UCD School of Mathematics and Statistics
UCD School of Computer Science

ROLE MODELS IN pSTEM

YOU CAN BE WHAT YOU CAN SEE

Teacher Resource

HEA HIGHER EDUCATION AUTHORITY
AN tÚDARÁS um ARD-OIDEACHAS

IOP Institute of Physics

This resource is published with the support of HEA Gender Enhancement Fund, Institute of Physics, UCD School of Mathematics and Statistics, and UCD School of Computer Science.

The ***'Role Models in pSTEM: You can be what you can be'*** project was also undertaken with the support of the following partners: Women in Technology & Science (WITS Ireland), CESI (Computers in Education Society of Ireland), Engineering & Technology Teachers' Association, Engineers Ireland, Exit-Entry, Irish Applied Maths Teachers Association, Irish Guidance Counsellors, Irish Maths Teachers Association, INGENIC (Irish Network for Gender Equality in Computing), Irish Science Teachers Association, IT Sligo, and TU Dublin.

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Introduction

The *'Role Models in pSTEM: You can be what you can see'* project hopes to highlight positive, relevant, contemporary role models for young women in Ireland across the subjects of physics, mathematics, computer science, and engineering.

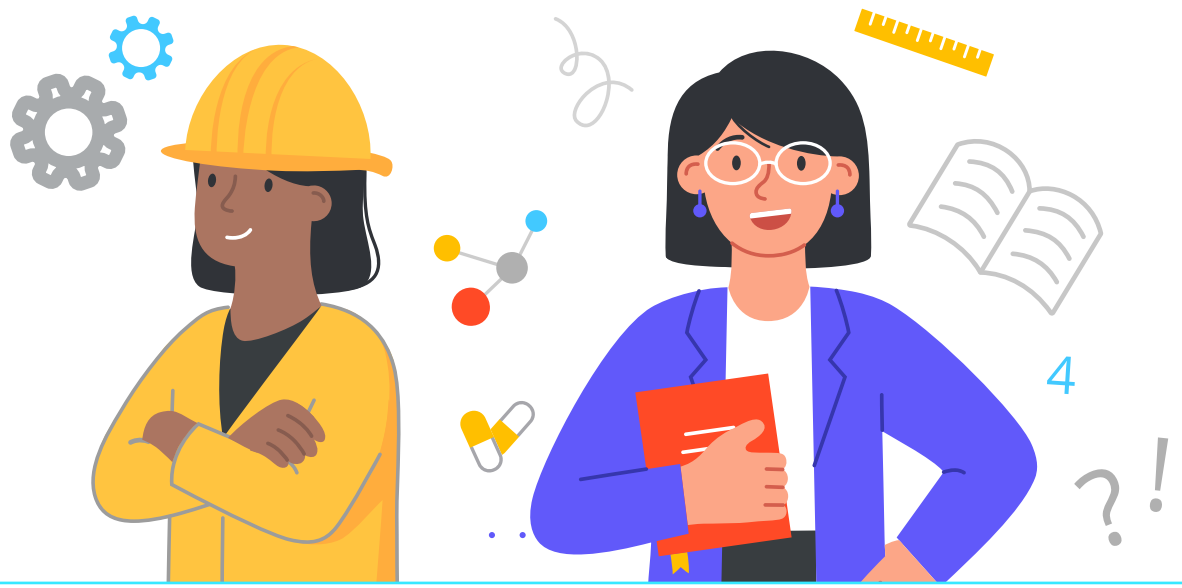
By creating videos for use in classrooms and on social media, the project aims to make more young women aware of the very many career paths and opportunities available to them by pursuing these subjects. Following the UNESCO framework of factors influencing girls' and women's participation in STEM, the videos showcase the backgrounds and influences of each of the role models and highlight what they enjoy about what they do. In their conversations, the role models identify challenges they may have faced in their career and also share advice with viewers on overcoming similar issues.

We hope this resource will be used by teachers and their students to discuss the very many interesting career paths available to those who wish to pursue the fields of science, technology, engineering, or mathematics beyond secondary school. We also hope the resource will support teachers in considering issues of equality, diversity, and inclusion in STEM with their students. The videos may be used in a single class (focusing on 2-3 role models), across a number of classes (utilising all ten role model videos), or over a number of weeks where students undertake projects researching their own favourite role models from their school, locality, family, or community.

We hope the videos and accompanying resources will help to encourage more young women into the pSTEM fields of physics, mathematics, computer science, and engineering, where there is a particular lack of gender diversity. However, we wish to highlight that by producing these videos we do not intend to move focus away from the equally important subjects within the Arts and Humanities. While we hope to encourage those who are interested to pursue pSTEM, we also hope those who influence the choices our young people make also have opportunity to highlight the key roles graduates of history, philosophy, and sociology (to name but a few) play in society.

'Role Models in pSTEM: You can be what you can see' was supported by the Higher Education Authority (HEA), Institute of Physics, UCD School of Mathematics & Statistics, and UCD School of Computer Science.

Along with our funders, we are very grateful to our project partners: Women in Technology & Science (WITS Ireland), CESI (Computers in Education Society of Ireland), Engineering & Technology Teachers' Association, Engineers Ireland, Exit-Entry, Irish Applied Maths Teachers Association, Irish Guidance Counsellors, Irish Maths Teachers Association, INGENIC (Irish Network for Gender Equality in Computing), Irish Science Teachers Association, IT Sligo, and TU Dublin. We would like to thank the many teachers who reviewed the teacher materials for us and provided excellent and insightful commentary on what they and their students found interesting and useful. Teachers are so incredibly important to the lives and well-being of our young people and to the success of our education system. We are very grateful to those who willingly gave of their time and insight to assist us in developing the booklet and slides.



