Annual Insights Report

2020 - Pilot study

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Introduction

There is a persistent lack of women in technology and engineering in the UK. Women make up 19% of the tech workforce [1] and only 8% of professional engineers [2]. There's also a lack of women in many creative sectors. Only 28% of the UK's games workforce are women [3], and across the wider creative media industries, it's 36% [4].

TECgirls was founded in November 2019 with the aim of tackling this gender imbalance in Cornwall's Technology, Engineering and Creative Digital (TEC) workforce. We believe that fair representation leads to better products, better services, better infrastructure, a better environment, and better life chances for people of all genders.

We aim to address the imbalance by inspiring a passion for TEC among primary-age (6–12) girls and children of all genders that are under-represented in the TEC workforce. The ultimate goal is to encourage more girls to take part in further education and informal education (clubs and home exploration) that could lead to a career within the TEC sectors.

Crucially, we aim to show their strongest influencers – their parents, carers and educators – that TEC can be a fun, exciting, welcoming and rewarding environment for girls, women and people of underrepresented genders.

[1] Tech Nation, Diversity and Inclusion in UK tech companies
[2] Royal Academy of Engineering, Diversity and Inclusion in Engineering: Key Facts
[3] UKIE, UK Games Industry Census - understanding diversity in the UK games industry workforce
[4] University of Leicester, Workforce Diversity in the UK Screen Sector, 2018

TECgirls Founders

Caitlin Gould, Director at Bluefruit Software, conference speaker and advocate for women's rights – particularly maternity rights – in the tech workplace.

Jane Orme, Software Engineer at Bluefruit Software and advocate for women working in artificial intelligence (AI).

Fiona Campbell-Howes, Tech Writer and Entrepreneur. As editor, Fiona produces the quarterly TECgirls Sandbox Magazine and runs the TECgirls blog.

The founders are supported by a core volunteer and advisory team including Jordan Barkway, Dan Goodwin, Julia Le Gallo and Emily King.

About This Report

As part of our mission, TECgirls aims to conduct an annual survey to understand the scale of the gender imbalance in education within TEC based subjects in Cornwall. We also seek to understand the behaviours, attitudes and access to education and equipment. All of these factors have the potential to influence the decision making of girls to pursue further education and/or engagement in TEC based areas. An annual report will allow us to monitor progress and the group's impact over time.

This report represents the findings of an initial pilot study conducted in July and August 2020 to establish some baseline data from which to monitor progress over time.

To produce this report, TECgirls sought assistance from the Nuffield Foundation's Future Researchers Programme. Nuffield Foundation Future Researcher Amran Abdiqadir Mohamed joined TECgirls on a summer research placement in August 2020 to conduct the initial quantitative and qualitative research, and to produce a first draft of this report. TECgirls are extremely grateful to Amran for her valuable work to produce this pilot study.

Introducing Amran Abdiqadir Mohamed

Amran Abdiqadir Mohamed is an A-Level student studying Psychology, Biology and Religious Studies (Philosophy and Ethics). As Head Student for Culture and Diversity Awareness, Amran works to promote inclusion across all minority groups.

Amran produced this pilot study under the guidance of the TECgirls founders during a 2020 summer research placement with Nuffield Future Researchers, a programme that enables A-Level students to engage in hands-on research projects that make a meaningful contribution towards the work of a host organisation.

Research Objectives

TECgirls decided that to achieve their mission, a set of baseline data had to be collected and understood. It's known anecdotally that there is a lack of girls in TEC activities, but data for Cornwall specifically was non-existent. Through research, TECgirls are able to better understand what drives current behaviour and how we might be able to change it.

The main objectives of this research were to understand the different aspects of the COM-B model on young girls in TEC. We decided to gather the national data for girls who enter TEC GCSEs and A-Levels and then the same data but for Cornwall specifically as our baseline research. We hoped to gain a better understanding of the options available to girls in Cornwall and compare Cornwall to national statistics.

The data we gather will allow TECgirls as an organisation to better understand what girls in Cornwall are interested in so we can adapt our activities to appeal to those interests. We are also looking for areas where there might be a lack of opportunities such as gaps in education, equipment, or out of school activities.

TECgirls hope to use this data to provide insights to larger bodies within Cornwall, to highlight potential gaps that might benefit from support through funding, training or equipment. TECgirls have built connections with the Cornwall and Isles of Scilly Digital Skills Partnership, Software Cornwall and Cornwall Council to help create county-wide change. The data we gather will help us to identify a starting point for this change.

Time Period Covered

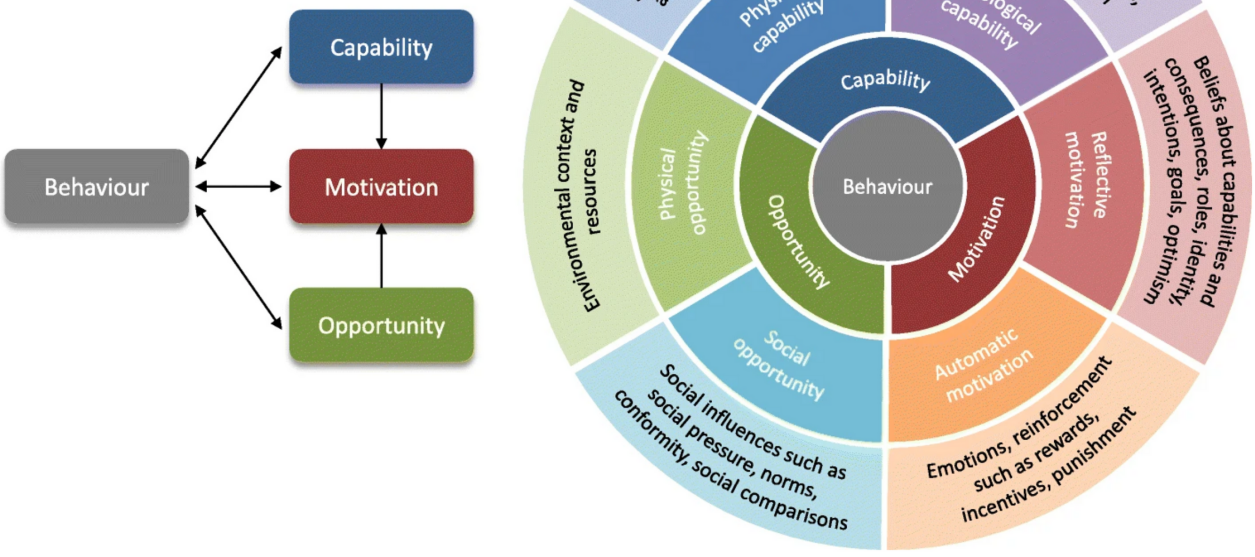
For this pilot report, TECgirls have gathered data spanning academic years 2018–2019 and 2019–2020. We have chosen a two-year span as there have been significant changes to TEC-related GCSEs and we would like our report to reflect that.

In future we are likely to take a one-year focus, as we aim to create an annual report with a month of gathering data and another 11 months to create an impact. This is so that we are able to assess the change for the following year's results.

Research Model and Methods

Choice of model

We used the COM-B model [5] to identify which issues are impacting the decision by girls aged 6–12 in Cornwall to engage with TEC-related subjects and activities. COM-B is a proven scientific model for measuring the many factors that contribute to behaviour and the impact of any interventions. It enables us to look at the complex question of why girls are not engaging in TEC subjects at school from a multifaceted perspective, as there is often a combination of influences that affect this issue.



Research methods

Our research method consisted of statistical data analysis, three quantitative surveys, and qualitative interviews with parents and 6–12 year old girls. For the interviews, we divided our volunteers into three groups: guardians, students and teachers. All of the survey respondents and interviewees were based in Cornwall.

We found that this was the most suitable method to address our research question as a mixed approach (quantitative and qualitative) allows for a combination of numerical measurements and in-depth exploration of the COM-B issues.

[5] Michie, Susan, van Stralen, Maartje, West, Robert, The Behaviour Change Wheel: a new method for characterising and designing behaviour change interventions, published in Implementation Science, 23rd April 2011

Desk Research

To create a national baseline for our research, we sourced data relating to the proportion of girls who took TEC-related subjects at GCSE and A-Level in England and Wales in 2019.

We used data from the WISE Campaign [6] as it is a well-established organisation that analyses the same issues TECgirls is interested in at a national level. WISE has gathered data surrounding gender inequality for a long period of time and has been proven to be a reliable resource for national data.

To create a comparable baseline for Cornwall, we requested the data from Cornwall Council under a Freedom of Information (FoI) request relating to the proportion of girls in Cornwall who took TEC-related subjects at GCSE and A-Level in 2019. In the future, we would like to work closer with Cornwall Council to measure and report on this data.

To understand one of the potential influences on why girls do not choose TEC-related subjects, we also researched which schools in Cornwall offered TEC-related subjects at GCSE in 2019. We chose to research this as the unavailability of TEC-related GCSEs can potentially impact girls' aspirations to work in TEC-related fields in future.

We found no central reference for this data, so we sourced it by compiling data from each school's website and publically available information on the Cornwall Council website – a significantly time-consuming process.

[6] WISE Campaign for Gender Balance in Science, Technology and Engineering

Primary Research: Quantitative

We used a multiple choice survey to source quantitative data from girls and their parents/carers. The design of the questions was based on the themes from the COM-B model.

