
- Better match between skills demand and skills supply
- Better employability skills
- Wrap around childcare
- Curriculum is a problem; therefore to change the curriculum and make science statutory at A-Level
- In the long term we wouldn't need one.
- There isn't a Women in STEM strategy.
- The elephant in the room is strategic leadership from a functional government.
- Increased number of females making the step between 16 & 18.
- More STEM Female Leaders.
- Leadership amongst political representations.
- Chief Scientist for Northern Ireland (Female) to push a STEM agenda (for women)
- Location of STEM industries.
- Higher engagement in terms of number of women in STEM.
- More flexible working with workforce in STEM industries.
- Broader public awareness of STEM (what it actually means)
- Higher number of females in Physics at A-Level.
- Stronger industry to education engagement
- EMA allowance only for Science Subjects
- Reduce the transition period fall offs.
- Need a vocational pathway into science.
- Yes it is nature & yes it is nurture - influenced by experiences
- We are losing motor skills that we had previously - influence of technology e.g. Surgeons
- Local industry with local employees with appropriate skills
- Gender discussion no longer on the agenda - STEM normalised across genders
- Sustainable business and sustainable workforce - giving young people the opportunities and ambitions
- Increase in entrepreneurs - moving away from "low risk" public sector
- Organisational retention - less churn - looking after your workforce
- Greater opportunities in STEM industry as it is supported with growing STEM skills
- Growth in industry - attractiveness of the region
- Job satisfaction within organisations - including visibility of career progression/opportunities
- Not feeling trapped in an organisation - development opportunities - removing silos. Contingent working.
- Supporting freelance working - supporting specialist skills
- More women leadership/directorship of organisations
- Success would be girls getting opportunity to get excited about science early
- Getting passionate well qualified teachers delivering engaging science
- More focused CPD for teachers and keeping them up skilled
- Primary teachers all need basic science training
- Everyone will have a fundamental science education - start this journey within 5 years, 10 years in to secondary, 20 years into the economy
- Within 5 years - FUNDED CPD for teachers (Scottish model)
- Increased numbers of businesses that embrace diversity, specifically because it improves the competitiveness
- An economy where everyone with the ability to work in STEM achieves their goal
- STEM should be an environment that being male or female is not an issue
- An environment where men can become fully involved in child rearing to allow women to proceed with their career

- Needs a societal change so it can work both ways
- Pick the right husband
- Nature vs. nurture - produced differing views - more environment, personality of the child, is it taught by parents
- Behaviours and changes need to start in the home
- QUB running a parents awareness event and Ulster schedules Open Days at weekends to accommodate the prospective students and their parents / family to attend.
- Can be determined by parents' background in education etc.
- Support for fringe groups needed
- Linkage from industry to schools.

Topic 4: Ranked Priorities

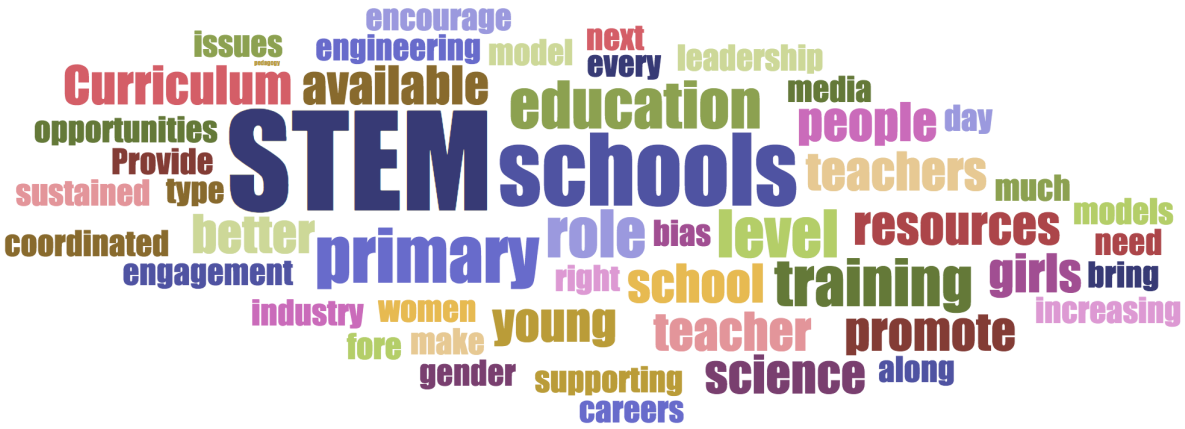


Table 1

1. More advancement in science and technology leading to improved health and economic wellbeing
2. More STEM ambassadors in school - i.e. girls within school acting as ambassadors "giving piggy backs to all the other girls who haven't thought about STEM"
3. Forum for young girls to discuss shared STEM interests - driven by young people for young people... social media.
4. "STEM Pride" / shared identity

Table 2

1. The nature vs. nurture argument should not even be in this discussion!
2. The 20- year target would ideally be 50/50 across all STEM
3. The 5 - year target would ideally be doubling the number of females within the STEM environment particularly in Physics

Table 3

1. A much higher level of women working in STEM careers
2. Gender won't matter and positive re-enforcement is unnecessary - e.g. no special awards for 'Best Woman in I.T.'
3. Better match between skills supplied and skills demanded

Table 4

1. Increased level of female representation in STEM workforce.
2. Increased number taking STEM related subjects. Cliff transition stops.
3. Improve links with Industry with female STEM role models; what STEM can give throughout life.