List of Role Models:

1. Kyla Adanza – Software Development Engineer at Amazon Web Services
2. Anu Bode Favours - Computer Science Undergraduate Student
3. Emily Clarke – Apprentice Electrician, ESB
4. Dr Sandra Collins – Director of the National Library
5. Dr Cathy Fleming – Senior Medical Physicist, St. Luke's Hospital
6. Dr Sarah Markham – Physics Researcher at University of Limerick
7. Sharon McManus – (Commandant) Army Engineer Officer
8. Riana Roche – Engineering Manager at Etsy
9. Dr Lána Salmon – PhD Graduate in Space Science
10. Sharon Sweeney – Fashion Designer

What are the 'Role models in pSTEM' videos?

These are videos of ten role models across the fields of physics, engineering, mathematics, and computer science, representing women from all across Ireland who chose to pursue STEM pathways after school. There are two versions of videos for each role model, a short one for use on social media (approximately 1 minute) and a longer one for use in the classroom (approximately 5 minutes).

Who are the videos for?

The videos can ideally be used with students from 4th class in primary school to 4th year in secondary school. While the videos are produced specifically to encourage young women to consider pursuing pSTEM subjects, the videos are suitable for all students across all genders.

How can I use this resource?

This document, and associated slide deck, can be used by teachers to demonstrate various career pathways in pSTEM to discuss prejudices, anxieties, and biases associated with pSTEM, and to promote students' thinking around pSTEM subjects. It is suggested as a guide for teachers and can be used for an individual lesson or as a series of lessons where students are encouraged to find, document, or interview their own role models from their school, family, locality, or community.

Where can I find the videos?

All of the videos are available here:
https://www.youtube.com/channel/UCYrh8Eh848_Ljzfx5BXiE9A

Where can I find further information and materials?

Further information and materials are available here:
https://www.ucd.ie/mathstat/rolemodelsinpstem/

Where can I share my students' work on their own role models?

Feel free to share your students' role model projects on social media using #rolemodelsinSTEM. You can also contact the project leads (emails below).

Where can I send feedback on the videos or resources?

If you would like to provide any feedback on the videos or resources, please feel free to contact the project leads (emails below).

Contact Project Leads:
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ROLE MODELS IN

pSTEM

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Teacher Guide

The following are suggested activities you may wish to undertake in class when watching the videos with students. Additional background information for teachers' use is provided below to align with the presentation slides available on the website.

Norms for Fruitful Classroom Discussions

(Slide 5 in associated PowerPoint)

The following are some suggestions on establishing norms for fruitful classroom discussions from the National Science Foundation (USA) and American Physical Society that you might like to share with students in advance of the discussions above.

- ✓ **Share air time equitably**
  Know yourself, balance your listening and talking
- ✓ **Value differences**
  Remember that your perpsective is not the only one
- ✓ **Argue using evidence**
  Back what you have to say with data
- ✓ **Make sure everyone feels safe**
  Safe is not the same as confortable
- ✓ **Discomfort is okay**
  Identify your learning edge and push it
- ✓ **Own your impact**
  Your intentions may not be the same as your impact

1. Pre-Lesson / Introductory Activities

These activities and discussions can be undertaken as a pre-lesson activity or as an introductory in-class activity.

Suggested Prompts for Student Activities and Class Discussions

Prompt 1

(Slide 6 in associated PowerPoint)

- What does the acronym STEM stand for?
- What does the acronym pSTEM stand for?
- What do the acronyms of STEAM and STEMM represent and why are these acronyms useful (or not)?
- What are potential careers in STEM and/or pSTEM?
- Why might more women do Biology & Chemistry than Physics/Maths/Computer Science/ Engineering?

Prompt 1: Teacher notes

You will likely already have heard of the acronym STEM and be aware that the acronym represents the subjects of Science, Technology, Engineering and Mathematics. The acronym recognises design, creativity and innovation that is fundamental to these fields. When we refer to STEM, it often goes beyond the main disciplines that constitute the acronym STEM and is, instead, viewed as a multi-faceted endeavour in and of itself [1].

There are other acronyms associated with STEM, the most common of these being STEAM where 'A' represents the Arts. This acronym may, unfortunately, imply that the creativity core to the Arts is not associated with the subjects of Science, Technology, Engineering, and Mathematics. Other acronyms are also in use such as STEMM (including Medicine) or STREAM (including Religion). While it is useful to be aware of these, in this booklet we will therefore refer only to STEM (and its derivative of pSTEM) as an internationally renowned term that is in use by governments and policy makers around the word.

In this project we focus on the areas of pSTEM, which is specific to the fields of Physics, Computer Science, Engineering and Mathematics. There is a particular lack of diversity in these fields and we therefore highlight these particular areas in our videos. It may be interesting to review why this is the case and why there is gender parity in the fields of Biology and Chemistry. When women began receiving formal education in the late 18th and 19th centuries (many did not have access to education before then), subjects like Botany were thought likely to appeal to women with its associations to flower collecting and sketching. Women were, however, interested in all subjects as demonstrated by the Irish woman Agnes Clerke who wrote a Popular History of Astronomy (1885). Unfortunately, as the majority of scientific discoveries and ideas were only presented at scientific societies, which were effectively gentlemen clubs, women had very little opportunity to share their work in any other fields such as geology or chemistry [2]. While the Dublin Zoological Society (Dublin Zoo) admitted women from its foundation in 1830, women were not allowed to register as students at Ireland's universities until 1880 [3]. The Royal College of Science for Ireland (which is now home to the Irish Oireachtas, with statues of the Irish scientists Boyle and Hamilton on either side of its entrance) allowed women to register for courses in 1867. That year Matilda Coneys and four other women (including her sister Zoe Leigh) registered for courses at the new college, where Matilda won the first prize in mathematics the following year. As demonstrated by many others, including the Boole sisters in Co. Cork, women were incredibly capable of achieving in pSTEM subjects, but societal culture did not commonly welcome women to these fields.