To maximise the sample, TECgirls publicised the survey on platforms including:

- The TECgirls website
- Local Facebook parents' groups
- TECgirls Twitter, LinkedIn and Facebook accounts
- Twitter, LinkedIn and Facebook accounts of TECgirls founders and volunteers
- Cornwall business groups
- Live event attendees

The survey was constructed via a Google Form and was entirely voluntary. We chose to use Google Forms because:

- It graphs data as it is captured
- It is a platform that is easily accessible, which allowed us to share the survey
- It is simple to create and run within Google Classroom – the platform used for the Nuffield research project

The surveys were directed at three groups: teachers, parents/guardians and their 6–12 year old daughters. We chose these groups to gain a holistic view of the influences and exposure that TEC girls aged 6–12 gain from their environment.

For the teachers' survey, the main themes we chose were:

- If their school offered TEC (technology, engineering and creative design) clubs
- The percentage of female students that attended these clubs
- Students' access to computers and other technology

For the parents/guardians' survey, the main themes we chose were:

- What subjects parents valued and encouraged their daughters to try and succeed in
- Their children's exposure to TEC-related activities (in the form of clubs and lessons)
- Access to computers and other technology
- Their knowledge of different careers (some TEC related, some not)
- The availability of those careers in Cornwall

The girls' survey essentially reviewed the same themes as the guardians' survey, but from the girls' perspective. We chose these themes as they allowed us to better understand how the issues from the COM-B model impact the decision by girls to engage with TEC-related subjects and activities.

Primary Research: Qualitative

To gain qualitative insights to support the quantitative data, we conducted a small number of in-depth interviews with teachers, parents and their daughters.

We originally planned to interview 22 people across all three groups, but due to the deadline set by the Nuffield research placement, we were unable to interview all of them. We reduced the number to 15 but five cancelled, creating a sample group of 10 participants. In future, we would aim to give ourselves time to gather a larger sample size.

We used the Google Meet platform to conduct 30–40 minute interviews. The structure of our interview was dependent on who we were interviewing. The student researcher had prepared a theme guide that contained the key concepts to be covered in each interview, but other than that there were no standardised questions.

Interview Method

Interviews took place via video conference. The interview method consisted of a mixture of open and closed questions that built upon the conversation between our student researcher and the participants.

We felt that this was an effective method as we were able to build a rapport that allowed the participants to feel comfortable enough that they expanded on their viewpoints on key concepts.

The interviews were then transcribed to identify the themes from the COM-B model and any patterns that could be helpful to our research.

Although unstructured interviews produce results that cannot be generalised beyond the sample group, we found them effective for TECgirls research as they have provided a more in-depth understanding of participants' perceptions, motivations and emotions towards TEC.

Impact of Coronavirus Pandemic

Due to the coronavirus pandemic, all of our primary research took place virtually, which had benefits as well as its drawbacks.

In the interviews, there were instances where the connection was not clear or there was a time lag, making it difficult for participants and our student researchers to maintain the conversational aspect of the interview.

However, one benefit from conducting research virtually was that our survey was available to a larger sample of participants, which could potentially increase our response rate.

Headline Findings

The six key findings of our research in relation to the TECgirls mission are:

1. Parents tend to encourage girls to do well in Science, Maths and English at school, but consider Design Technology to be one of the least important school subjects

2. Relatively few parents take their daughters to TEC-related clubs outside of school, with art, music lessons and sport the most popular extra-curricular activities after Guides/Brownies/Rainbows

3. Most girls (74%) say they enjoy coding at school, yet our research suggests that most parents do not encourage or support their daughters to continue to explore coding outside of school

4. While coding is widely available at school, there is little on offer at school in terms of hands-on TEC activities like Lego/Meccano, engineering, electronics, animation, Minecraft and robotics. These are areas girls have expressed an interest in doing more of. There is also a very large gap in engineering as a subject available at the GCSE level, which has a substantial impact on both girls and boys.

5. Girls display high enjoyment of art both inside and out of school. This may be a key route into encouraging girls to explore the more creative side of TEC, such as video game design and development and digital animation. Girls are also interested in science, which could be a great opportunity to do more STEM-related activities that tie in more technology and engineering elements.

6. There is relatively low awareness among girls and parents that careers are available in Cornwall in some key TEC-related areas, including Aerospace Engineering and Scientific Research

TECgirls believe that these findings show that there is a higher appetite for technology, engineering and creative digital learning and activities from girls than what is currently on offer. hint at a generational gap in awareness and knowledge of TEC-related subjects, and of their suitability and importance for girls. We plan to explore this gap in more depth to assess how we can help to educate and support parents to encourage an interest in TEC in their children.

Detailed Findings

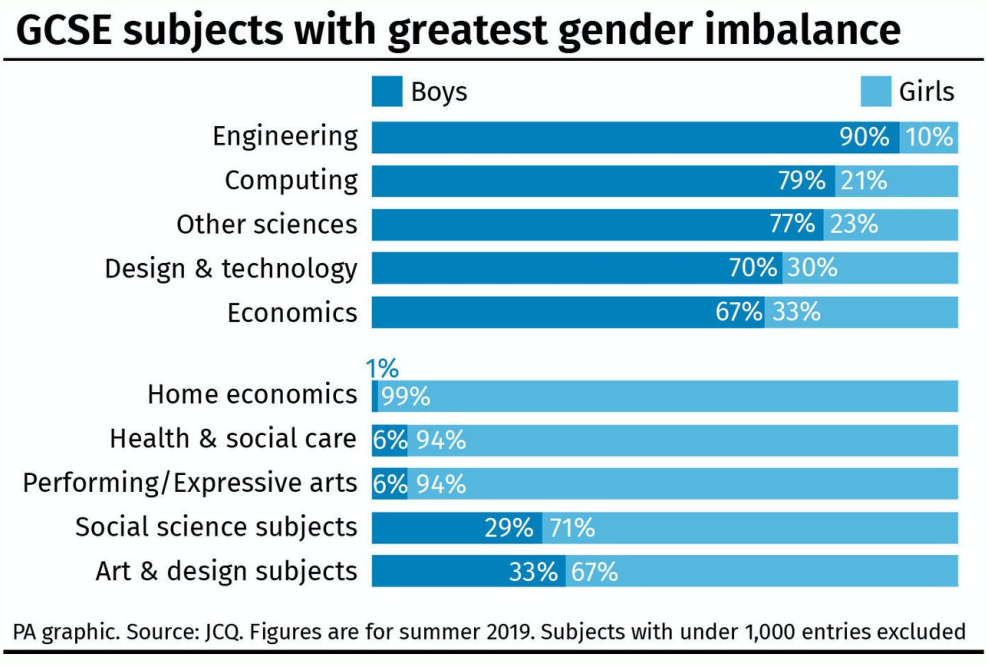
From our initial desktop research, we were able to source data regarding how many female students entered the exam in TEC-related subjects at GCSE and A-Level nationally.

The subjects that had been documented were:

- Computing (GCSE and A-Level)
- Design Technology (GCSE and A-Level)
- Physics (GCSE and A-Level)
- Mathematics (GCSE and A-Level)
- Statistics (GCSE)
- Engineering (GCSE)
- ICT (GCSE and A-Level)

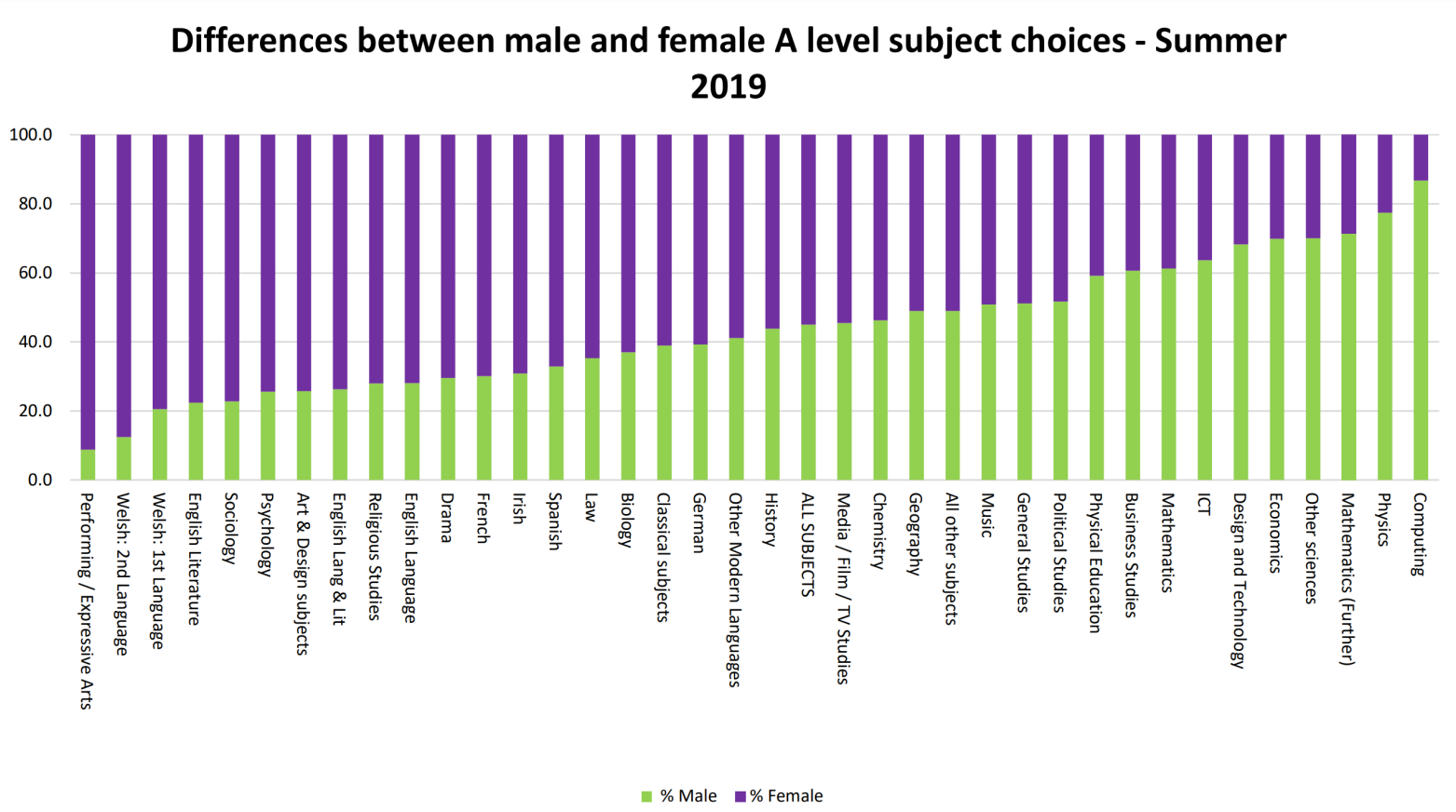
The statistics for girls who took TEC-related GCSEs and A-Levels nationally are as follows:

GCSE Subject Choices (UK Wide)



Note that we were unable to find a full table of all GCSE subjects with entrants broken down by gender, though we understand the Joint Council for Qualifications (JCQ) does have this data.

