

"We must have perseverance and above all confidence in ourselves. We must believe that we are gifted for something and that this thing must be attained."

Marie Curie



2022 SURVEY

OF FEMALE STUDENTS' ATTITUDES TO STEM

#DREAMIT
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#DOIT



#DREAMIT

IWish was **born out of a dream to change and influence the world we live in**. To do something to increase female participation in STEM. To give girls a voice. We figured if we need to motivate and equip our young people with the curiosity and drive to solve the problems facing the world today, **we must attract more girls to STEM to ensure equality and diversity of thought**.

Early in the IWish journey, we recognised gender balance in STEM as more than a gender issue. In our view it was a complex societal issue requiring a multi-faceted holistic approach in our homes, in our schools and in our workplaces. This view was recently reiterated by the Department of Education's Gender Balance in STEM Advisory Group (Dept of Education, 2022).

IWish started as an annual showcase event. But it is more than that. **It is a movement**. A community of people wanting to do more. Through that movement, we have seen 50,000 girls think about STEM differently, and begin to realise their dreams and ambitions through STEM. Through their active participation in our community, IWish has evolved in a way we never dreamed possible ourselves.

Through our community of IWish partners, our IWish alumnae and mentors, supported by a network of teachers, we are working towards a model for sustainable interventions that drive real change throughout the year, and year on year. Since 2016, **our annual survey reports have influenced policy, emphasising the need for earlier, structured, inclusive interventions, within our primary and second-level education systems, to enable female students envisage futures for themselves in STEM**.

The IWish annual survey is our chance to ask girls what they think about STEM, to see how their views are evolving and what supports they need to effect real change. **This report captures what the young women of IWish 2022 have to say!**

This is their voice, their dream.

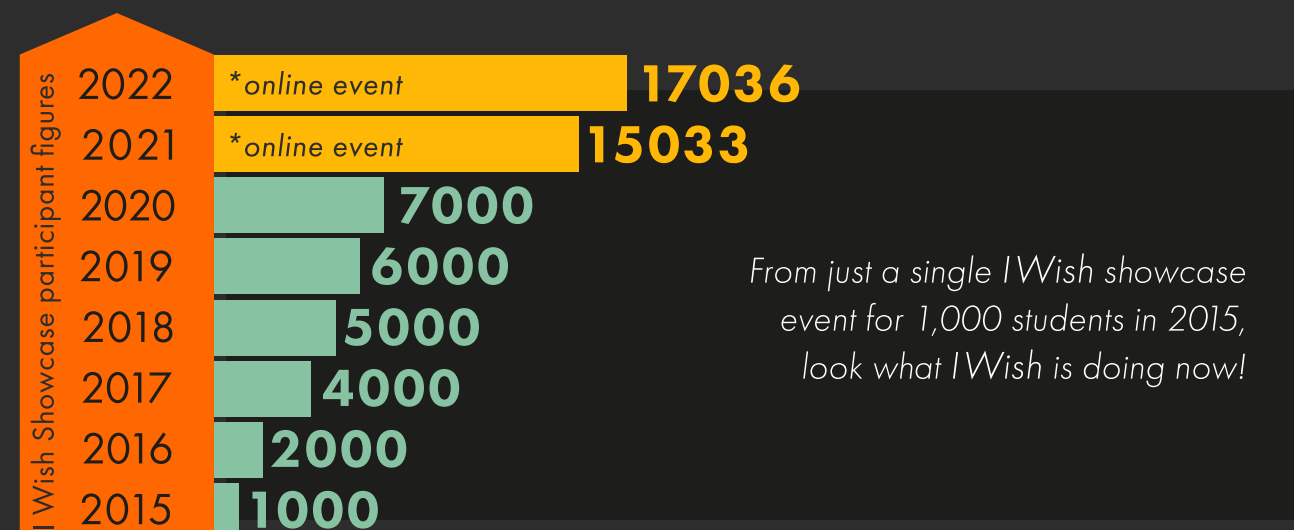
✓ The IWish Team

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LOOK HOW WE'VE GROWN!