Prompt 2

Slides 15 – 29 in associated PowerPoint)

- Who belongs in the fields of pSTEM?
- What contributes to a person being successful in the fields of pSTEM?
  - A sense of belonging and biases around STEM are important to discuss.
  - Students can do a google search about people in STEM fields using the image search. Encourage students to examine the images that come up. What trends do they notice?

Prompt 2: Teacher notes

Sense of belonging and Gender Diversity

A 'sense of belonging' can be described as the feelings of membership and acceptance a person feels as part of a particular subject. It reflects the feeling that one fits in, belongs to, or is a member of the learning community in a particular subject and involves a person's belief that they are an accepted member of that community (be that in the classroom or elsewhere) whose presence and contributions are valued. A sense of belonging can reflect a student's emotional response to feeling happy and comfortable, rather than chronically nervous or distressed, when learning a particular subject.

A sense of belonging is important to discuss in the context of STEM and pSTEM, as research has demonstrated that students who perceive a low sense of belonging with a subject are less likely to consider pursuing it. This correlates directly with gender stereotyping, as research has found that students who perceive greater amounts of gender stereotyping in a subject had a lower sense of belonging with it [4].

Growth Mindsets and Gender Diversity

Western societies, in general, often view ability in the pSTEM subjects as a 'talent', i.e. something that you are either born with or without. In fact, many people console themselves about their perceived ability in subjects such as mathematics by expressing that they are not a 'maths person'. Entity theory (or fixed mindset) describes this notion that intelligence is a fixed trait. Research has demonstrated that having a mindset about the nature of intelligence (or indeed other traits) being fixed undermines students' achievements in the face of difficulty. While fixed mindsets can be motivating for groups which are favourably stereotyped (for example, those deemed to be of Asian origin or men in the subjects of pSTEM [5]), such a mindset can turn learners away from challenges that might undermine their belief that they are good at something [6, 7]. Unfortunately, female students have been found to be more impacted by messages around fixed mindsets than male students [4, 8].

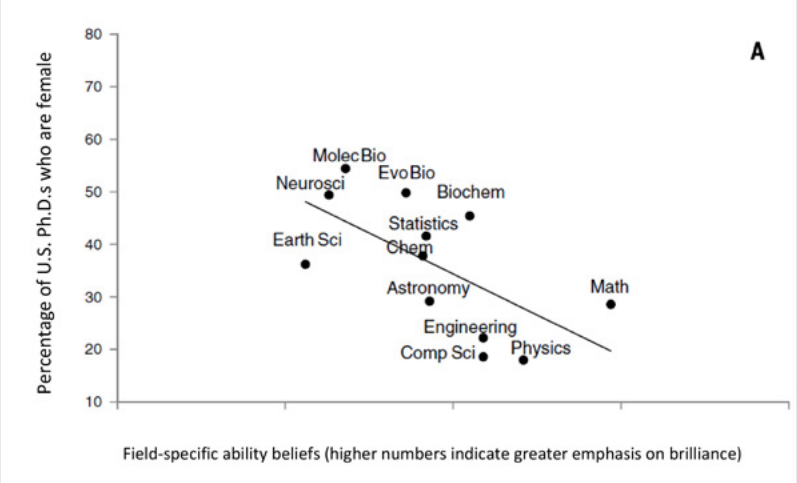
In contrast, students who hold the concept that ability is malleable (an incremental theory or growth mindset) are less focused on proving themselves and more focused on learning [6, 9]. Students with this perception of their own ability view unsolved problems as challenges to be mastered through effort and are more likely to self-monitor their work [9]. These entity and incremental theories impact students' academic achievement and persistence.

It might be interesting to note that we can develop fixed or growth mindsets depending on whether we focus on the 'product' of our effort (e.g. getting the correct answer) rather than the 'process' of our efforts (e.g. how we got to our particular answer). How we are praised at home or in school influences this. Research undertaken with children from ages 1-3 later found a correlation with their mindset at ages 7-8 based on the type of praise they commonly heard at home [10]. Children who heard 'process praise' like "you must have tried hard" or "good job drawing" were more likely to believe that traits were malleable, prefer challenging tasks, and attribute success and failure to effort in contrast to children who heard 'person praise' like "you're so smart" or "good boy/girl". Interestingly, girls received less process praise than boys and demonstrate less growth mindset at age 7-8 [10].

Some research that may be useful to share with students for discussion comes from Leslie and colleagues [11]. In this research they surveyed academic staff, postdoctoral fellows and graduate students (n = 1820) from 30 disciplines (12 STEM, 18 Social Sciences / Humanities) at geographically diverse high-profile public and private research universities across the United States. Participants were asked questions concerning their own discipline such as "Being a top scholar of [this discipline] requires a special aptitude that just can't be taught.", i.e. 'do you need to be born good at this subject in order to succeed at it?' ultimately testing participants' fixed mindset with regards to a subject. The researchers' hypothesis was to suggest that, across the academic spectrum, women are under-represented in fields whose practitioners believe that innate talent is the main requirement for success, since women are stereotyped as not possessing such talent.