A-Level Subject Choices (UK Wide)



The full A-level results report for summer 2019 can be found on the JCQ website at www.jcq.org.uk/examination-results/a-levels

Our interpretation:
This data serves to highlight the stark imbalance between male and female participants in TEC-related exam subjects. In Engineering, only 10% of GCSE entrants were female. In Computing, 21% of GCSE participants were female. We note that the JCQ rated 2019 as a particularly good year for female participation in the Computing GCSE, with entries up by 14% over 2018 [7]. A-Level results also show that girls are still much lower than boys in Computing (13%) Further Maths (28%), Physics (22%) and Design and Technology (32%) [8].

Despite year on year improvements, these numbers show that there is still a very sizable gap in the number of girls participating across all TEC related subjects.

[7] JCQ, Press Notice for Summer 2019, August 2019
[8] https://www.jcq.org.uk/wp-content/uploads/2019/08/A-Level-and-AS-Results-Summer-2019.pdf

TEC-related GCSE subjects offered in Cornwall

To understand the availability of TEC-related GCSE subjects to students in Cornwall, we sourced data from the county's 31 secondary schools. The data is shown below. Green boxes are yes and purple boxes are no.

School	Construction	Engineering	Computing	DT	ICT	Bussiness	Statistics	Mathematics	Physics	Art and Design
Bodmin College	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Brannel School	Yes	No	Yes	Yes	No	No	No	Yes	Yes	Yes
Budehaven Community School	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Callington Community College	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes	Yes
Camborne Sciences and International Academy	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Cape Cornwall School	No	No	Yes	Yes	No	No	No	Yes	Yes	Yes
Falmouth School	No	Yes	No	Yes	No	No	No	Yes	Yes	Yes
Fowey River Academy	No	No	Yes	No	Yes	Yes	No	Yes	Yes	Yes
Hayle Academy	No	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes
Helston Community College	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Humphry Davy School	No	No	No	No	No	No	No	Yes	Yes	Yes
Launceston College	No	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Likseard School & Community College	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes
Looe Community Academy	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Mounts Bay Academy	No	Yes	No	No	Yes	Yes	No	Yes	Yes	Yes
Mullion School	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Newquay Tretherras School	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Penair School	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Penrice Academy	Yes	Yes	Yes	Yes	yes	Yes	No	Yes	Yes	Yes
Penryn College	No	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes
Poltair School	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pool Academy	No	No	Yes	Yes	yes	No	No	Yes	Yes	Yes
Redruth School	Yes	No	Yes	Yes	yes	Yes	No	Yes	Yes	Yes
Richard Lander School	No	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes
Saltash.net Community School	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes
Sir James Smith's School	No	No	No	Yes	No	No	No	Yes	Yes	Yes
St Ives School	No	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes
The Roseland Academy	No	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes
Torpoint Community College	No	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes
Treviglas Community College	No	No	No	No	yes	Yes	Yes	Yes	Yes	Yes
Wadebridge school	No	No	Yes	Yes	yes	Yes	No	Yes	Yes	Yes

Our interpretation:
This is important data for our research as girls may not be encouraged to focus on certain subjects if the GCSE is not offered at their school. Though we note that the same would apply to all children at the school. We found that while all of Cornwall's secondary schools offer core subjects of Maths, Physics and Art & Design at GCSE, other subjects are less well represented.

In particular, Engineering is only offered by 10 of the 30 schools for which data was available, and Statistics only by six.

GCSE and A-Level entrants by gender: Cornwall

TECgirls made a freedom of information request to Cornwall Council for the data on participation by gender for Technology, Engineering and Creative digital-related subjects. Cornwall Council were able to provide some data in this space. Here are some of the headline facts and figures:

GCSE Data from 2019

- Over 4,700 girls in Cornwall took GCSEs in STEM-related subject in 2019.
- On average, girls made up close to 48% of all Mathematics, Biology, Chemistry and Physics entries.
- In Computing, girls only made up 13% of entries, with only 78 girls out a total of 581.
- There was no data for Engineering or Creative digital subjects.

A-Level Data

- Girls made up more than 55% of all entries in Biology and Chemistry.
- In Mathematics, girls made up 37% of the entries, however in Maths (Further) that number drops to 24%.
- In Physics, only 16% of the entries were from girls, however, on average they outperformed the boys.
- Only 28 students in Cornwall took Computing and the number of girls partaking was so small that the data wasn't shared. This means the number of female entries was 5 or less.

Our interpretation:
This data shows that Cornwall is actually performing lower than the national average in terms of participation from girls in both GCSE and A-Levels. The lack of any information regarding Engineering also points to large challenges in that space.

Additionally, while some STEM subjects such as science and mathematics subjects have a good gender balance, subjects such as computing still show marked gender inequality.

At this point in time there was no data provided on the following subjects:

- Design Technology
- ICT
- Engineering
- Art and Design

Quantitative Data

This section includes the key findings from our multiple-choice surveys. At the time of writing this report, we had received responses from 38 parents and 29 girls.

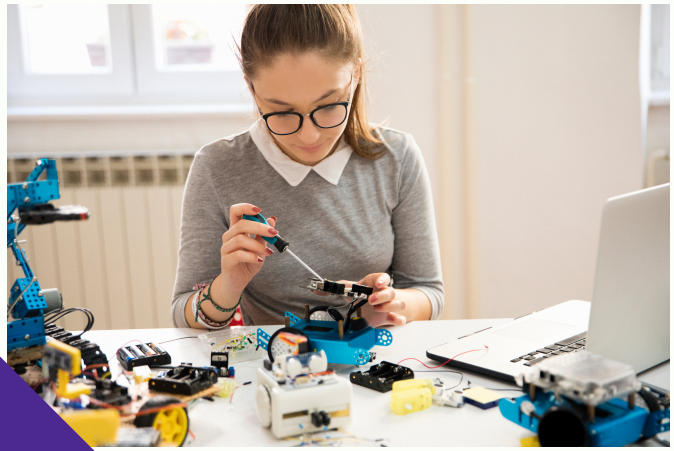
Note that we also intended to include data from the teachers' survey, however, the response rate was low due to releasing the survey very close to the end of the academic year. We have therefore not included the findings in this study but intend to do so in future reports.

One piece of feedback from the teacher survey was a general interest in more training and support for teachers, especially regarding ICT skills and coding lessons.

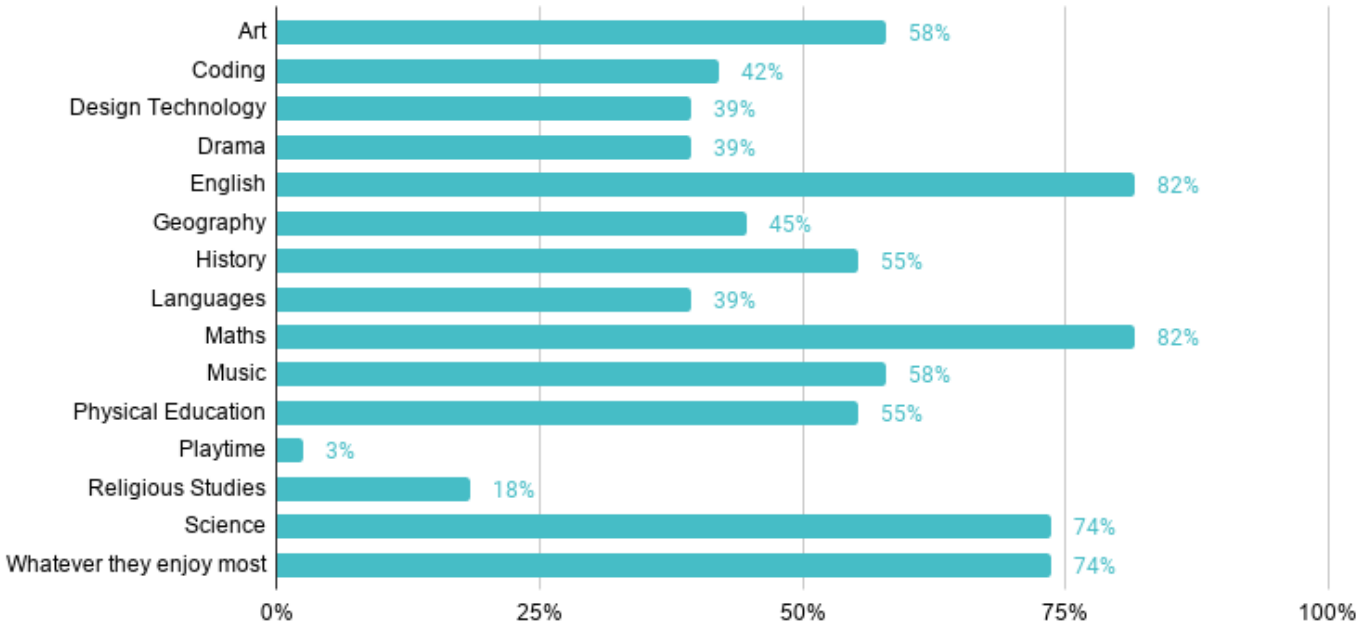
Parents' and Guardians' Responses

Understanding motivation

This question aimed to investigate the reflective and automatic motivation part of the COM-B model. If children are encouraged to do well/try hard in a subject, they are more likely to do so and rewarded for doing so. This would be an example of positive reinforcement, which might inspire the girls to try harder in that subject. It is then important for TECgirls to understand in which subjects this positive reinforcement would be taking place.



