

Why Is The STEM Skills Gap Widening In Newer Generations, And What Are Organisations Doing To Bridge It



All that is written in this essay is product of my own sole work, and all information stated is referenced appropriately.

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Abstract:

STEM careers are essential for advancing society and improving the environment. However, despite rising industry demand, young people's interest in STEM fields is declining. Stereotypes, stress, and other factors contribute to this problem, which has prompted organisations to address it through educational initiatives, school partnerships, and involvement of young people.

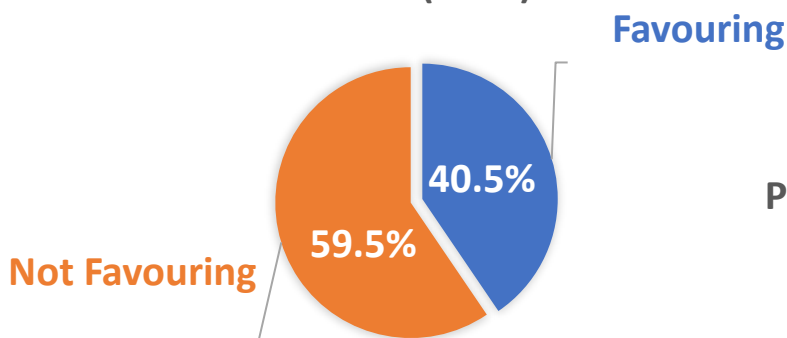
Introduction:

Young people with STEM skills are essential in today's world in order to prosper in the rapidly developing technology industry; however, interest in these career paths have decreased among younger generations recently.

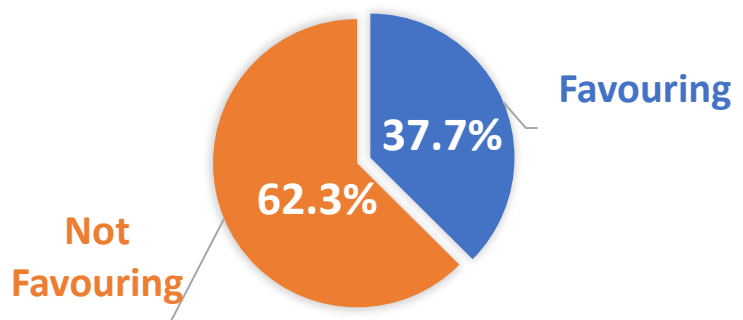
The number of STEM students has decreased by 6.5%, with 307,000 students being recorded, according to German statistics.

40.5% preferred STEM courses in 2015, compared to 37.7% in 2021 (schengenvisa.info.com, 2023).

PERCENTAGE OF STUDENTS FAVOURING STEM (2015)

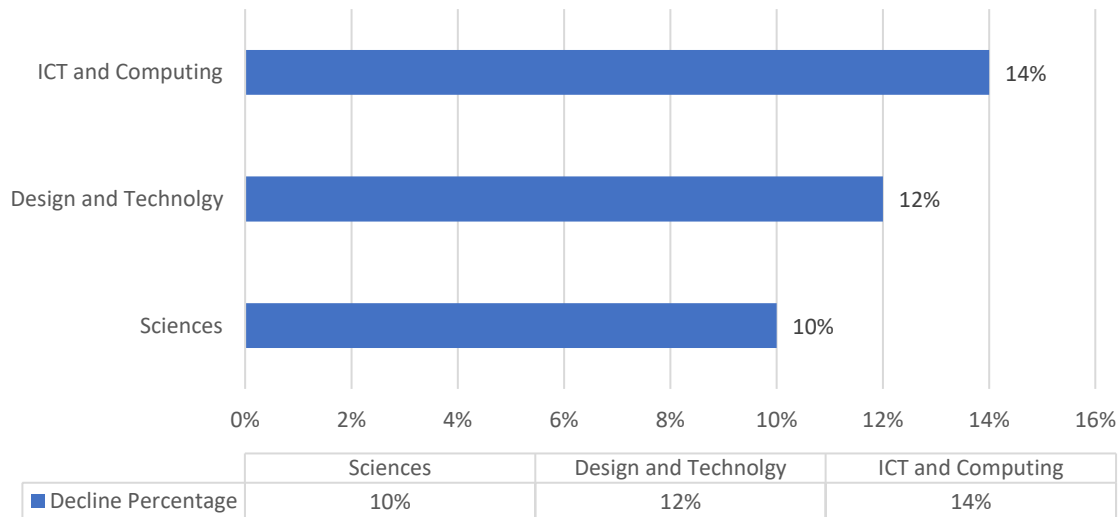


PERCENTAGE OF STUDENTS FAVOURING STEM (2021)



In the last few years, 9–12-year-olds' interest in the sciences had decreased by 10%, and in design and technology it decreased by 12%, as well as ICT and computing being decreased by 14%, according to the Institute of Engineering and Technology (Lamb, 2019).