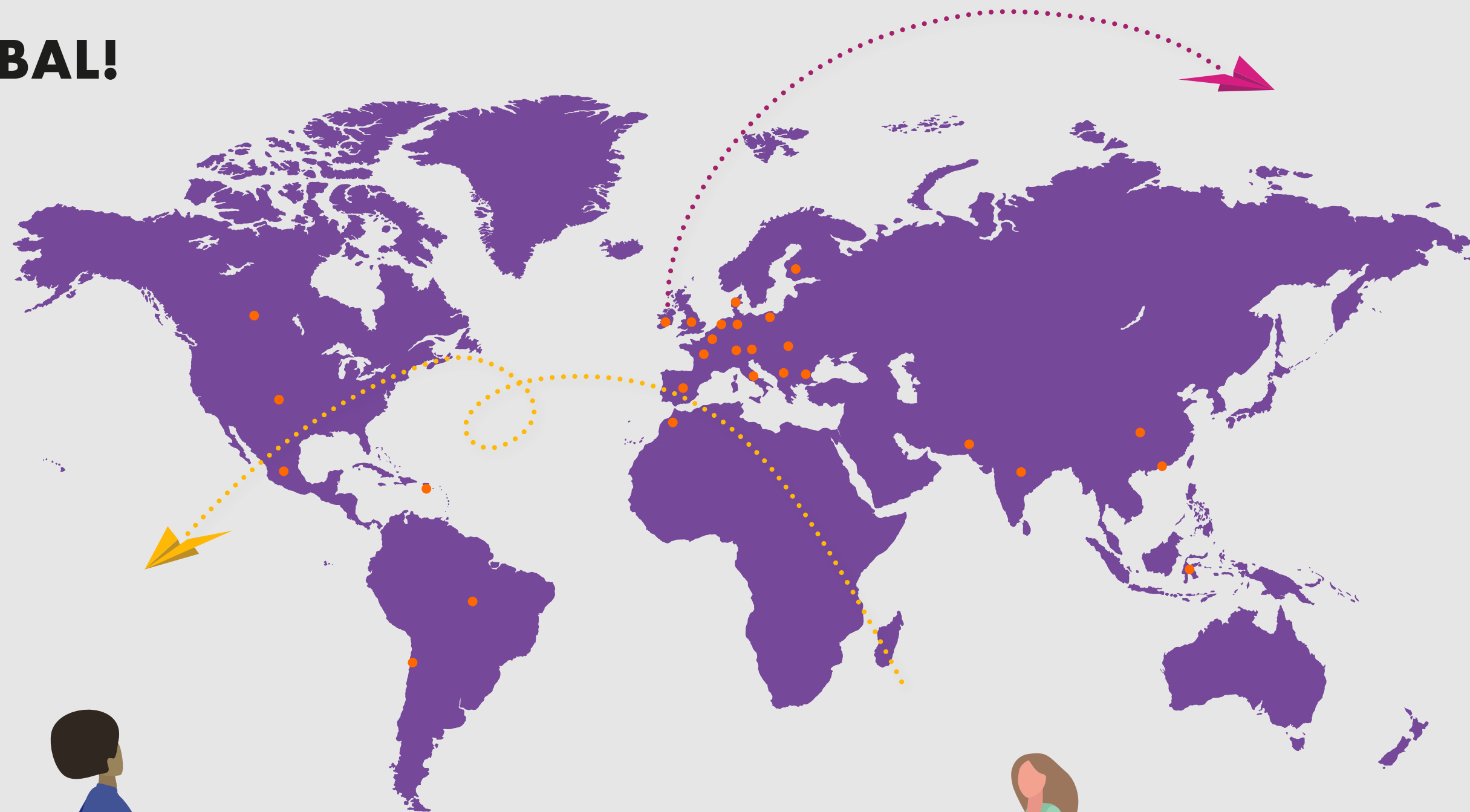
From just a single IWish showcase event for 1,000 students in 2015, look what IWish is doing now!

- Annual showcase events
- 96 laptops gifted to second-level students, through the IWish Park Place Tech For Good Programme
- Repository of high-quality online resources for self-directed student learning and in-class use
- Partnering schools in Ireland and the US through our IWish twinning exchange programmes
- On-campus IWish programmes run by higher education institutions
- IWish Deloitte Mentorship Programme '180 Days to Make a Difference'
- 50 IWish STEM industry partners
- 80 IWish Ambassadors



I WISH 2022 GOES GLOBAL!

- The 2022 IWish online showcase events drew an audience of **17,036 second-level students**, with participants from all **32 Irish counties**. The events had a **global reach**, attracting students from 28 countries, in Africa, Asia, Australia, Europe and North & South America.
- Almost 3,000 students participated in the IWish annual survey 2022, **93% of them identifying as female**. These young women represent the Scientists, Technologists and Engineers of the future. This report summarizes their perspectives on STEM, captured at a key, transition point in their lives, when they are making subject choices that are likely to influence their career choices.



WHO PARTICIPATED IN THE 2022 IWISH SURVEY?