Q1. Parental encouragement to study specific subjects.
Which of these subjects do you encourage your child to do well in at school? Tick all that apply.



Key findings:
Design & Technology and Religious Studies are seen as the least important subjects, with only 39% and 18% of parents respectively encouraging their daughters to do well in them.

"Schools are trying to teach children things that aren't relevant to the jobs and roles that we need to get them ready for in the future."

- from our parent survey pg 30

Most parents encourage their children to try hard in English (82%), Maths (82%) and Science (74%). We can infer that parents consider these the most important subjects for their daughters' future career success.

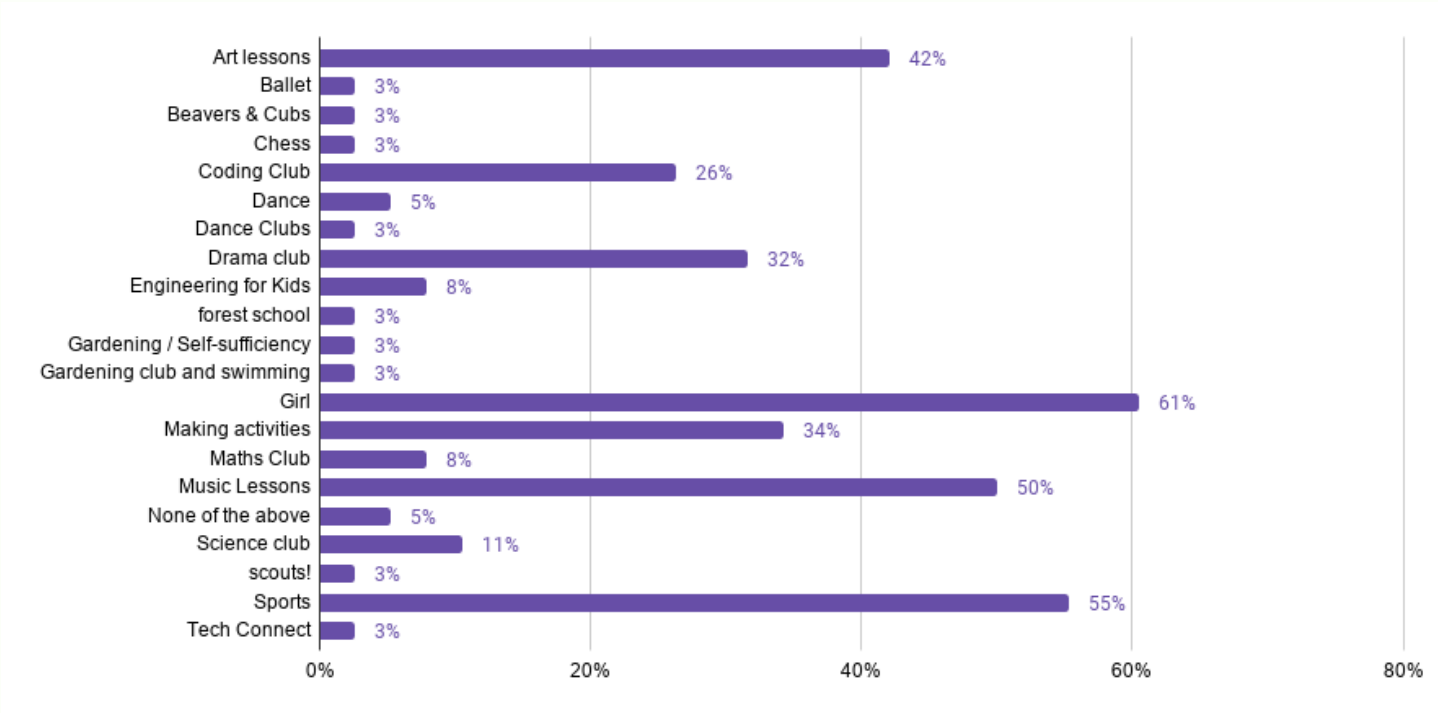
Our interpretation:
We can infer that parents value STEM subjects over others, followed by traditional subjects such as art and history. This could result in them encouraging their daughters to engage with STEM subjects from an early age rather than TEC-related subjects such as Design & Technology.

Their daughters are more likely to try harder in STEM subjects due to this positive reinforcement from their parents. In the COM-B model, this behaviour would be categorised as automatic and reflective motivation.

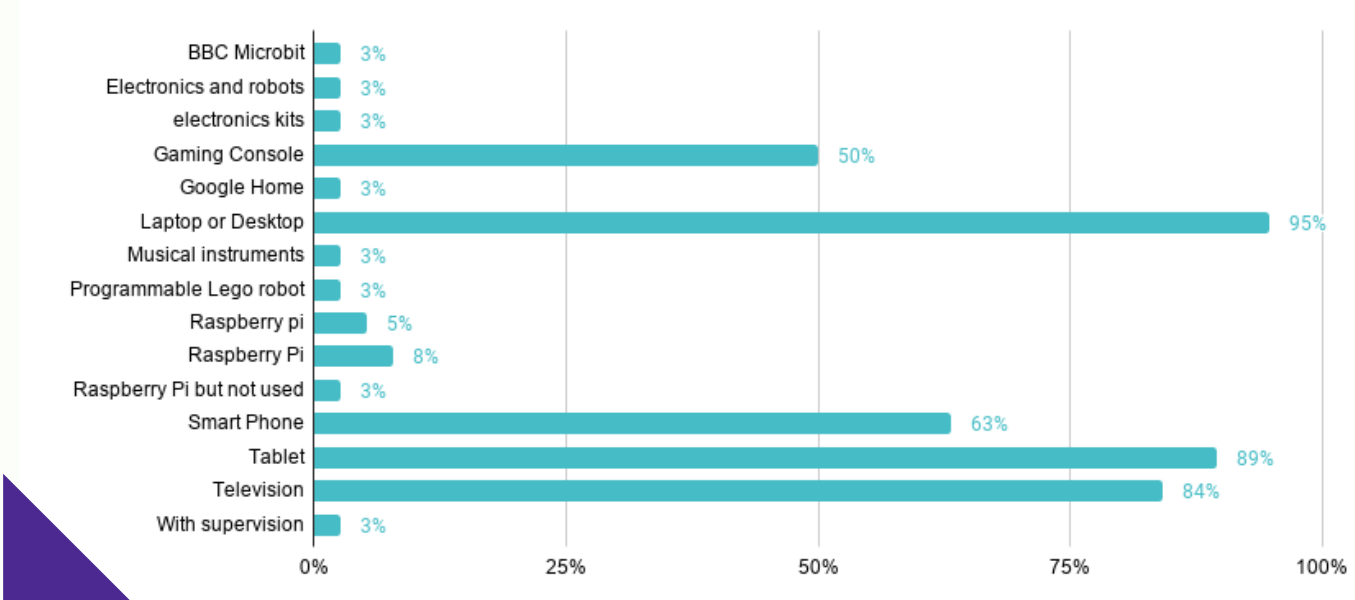
Accessibility and opportunity

These questions explore the accessibility of TEC to girls aged 6–12. The first question investigates the level of exposure to TEC activities that parents provide for their children. The second explores one of the potential barriers that these girls may have. This examines the physical opportunity aspect of the COM-B model.

Q2. Parental engagement in TEC-related activities.
Has your child ever attended one of the following?



Q3. Access to technology at home.
Please tick all of the gadgets at home that your child has access to.



Key findings:
The most popular extra-curricular club for girls is Girl Guides/Brownies/Rainbows, with 61% of parents saying their daughters attend one of these. Other popular extra-curricular activities are sport (55%), music lessons (50%) and art (42%). At least 26% of girls had been to a coding club. Very few parents said their daughters attend a maths club (8%) or engineering club (8%), and none go to a robotics club.

At home, we found that almost every girl has access to some form of technology. The most widely available technologies accessible to girls at home are:

- Laptop (94%)
- Tablet (89%)
- Television (83%)

Our interpretation:

From the first question, we can interpret that the types of clubs parents take their children to are similar to one another. However, they may not understand how TEC can be incorporated into those activities such as music and art.

