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The Tech Pipeline

Investigating educational pathways into the tech sector in England

A summary report

Michael Scott, Maria Pia Iocco, and Luke Bocock, with research assistance from Sarah Tang and Juan Manuel Del Pozo Segura

Contents

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Executive Summary

This is one of a suite of reports published by NFER and The Hg Foundation on changes in UK tech hiring, future opportunities in the sector, and education pathways into tech jobs. This report presents the findings of secondary data analysis, completed by NFER in 2025, on the tech pipeline. It sits alongside a longer technical report of this analysis, as well as another report on past trends and future predictions for UK tech hiring.

Educational pathways into jobs in the tech sector are critical for the UK economy, as well as for social mobility. This report looks at how those pathways support entry into the tech workforce (primarily in England). It then reviews the extent to which there are disparities between different groups (defined by gender, ethnicity and disadvantage) within the education pipeline, as well as within the tech sector.

To do this, we look at education and employment data. To review the whole pipeline, much of the analysis looks at a specific cohort – those aged 28 in 2019/20 – although more recent data too. We look at associations, not causal effects. The education and employment landscape changes over time, so readers should carefully consider findings when they relate to qualifications achieved some time ago.

Section 1: The benefits of tech qualifications

People who study qualifications in tech subjects tend to subsequently earn more (at age 28) than their peers who study other subjects.[1] Amongst those aged 28 in 2019/20, those who had taken tech subjects in a given qualification earned more on average than the wider group who took any subject in that qualification. Those who did science and maths subjects sometimes earned more on average than those who did tech.

People who study tech qualifications, particularly apprenticeships and degrees, are also more likely to subsequently work in a tech industry. This is particularly true at higher levels of qualifications and for apprenticeships. Nudging more people towards tech qualifications at every level would strengthen the pipeline into tech industries.

Those who do tech qualifications sometimes have lower levels of prior attainment than their peers who do other subjects. In more recent data, students who take Level 3 vocational qualifications (VQs) or university degrees in tech subjects tend to have lower attainment at GCSE than those taking these qualifications in any subject. Given workers in tech industries tend to earn more, on average, than their peers across other industries, tech courses appear to play a role in providing accessible opportunities for students, including lower attainers. Given the link between disadvantage and poorer attainment, they can thereby support social mobility.

Section 2: Tech qualifications across the system

Tech degrees are vital for the tech industry, and those who do tech degrees earn more than the average graduate. A graduate with a tech degree is five times more likely to work in the tech industry than the average graduate. Their earnings at age 28 are higher on average too, although not as high as those who do maths or science degrees.

Vocational qualifications in tech subjects, particularly tech apprenticeships, appear to be associated with especially favourable outcomes. Those who did higher apprenticeships in tech subjects and were employed at 28 had even higher average earnings than their counterparts who did tech degrees, despite having worse GCSE results. A similar pattern is observed when we compare those that did advanced apprenticeships in tech with those that did A-levels. Whilst limited numbers do these qualifications, this suggests that doing more to promote the benefits of VQs and apprenticeships in tech could benefit both the pipeline into tech industries and the young people who access these opportunities.

[1] Tech subjects, qualifications, industries and occupations are defined on pages 6-7

A-level tech subjects are an effective route into doing a tech degree, working in the tech industry, and achieving relatively high early career earnings. This is particularly true for those doing computer science (or ICT) A-levels and those combining tech subjects with maths and science. On the other hand, those that do A-levels in a tech subject without maths or science have relatively poor labour market outcomes.

Students who do tech subjects at earlier stages are much more likely to study these subjects at higher levels. In our cohort, 13% of those who did a GCSE in a tech subject went on to do an A-level in a tech subject. The equivalent figure for the entire GCSE cohort (including anyone with any GCSE) was 8%. Whilst many people first encounter formal tech qualifications at higher levels, getting people engaged with tech subjects early pays dividends.

Section 3:
Accessing tech subjects and tech jobs

Girls are less likely to engage in tech subjects than boys, and women are less than half as likely to work in tech at age 28 than men. Girls outperform boys at GCSE, and higher GCSE attainment is a predictor of studying tech subjects and working in a tech industry. As such, we might expect the girls in our data to have achieved these outcomes more than boys, but the opposite is true. These results are likely to be explained by either preferences, discriminatory approaches or both – suggesting both further research and interventions are needed.