Table 5

1. We won't be talking about women in STEM, it will just be the norm
2. Incentive to allow men to take parental leave
3. No leaky pipe

Table 6

1. Greater diversity/inclusive culture
2. To have accountability leadership role, coordination and organisations all with clear responsibilities and ownership
3. Greater STEM opportunities through growth of STEM skills base and success/attractiveness of the region to STEM industry

Table 7

1. FUNDED STEM CPD for teachers
2. Increased numbers of businesses that embrace diversity, specifically because it improves their competitiveness
3. Everyone will have a fundamental science education, start this journey within 5 years, embed in secondary within 10 and see this develop across the economy within 20

Table 8

1. An environment where being male or female is not an issue
2. Behaviours and changes need to start in the home and transfer into society
3. Need effective linkages from industry to schools
4. Instil culture where there is not a fear of failure

Topic Five: Having discussed all of this today, what would you now suggest as the top priorities for supporting the engagement of girls and women in STEM?

Top Priority Ranking By Table

Table 1

- Get girls much younger more involved - this alone will drive behaviour in next generation of girls coming along behind them
- Young people trail blazing, therefore role models inspiring
- Shock marketing - raise public awareness
- "STEM Pride" rallies mobilise interest...this is not a joke!
- STEM conventions for primary and secondary schools - with themes
- Have an engineering day for all schools - with same level of organisation e.g. as enterprise/entrepreneurship programmes
- STEM can be lots of fun - a W5 for older children
- Young STEM along the lines of young enterprise
- Have a UCAS type day where all the engineering businesses are on display
- Communicate more across schools - provide better insight into subjects available e.g. is there a difference in boys' schools - do they have different subject options?
- Sustained engagement where schools come together to hear from a specific speaker etc. - STEM ambassador in every school
- Provide training and development for teachers - many may not be aware of the stats. etc.
- The girls at Table 1 have just held the inaugural meeting of the new NI STEM Council - they are currently planning their next meet-up.
- I fear I have just been appointed secretariat to the new NI Youth STEM Council. #STEMSQUAD !!

Table 2

1. Start at primary school level!
2. Exposure to the opportunities
3. The right amount of funding available throughout to promote STEM correctly
4. The right type of role model who are linked to particular community
5. Support given from industry to schools for STEM and decisions about curriculum, CPD and development should be taken by appropriately qualified personnel

Table 3

- One of the top priorities is to change the education system especialy at age 11-14
- Government needs to invest in people who will be proactive in supporting women in STEM
- Make the curriculum fit for purpose
- Early exposure to STEM via primary schools
- CPD for teachers
- Cross sectoral partnerships to deliver on recommendations

Table 4

- Mandatory Teacher Science (pedagogy and knowledge) training programme for Primary teachers, both in post and newly qualified.
- Training for teachers with regard to gender bias within schools. (Re-look at role of teacher)
- Linking Primary Schools to industry - increasing accessibility.
- More bursaries (free education) for Higher Education abd targeted courses for females in STEM.
- Introduce Media gender equality standard addressing gender stereotypical adverts especially those targeting children

Table 5

- Bring science back in to the curriculum at primary school
- Improve training to understand each other
- Increase and promote female role models in STEM
- Train women to overcome barriers in a STEM career
- Prioritise resources to ensure STEM careers are promoted, obtained and maintained
- Campaign to promote STEM careers
- Encourage resilience
- Connecting a STEM education with a opportunities
- Recognise male champions

Table 6

- Media promotion - unconscious bias - make people think about the issues and encourage reflection.
- Media/social media - more STEM stories brought to the fore & knowledgeable correspondents - normalise STEM and remove stereotypes.
- Science is part of our culture (as arts is considered)
- Curriculum revision - P7 to post-primary and GCSE to A-level transitions. Better progression as there are gaps.
- Leadership at senior level - coordinated and inter-policy.
- Investment for the long haul - teacher CPD/industry experience/applied learning - increasing STEM capital and supporting sustained engagement in STEM

Table 7

- Early STEM intervention at nursery/primary - CPD and resources
- Schools need much better links with industry, using technology and resources to have a scalable, sustainable model - e.g. every business doing a 5 minute video for schools that can be a resource
- We need to have faces/names that inspire - Sarah Friar, Sinead O'Sullivan
- Concentrate on what works and scale it up properly (kill off what doesn't rather than repeating failure)
- There needs to be a properly resourced STEM strategy tied in to Programme for Government

Table 8

- Strategic coordinated approach to identify support mechanisms available to enable it to rolled out in a consistent way.
- Address the issue of leadership at a Government level for STEM generally
- Bring the gender issues in STEM to the fore, e.g. pay imbalance
- Have Metrics available to make results measurable e.g. female retention rates in STEM

TITANIC
DOCKERS
AND
CARTERS

TABLE
8

MATRIX

NORTHERN IRELAND SCIENCE INDUSTRY PANEL

Ulster University

engage

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