As predicted, Leslie and colleagues found that the more a field valued 'giftedness', the fewer the female PhDs in that discipline [10]. Field-specific ability beliefs or fixed mindsets were significantly correlated with female representation across all 30 fields. "Disciplines that emphasized raw talent were more likely to endorse the idea that women are less suited for high-level scholarly work. In turn, higher endorsement of this idea was associated with lower female representation" [10, p264]. This was particularly evident across the pSTEM subjects.

Figure 1: Field-specific ability beliefs versus percentage of U.S PhDs who are female, (Leslie et al. 2015)



In their article, Leslie and colleagues suggest that academics who wish to diversify their fields might want to downplay talk of innate intellectual giftedness and instead highlight the importance of sustained effort for top-level success in their field. Needless to say, a diverse research field has shown to positively impact the quality of research work [12].

In Ireland, research undertaken by SFI (Science Foundation Ireland) with 2000 undergraduate students found out that 62% of them had chosen their degree course based on how they felt they would 'fit in' [13]. A sense of belonging is therefore already impacting young people's decisions on what subjects to pursue beyond secondary school.

You might wish to consider your own role in cultivating a sense of belonging to a subject in your classroom. A teachers' beliefs and attitudes towards teaching and learning impact their classroom practices and contribute to the messages implicitly communicated to learners about learning. Considering elements such as 'agency, authority and identity' and 'equitable access to content' as part of the Teaching for Robust Understanding Framework [14] might be something useful for your own practice.

Gender stereotypes and Gender diversity

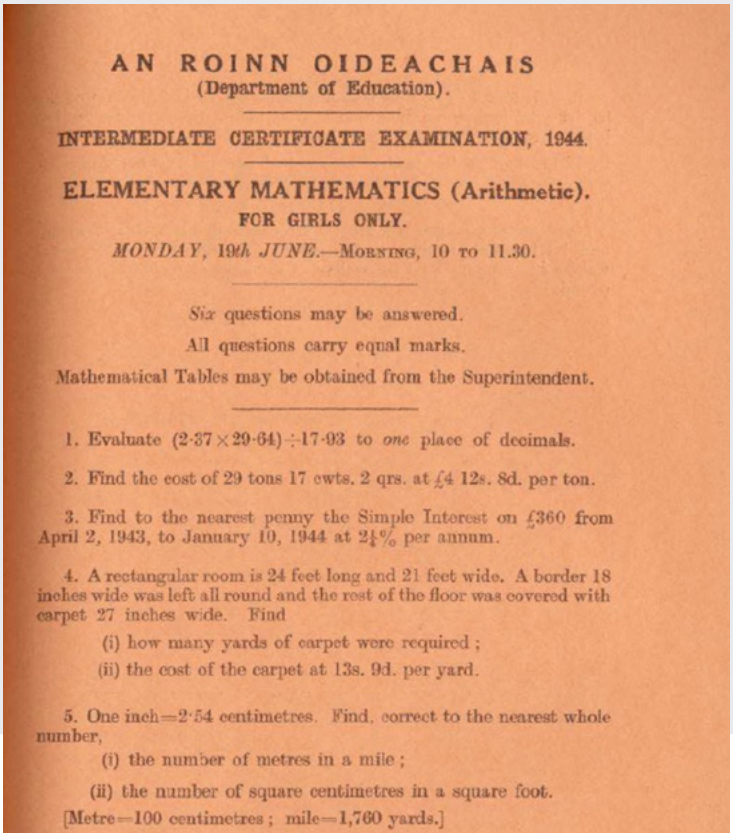
Unfortunately, 'unconscious bias' is something which everyone is susceptible to. You may have heard of the orchestra study conducted in relation to this issue. Harvard economist Claudia Goldin and Cecilia Rouse from Princetown wanted to find out why only 5% of lead violinists were female. When a blind audition was undertaken (where musicians were fully hidden behind screens), women's chances of making it through the first round of auditions increased by 50% and in the final rounds by 300% [15]. Biases prevail in many fields but seem to particularly hold in the pSTEM fields.

Cultural messages impact our thinking and contribute to the gender stereotypes around a particular subject. T-shirts like "too pretty for maths" only found in the girls' sections of clothes shops or movies characterising the kids successful in science or maths as 'nerdy' and 'uncool' contribute to broader norms and stereotypes around these subjects.

In Ireland, we may be subject to particular historical cultural messages around mathematics and sciences based on girls being having been 'allowed' to study certain subjects. The examination below was titled "for girls only" and was based on 'simple' mathematics. It was unusual for Higher Level Mathematics to be taught in all-girls schools and, even now, subjects like Engineering and Applied Mathematics are less likely to be taught in all-girls schools.

As an activity, you may wish to print some papers (girls version and non-gender specific version) for maths and for technical graphics from the same year. You can ask your students then to spot the difference in the different papers they receive.
https://archive.maths.nuim.ie/staff/dmalone/StateExamPapers/

Figure 2 Intermediate Certificate Examination, 1944, For Girls Only



AN ROINN OIDEACHAIS
(Department of Education).

INTERMEDIATE CERTIFICATE EXAMINATION, 1944.

ELEMENTARY MATHEMATICS (Arithmetic).
FOR GIRLS ONLY.

MONDAY, 19th JUNE.—MORNING, 10 TO 11.30.

Six questions may be answered.
All questions carry equal marks.
Mathematical Tables may be obtained from the Superintendent.