People from ethnic minority groups are more likely to study tech subjects at most levels of qualifications than White peers. They are also more likely to work in tech jobs at 28. However, there is some heterogeneity across different ethnic minority groups. We also found young people from ethnic minorities who are working in the tech industry at 24 are less likely than White peers to still be working in the industry at 28. Whilst there is mixed evidence on disparities in pay, the strongest evidence suggests young White workers in the tech industry are paid around 10% more than their counterparts from ethnic minority backgrounds, and this is not explained by underlying differences between ethnic groups. As with gender, this could be explained by differences in preferences over roles, discrimination, or both.

People from poorer family backgrounds are less likely to study tech subjects (except at degree level) or enter the tech industry than their peers from relatively more advantaged backgrounds. However, these differences are largely explained by other underlying differences between these groups, particularly in their prior attainment at the end of secondary school. This suggests efforts to support young adults from low-income backgrounds to access tech jobs and progress in their careers need to focus on addressing the root causes of these gaps in attainment and early-career progression, as well as investment in programmes that can help counteract these gaps at a later age.

Introduction

The UK's recent 'Digital and Technologies' strategy suggests that the tech sector contributes about £207 billion in gross value added (GVA) and supports over 2.6 million jobs, with productivity 19 percent higher than the national average. This is expected to increase by £90 billion, creating 500,000 jobs by 2035 (UK Government, 2025). Developing the tech skills pipeline has been stated as a national priority and the government is investing nearly £200m in funding focused on bursaries, outreach, apprenticeships, and fellowships to develop a skilled workforce. Yet relatively little is currently understood about educational trajectories into tech.

The tech sector is heavily reliant on workers with degree qualifications. In growing occupational areas of tech, more than two-thirds of early career workers hold higher education qualifications (DfE, 2024). But many workers also come from other backgrounds. Understanding the different routes into the tech workforce is critical to sourcing these workers.

We also need to understand these pathways to help people access them. Recent evidence has highlighted that women, people from ethnic minority groups, and individuals from disadvantaged backgrounds face clear and concerning disparities in participation and career progression within the tech sector (Tech Talent Charter, 2024). Similar gaps have been found in participation in tech subjects at A-level (Scott et al., 2024) and degrees (BCS The Chartered Institute for IT, 2024). Helping these groups access effective pathways into tech subjects is therefore paramount to increase the skills pipeline into tech, particularly given that recent data suggests the pipelines are narrowing. (Bocock, Scott and Tang, 2025)

This research is one strand of a mixed methods research programme on future trends in tech hiring, educational trajectories into the tech sector, and disparities within the tech workforce. The programme is intended to inform efforts to increase the pipeline into tech jobs, ensure young people acquire the relevant skills to thrive in the sector, and address disparities in outcomes by gender, ethnicity and socio-economic background. This strand involves secondary data analysis of administrative datasets, and aims to address two key questions:

- **How do different educational pathways (including educational choices and achievement) support entry into the tech workforce?**
- **To what extent are there disparities for different beneficiary groups (by disadvantage, ethnicity and gender) in entry, progression and earnings into the tech workforce?**

Data and Methodology

*This page gives the key details about the analysis in this report.
For more information, please refer to the accompanying technical report.*

To answer our key questions, we use:

- the Longitudinal Educational Outcomes database (LEO) to analyse the pathways from tech-specific qualifications in England. This data contains educational and labour market records (including industry but not occupation). To look at how outcomes change over time, we focussed on two birth cohorts: 1990/91 at ages 24 and 28, and 1994/95 at age 24. We mainly look at employment and earnings in 2019/20 because it is the latest year available in LEO except for 2020/21, which we avoided due to the probable Covid-19 impacts.
- linked data from the National Pupil Database (NPD), the Individualised Longitudinal Records (ILR) and the Higher Education Statistics Agency data (HESA). This is used to analyse the previous qualifications people took before taking tech-specific qualifications (in England), focusing on the 2022/23 cohorts for each type of qualification we look at.
- the Annual Population Survey 2022 (which covers the UK), and LEO to investigate disparities in people's entry into, earnings and progress within tech industries.

In this report, we look at those who take tech qualifications and compare them to the wider cohort who took similar level qualifications in different subjects. In the technical report, we look at more granular groups, defined by subject.

What is a tech subject?

- At GCSE (level 2), we classify 'tech-specific qualifications' as any subject related to design and technology (DT), to information and communication technology (ICT) or to computer science.
- A-levels and Level 3 vocational qualifications (VQs) are classified as 'tech-specific' where they relate to electronics science, computing, information and communication technology (ICT), communication studies, and design and technology (DT) subjects on systems or production. Level 3 VQs are defined in the technical report.
- Apprenticeships were classified using the subject sector area. This included the manufacturing technology sector, information and communication technologies, media and communication, and publishing and information sectors.
- For undergraduate and master's degrees, we classify as 'tech-specific' any programme where more than one third of the course is in medical technology, computer science, information systems, software engineering, artificial intelligence, health informatics, games, biotechnology, maritime technology, or other topics related to computer science or technology.