2839 online surveys completed

55% respondents from single-sex schools

2583 Irish respondents identifying as female



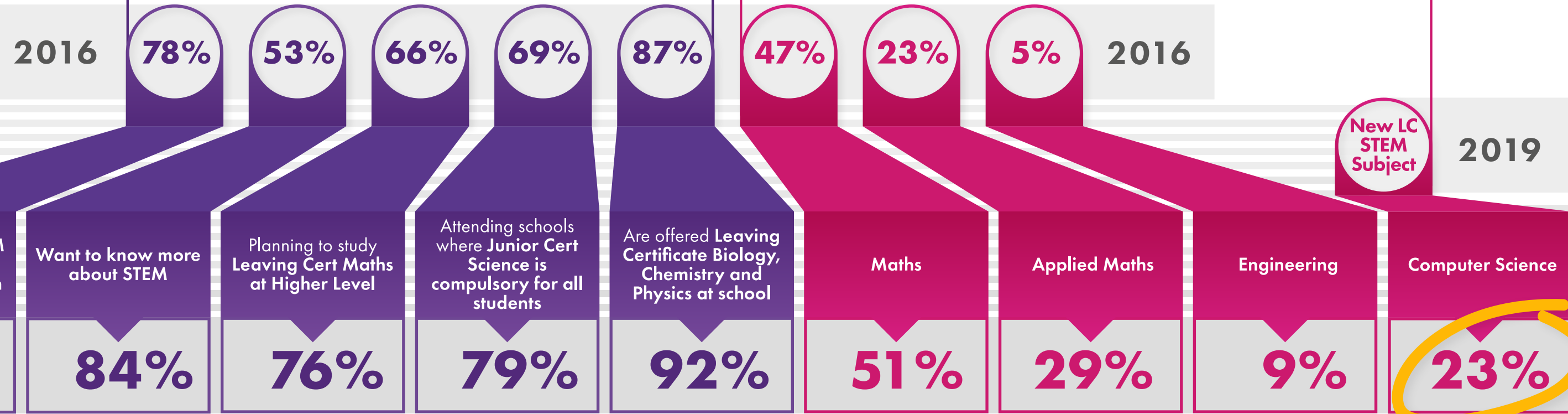
#DOIT

POSITIVE CHANGE!



Since the first IWish survey in 2016, IWish has seen real, positive change in female Transition Year students' perspectives on STEM and in their engagement with STEM subjects.

Nationally, these positive IWish survey trends have been reflected in increased engagement by female students in STEM subjects at Leaving Certificate Higher Level:



New LC STEM Subject

Female participation in Leaving Cert Engineering almost doubled since 2016, but 9% represents just 219 girls!

We need to do more to increase the female participation in Computer Science

REAL PROGRESS MADE... BUT STILL ROOM TO GROW!



Despite evidence of improvement in girls' awareness and understanding of STEM careers since 2016, **progress towards gender equality in STEM remains slow.** This is clearly illustrated in enrolment in third-level STEM courses, which are the pipeline for the Irish STEM labour force.

We've come a long way! The IWish annual survey 2022 shows real improvement in girls' awareness and understanding of STEM careers since 2016. There's been a steady increase in % female new-entrants into STEM undergrad programmes (HEA, 2022) from 28.5% (2014) to 35.6% (2021). In the traditionally male-dominated Engineering, Manufacturing & Construction sector, % female enrolments have risen by 51%, from 14.7% (2014) to 22.2% (2021). We now rank 1st in the EU Digital Agenda Scoreboard 2021 (EC DG Connect, 2021) for the number of female STEM graduates per capita!

However, despite these wins, a stubborn gender gap persists in the third-level pipeline for the Irish STEM labour force, particularly in Engineering, Manufacturing & Construction and in ICTs.

FEMALE NEW ENTRANTS IN STEM UNDERGRADUATE PROGRAMMES, BY BROAD ISCED CATEGORY (HEA, 2022)

	2014	2021
All STEM disciplines	29%	36%
Natural Sciences, Maths & Stats	51%	59%
Engineering, Manufacturing & Construction	15%	22%
ICTs	15%	16%

The positive trend in female STEM undergraduate enrolments is heavily weighted by high and increasing % female enrolment in the Biological Sciences and in inter-disciplinary programmes, involving Maths, Stats and Natural Sciences. But in Physics and the Physical Sciences, % female enrolment has gradually declined since 2014 and women remain in the minority in Maths & Statistics.

FEMALE NEW ENTRANTS IN UNDERGRADUATE PROGRAMMES IN NATURAL SCIENCES, MATHEMATICS & STATISTICS SUB-DISCIPLINES (HEA, 2022)

	2014	2021
Biological Sciences	59%	67%
Physics/Physical Sciences	39%	31%
Maths/Stats	23%	32%
Interdisciplinary, involving Maths, Stats & Sciences	47%	60%



Only 29% of students taking Higher Level Leaving Certificate Physics in 2022 were female.

IT'S NOT JUST AN IRISH ISSUE!
2020 STEM graduate distributions in the US (NCES, 2021) and Ireland (HEA, 2022) show similarly low female representation in the Engineering sciences (US: 23%, Ireland: 17%) and ICTs (US: 22%, Ireland: 19%), with Biological Sciences female-dominated in both (US: 65%, Ireland: 61%). Unfortunately for the STEM labour force in Ireland, 2020 STEM entrant data provide no basis for improvement for several years.

No STEM careers feature in the 'Top 10 careers' in which 53% of girls participating in PISA 2018 expected to be working by age 30 (Mann et al., 2020) (PISA is a study that assesses the abilities of pupils aged 15 in reading, mathematics and science). What does this mean for the STEM labour market and for students continuing to target traditional labour sectors increasingly threatened by automation?