1. Evaluate $(2{\cdot}37 \times 29{\cdot}64) \div 17{\cdot}93$ to *one* place of decimals.

2. Find the cost of 29 tons 17 cwts. 2 qrs. at £4 12s. 8d. per ton.

3. Find to the nearest penny the Simple Interest on £360 from April 2, 1943, to January 10, 1944 at 2½% per annum.

4. A rectangular room is 24 feet long and 21 feet wide. A border 18 inches wide was left all round and the rest of the floor was covered with carpet 27 inches wide. Find
(i) how many yards of carpet were required;
(ii) the cost of the carpet at 13s. 9d. per yard.

5. One inch=2·54 centimetres. Find, correct to the nearest whole number,
(i) the number of metres in a mile;
(ii) the number of square centimetres in a square foot.
[Metre=100 centimetres; mile=1,760 yards.]

The most recent report on STEM Education in Ireland [16], demonstrates that it is far more likely for girls to study Biology and Chemistry than Physics. You may wish to ask your students if they think there are still biases about what subjects get taught to girls.

It's important to remember that we have some wonderful current and historical female role models in STEM in Ireland and, as part of a follow-up activity, you may wish to research some of these [17, 18].

Prompt 3

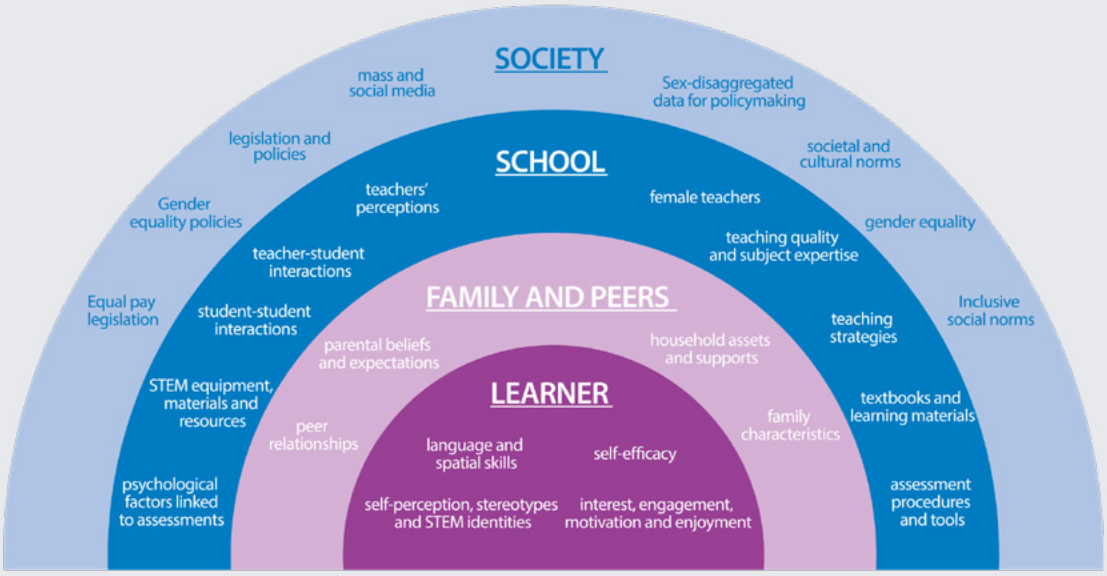
Slide 32 - 33 in associated PowerPoint)

- Why might people decide to go into a career in STEM?
- What might be some barriers which prevent people from going into STEM careers?
- Do you think stereotypes have any influence on what career you would or would not want to pursue?
- What is unconscious bias and how does it manifest? For example: if you go to a toy store what are the toys typically indicated for boys and for girls?
- Why might we need particular days like the International Day for Women & Girls in Science (February 11th)?
- How might we all support diversity and inclusion better in our everyday lives?

Prompt 2: Teacher notes

There are many factors which relate to the gender disparity in pSTEM. These factors operate at multiple levels, from society to the individual, and interact in complex ways. UNESCO's ecological framework outlines spheres of influence including: Learner, Family, School and Society.

Figure 3 Ecological framework of factors influencing girls' and women's participation, achievement and progression in STEM studies



At the individual level, there are biological factors that may influence individuals' abilities, skills and behaviour. This level also considers psychological factors such as self-confidence, interest and motivation. At a family and peer level parental beliefs and expectations play a role in what a person considers pursuing, as do peer influences. At a school level factors within the learning environment, including teachers' beliefs and expectations, curricula, assessment practices, and the overall school environment, impact on the learner. Finally, at a societal level, social and cultural norms related to gender equality and stereotypes visible in the media impact on a person's consideration of their progression in STEM [19].

Interest in STEM is also influenced by the role models people see. The presence of family members with STEM careers has been shown to influence girls' study of STEM subjects. Teachers also act as important role models in influencing the career pathways of students [19], particularly in dispelling myths about sex-based abilities in subjects. Female role models in STEM subjects can mitigate negative stereotypes and offer girls an authentic understanding of a career in STEM. They can also enhance a young woman's self-perception and attitudes towards STEM. This is particularly effective when young women can identify with the role models as being 'like them' [20].

International days of celebration, like the International Day of Women & Girls in Science held on February 11th each year take place, to educate the public on issues of concern, to mobilise political will and resources to address global issues, and to celebrate and reinforce achievements of humanity. The purpose of the International Day of Women and Girls in Science is to achieve full and equal access for women and girls in science. The day also recognises women and girls as not only the beneficiaries of science, but also as agents of change.

2. Pre-Viewing Questions

These are some suggested questions to share with students before they watch the videos that can form a basis for discussion afterwards.