"The Brownies and Guides have a real focus on STEM now... X can come and learn things that she's not learning elsewhere because I think those are the things that are going to progress her career and get her excited."
- from our parent survey pg 30

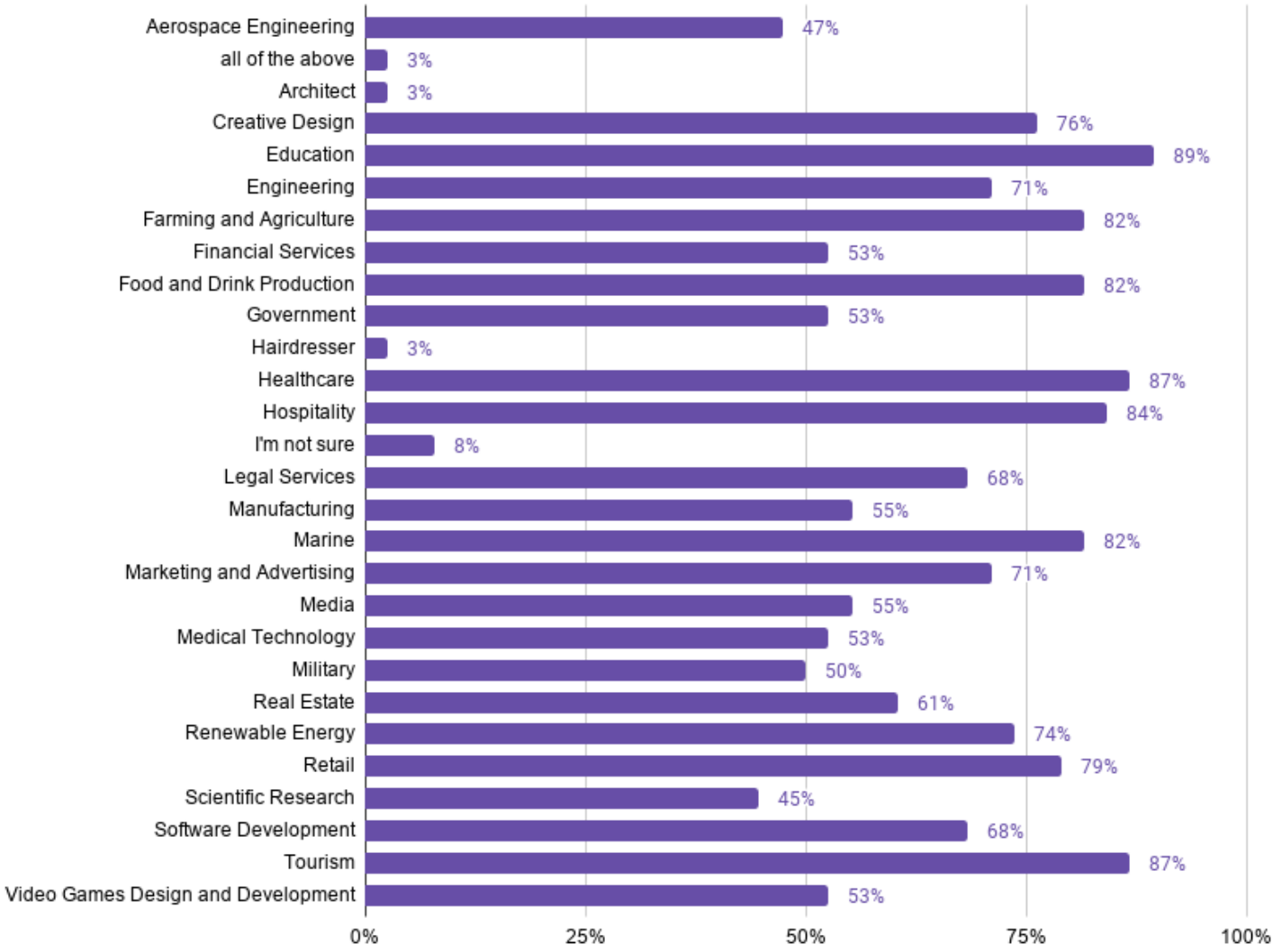
From the second question, we can infer that although most girls have access to technology they may not realise how to use it in a productive manner so that their use of it becomes TEC related. In COM-B terms, they have the physical opportunity but their physical capabilities could be extended.

Researcher Note:
We understand that the data we have on access to technology may be biased in this initial study as due to COVID restrictions we were only able to speak with girls whose parents connected with us online. This is likely to skew the data towards girls who are more likely to have access to laptops or tablets. We plan to work with other Cornwall organisations to better understand the digital inclusion gap in Cornwall and how many children might be lacking in access to equipment. This will inform our next insights report.

Parental awareness of the availability of TEC careers in Cornwall

This question examines parental awareness of different TEC careers and their availability in Cornwall. It was designed to analyse the psychological capability aspect of the COM-B model. If a parent's knowledge of TEC careers is limited, then their child's knowledge may be limited also. This could lead to them not pursuing a career in the field later on.

Q4. Which of these sectors do you think have roles available for people living and working in Cornwall? Tick all that apply.



Key findings:
Only 44% of parents were aware of careers in Scientific Research being available in Cornwall and only 47% were aware of the availability of careers in Aerospace Engineering locally. Additionally, only 68% of parents are aware of careers in software development and only 53% are aware of Video Game Design and Development jobs. By contrast, the careers most parents believed to be available in Cornwall were:

- Education (89%)
- Healthcare (87%)
- Tourism (87%)
- Hospitality (84%)

Our interpretation:
If parents do not believe there are careers available locally in a particular sector, they may be less likely to encourage their daughters to pursue it.

We know that parents are most likely to encourage their daughters to study Science, Maths and English and that most believe that careers are available locally in Healthcare and Education. This may imply that parents are encouraging their daughters from an early age to try hard/succeed in subjects that might prepare them for a career in these sectors. While these are important careers, it might present the girls with a limited understanding of all of the career possibilities available to them, influencing their secondary school and further education decisions.

We note that there is relatively low awareness of careers available locally in Aerospace Engineering, Software Development, Video Games Design and Development and Medical Technology, sectors that are in fact growing fast in Cornwall, with a wide range of roles becoming available.

This implies that the county would benefit from further outreach by organisations representing the aerospace, software and video game industries, to improve awareness locally, helping to grow the future talent pipeline, and improve the perception of employment opportunities within the young people of Cornwall.

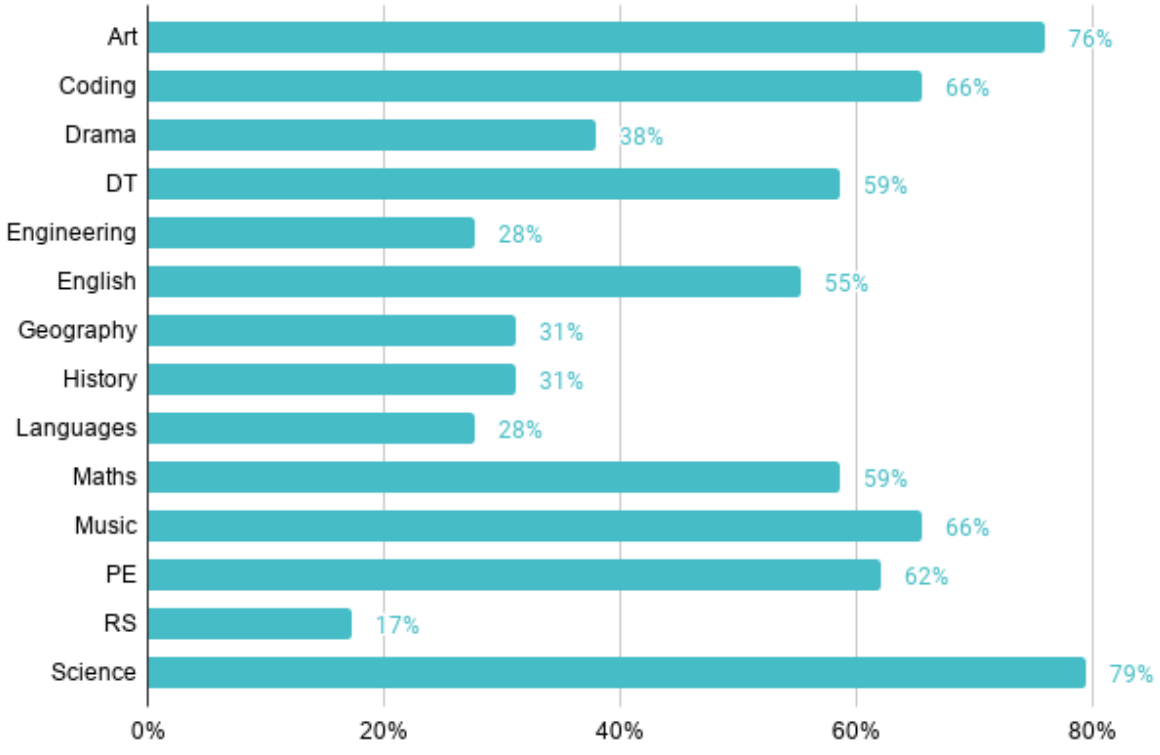
Girls' Responses

Engagement in TEC-related subjects

This question investigates which subjects girls do and do not enjoy. This could highlight areas where TEC could be incorporated in a way where the girls are still enjoying the subject.

One purpose of this question was to see how these answers compared to parents' answers regarding subjects they encourage their daughters to do well in.

Q1. Which of these subjects do you enjoy at school? Tick as many as you would like.



Key findings:
Engineering and Religious Studies were the least popular subjects, with just 28% and 17% of girls respectively saying they enjoy them. Subjects enjoyed by the highest number of girls were:

- Art (76%)
- Science (79%)
- Coding (66%)
- Music (66%)

Our interpretation:
The parents' survey found that parents view Religious Studies as the least important subject and Science (along with Maths and English) as the most important. We can infer that the subjects parents do not value become the subjects their daughters enjoy the least.