ONLY ONE-IN-FOUR PEOPLE WORKING IN STEM ARE WOMEN.

WHY DO YOU THINK THAT IS?



I don't know/not sure

"There aren't enough female role models for girls to be inspired by."

"I believe that more and more women will enter the field of STEM because of things like the IWish events."

"There's a lasting legacy of 'female jobs', like teaching, and 'male jobs', like engineering."

"People are brought up from a young age with an ingrained mindset, that men are the engineers, scientists and mathematicians, and women do more creative subjects... In order to change the number of women in STEM, we must start from Day 1 in primary school telling people about career opportunities."

"The subject options in girls secondary school are limited."

"I think that women aren't given the same support, and lack the confidence to go into STEM."

existing stereotypes

lack of role models

other

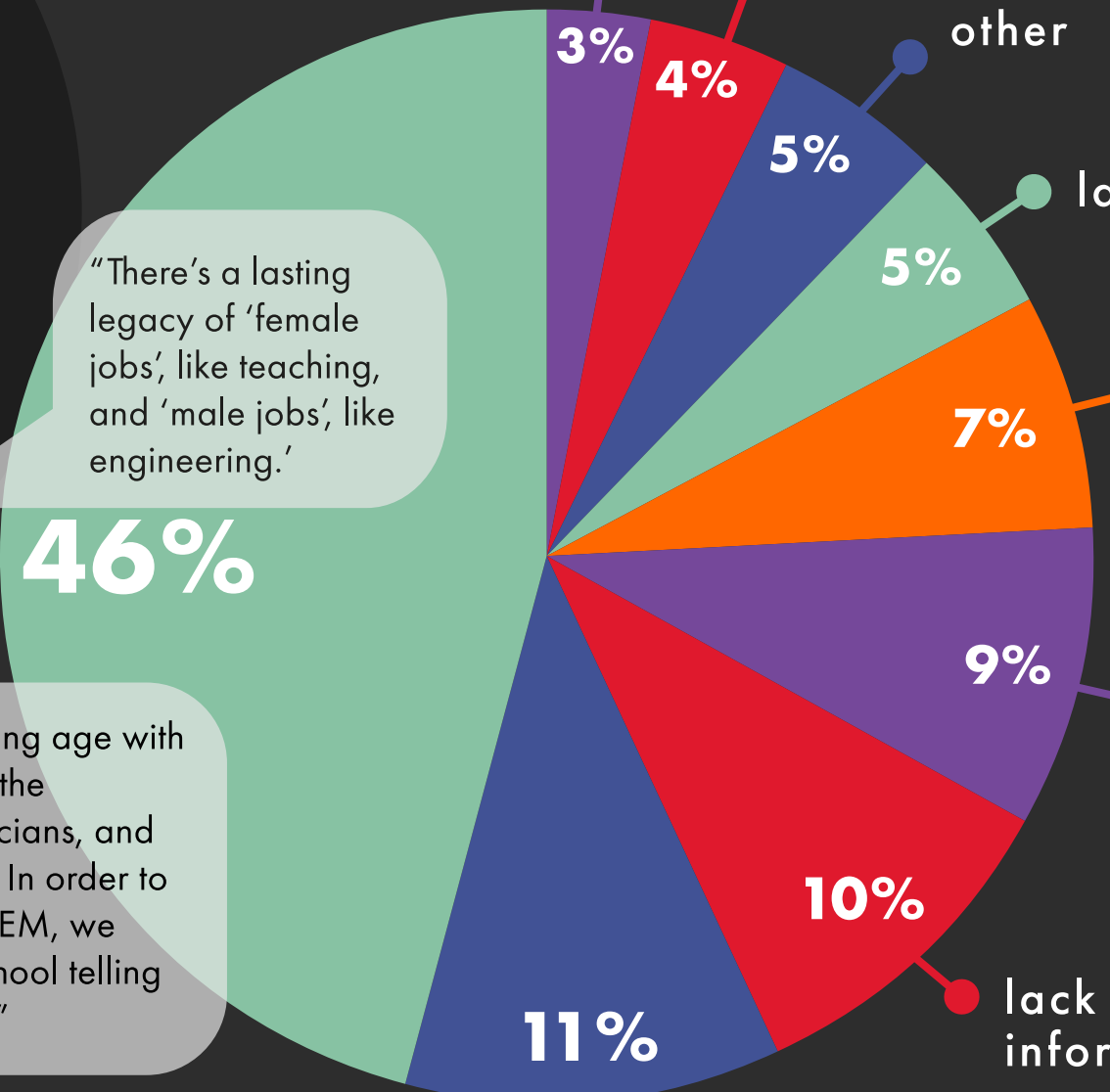
lack of interest

perceived lack of opportunities for women in STEM

lack of support

lack of information/access to STEM subjects