The decline in interest in STEM within 9-12 year olds



International STEM students in British institutions have significantly decreased over the past two years, according to parliamentary data, and 35%–39% of respondents would not recommend studying in the UK because of discrimination in employment, higher education, and immigration policies (committees.parliament.uk, 2014).

Resolution of this issue is a top priority because STEM-skilled workers are in demand (it is estimated that 200,000 engineers will be needed in Britain by 2024) and account for 18% of all employment in the UK.

Major causes for the decline:

Stereotyping:

The decline in young people's interest in STEM fields is significantly attributed to stereotyping. The perceptions of a profession affect the career path that young people choose. Science and engineering are stereotyped as demanding subjects suitable for nerdy, highly intelligent male introverts, and from this people with communal or collaborative

mindsets now perceive STEM disciplines as isolating and preventing them from contributing to society. The charitable and cooperative goals that formed the basis of STEM are rendered invisible to those who represent the noble definition of what it exists for due to this stereotyping (Boucher et al., 2017).

The impact of this image has significantly changed how women perceive STEM fields. According to studies, women would be more likely to pursue a career if it seemed more sociable, and because of the stereotypes associated with STEM fields, women would focus their efforts on other directions (Morgan et al., 2001; Boucher et al., 2017).

In contrast, a study found that after three years, the number of science and engineering courses taken by women who thought STEM was centred on communal goals was comparable to that of men, while the number of courses taken by women who did not share this belief was lower than that of men (Stout et al., 2016; Boucher et al., 2017).

Additionally, this portrayal of STEM discriminates against minority groups like Aboriginal-Americans, Ibero-American, Asians and Africans (Boucher et al., 2017). 3,852 American high school students participated in a study based on Problem-Based Learning (PBL), one of the most extensive quantitative studies of its type, to ascertain the primary causes of this decline. According to the findings, PBL rates—which are linked to students' commitment to pursuing a STEM career—were especially low among women and underrepresented groups (LaForce et al., 2017).

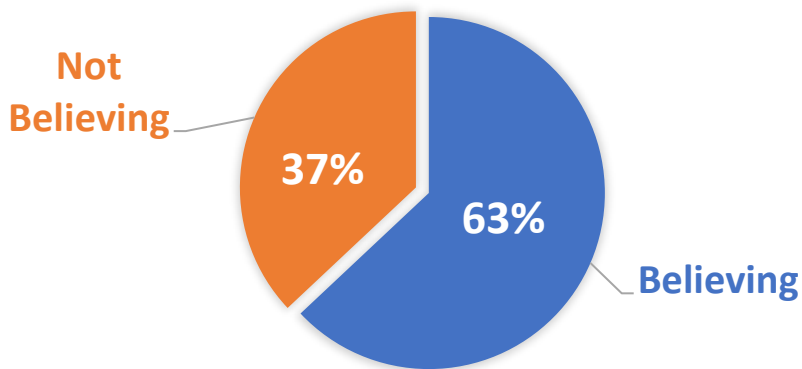
According to the National Science Board (2008), female and underrepresented minority students make up the majority of dropouts in the United States (Sithole et al., 2017).

