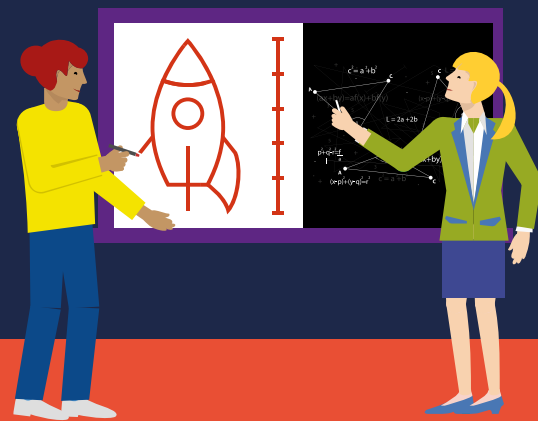


Why Europe's girls aren't studying STEM

Region-wide research of 11,500 women reveals how we can get more young women into science, technology, engineering and math.



Introduction



Across 35 European countries¹, fewer than 1 in 5 computer science graduates are women. Interest in science, technology, engineering and math (STEM subjects) drops off far too early. In fact, the OECD's Programme for International Student Assessment (PISA)² reveals that boys are far more likely than girls to imagine themselves as ICT professionals, scientists or engineers. This is a major issue for both the current and future jobs market: Europe could face a shortage of up to 900,000 skilled ICT workers by 2020 according to the European Commission³. If we don't help more young women to embrace STEM, we'll never close this widening skills gap. Nor will we ensure students are set up for success in a world where STEM skills are increasingly important.

This is something we're committed to changing, both internally and in the wider world.

That's why we commissioned new Europe-focused research into why the region's young women aren't studying STEM. This report will answer the important questions of exactly when girls' interest in STEM subjects begins to decline, and why. It will also make recommendations for policymakers, educators and private sector executives on how to get more young women interested in these fields. After all, when we encourage girls to pursue science and technology we double our potential to solve problems – essential when more and more jobs are being created to address big global challenges.

The research spans 12 European countries: Belgium, Czech Republic, Finland, France, Germany, Italy, Ireland, Netherlands, Poland, Russia, Slovakia, and

the UK. The result is what we believe to be the most in-depth European study conducted on this topic to date⁴.

The main findings show:

- There is a narrow, four-year window of opportunity to foster girls' passion in STEM subjects in Europe
- The country where young women live has a major impact on their attitudes to STEM. Results varied wildly from country to country. In some places, confidence is a major barrier, while in others, peer approval or lack of role models is holding them back most
- There are five major drivers impacting girls' interest in STEM subjects. These include encouragement and mentorship; gaining practical experience; and having visible role models
- Girls believe anything is possible, but only if they are treated the same as boys. Young women are confident that their generation is the first in which men and women will be truly equal in all areas of society, but acknowledge that men and women are treated differently in STEM jobs – and this perceived inequality is actually putting them off further STEM studies and careers.

¹ OECD Gender Data Portal, [Where are tomorrow's female scientists?](#)

² PISA 2015, [Results in Focus](#)

³ European Commission [Digital skills, jobs and the need to get more Europeans online](#)

⁴ We partnered with an academic in this field, undertook a comprehensive literature review, held focus groups with 54 girls in nine countries, and ran a quantitative survey of 11,500 girls across 12 markets

Our Approach



Working with Professor Martin W Bauer from the Department of Psychological and Behavioral Science at the London School of Economics (LSE), we embarked on focus groups with 54 girls in nine of the markets (the UK, Ireland, France, Germany, Finland, the Netherlands, Italy, Poland, and Russia) who shared their views on STEM-related subjects. These insights were used to develop a quantitative survey of 11,500 girls across 12 countries, to explore the age at which girls opt out of these subjects, and why they do so.

A great deal of work has already been done by many committed researchers and organizations on this topic. A comprehensive review of literature from the academic fields of sociology, psychology and educational science revealed 95 significant studies from across Europe examining some of the drivers that prevent girls from becoming more involved in

STEM subjects. However, this report brings together qualitative and quantitative findings from 12 markets, for the first time.

We hope that insights gained from this research will help policymakers, educators and companies like us better understand and overcome the challenges young European women face when it comes to pursuing these fields. Our current demographics show that there's no easy path to achieving a more diverse workforce⁵. That's why we're committed to continued investment in STEM programs to help fill the talent pipeline with the amazing potential of more young women. It's also why we have outlined education-focused policy recommendations for creating a more diverse and skilled workforce as part of our [Cloud for Global Good](#) initiative.

⁵ [Microsoft Global Diversity & Inclusion report, 2016](#)



Foreword

by
Professor
Martin W Bauer
Department of
Psychological and
Behavioral Science

London School
of Economics

Microsoft has adopted a critical issue as part of its commitment to Corporate Social Responsibility, seeking to investigate and address the causes of the gender gap in STEM (Science, Technology, Engineering and Math) careers. Computer science, a field that women once pioneered, has become largely a male-dominated career path. The very word "STEM" stands for attempts to raise awareness, create enthusiasm and mobilize resources for competencies that are in short supply, and the challenge is to open up as-yet untapped reserves. Since the 1990s we have seen a massive expansion of Higher Education in many countries. The problem is no longer lack of talent, but talent in the right career path. And one of the key issues is the fact that male and female students continue to make different career choices. Conformity to social expectations, gender stereotypes, gender roles and lack of role models continue to channel girls' career choices away from STEM fields.

This imbalance is the result of many bottlenecks. In early education, girls and boys are equally touched by the wonders of science, technology and engineering. But as adolescents move from primary to secondary schools, things begin to change; girls become much less interested in these topics. A few years later, as large numbers enter university, again these subjects are more popular among boys than girls. And as students complete their studies and think about doing a PhD, it is boys that hang on in these fields. Finally, once in a STEM career, girls are more likely to leave and many of them do not return. So, at the recruitment, retention and recycling stages women are less likely to proceed than men. At all these transitions, the gender imbalance is influenced by the legacy of early life experience and the surrounding climate of social opinion.

This study makes a valuable contribution with important and necessary research, both quantitative and qualitative, into the experiences of women's career choices. This survey and interview study of many hundreds of young European women under the age of 30 brings to light how many of them think about their careers. It should be commended for illuminating comparative and useful observations on what determines these early career choices and how they might be supported to encourage more women into these professions. As such, this report should be read by the increasing numbers of people who care about STEM skills in a modern society, and care at the same time about removing obstacles to universal gender equality.