lack of confidence

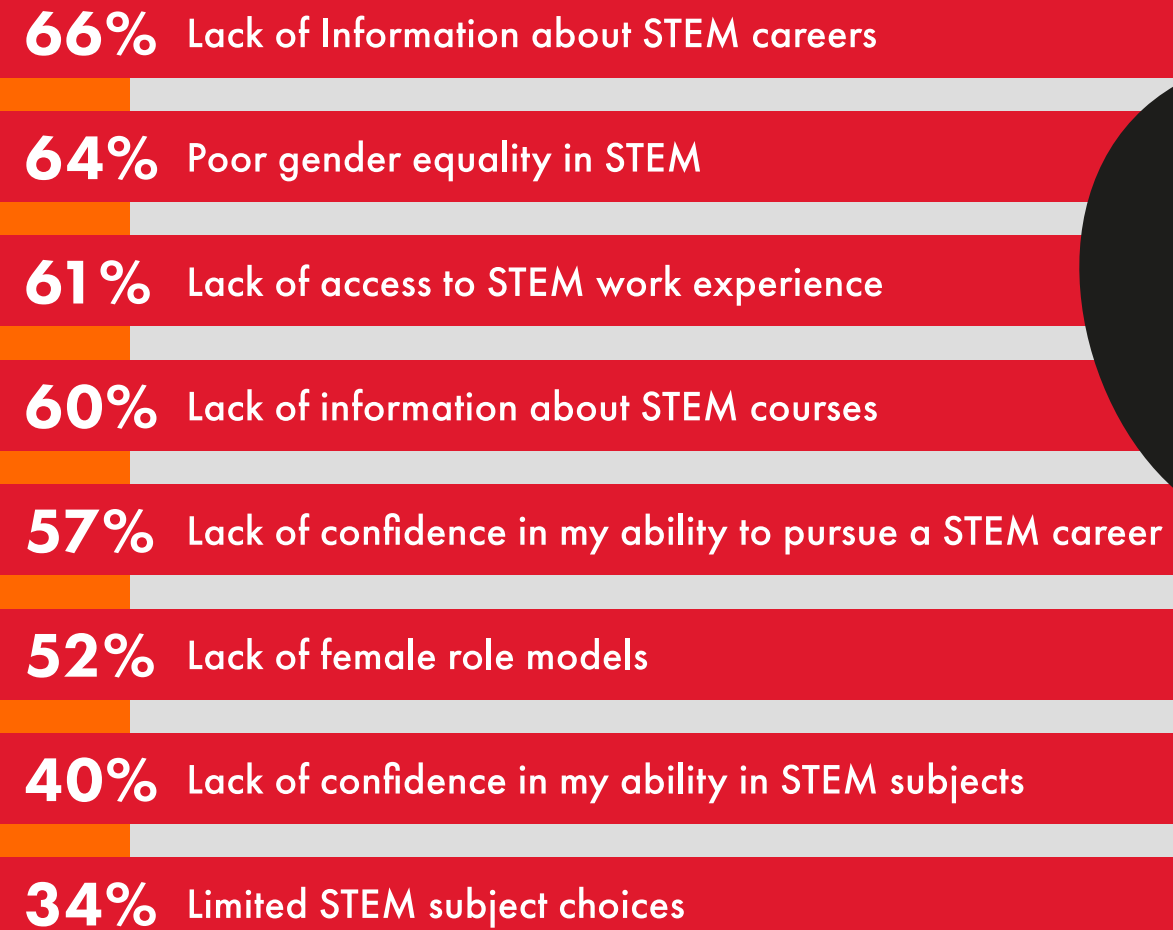


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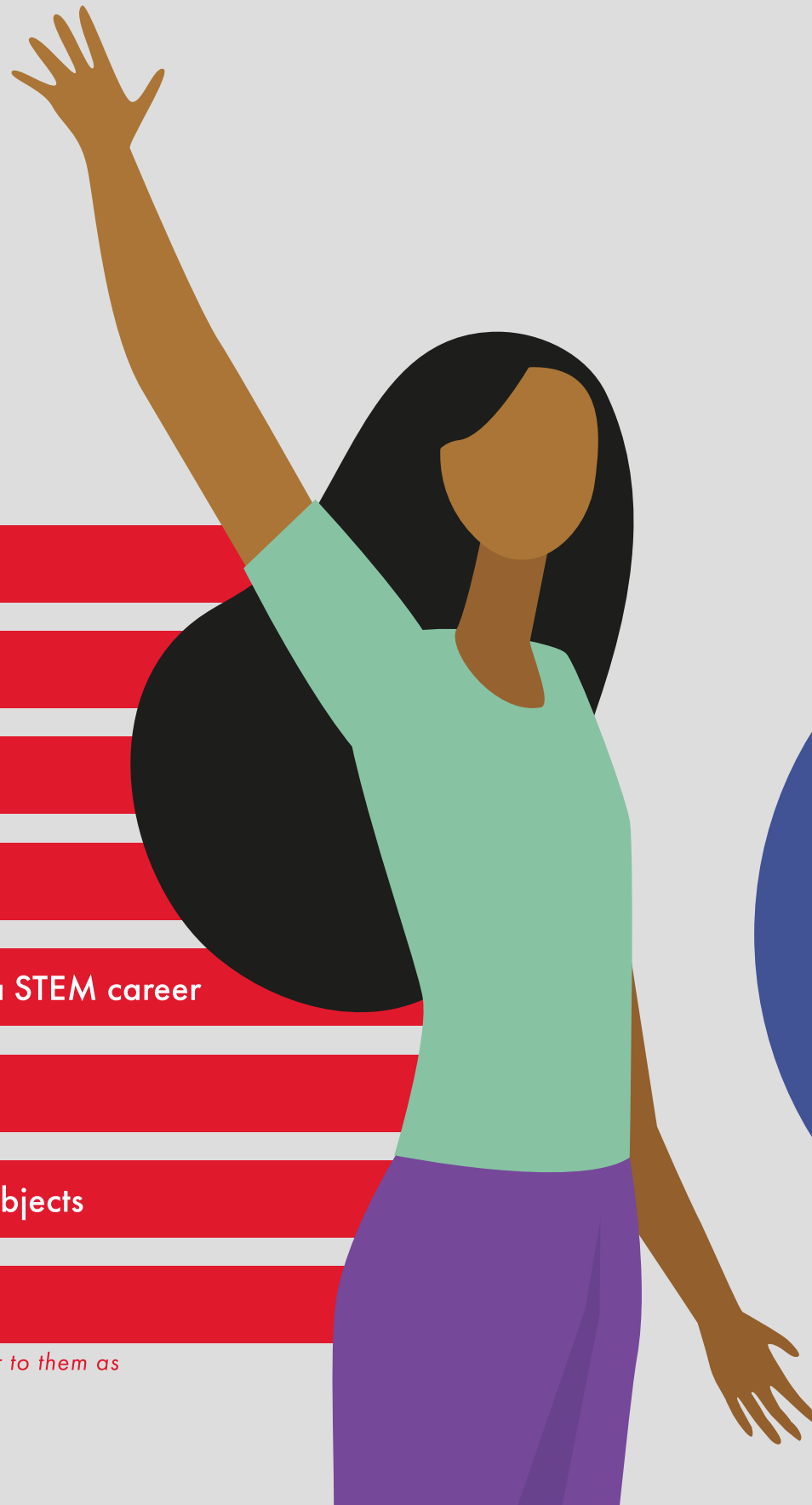
WHAT CAN WE DO TO CHANGE THESE TRENDS?

What barriers do IWish respondents see in front of them, as they consider STEM careers? What can we do, together, to break down those barriers?

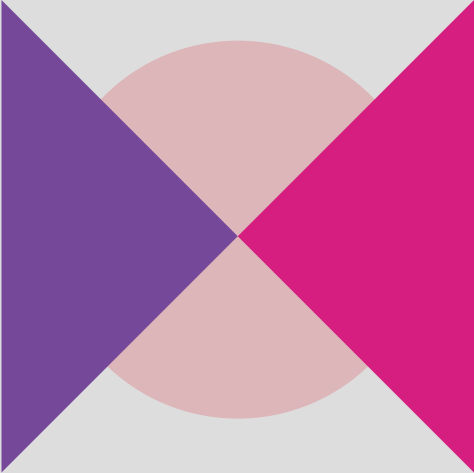
BARRIERS



% of survey respondents identifying the extent of the barrier to them as "quite a bit of a barrier", or "a big barrier".