Stress:

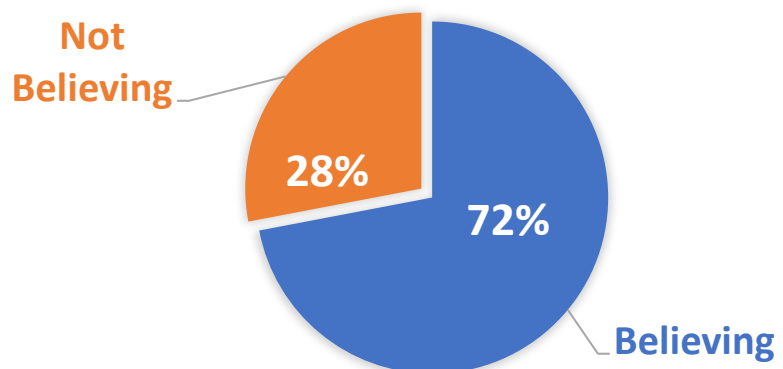
Due to the many pressurising factors of this subject, students develop a conscious dislike of STEM, which causes stress and lower engagement. These factors can include under-developed lessons delivered by teachers through poor teaching techniques, unsuitable study environments that cause students to lose focus, or high attrition rates that result in worsened student performance rates (Rogers et al., 1997; Cheryan et al., 2015; Sithole et al., 2017). This prompts students to move towards alternative options.

Stress was cited as a major factor in the decline of student STEM interest, by 63% of secondary school teachers and 72% of primary school teachers (Lamb, 2019).

PERCENTAGE OF SECONDARY TEACHERS BELIEVING STRESS IS A MAIN CAUSE



PERCENTAGE OF PRIMARY TEACHERS BELIEVING STRESS IS A MAIN CAUSE



According to an older American three-year study, approximately 60% of students drop out of mathematics courses, 40% of engineering courses, 50% of the various sciences, and after they've typically study majors unrelated to STEM (Correll et al., 1997; Sithole et al., 2017).

This study demonstrates that this severe problem is not a recent one but has been affecting countries for decades due to the negative portrayal of this issue, which causes some groups to feel excluded and leads to stress.

What are organisations doing to solve this:

Role-Models and Awareness:

Many organisations are working hard to address this issue by developing better pathways for pupils to enter the STEM fields. One way to mitigate the effects of stereotyping, particularly on young women, is to introduce more diverse STEM professionals to a wider audience in order to provide role models for them in this career path and attract more students.

A relatable role model helps young women feel more confident and can help them have a more positive perception of STEM fields. Youngsters can be more inspired to succeed and persevere in the face of stereotypical views if they have a STEM role model to look up to (Dasgupta, 2011; Stout et al., 2011; Boucher et al., 2017).

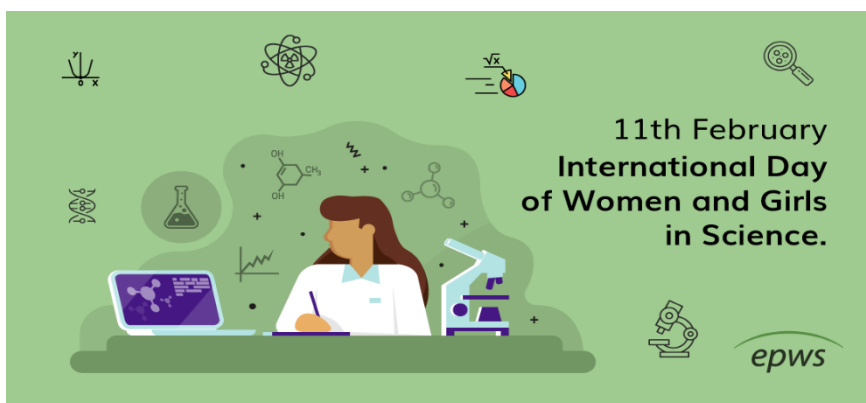
The United Nations organised the International Day of Women and Girls in Science, which is celebrated on February 11, as a way to raise awareness and encourage reflection among young people about women's roles in STEM and their contribution to achieving sustainable development goals (un.org, 2023).



Source: un.org



Source: psy.ox.ac.uk



Source: epws.org

In an earlier instance, students at the American Harvey Mudd College were given the opportunity to attend the annual Grace Hopper Celebration of Women in Computing at the Anita Borg Institute for Women and Technology as part of their computer science programme. This was done to increase student's knowledge of the diversity of professionals in STEM and to further motivate them (Boucher et al., 2017).



Source: techcrunch.com



Source: disney.com

Sunita Lyn Williams – a former NASA astronaut – visited the Scottish Space School, a programme for secondary-school students hosted by the University of Strathclyde, to give talks and encourage young women thinking about pursuing STEM (strath.ac.uk, 2018).