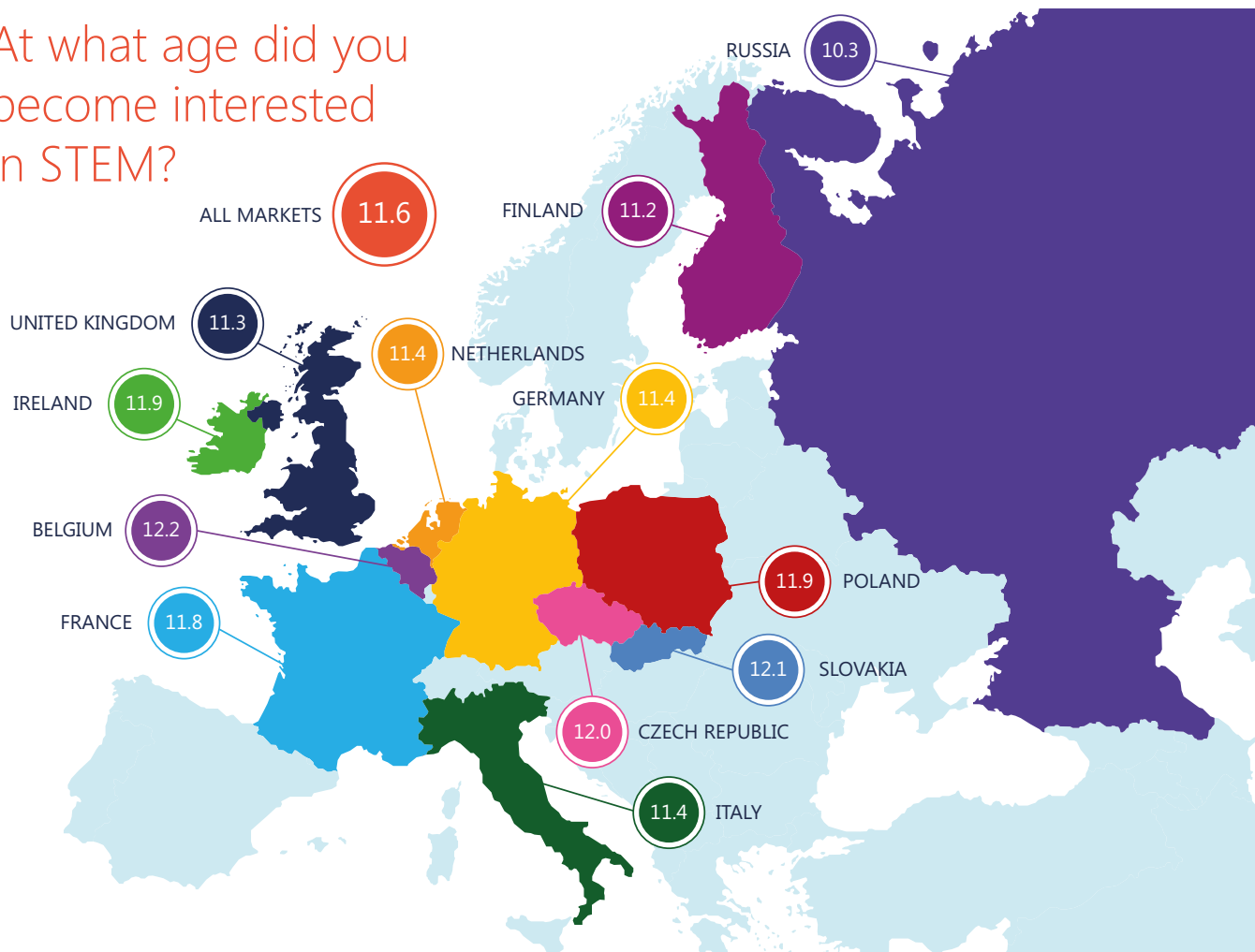
What's new



A four-year window of opportunity

For the first time, we can say decisively that most young European women become attracted to science, technology, engineering and math between the ages of 11 and 12. But that interest then drops off significantly between 15 and 16, with limited recovery. This means that governments, teachers and parents only have four or five years to nurture girls' passion before they turn their backs on these areas, potentially for good.

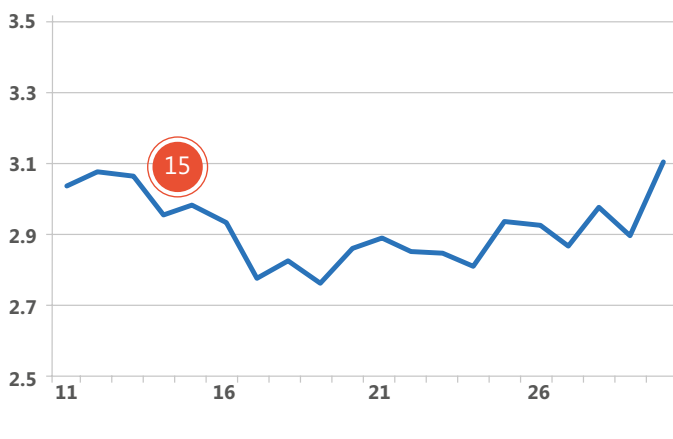
At what age did you become interested in STEM?



Graph 1. We asked school girls (11-18) 'At what age did you become interested in STEM?'



At what age do Europe's young women lose interest in STEM?



Graph 2. We asked school girls (11-18) and young women (19-30): 'Rate on a scale from 1 to 5: how interesting do you consider STEM subjects and at what age did you start feeling this way?'

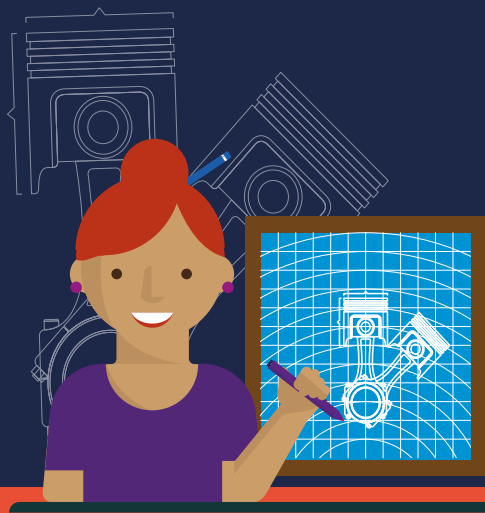
We asked the same group of girls to tell us what they thought about humanities subjects. These additional questions revealed that interest in humanities subjects drops off at the same age, but that girls regain interest in them much more quickly, compared to STEM subjects.