(Slide 34 in associated PowerPoint)

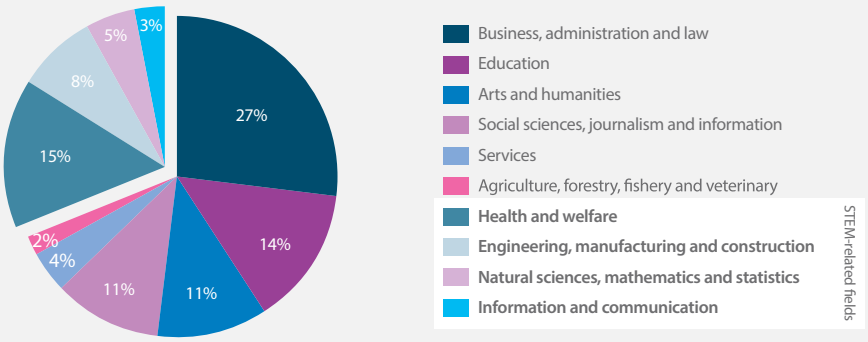
- What surprised you most from watching the video(s)?
- What were the stereotypes you may have had of someone working in this field before watching the video?
- What advice did you find most helpful from the role model?
- What struck you most about the background of the role model?
- What do you have in common or that is different to the role models you saw?

www.youtube.com/channel/UCYrh8Eh848_Ljzfx5BXiE9A

3. Follow-up Activities and Discussions

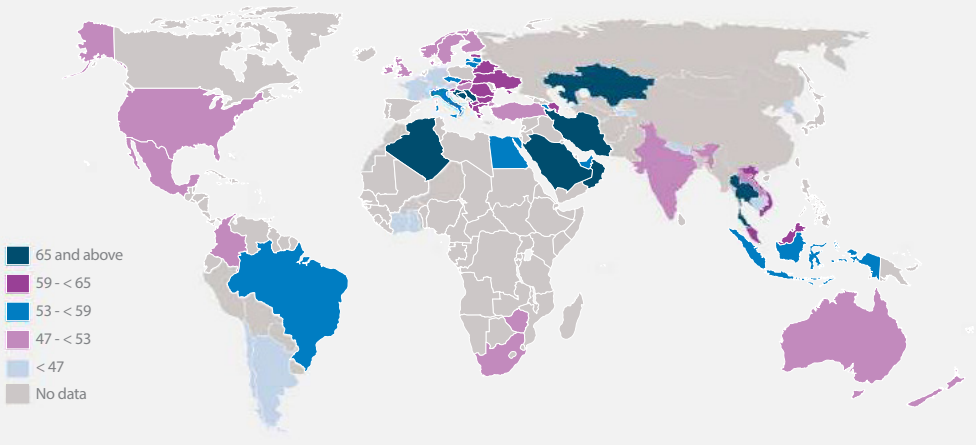
(Slides 35-43 in associated PowerPoint)

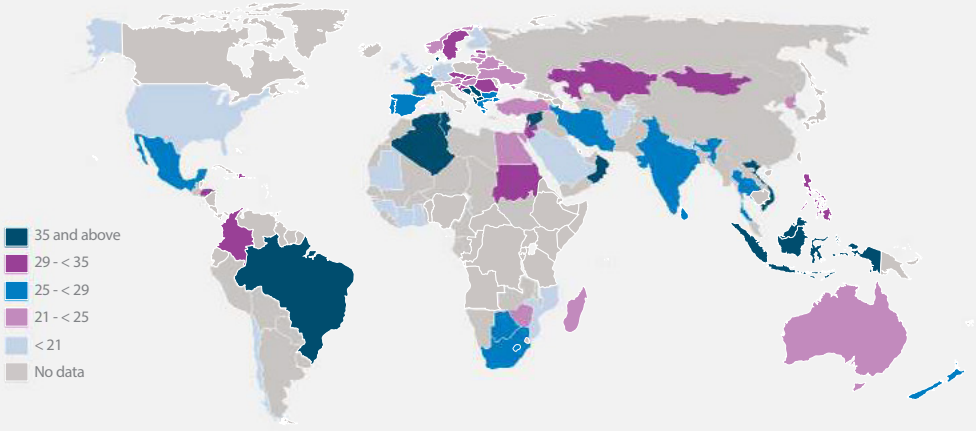
Let's discuss global trends. Within the female student population in higher education around the world, only around 30% chose STEM related fields of study (figure 5). This, however, is very dependent on national cultures and traditions. In Bahrain, for example, 86% of those enrolling in science, mathematics and statistics courses are female and there are high proportions (over 65%) of female students enrolling in engineering, manufacturing and construction in South-East Asia, Arab States and some European Countries.