Source: strath.ac.uk

Early Interest:

A solution to the stress and high dropout rates, caused by the difficulties of learning and obtaining skills, is to encourage early interest in STEM fields by giving pupils tools and experience to help them along their pathway (Sithole et al., 2017).

For instance, the STEM Grant Programme, a collaboration between the Fraserburgh Academy and Northeast Scotland College, has allowed students who wish to pursue STEM with the necessary higher mathematics qualifications and digital skills in professional equipment (excessive through a SCQF-Level-5 course) so to be able to enter higher education. By this a number of pupils pathways into professional STEM disciplines have been resolved, allowing them and others to be motivated to enter.

Additionally, the Scottish Government has increased the funding for ELC (Early Years in Childcare) and, in partnership with Education Scotland, launched its newest practise resource in 2020, "Realising the Ambition," which aims to provide young children with a better understanding of STEM skills.

Also, 69,764 students (80% of Scottish schools) participated in Skills Development Scotland's Discover Tech Skills programme in 2021, which gave those pursuing careers in STEM an understanding of the digital skills required and the chance to network with professionals via webinars (gov.scot, 2021).

More significantly, the Scottish Space School at the University of Strathclyde is a week-long programme for S5 students who are interested in STEM fields to learn from industry experts in space exploration and research, as well as staff from Strathclyde about further education and pursuing STEM careers. Additionally, teams will compete to present a group project. Eight students will also be chosen during the week to participate in the "Learning Journey to NASA" educational trip to NASA's Houston headquarters, where they will have the opportunity to interact with STEM pioneers like engineer Amber Gell and former astronaut Alvin Drew in October (strath.ac.uk, 2023)



Source: strath.ac.uk



Source: wikipedia.org

The Accelerate Programme is another initiative of the University of Strathclyde that introduces volunteers to the university's various STEM-related departments (strath.ac.uk, 2023).

Participants in such programmes can also benefit from the experience they gain, which can help them to strengthen their personal statements for applying to universities or apprenticeships.

Besides courses targeted for secondary school pupils, Mark Rober (a former engineer and founder of CrunchLabs) produces buildable engineering toys to encourage kids to pursue careers in STEM fields and to help them learn the engineering design process and how mechanics, work by constructing the toys themselves. With the help of a medium they can easily understand, this initiative enables kids to develop an interest in STEM subjects at an early age, which will make it easier for them to choose a related career path in the future (crunchlabs.com, 2022).



Source: crunchlabs.com

The First Lego League Challenge 2021, funded by the Wates Family Enterprise, allowed pupils from Penpol Primary School to enhance their problem-solving skills, teamwork, and confidence needed to engage in STEM and expanded their interest in joining the field. (theiet.org, 2021).



Source: theiet.org

Improving Educator Training

The lack of organisation among teachers who teach STEM subjects is a factor to the STEM achievement gap among students. Improving practitioners training programmes to make them more individualised and immersive is one solution to the issue discussed. By involving trainees more thoroughly, future-teachers can improve their skills and get a better understanding of how session components can affect student engagement (Sithole et al., 2017).

For example, in collaboration with the University of the West of Scotland, a free online STEM course was established. 3,500 people have already completed the certificate programme, and 98% of them are enthusiastically recommending it to other practitioners (gov.scot, 2022).

Summary of industry professional's opinions:

Foster J. Douglas – How mental health effects pupil engagement and the ways it can be solved:

In order to properly address the issue, it would be necessary to understand how mental health influences young people's interest in STEM. To help the young person feel less stressed, institutions should offer the proper support, such as counselling and flexible schedules. In order to help each student, teachers also need provide a variety of resources and interactive teaching techniques.

(Foster J. Douglas, St. Mungo's Academy's Department Head for Design, Engineering, and Technology, personal communication, August 2023).

Pierce Hough & Haris Saif – The ways teachers can support their students in STEM and improve their own teaching:

To increase students' confidence and STEM knowledge, teachers should welcome and candidly respond to questions. A thorough understanding of the learning environment can provide teachers with the necessary teaching experience to lead to greater student success. Teachers should also emphasise the perseverance required to succeed in STEM fields, realising that failures are inevitable is important for students to overcome obstacles in their careers.

(Pierce Hough, Technical Teacher, All Saints Secondary School, personal communication, August 2023; Haris Saif, BEng Aero-Mechanical Undergrad, University of Glasgow, personal communication, July 2023).