Active encouragement in school and at home plays a vital role in keeping more young women interested in science and technology. Those we spoke to claimed that they feel accepted, valued and taken seriously when teachers and boys in their class openly acknowledge their skills in a STEM subject. Nearly half (41 percent) said their teachers often talk to them about these subjects, or encourage them to pursue careers in these areas. Similarly, 38 percent were encouraged by their parents.

That's a strong start, but more can be done. With more female role models, both in the classroom and at home, there's a real chance to turn the tide on this trend.

” I like science subjects. I know that I am talented in them and this boosts my self-confidence ”

15 year old, Ireland



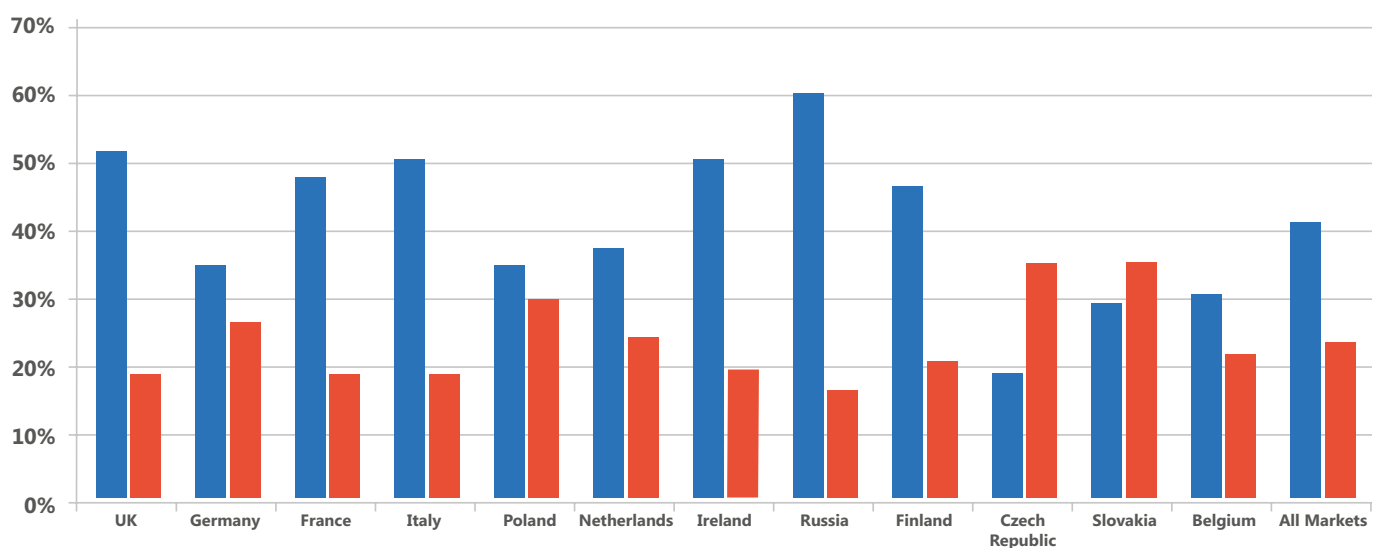
Attitudes vary significantly by country

As a young woman, where you live has a major impact on your attitudes to STEM subjects – both positive and negative. We found that in Russia, interest begins at age 10, a year before the rest of Europe, and Russia seems to be achieving the right balance when it comes to encouraging more girls to pursue these careers. In fact, 60 percent of girls in Russia claimed teachers always talk to them about these topics.

But on the other hand, there's a lack of support at home in countries like Czech Republic and Slovakia, where only 16 percent and 26 percent of girls said their parents engage with them on STEM. This could be one of the factors hindering their interest, which doesn't start until the age of 12, compared to the European average of 11.

What's more, over half (55 percent) of Russian girls feel there are encouraging role models out there for them, compared to, for example, just 35 percent of Dutch respondents.

Are teachers engaging their pupils in STEM?

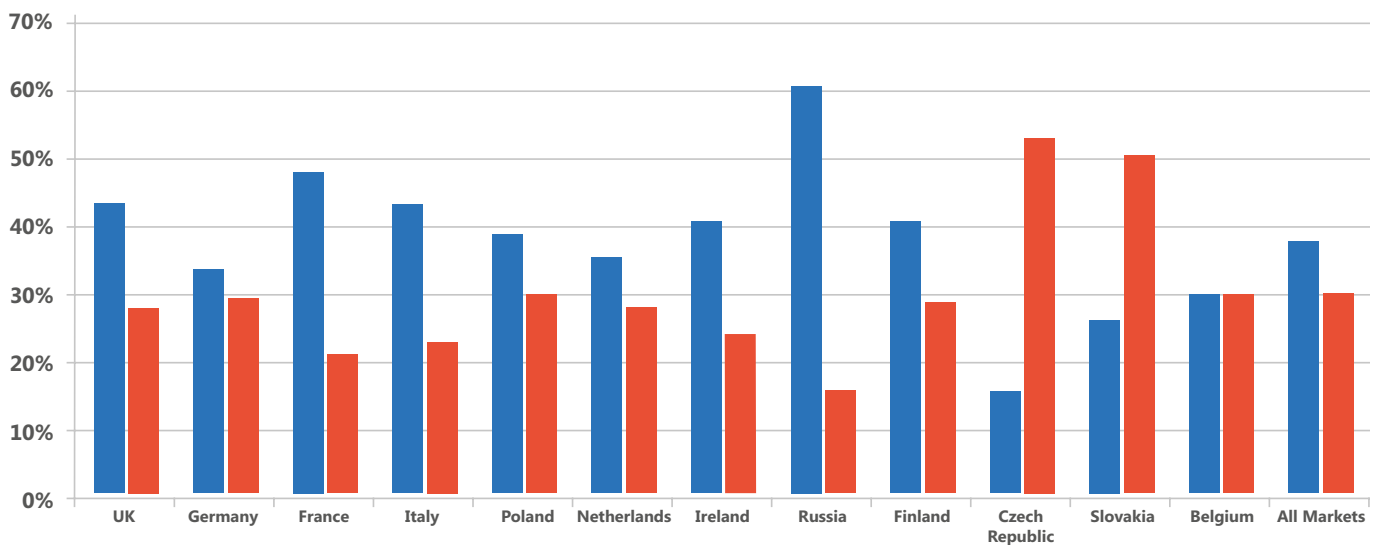


Graph 3. We asked school girls (11-18) to rate on a scale from 1-5: do you agree or disagree with the following statement: 'My teachers always talk to me about STEM subjects and encourage me to pursue STEM'. We used a scale where 1 = "strongly disagree" and 5 = "strongly agree".