What is a tech job?

- The LEO dataset only contains information about the industry which someone works in, so we use these industry codes to define 'working in the tech sector'.
- To supplement this, in APS, we look at occupational codes to define 'working in a tech occupation'.
- In the APS, there is overlap between these groups, but also many people meeting only one definition. We estimate that almost four times more people work in tech occupations than in the tech sector.

To find out more about the analysis in the paper, including the industry and occupation codes we use and why we use them, please read the accompanying technical report.

Characteristics of the main cohort

Throughout this report, our main cohort of interest is the LEO 1990/91 cohort. There are around 660,000 people in this group. Of these, around 95% have some form of GCSE (at any grade) by age 28, and around 34% (of 660,000) have some form of GCSE in a tech subject. 37% have an A-level, with around 4% having an A-level in a tech subject. 22% have a Level 3 VQ and 3% have a Level 3 VQ in a tech subject. 8% have an advanced apprenticeship, with around 1% having such a qualification in a tech subject. Less than 1% of the cohort have a higher apprenticeship (in any subject). Around 37% have a degree by age 28, with around 2% having a degree in a tech subject.

Of those with any form of GCSE, 77% are employed (not including self-employed) at age 28 in 2019/20, with median earnings of around £20,400 (in 2019/20 prices). Of those with any GCSE, 3% were employed specifically in the tech industry at age 28, with median earnings of around £29,200.

In Section 3 analysis[2], around 49% of the analysis cohort are female, whilst 30% of those working in the tech industry at age 28 were. Likewise, 14% are from an ethnic minority, compared to 18% of those working in tech at 28. Finally, 12% of the cohort received free school meals in Year 11, but only 8% of those working in the tech industry at age 28 did so.

[2] The analysis cohort in Section 3 is around 15% smaller than the full cohort because some records needed to be excluded due to missing data.

Section 1:
The benefits of tech qualifications

In this section, we look at how the employment outcomes of young adults vary depending on whether they studied tech subjects or not, at each level of education.

People who do tech subjects earn more, on average, than the average peer who studies the same qualifications. Those who study maths and sciences sometimes earn more.

As shown in Figure 1, studying a tech subject is associated with higher subsequent earnings at age 28, compared to the average earnings of all those who took qualifications in any subject.

For example, a student who took a tech subject at GCSE (either IT or DT) in around 2008 and was working in 2019/20 earned around £22,500, whereas the wider GCSE cohort who were working in 2019/20 earned £20,400, over £2,000 less.[3]

People who took tech subjects also earned more on average than those who exclusively took non-STEM subjects[4]. They also tended to have similar earnings to those who took science subjects but who did not study a tech subject or math. Those who took maths subjects (without tech subjects) did, however, have higher earnings at 28 than those who took tech subjects without maths. (*See technical report for more details*)

The higher earnings of 28-year-olds that did tech qualifications can be partially explained by the fact students who take tech qualifications have higher prior attainment than their peers, on average. As shown in Table 1 on page 10, at some qualification levels (A-levels and Advanced Apprenticeships), recent cohorts who have taken tech subjects have better prior attainment than their peers, on average, which could contribute to gaps in their earnings in a variety of ways. However, this is not true for all qualification levels in the recent data. For example, those who took degrees in tech subjects did not have better prior attainment at KS4 than people who took a degree in any subject, on average. The same is true for Level 3 vocational qualifications.

Overall, the data suggests there are benefits to studying tech subjects at many different levels – we explore this finding further throughout this report.

[3] Later, we will see that this is true at GCSE because of the association between IT GCSE and later earnings, and less true for DT GCSE. There is a similar pattern at A-level.

[4] STEM is science, technology, engineering and mathematics.