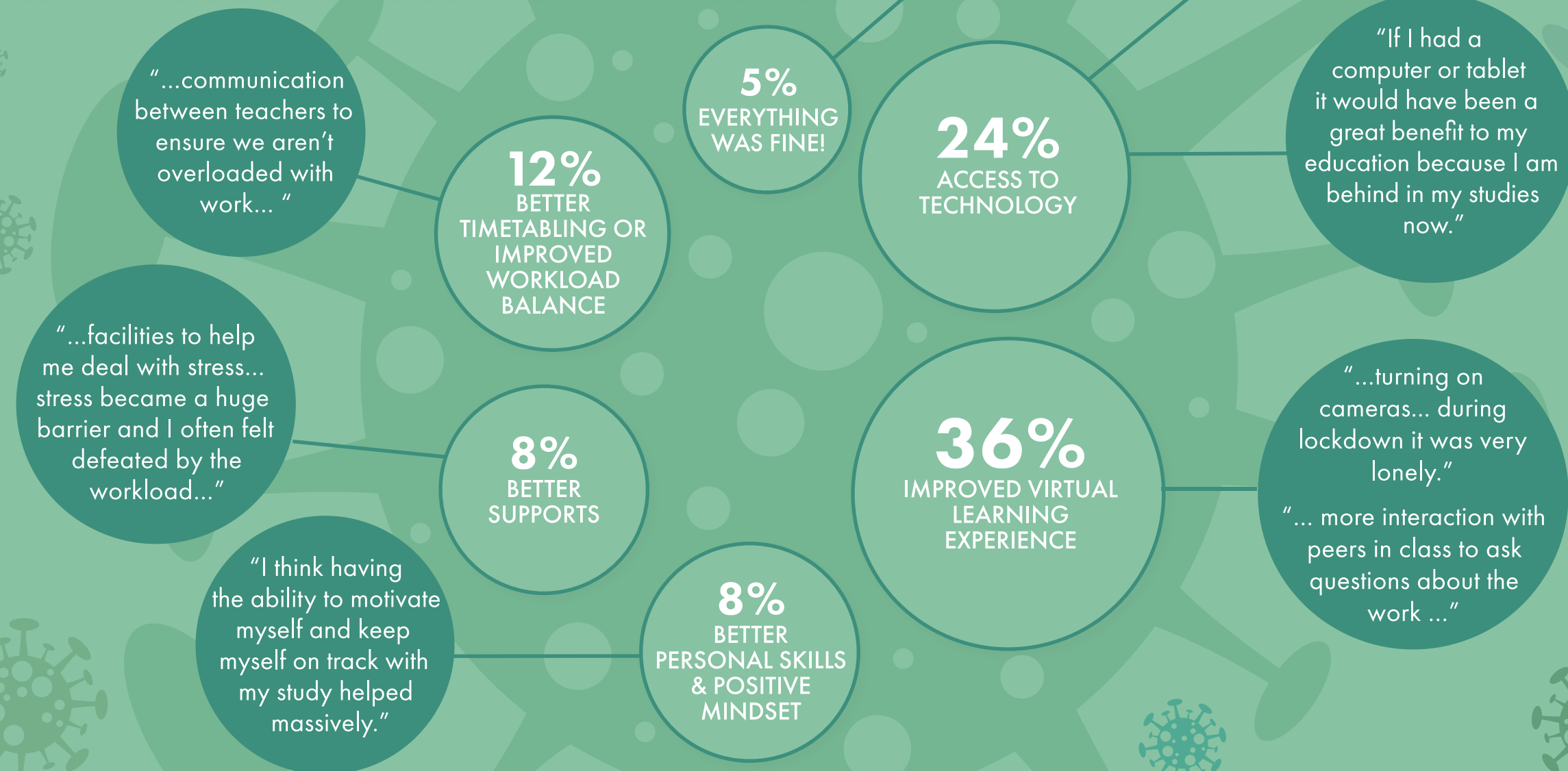
The IWish survey shows that female students are still heavily impacted in considering STEM careers by three interrelated factors: **gender stereotypes, lack of confidence in their own potential to succeed in STEM, and lack of information about STEM careers/courses/subjects.** These issues can only be effectively addressed through strategic efforts to tackle broader and more equitable engagement in STEM from early years education on, as recommended by the Dept of Education (2022). Increases in female participation in STEM degree programmes might be expected to increase the pool of female role models. However, UK-based evidence (Devereux & Delaney, 2022) indicates that gender inequalities persist even after graduation from STEM programmes, due to higher exit rates by women from STEM career paths. **This is why we created the IWish Deloitte Mentorship programme to continue our support for young women in STEM as they pursue their STEM dreams.**



PANDEMIC LEARNINGS

IWish 2022 respondents experienced learning through a pandemic like no other generation. This experience impacted all aspects of their learning, including their STEM learning. While memories of online learning were still fresh in their minds, we asked...

WHAT ONE THING WOULD HAVE IMPROVED YOUR LEARNING EXPERIENCE DURING THE PANDEMIC?



*** THE RISE OF PARENT POWER! LA PANDEMIC EFFECT!***

Since 2016, IWish Annual Survey respondents have told us that **teachers are the most important influencers for them in making subject choices**. This year, teachers were outranked! **Parents/close family members** were identified by 59% of respondents as the most, or second most important factor for them in choosing Leaving Certificate subjects.

PANDEMIC LEARNINGS

Only 43% of IWish respondents have a close family member who works in STEM, of whom 43% are parents/guardians. Of these STEM-informed adults, only 1 in 3 (37%) are female. **If we are to support the Scientists and Engineers of the future, we must also support the adults who influence their subject and career choices.**

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WHAT DO GIRLS VALUE IN A CAREER?

2016

- #1 AN INTERESTING CAREER
- #2 BEING GOOD AT IT
- #3 EXCELLENT JOB OPPORTUNITIES
- #4 CONTRIBUTING TO THE WORLD/HELPING OTHERS
- #5 WORK-LIFE BALANCE

AND HOW HAVE THOSE VALUES CHANGED?