■ Strongly agree or agree
■ Strongly disagree or disagree



Are parents encouraging their daughters to pursue STEM?



Graph 4. We asked school girls (11-18) to rate on a scale from 1-5: do you agree or disagree with the following statement: 'Both parents often talk to me about STEM and encourage me to pursue STEM'. We used a scale where 1 = "strongly disagree" and 5 = "strongly agree".

■ Strongly agree or agree
■ Strongly disagree or disagree

In Russia and Finland the curriculum is perceived to be gender neutral. Finland goes one step further, with 62 percent of young women arguing that they also understand how these topics are relevant to their life and the kinds of jobs they could get. This strategy is clearly working. PISA research⁶ found that Finland is the only country where girls are more likely than boys to be top performers in science. Conversely, 33 percent of girls in Germany believe that all STEM-related examples in school are crafted towards boys' interests. And only a quarter of Dutch respondents claimed to understand how these disciplines are important to their life and future.

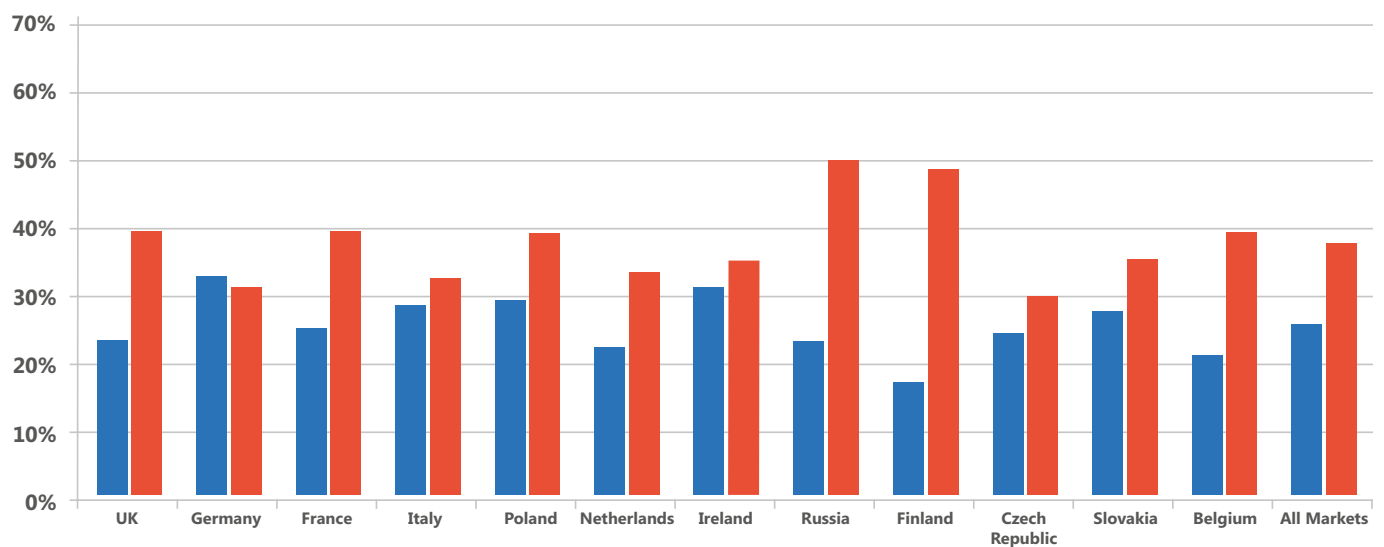
” A good teacher gives life to the subject ”

11 year old, France

⁶ PISA 2015, [Results in Focus](#)



To what extent are STEM subjects modelled for boys?



Graph 5. We asked school girls (11-18) to rate on a scale from 1-5 if they agreed or disagreed with the following statement: 'All examples that were ever given to me about STEM are mostly about what boys like.' We used a scale where 1 = "strongly disagree" and 5 = "strongly agree".

■ Strongly agree or agree
■ Strongly disagree or disagree

Five biggest factors driving girls' interest



With such a small window of opportunity before interest starts to wane, it's vital for teachers and parents to actively encourage any girl with an early interest in STEM. The following drivers, listed in order of importance, can offer some practical steps to sustaining young women's interest in STEM:

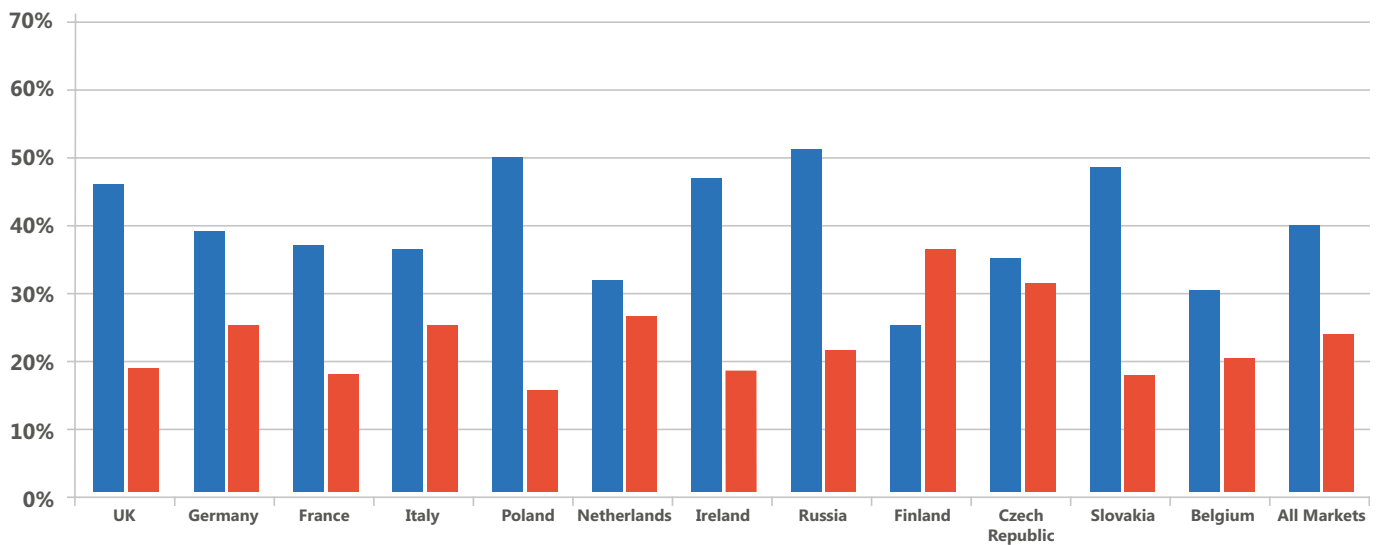
- 1. Female role models**
Having visible female role models sparks girls' interest in STEM careers and helps them to picture themselves pursuing these fields.
- 2. Practical experience and hands-on exercises**
The more practical experiences a girl receives during her education – inside or outside the classroom – the higher her interest in STEM. Yet 39 percent say they're not getting enough of either of these. Creativity in the classroom is also key: girls who like STEM enthuse about being able to choose their own projects or go on field trips where STEM subjects are brought to life.
- 3. Teacher mentors**
When educators talk to girls about STEM subjects and actively encourage them, girls become more attracted to these disciplines. Over half (56 percent) of those we spoke to said they'd like to receive more encouragement from teachers.
- 4. Real-life applications**
Girls become more interested in STEM once they're able to conceive what they can do with these subjects, how they can be applied to real-life situations and how relevant they might be relevant to their future.
- 5. Confidence in equality**
Young women are more likely to pursue STEM careers when they are confident that men and women will be treated equally working in these disciplines.



“ We need to do more practical experiments so that we can see how things happen in the real world ”

13 year old, Poland

How many girls gain practical experience in STEM at school?

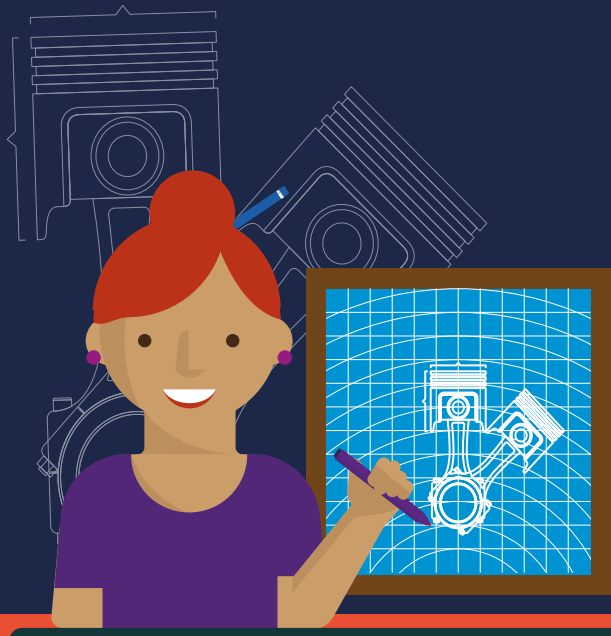


Graph 6. We asked school girls (11-18) to rate on a scale from 1 to 5: do you agree or disagree with the following statement: 'I am able to get practical experience with STEM activities such as math riddles, physics experiments or coding challenges'. We used a scale where 1 = "strongly disagree" and 5 = "strongly agree".

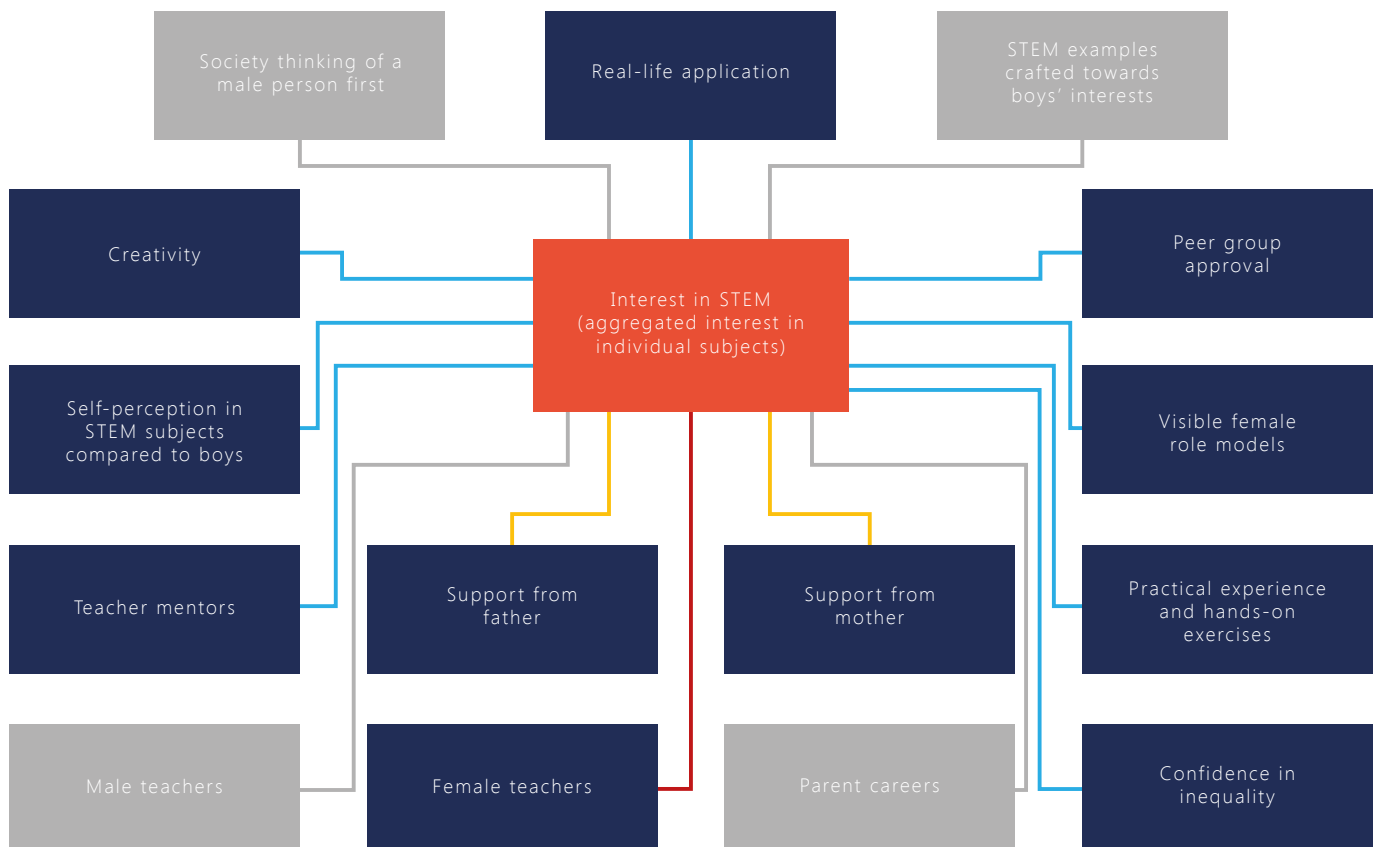
■ Strongly agree or agree
■ Strongly disagree or disagree