Figure 1 – Earnings at 28, by qualification and tech subject

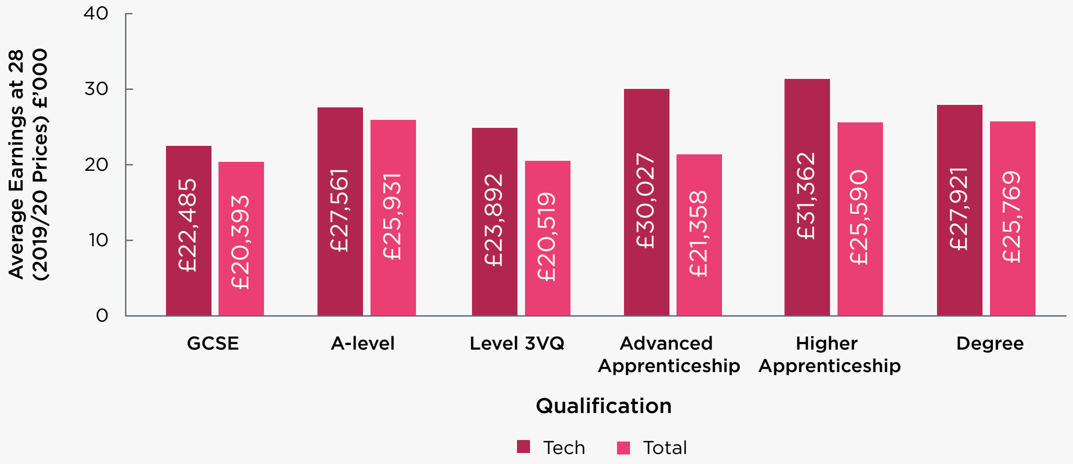
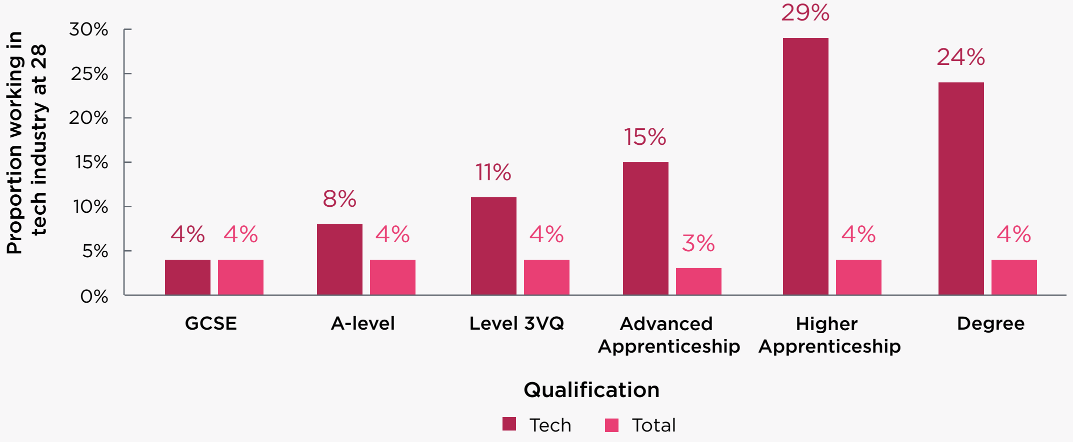


Figure 2 – Progression into working in the tech industry, by qualification and tech subject



Source: NFER analysis of LEO

Studying tech subjects leads to people working in the tech industry. Promoting qualifications in tech subjects, particularly at higher levels, could funnel more people towards tech jobs, which tend to be higher-paid than jobs in other industries.

Figure 2 shows that, amongst the cohort that turned 28 in 2019/20, those who took tech subjects – at any level – were more likely to subsequently work in the tech-industry at age 28.[5]

The link between studying tech subjects and then working in the tech industry becomes stronger at higher levels of education. At GCSE, the difference is very small. By A-level, students who studied a tech subject were twice as likely to work in the tech industry by age 28 compared to the average rate across their whole cohort, with similar differentials for other Level 3 VQs. For apprenticeships and degrees, the gap widens further. Someone who completed a degree in a tech subject was six times more likely than those with a degree in any subject to work in the tech industry at 28. (In the technical report, we also show that studying tech subjects, whether at GCSE, A-level or for a degree, is associated with young people retaining a job in the tech industry between the ages of 24 and 28.)

These results are intuitive. Students with an interest and proclivity for tech subjects will generally be those who are more likely to take them (although some will face larger barriers than others) and in turn, they will be more attracted to working in this sector. Qualifications in tech subjects will often be preferred by employers in the tech industry too.

The evidence reaffirms that there is a tech pipeline through the education system. As shown throughout Section 2, those who take tech subjects at earlier levels in the system (e.g. GCSE) are more likely to do them at higher levels too (e.g. A-level), and this is true at different levels of qualifications. This suggests efforts to help young people into tech jobs should focus on encouraging take-up at Level 3 and earlier, because doing tech subjects at this level is a predictor of doing them at higher levels (assuming the pattern holds for those that need more encouragement).

On the other hand, the data also suggests many people 'switch onto' tech subjects later, with many students doing tech subjects at Level 3, or even degree, who have not done them at the preceding level. This is important because some people will not be able to take tech subjects at all levels.[6]

[5] Some people will also work in tech occupations but outside the tech industry.