2022

- #1 BEING GOOD AT IT
- #2 WORK-LIFE BALANCE
- #3 A GOOD SALARY
- #4 OPPORTUNITY TO TRAVEL
- #5 CONTRIBUTING TO THE WORLD/HELPING OTHERS

#DOIT

We don't yet understand the full impacts of the pandemic on learning at all levels. We do know that access to broadband and to appropriate devices for online learning were real barriers to significant numbers of students at second-level (Mohan et al., 2020) and in higher education (Cullinan et al., 2020), disproportionately affecting socioeconomically-disadvantaged students.

Through the IWish 2022 survey, second-level learners are signposting ways in which educators and policy-makers can harness the best that online learning can offer and ensure that every student can benefit from it. **Technology is no longer a luxury, it's a necessity!**

Post-pandemic IWish survey respondents echo GenZers in prioritising work/life balance and travel opportunities. They value well-paying jobs. Let's help them realise that STEM offers jobs aligned with their values!

Why is helping others, or contributing to the world now less important to students? Is it a lack of interest - or a lack of understanding of STEM? We call to all stakeholders to ensure that, from an early age, children come to understand the relevance and real power of STEM.

SINGLE SEX/MIXED SCHOOLS: WHAT DIFFERENCE DOES IT MAKE?

With good representation from both single-sex (55%) and mixed (45%) schools, the IWish survey provides an insight into differences in the perceptions of female TY students about STEM subjects and careers, depending on their educational environment.



STEM ISSUES WHICH GIRLS IN SINGLE-SEX SCHOOLS RATED AS MORE IMPORTANT THAN GIRLS IN MIXED SCHOOLS

BARRIERS TO PURSUING A CAREER in STEM

- Limited access to STEM subjects in school

FACTORS INFLUENCING LEAVING CERT SUBJECT CHOICE

- HL Maths: How good I am at Maths
- HL Maths: Amount of time required for HL Maths

Access to STEM subjects

FACTORS THAT WOULD ENCOURAGE MORE STUDENTS TO PURSUE STEM

- More confidence in their ability in STEM
- More gender equality in STEM
- More information about careers in STEM
- More information about STEM college courses
- More STEM subjects in School

Building STEM confidence through engagement

Access to STEM careers information



What we hear, when we listen to IWish respondents, is that girls who attend mixed schools have more information about STEM careers and STEM subjects and greater access to those STEM subjects than girls in single-sex schools. In single-sex schools, this lack of information and access is reflected in lower levels of student confidence in their own ability in STEM subjects and in their heightened awareness of STEM gender gaps. Counter-intuitively – and frustratingly – access to STEM subjects has little impact on subject choice (Delaney & Devereux, 2019). Girls in mixed-sex schools are typically less likely to take STEM subjects than girls in single-sex schools (IoP, 2012), suggesting that gender stereotypes surrounding subject choice may be reinforced in mixed-sex schools. And every school and every student is different: when US data for female progression into third-level were corrected for school/student characteristics (HERI, 2018), girls from mixed schools show no appreciable advantage in terms of STEM career aspirations, or self-confidence in STEM. Coeducation will not close the STEM gender gap!

#DREAMIT

Equality of access for all students – regardless of gender – to STEM information, engagement, and role models, from early years education onwards.

WE CAN REALISE THE I WISH DREAM WITH A FEW SIMPLE STEPS

PRIMARY LEVEL

- **Infuse stories featuring women in STEM** in course work across all subjects – to help counteract gender stereotyping from an early age.
- **Include STEM community based projects** in the sixth class curriculum – hands on projects showcasing the power of STEM can encourage girls to take STEM subjects at secondary school.



SECOND LEVEL

- **Formalise introductions to and connections with locally based female STEM professionals** as part of the curriculum in first year – role models are a key influencer for young girls.
- **Connect future career opportunities** with STEM classes throughout Senior Cycle? – the lack of information on STEM courses and careers has a negative impact on higher level subject choices.

NATIONAL INITIATIVE

Establish a **Maths and Science Initiative** to look at ways to better showcase the power of STEM to girls and how schools, companies, professional organisations and higher education institutions can work together to **mentor and empower young women entering STEM to ensure they stay and excel.**



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The team at IWish would like to thank our private and public sector partners, and the Higher Education institutes, school teachers, and incredible network of IWish alumnae for your loyalty and support. You are helping to provide inspiration and encouragement to the STEM women of the future.

Special thanks to Prof Ciara Heavin at Cork University Business School, UCC, Dr Samantha Dockray, Senior Lecturer, School of Applied Psychology, UCC, Eadaoin Whelan, School of Applied Psychology, UCC, and Dr Patricia Kieran, for their incredible insights and invaluable assistance on the data analysis.

Designed by Kim McCullough at Minti Studios.

ANYTHING IS POSSIBLE

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www.iwish.ie



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