“ When we do experiments, we learn new things that matter in our daily lives ”

11 year old, France



Which factors have the biggest impact on girls' interest in STEM?



Graph 7. We created an aggregated multi-regression analysis to identify and statistically prove the key drivers influencing girls' interest in STEM-related subjects.

Statistically important effect
 Statistically unimportant effect

Strong impact
 Moderate impact
 Weak impact
 Negligible

Contradictions: anything is possible, but concerns persist

Through our research we uncovered a common belief among young European women: that their generation is the first in which men and women will be truly equal in all areas of society.

In fact, girls expressed a huge amount of confidence in their own STEM abilities. Across Europe, between 46 to 68 percent of girls rejected the idea that they will never be as good at STEM subjects as boys.

But despite this “girls can do anything” attitude, gender disparity in the workplace is still a concern for many. In fact, 59 percent admitted they would feel more confident pursuing a career in a STEM-related role if they knew that men and women have equal opportunities. This trend is even more pronounced in the UK and Ireland. Here, 70 and 73 percent of respondents agreed with this statement, but only 42 percent said they could imagine themselves pursuing a related career.

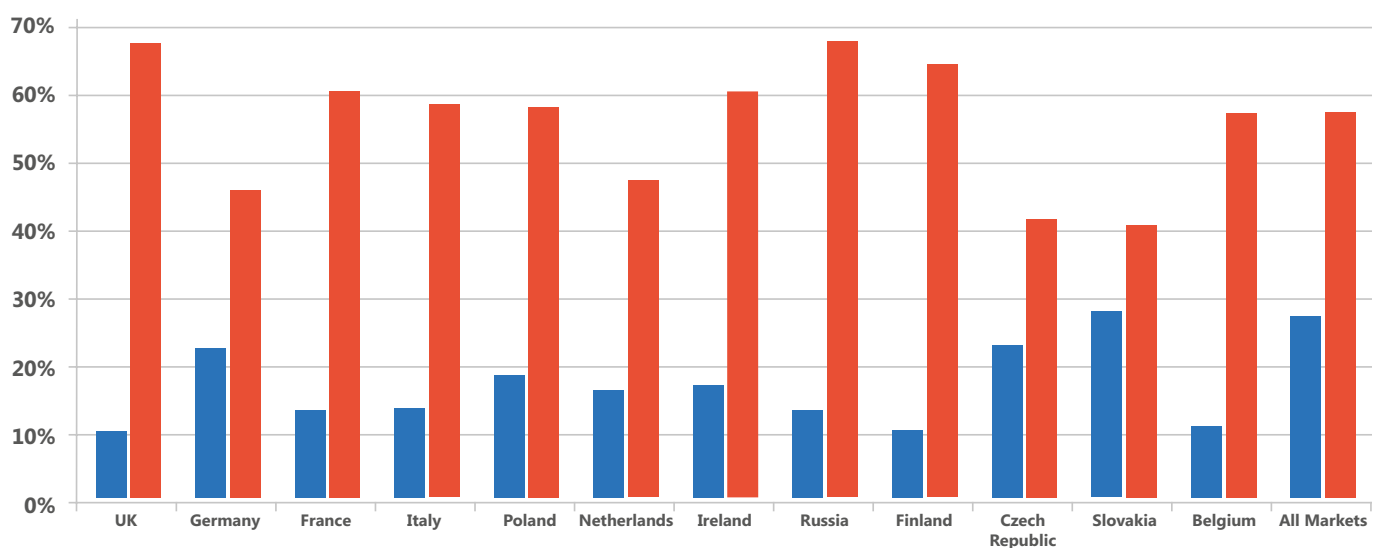
” It might be that at school you are not seeing the full scope of what you can do in science. You could study maths and end up working in biology ”

Sara-Jane Dunn,
Scientist, Microsoft Research

” Our generation will be the first in which all men and women will be truly equal ”

14 year old, Netherlands

How do girls rate their ability in STEM subjects compared to boys?