On the other hand, we know that parents value science and encourage their children to engage in it, and this is perhaps why 79% of girls say they enjoy it. We also know from the parents' survey that music lessons and art are popular extra-curricular activities, and this is perhaps reflected in the high number of girls who say they enjoy art and music at school.

In COM-B terms, these behaviours are examples of automatic and reflective engagement, where the parent's positive reinforcement pushes girls to engage with that subject more. We note that 66% of girls say they enjoy coding, but only 28% of parents said their daughters attend a coding club.

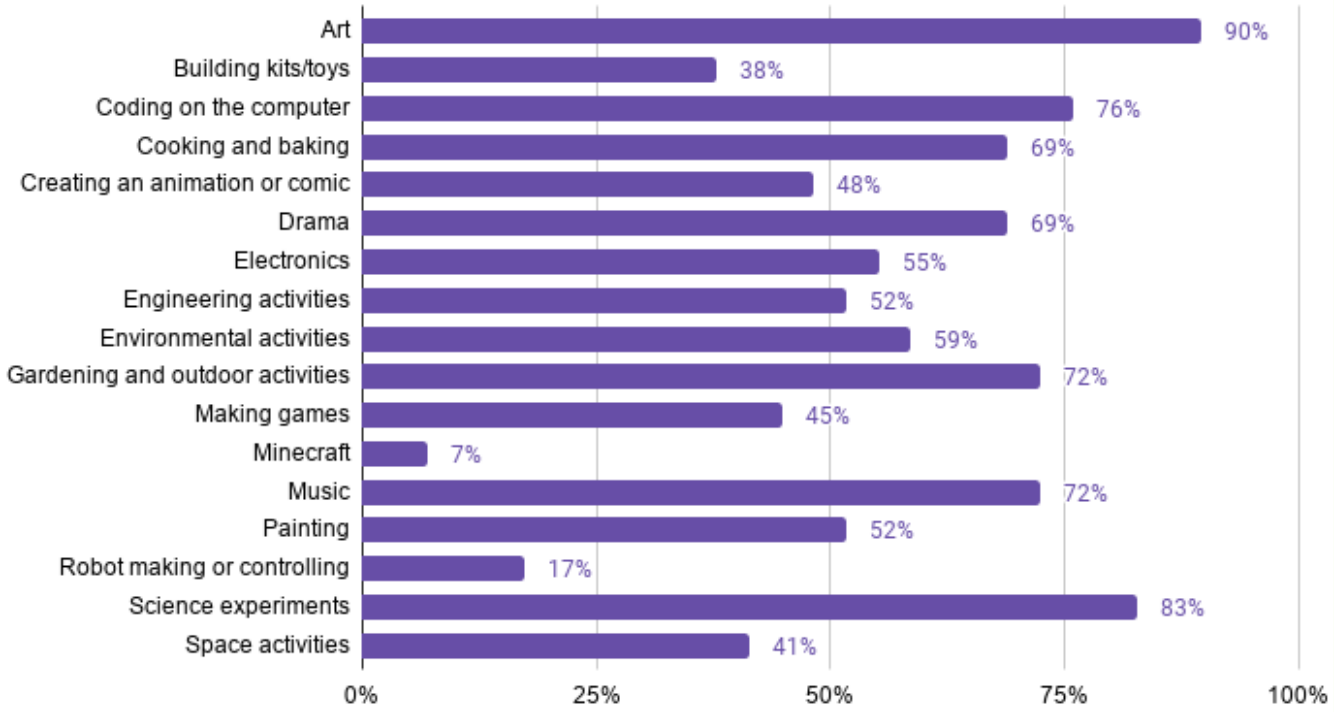
This could imply that girls are enjoying learning to code at school, but parents are not encouraging them to focus on it. This could be due to their own low knowledge of coding, which was not available to them at school. If so, this could be an area where TECgirls could help to support and educate parents.

We also note that girls display high enjoyment of art both inside and out of school. This may be a key route into encouraging girls to explore the more creative side of TEC, such as video game design and development, and digital animation.

Engagement in TEC-related activities at school

This question was intended to provide a better understanding of schools' provision of TEC-related activities. This is a further investigation of girls' exposure to TEC under the physical opportunity aspect of the COM-B model.

Q2. Tick the activities that you have done at school. Tick as many as you would like.



Key findings:
Few girls had experienced robotics (17%) and Minecraft (7%) at school. By contrast, coding (76%), science (83%) and art (90%) were widespread.

Our interpretation:
Some of the activities listed will form part of the standard curriculum in schools, such as science experiments, coding and art. This may explain the high levels of participation, although we know from other questions that girls enjoy coding and art, are encouraged by their parents to do well in science and are often taken to extra-curricular art lessons.

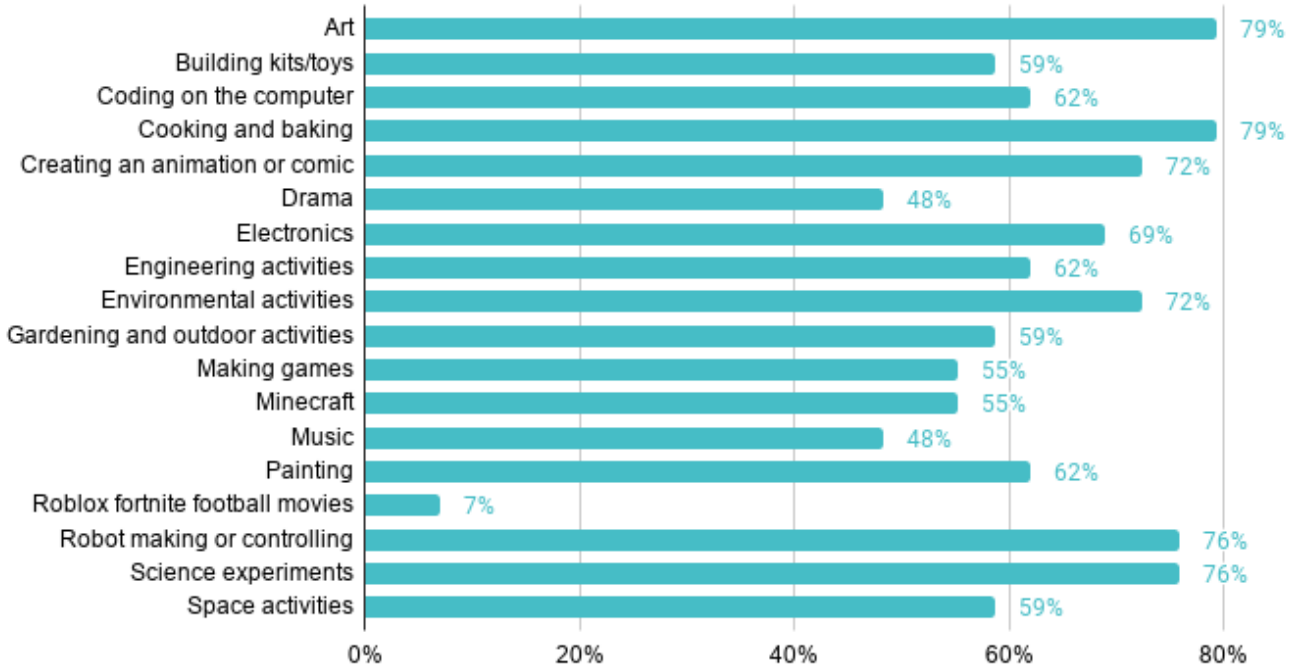
Other activities are likely to be at the school's discretion and may be available only when there is a teacher or a club leader with an interest in designing activities around them. This may be true of more niche TEC activities like Minecraft, building kits/toys and robotics. Teachers might also not be aware that activities like Minecraft can have STEM applications and benifits.

It's difficult to tell from these responses whether these more niche activities are less available in schools in general, or that relatively few girls participate in them. We hope that our teachers' survey will shed light on this in future.

Girls Attitudes towards TEC related Activites

This question was intended to provide a better understanding of girls current interest and motivation for TEC-related activities. The goal is to understand if girls are being limited by their own choices or by what is available and on offer at the school.

Q2. Tick the activities that you would like to do at school. Tick as many as you would like.



Key findings:
There are a few keys areas that girls would like to do more in school that what they have reported on doing. This includes Building kits/toys (59%), creating an animation or comic book (72%), electronics (69%), Engineering activities (62%), environmental activities (72%). Two of the biggest gaps between what is on offer and what girls would like are Minecraft (55%) and Robot making or controlling (76%). Coding sees a decrease with only 62% of girls wanting to do coding at school.