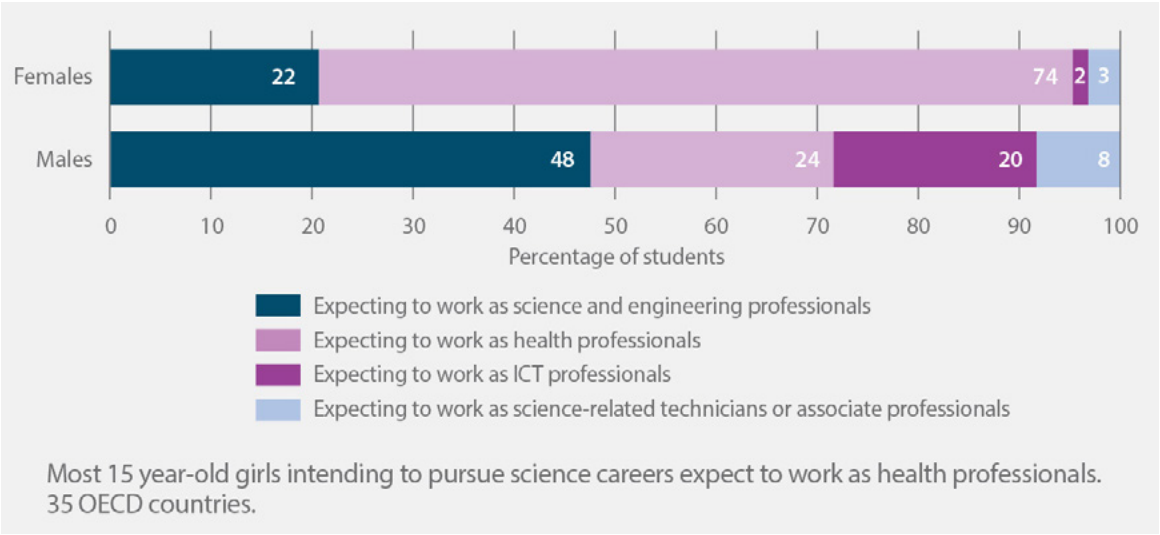
Only around 30% of all female students select STEM-related fields in higher education.
110 countries and dependent territories.

Data source: UIS 2014-2016[25]





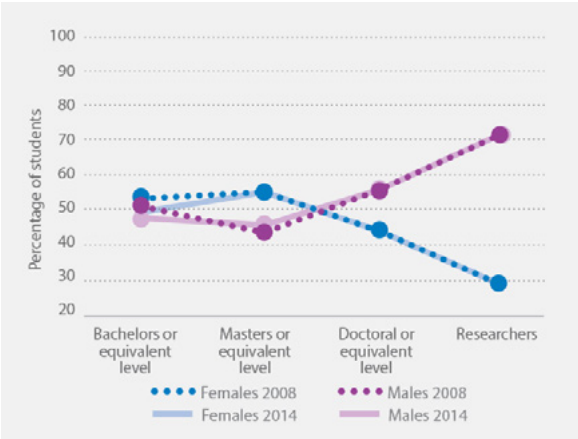
The underrepresentation of girls and women in STEM is a continual concern for scientists and policymakers. As we can see from the figures above, however, there are far more women choosing to pursue subjects such as Mathematics and Engineering in some countries compared to others. Your students may be interested to consider the different cultures surrounding these topics in other countries.



Most 15 year-old girls intending to pursue science careers expect to work as health professionals. 35 OECD countries.

In international PISA tests, differences in career aspirations were observed between girls and boys.

Unfortunately, the gender gap in science widens as we move from undergraduate to post-graduate study. Even though women may study in a particular field, they do not pursue a career in that field as often as their male counterparts.



Gender gap widens significantly among science researchers. 226 countries. Data source: UNESCO 2008-2014[11]

How does Ireland compare?

- A study from UCD reveals that in CAO applications while 40% of boys select STEM fields courses, only 19% of girls do so.
- Numbers in industry: of the over 115K STEM related jobs in Ireland listed in 2021 only 25% of those are done by women.
- There is also a "marked under-representation" of women occupying senior-level positions across the various STEM sectors ("This is why more girls need to take up STEM subjects in school").

Activity: Review Leaving Cert Results (Slide 46 in associated PowerPoint)

Examine how well girls do in Physics, Applied Maths, Engineering etc. in the annual Leaving Certificate results. How does this compare to Biology and Chemistry? (www.examinations.ie)

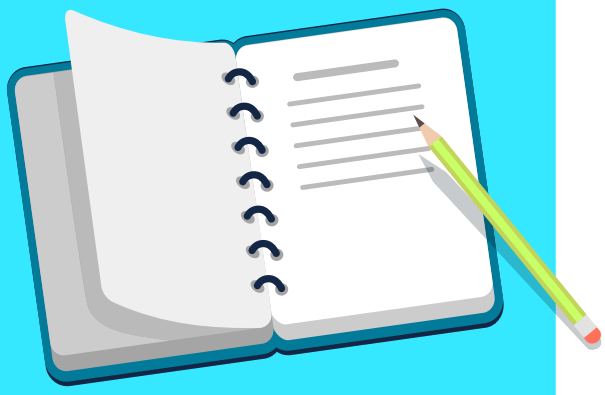
Activity: Values Affirmation Exercise (Slide 47 in associated PowerPoint)

Interesting research from Miyake and colleagues [21] has demonstrated that in undergraduate physics classes, students improved their academic results simply by spending 15 minutes writing about the values that matter to them most.

Why not spend 15 minutes on the following activity – it may impact positively on your next exam result!

Choose two or three values that are most important to you and write about why they are important to you. You may also wish to consider how you try to live up to these values.

You can use the following list to choose the values most important to you or can identify your own: *being good at art; creativity; relationships with family and friends; government or politics; independence; learning and gaining knowledge; athletic ability; belonging to a social group (such as your community, racial group, or club); music; career; spiritual or religious values; sense of humour.*



Follow Up Project (Slides 48-54 in associated PowerPoint)

- Find a STEM or pSTEM role model from your local school, community, family, or area to do a project on:
  - You may find inspiration online, for example on the WITS Ireland website
  - You might like to ask these people the same questions that we asked our role models for the videos (see 'Interview Questions for a Role Model' section)
  - Your project may be a video, podcast, presentation or poster – depending on what works best for your class

OR

- Find an historical role model in STEM/pSTEM to do a project on:
  - You may like to focus on Irish women only (e.g. Kay McNulty) [17, 18]
  - You may wish to consider women from movies such as 'Hidden Heroes' or those from books such as 'Power in Mathematics'
  - Why not visit the local library and see who you might find there?