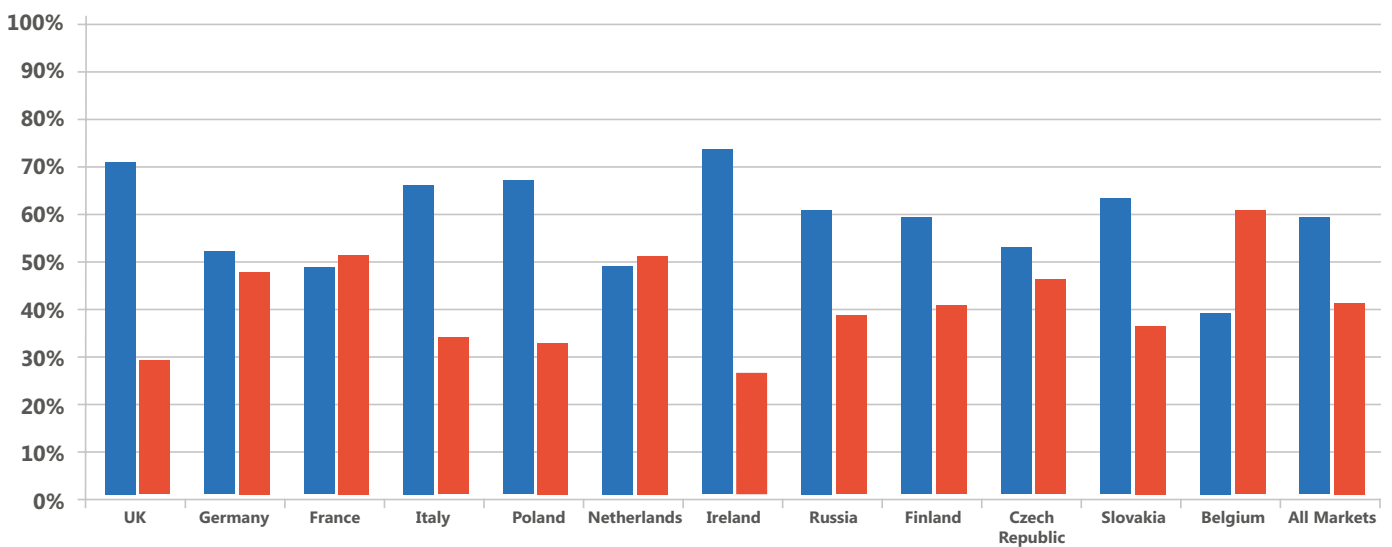


Graph 8. We asked school girls (11-18) to rate on a scale from 1 to 5: do you agree or disagree with the following statement: 'I will never be as good at STEM subjects as boys'. We used a scale where 1 = “strongly disagree” and 5 = “strongly agree”.

■ Strongly agree or agree
■ Strongly disagree or disagree



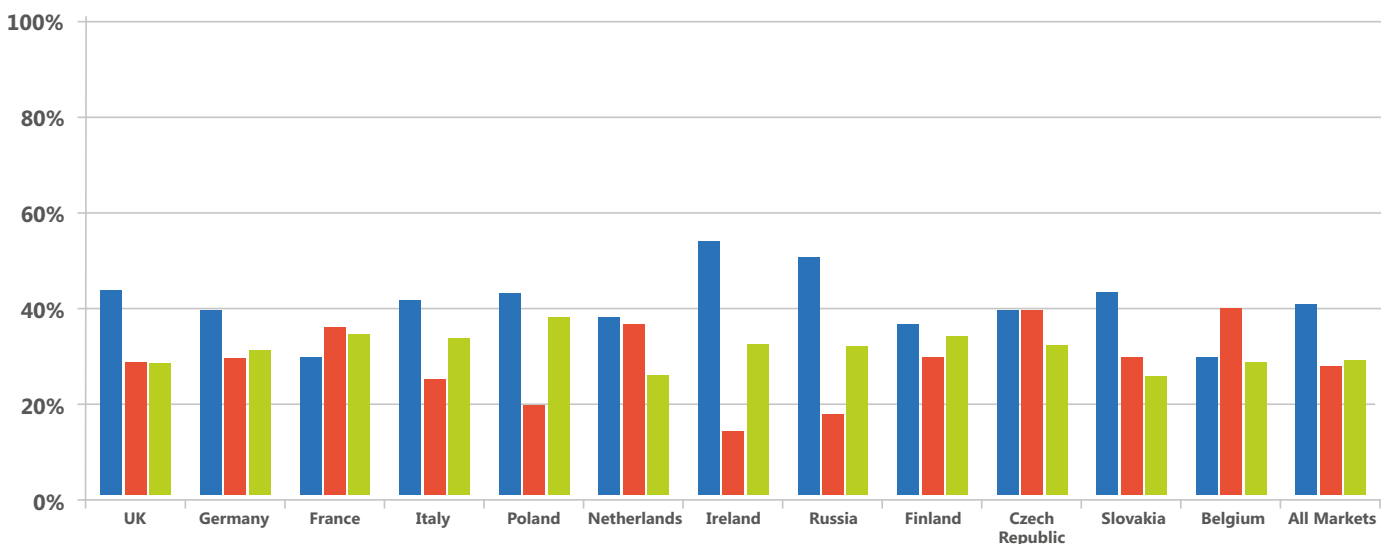
Would more girls pursue STEM if men and women were equally employed?



Graph 9. We asked school girls (11-18): 'Would you feel more confident to pursue a career in STEM if you knew that men and women are equally employed in STEM disciplines?'

■ Strongly agree or agree
■ Strongly disagree or disagree

How many girls are thinking of pursuing a career in STEM?



Graph 10. We asked school girls (11-18): 'Can you imagine yourself pursuing a career in one of the STEM disciplines?'

■ Yes
■ No
■ Don't know yet

Turning insight into action



Recognizing the need to equip more people with the right skills for our digital era, we recently published a book called [A Cloud for Global Good](#), which includes policy recommendations for creating a more inclusive society – from getting computer science on the curricula, to fostering public-private partnerships, or investing in lifelong skills training. This is important because the jobs of today and tomorrow – whether you’re working on cancer research, finding renewable energy, or designing the cars of the future – will all require a basic understanding of new technologies, including the cloud. We believe that all citizens should be able to take full advantage of the benefits and opportunities promised by a new generation of technology.

At Microsoft, our continued success depends on the diverse skills, experiences, and backgrounds that our employees bring to the company. A diverse and inclusive workforce will yield better products and solutions for our customers, and better experiences for our employees. We hope the insights revealed in this research will help companies like us, as well as educators and policymakers take practical steps to get more youth – particularly young women – interested in science and technology. With this in mind, we developed a series of recommendations across the public and private sector.

Key actions include:

Policy

Integrate digital literacy into the broader curriculum.

Some European countries, like the UK and Finland, are making successful first steps integrating coding and computer science education into their national curricula to drive interest in STEM.

Create more opportunities for computer science teaching in and out of the classroom.

While curricula reform across Europe takes place, we must not lose sight of the tangible ways the public and private sector can help young women to build their skills. Cross-industry initiatives like *Europe Code Week*, *Hour of Code* and *Girls in ICT Day* are helping to introduce young women to a more digital way of thinking and ultimately nurture a passion for STEM education.