Amber Kenny – The importance of collective research and analysis to solving an issue:

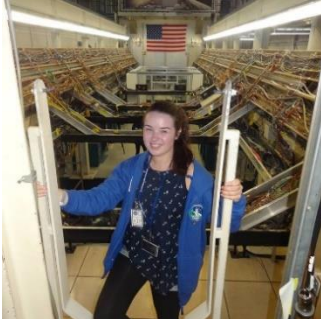
Student engagement and opinions are essential to resolving the current perceptions of STEM. When given the chance, they'll describe the problems they encounter. Through this a better understanding of this issue can be developed, leading to the right decisions being implemented.

'It would be interesting to see the findings of a sizable, qualitative study based on various of accounts.'

(Amber Kenny, MSc Medical Sciences Undergrad, University of Aberdeen, personal communication, August 2023).

Inspirations:

Marnie McKay:



Source: strath.ac.uk

Marnie McKay, a participant in the 2013 Scottish Space School, was similarly negatively impacted by stereotypes surrounding STEM, leading her to believe she wasn't cut out for this field before: 'I had always loved maths and science at school but fell for the male-dominated stereotypes, which I believed dominated this field, and instead aspired to study law'. But after taking part in the programme at Strathclyde, she was better able to understand the STEM career path, which amplified her resilient dedication to strive for her dream: "It was only after taking part in the Scottish Space School's week-long residential programme at Strathclyde and the subsequent Learning Journey to Houston, Texas, that my eyes were opened to the world of engineering." She was able to earn an MEng Electrical and Mechanical degree at the University of Strathclyde after secondary school thanks to this extraordinary experience.

Marnie McKay is a prime example of how a STEM programme was able to inspire someone who had been discouraged by stereotyping and pushed them to succeed and challenge preconceived ideas by using the necessary skills. Another benefit from this, is that McKay's career path can serve as an example for other young women interested in the sciences and engineering.

Neal Stokes:



Source: linkedin.com

Another participant, Neal Stokes, had a passion for aerospace engineering and went on to earn an MEng in aero-mechanical engineering from Strathclyde and a certificate in international studies from the Georgia Institute of Technology.

He had the opportunity to meet many other participants in the programme, as well as experts in the field. 'Speaking with astronauts about their experiences in space and their training was incredibly inspiring. But undoubtedly one of my favourite aspects of the Space School was the fantastic opportunity it provided to connect with 100 like-minded individuals from all over Scotland, many of whom I have since attended university with and remain close friends with (four years later)'. Additionally, he helped throughout the 2014–2016 programmes.

People like Neal were able to experience the STEM professional world and gain insight into university life thanks to opportunities like these. Additionally, he made friends who encouraged him to pursue higher education. This example can motivate people who are deciding on a career or in need of answers to turn to programmes like these, creating a strong future STEM workforce.

Ref: (strath.ac.uk, 2023)

Conclusion:

The aspects that resulted in this declining STEM interest among younger generations are complex and difficult to discuss properly without advanced knowledge about them. Whether it's stereotyping, poor teaching, inappropriate learning conditions, stress, or lacking skills, it can be stated that this dateless issue is massive, and effortless collaboration is needed to solve it.

The number of students participating in these innovative, encouraging programmes and competitions needs to be increased. This will give students a better understanding of the amazing future that STEM holds for them and give them the chance to connect with others who have succeeded in this field.

STEM disciplines should be shown as communally centred so that participants can understand their career aspirations. By doing so, we will shatter the media's portrayal of science and engineering, encourage more underrepresented groups to participate, and change the perception of STEM to a pathway that is open to everyone, like Marnie and Neal.

To reach a larger audience of potential STEM disciplinaries, supportive programmes in educational centres and joint events with schools need to be promoted.

In order to employ STEM-minded individuals and highlight additional role models, we need to change people's perceptions of what STEM can offer to benefit sustainability and how it confronts the climate crisis head-on.

However, first expansion of knowledge is required to understand the causes of this issue, so to counter it decisively, *Churchill didn't send troops to Normandy because it was near, but because it was what the enemy least expected* (History on Map, 2020). To develop precise solutions, more studies and investigations are required. The amount of effort people has put into solving this issue is barely scratched by this paper.

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