- Celebrate students' work on role models by holding a demonstration day as part of Ada Lovelace Day (October), Maths Week (October/November), Science Week (November), International day of Women & Girls in Science (February 11th), Engineering Week (March) or International Women's Day (March 8th).

Teacher: *I have one lesson with students – what should I do?*

1. Begin the lesson with some Pre-lesson / Introductory Activities outlined above, based on the resources and time available to you and the students (you may wish to restrict yourself to Prompt 1 for one lesson)
2. You may wish to follow the guidelines for fruitful classroom discussions outlined above for any discussions.
3. Share the pre-viewing questions with students outlined below and choose two 5-minute videos to watch in class. WATCH VIDEO
   https://www.youtube.com/channel/UCYrh8Eh848_Ljzfx5BXiE9A
4. Discuss these questions with students afterwards.
5. Homework suggestion: Set students a task with finding a role model in pSTEM that they have not come across before. This could be done in the library or online.

Teacher: *I would like to do a series of lessons utilising the videos – what should I do?*

1. For your initial lesson, utilise the Pre-Lesson / Introductory Activities ideas to promote discussion and get students researching role models in STEM or pSTEM. You may wish to also set out the classroom norms for fruitful discussions outlined above. The presentation slides shared on the website may be helpful for use in your lessons.
2. Conduct a discussion for 10 minutes (Prompt 1) and watch two of the videos. Continue steps 2-4 through each of the prompts until all 10 videos have been viewed by the class group of students.
3. Share the pre-viewing questions with students and choose two to three 5-minute videos to view per lesson. WATCH VIDEO
   https://www.youtube.com/channel/UCYrh8Eh848_Ljzfx5BXiE9A
4. Discuss the questions after viewing the videos in each lesson.
5. Utilise the Follow-Up Activities and set students a project to undertake over a number of classes.

Teacher:
I am a Primary school teacher – what should I do?

Review the booklet and plan one or two lessons using the role models. They link to SESE and other areas of the primary curriculum. Here are some suggestions.

1. Start with the Pre-lesson / Introductory Activity e.g. What does the acronym STEM stand for? (from Prompt 1).
2. Explore with the children what science, technology, engineering and mathematics are and where they use it every day.
3. Share the pre-viewing questions with the children as outlined on page 12 and choose two 5-minute videos to watch in class.
   https://www.youtube.com/channel/UCYrh8Eh848_Ljzfx5BXiE9A

   WATCH VIDEO
4. Discuss these questions with the children afterwards.
5. Follow up questions / exercises
   a. Set students a task with finding someone who works in pSTEM. This could be done at home in the family or in the local area as well as in the library or online.
   b. Use the dictionary to find out the meaning of words such as science and scientists, apprentice, engineer etc. Compile a glossary for the class from the children's research.
   c. Explore with the children what they think about STEM (science, technology, engineering and mathematics) after watching the videos.
   d. What do our games, toys, and clothes say about girls and boys and STEM?

Interview Questions for a Role Model

1. **Who are you and what do you do?**
   (e.g. Is there a job title? What is the objective or every-day activity of the work? What are you trying to find out?)

2. **What drew you to this role?**
   (Why did you want to pursue this role? What was the drive in achieving this job? Note: It would be lovely here to emphasise how this work impacts on society on a broader scale or helps people.)

3. **Are you engaged in STEM related activities outside of work?**

4. **What aspects of your role inspire you?**

5. **What do you enjoy most about your work?**
   (You can mention anything and everything here, from colleagues, to the people you meet, to the ins and outs of your job. You can also choose to include what you least enjoy about your work.)

6. **Tell me about your formal and informal education path.**
   (Please mention, where relevant, any other qualifications you have pursued since during your undergraduate e.g. Masters etc.)

7. **Were you drawn into studying STEM subjects at school?**
   (We would like to hear how you felt about these subjects in primary and secondary school.)

8. **Were there any particular difficulties or challenges you had to overcome in terms of your study or work? If so, please share.**
   (We don't want to gloss over the challenges on this as we feel young women will be more inspired to hear about challenges and overcoming them rather than thinking everyone that studies physics has to be the 'best in class' all of the time.)

9. **Are there any challenges you still face?**

10. **What and/or who inspired you to go into this field (or into STEM)?**
    (You may also wish to mention here people or cultural messages that may have discouraged you from initially considering the path.)

11. **What do you wish someone would have told you when you were younger (advice regarding a career in science or confidence, inspirational)?**

12. **Is there anything else you feel is important for us to know about your experience?**

Further Resources

https://www.un.org/en/observances/women-and-girls-in-science-day#

https://engage.aps.org/stepup/home

https://www.witsireland.com/

https://www.iop.org/physics-community/iop-membership-where-you-are/iop-ireland#gref

https://www.aauw.org/resources/research/the-stem-gap/

https://obamawhitehouse.archives.gov/women-in-stem

https://teachwithmovies.org/hidden-figures/

https://www.youcubed.org/

https://www.berkley-group.com/women-in-stem-ireland/#:~:text=Currently%2C%20there%20are%20approximately%20117%2C800,roles%20are%20performed%20by%20women

https://youtu.be/mPohBFk6SV0

https://archive.maths.nuim.ie/staff/dmalone/StateExamPapers/

https://www.girlsinstem.ie/

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ROLE MODELS IN STEM

YOU CAN BE WHAT YOU CAN SEE

HEA HIGHER EDUCATION AUTHORITY
AN tÚDARÁS um ARD-OIDEACHAS

IOP Institute of Physics