Place a greater focus on STEM education as part of the Digital Skills strategy.

Earlier this year the European Commission adopted its *New Skills Agenda for Europe*. It recognizes the current mismatch between the skills employers need and those job-seekers have, and recommends a minimum level of digital skills for all jobseekers. By putting more emphasis on STEM education across Europe, we will help ensure that women have the right skills to succeed in the future.

” We need to be good
in science subjects
because it will
determine our
future jobs

17 year old, Russia



Education

Use new technologies to spark girls' interest.

Introducing technologies can help students to create and explore virtual worlds, learn basic coding and develop social skills.

Future-proof teacher training programs and make teaching more collaborative, immersive and social.

All teachers need to feel comfortable and supported in bringing technology into their classrooms to make learning more engaging.

Introduce more creative and hands-on experiences in classes.

One of the things young girls love is creativity and practical experiences. Hardware like the BBC micro:bit gives school kids a small, code-able device that can be programmed to light up using a series of tiny LEDs.

Classes must be gender neutral.

Creating an interactive and gender-neutral environment in classes helps young women to participate and feel engaged.

” Practical examples of what I have learned in physics help me better understand what I'm studying

15 year old, France

” STEM subjects are a great way to really help make an impact in the world

Camilla Longden,
Software Development Engineer
at Microsoft Research

Private sector

Partner with governments and the non-profit sector to support digital literacy initiatives.

As computer science becomes fully integrated into curricula across Europe, the private sector and NGOs have a critical role to play in bridging the digital skills gap.

More visible role models.

We need more role models from STEM industries who can inspire the next generation of women. This is something Microsoft is both passionate about and committed to supporting. Ultimately, sharing in the experiences and achievements of European female scientists, engineers, technologists and mathematicians will help girls picture themselves pursuing a career in these areas.

Methodology



We undertook a comprehensive literature review which examined all current available knowledge from academia, the corporate world and the NGO sector in Europe – covering girls' interest and participation in STEM subjects, with a focus on scientific findings. Scientific Journal Rankings and the Economic Research Institute were used to classify and rank the quality of the information obtained where possible.

This revealed that:

- The research field is vast but heterogeneous and without exchange between disciplines
- Multi-country research across Europe is rare
- There is almost no research that tracks developments over time
- Many commentators rely on data gathered by governments or supranational bodies
- No clear experts emerge when looking at the quantity of research conducted in high quality journals. Experts are self-proclaimed
- While a “drop off” point is implicitly assumed, it had not been scientifically proven

- Key drivers of interest and participation come from psychology, sociology and educational science, but they are not the only contributing disciplines

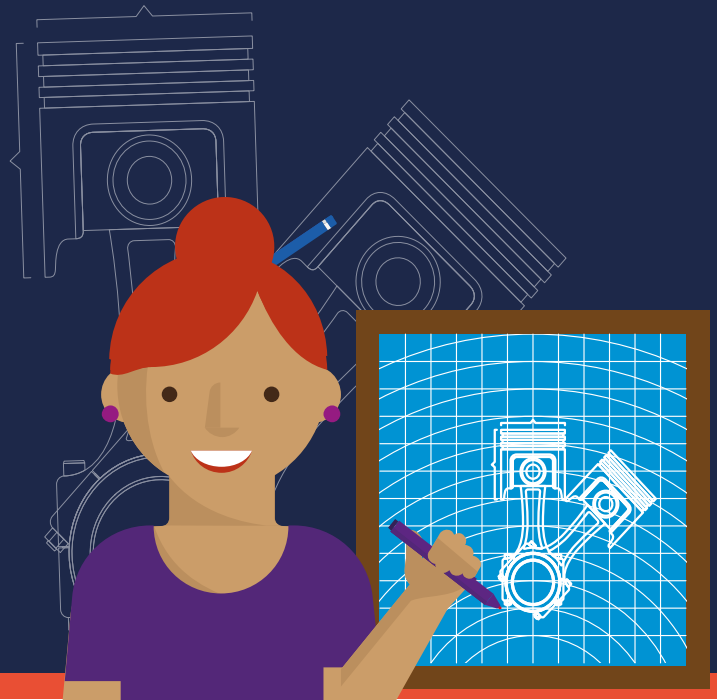
We held focus groups with **54 girls in nine countries** (Finland, France, Germany, Italy, Ireland, Netherlands, Poland, Russia and UK) to ask for their views on science, technology, engineering and math-related subjects. We then used those insights to drive a **quantitative survey of 11,500 girls across 12 markets** (Belgium, Czech Republic, Finland, France, Germany, Italy, Ireland, Netherlands, Poland, Russia, Slovakia, UK) to prove, with data, the exact age at which girls opt out of these subjects, and the most important reasons why. We also paired up with an academic – Martin Bauer, Professor of Social Psychology and Research Methodology at London School of Economics (LSE) – who worked with us to construct the approach to the survey and analyze the findings.

The ‘Why’ Model

We created an aggregated multi-regression analysis to identify and statistically prove the key drivers influencing girls' interest in STEM-related subjects. Our quantitative survey included a ‘Why’ section with questions about their practical experiences, visible role models, encouragement by teachers and parents and how these topics are relevant to their daily lives. In order to capture and measure each girl's attitudes thoroughly on each of the ‘Why’ dimensions, we used a 1 to 5 scale, where 1 = “strongly disagree” and 5 = “strongly agree”. We believe technology is a powerful force for improving people's lives. We see it every day

in our work—whether it's students discovering the magic of creating something new with code or health workers who use cloud services to better diagnose illnesses, collaborate with colleagues, and treat patients.

But technology can only change people's lives when they have access to the capabilities and benefits it provides. Right now, half the world does not. For them, the vast ocean of knowledge and opportunity that the technology revolution offers is out of reach. At Microsoft, we are working to change that.



Microsoft Philanthropies

We're investing our greatest assets – our technology, people, grants, and voice – to advance a more equitable world where the benefits of technology are accessible to everyone. Technology should be an equalizing force in the world, not one that drives people further apart. Through our philanthropic investments and partnerships, we are working to create a better future that everyone can share in.

For more information about Microsoft Philanthropies, please visit:

<https://www.microsoft.com/en-us/philanthropies/>

For further information about Microsoft's diversity and inclusion programs, please visit:

<https://www.microsoft.com/en-us/diversity/>

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