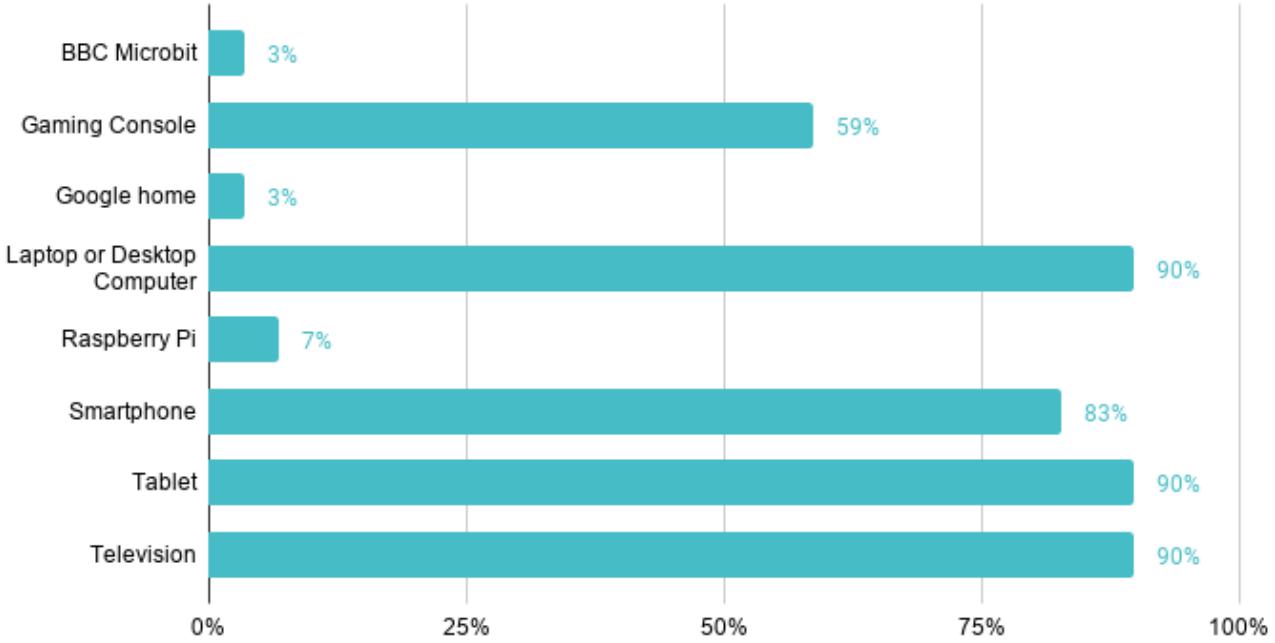
Our interpretation:
Girls are interested in a much wider range of TEC related activites than they are being offered. With the right support for teachers, there are some great opportunities to work Minecraft, animation, and robotics into STEM-related lessons. There is also a great opportunity to link up science and environmental lessons with other TEC activities with devices like micro:bits and raspberry pi, where sensors can be used to increase coding elements.

The feedback on coding might also be related to the type of coding lessons available. More research needs to go into this to better understand what coding is available and what type of coding girls enjoy.

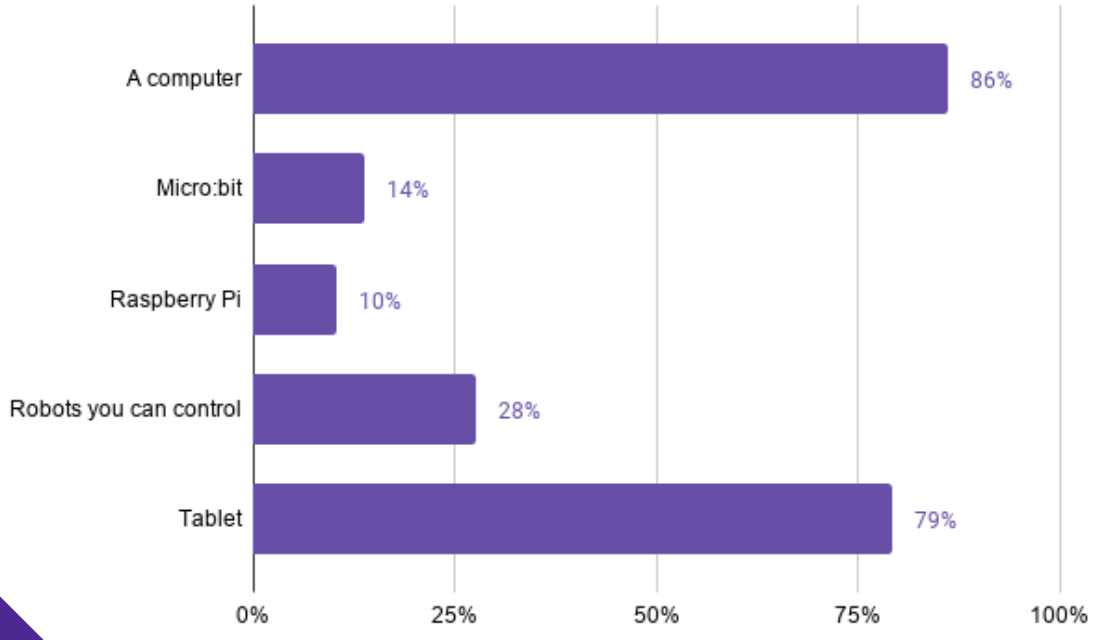
Access to equipment at home and at school

This question was intended to provide a better understanding of girls access to equipment that might encourage more computing or engineering activity. This looks at both the opportunity and access aspects of the COM-B model.

Q3. Please tick all of the gadgets you have in your home and that you are able to use on your own or with a parent.



Q4. Please tick all of the gadgets you have used before at school on your own or with a teacher.



Key findings:
In line with the parent responses, most girls have access to a smartphone, tablet, laptop and television at home. They are also able to access a computer and a tablet at school. More than half the girls also have access to a gaming console. However, very few girls have used a BBC micro:bit or a Raspberry Pi.

- BBC micro:bit use at school (14%)
- Raspberry Pi use at school (10%)

Our interpretation:
While the girls have access to many devices which can help grow their digital skills, the lack of access to devices and kit that help encourage computer science could be limiting their understanding of the subject. Both micro:bit and Raspberry Pi computers help introduce electronics and more physical computer science, which is very different from learning basic digital skills such as using a website or app.

Research conducted by BBC micro:bit in 2017 shows that when girls use a micro:bit in their lessons at school, 70% of them say they would consider a career in computer science [9]. While this data is unconfirmed in Cornwall, without access to micro:bits there is no way of fully understanding their potential to change attitudes towards computer science.

When looking at the COM-B model, this shows a key area where there is a gap in opportunity and access within schools. Cornwall would benefit from further investment into equipment that encourages more play and exploration within the areas of computer science, robotics and engineering. It is likely that more support for schools and teachers to use this equipment would also be beneficial.

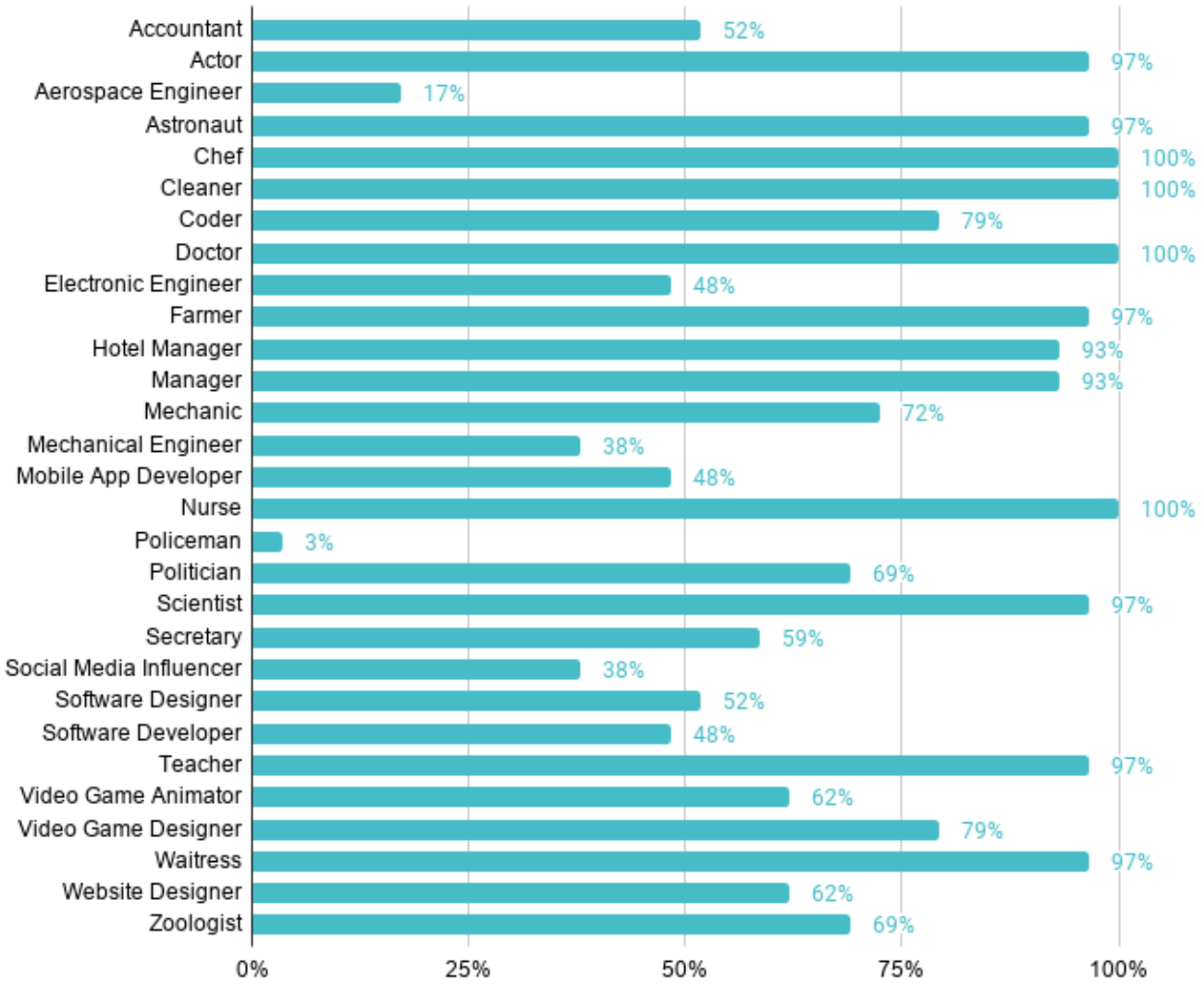
[9] https://microbit.org/impact/research/

Girls' understanding of career opportunities and interpretation of gender roles within different careers

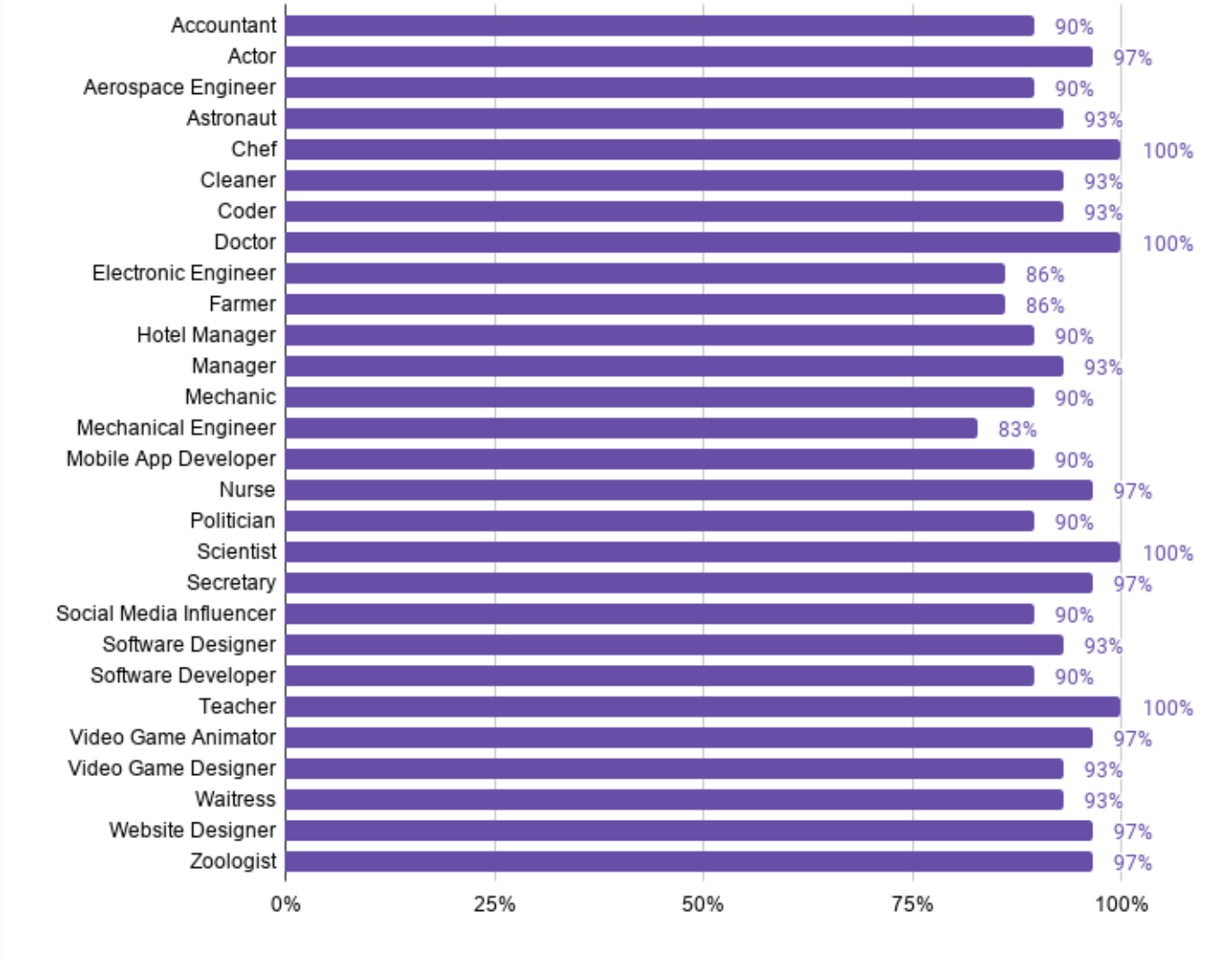
These last two questions were constructed to test a number of different things:

- Awareness of different careers
- Potential bias
- How awareness of the career affects potential bias
- Impact of social opportunity and psychological capability (COM-B model)

Q5. Tick all the jobs you have heard of before and know what the job is.



Q6. Tick all the jobs you think are good for girls/women.



Key findings:
The less-known careers within our sample group were:

- Aerospace Engineer (17%)
- Electronic Engineer (48%)
- Mechanic Engineer (38%)
- Mobile App Developer (48%)
- Social Media Influencer (38%)
- Software Developer (48%)

The jobs that 100% of girls said were "good jobs for women" were:

- Chef
- Doctor
- Scientist
- Teacher

Jobs that fewer than 90% of girls considered to be suitable for women were:

- Farmer (86%)
- Electronic Engineer (86%)
- Mechanical Engineer (83%)

Jobs considered 90% suitable for women:

- Aerospace Engineer
- Hotel Manager
- Mechanic
- Mobile App Developer
- Software Developer
- Social Media Influencer
- Politician

Our interpretation:
The jobs that they did not know tended to be the jobs that scored lower on good jobs for women. The jobs that had 100% votes might be jobs that they often see women have in their environment and so would be jobs that they think are good jobs for women.

We note that 79% of girls know what a Coder is, but only 48% know what a Software Developer is, which suggests that girls might benefit from more information on job titles in TEC areas. Engineering based jobs scored one of the worst for recognition, suggesting more needs to be done to promote these roles. Also, only 38% of girls said they were aware of Social Media Influencer as a job. We feel that if we had used the term 'YouTuber' or 'Instagrammer' instead of, or in addition to, Social Media Influencer, levels of awareness may have been much higher.

Primary research: in-depth interviews

The key themes from the interviews were:

- Access to technology
- Activities and clubs
- Career talks

Our main takeaway from the interviews was that girls generally had access to technology at home but not at school, be that physical technology or TEC-related activities.

One parent said she believed that schools are "trying to teach children things that aren't relevant to the jobs and roles that we need to get them ready for in the future." She went on to say she did not think that the lack of TEC within schools could be easily solved: "Unfortunately I think that the teachers in the school systems aren't even aware of this stuff."

If she is correct, and teachers are unaware of TEC or TEC-related opportunities, it is unlikely that girls as young as 6 years old would be.

One insight gained from the interviews was that there are many barriers to girls engaging in extra-curricular activities related to TEC. For some parents, childcare and work was an issue, and for others, it was the inability to afford certain activities. This led to parents relying heavily on Rainbows, Brownies and Girl Guides for extra-curricular activities for their girls.

One parent said that these organisations "have a real focus on STEM now... X can come and learn things that she's not learning elsewhere because I think those are the things that are going to progress her career and get her excited."

For other parents it was simply that their daughter was disinterested in traditional TEC-related activities: "You've never really enjoyed Lego or things like that."

The career aspect of the interview varied. Some parents believed it was too early to be thinking about careers, while others said their daughters had already shown interest in certain careers. Some girls had shown an interest in their parents' career as it was one they are constantly exposed to: "I guess because my husband and I are both teachers, she's talked about being a teacher."

Finally, we noted that when speaking directly with the girls, several seemed interested in a STEM or English related career.

"Unfortunately I think that the teachers in the school systems aren't even aware of this stuff."

Recommendations for further research

Having conducted this pilot study, we believe there are certain areas in which our research method could be improved for future surveys. Overall, the main barriers to our research methods were:

- The impact of the coronavirus pandemic
- The time frame of the Nuffield research placement
- Releasing the teachers' survey close to the end of term

Desktop research

For future iterations of this report, we recommend:
Approaching Cornwall Council earlier in the process to source data about GCSE and A-Level entrants by gender. Due to the coronavirus pandemic, the council does not data for this year and so our next report should include data for that current year.

Trying to source as much information from schools as possible. This and the teachers' survey should be done long before the end of the academic year.

Quantitative research

For future iterations of this report, we recommend releasing surveys during the academic year, particularly the one sent to teachers and schools. This is so that we increase our chances of a higher response rate.

Additional resources and research

Department for Education Report: Attitudes towards STEM subjects by gender at KS4, published in February 2019
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/913311/Attitudes_towards_STEM_subjects_by_gender_at_KS4.pdf

A Level results 2019: STEM gender gap increasing
https://edtechnology.co.uk/latest-news/a-level-results-2019-stem-gender-gap-increasing/

JCQ GCSE Press Notice
https://www.jcq.org.uk/gcse-press-notice-uk-summer-2019/

WISE Analysis of 2019 A Levels
https://www.wisecampaign.org.uk/statistics/analysis-of-2019-a-level-core-stem-entrants-and-results/

EngineeringUK briefing Gender disparity in engineering
https://www.engineeringuk.com/media/1691/gender-disparity-in-engineering.pdf

How Changing Attitudes are Closing the Gender Gap in Engineering
https://www.theguardian.com/careers/2019/jun/26/how-changing-attitudes-are-closing-the-gender-gap-in-engineering

Gender Pay Gap Report Reveals Women Underrepresented at High-Level Engineering Jobs in the UK
https://www.stemwomen.co.uk/blog/2020/02/gender-pay-gap-report-reveals-women-underrepresented-at-high-level-engineering-jobs-in-the-uk

IT'S A GIRL THING

Please email us if you are interested in a copy of our report, our data, or to discuss our findings and interpretations.

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