[6] Data suggests around half of providers of A- or AS-level qualifications have typically offered computer science qualifications, for example (Scott et al., 2024).

At some levels of qualifications, tech subjects can help narrow the earnings gap between lower attainers and their peers. This suggests they can be a driver of social mobility, particularly for students with lower prior attainment.

As well as looking at the outcomes, at age 24 and 28, of those who did tech subjects at a younger age, we also looked in the most recent data at who has started tech qualifications. In particular we looked at the prior attainment of those who have started tech subjects, compared to other subjects – this is shown in Table 1.

We find that tech students in the tertiary system generally have lower prior attainment than their peers studying other subjects, despite the earnings premium associated with having studied a tech subject. This is true for Level 3 VQs and again at undergraduate degree. Those that do tech subjects at these levels have lower prior attainment than the average across all subjects at that qualification level. However, this is not true for advanced apprenticeships, nor A-levels. Table 1 shows that, amongst those who did tech subjects at A-level, average GCSE attainment was around the 69th Percentile. By comparison, amongst those that did any A-levels, the average score was around the 66th percentile, meaning those that did tech subjects had better GCSE scores than their peers, on average. Students doing GCSEs in tech subjects had better average KS2 attainment than the wider GCSE cohort too.

These findings are interesting because, as previously covered in Figure 1, those who do tech subjects have tended to subsequently earn more, on average, than the wider cohort who took those qualifications in any subject. For example, those that did tech degrees and were working at 28 earned just under £28,000. For those with a degree in any subject, the equivalent figure was less than £26,000. This is despite the fact that, in the most recent cohorts, those doing tech degrees had a lower prior attainment profile.

It is also useful to compare levels of prior attainment across qualifications. Figure 1 showed that those who did an Advanced Apprenticeship in a tech subject and who were working at age 28 earned more than their counterparts with a degree, on average. This is despite the fact that, in the more recent data, those who have done advanced apprenticeships in a tech subject had substantially lower GCSE scores than new graduates, on average.

There is a strong association between socioeconomic disadvantage and lower attainment (Farquharson, McNally and Tahir, 2022). Our evidence suggests that tech degrees and VQs can help narrow the earnings gap between lower attainers and their peers by enabling learners with lower than average prior attainment to access jobs that pay relatively well.

Table 1 – Average prior attainment percentile of 2022/23 cohort (England)

	Tech Subjects	All Subjects
GCSE Students' Average KS2 Percentile	55	51
A-level Students' Average GCSE Percentile	69	66
Level 3 Vocational Qualification Students' Average GCSE Percentile	38	41
Advanced Apprentices' Average GCSE Percentile	49	45
Undergraduate Degree Students' Average GCSE Percentile	58	60

Source: NFER analysis of NPD, ILR and HESA

Section 2:
Tech qualifications across the system

In this section, we look more closely at those who study tech at different qualification levels and their subsequent labour market outcomes:

On average, people who have done tech degrees are more likely to move into work in tech industries than their peers, and they earn more than those who did non-STEM degrees.

As shown in Figure 3, having a tech degree is strongly associated with working in the tech industry, even when compared with maths and science degrees. A graduate with a tech degree is almost five times as likely as a graduate in any subject to work in the tech industry at age 28. This appears to translate into good earnings outcomes for those with tech degrees, as shown in Figure 4. In our cohort, 28-year-olds with a tech degree in work in 2019/20 earned a little under £28,000 on average. Of the other degree categories we looked at, only those with maths degrees clearly outperformed this. Those with degrees in subjects outside of tech, maths or science earned substantially less, on average.

Analysis of a recent degree cohort (see the accompanying technical report) suggests that those who did tech degrees in 2022/23 had lower prior attainment (at GCSE) than those that did maths or science degrees, and equivalent prior attainment than those who did degrees in 'Other' subjects. Combining these results with those above on the earnings of tech graduates suggests that encouraging more lower attainers to do tech degrees could support social mobility. Encouraging lower prior achievers (who are more likely to come from poorer backgrounds) to do tech degrees has the potential to help them achieve similar earnings to groups with higher prior attainment. This is relevant for those who would otherwise do non-STEM degrees; the data suggests they could gain the most from studying tech instead.

As outlined throughout the rest of this section, efforts to encourage more students to do tech degrees should focus on increasing engagement with tech subjects at earlier levels, given this is associated with their likelihood of studying a tech subject at higher levels thereafter.

Figure 3 – Employment in the tech industry in 2019/20, by degree subject

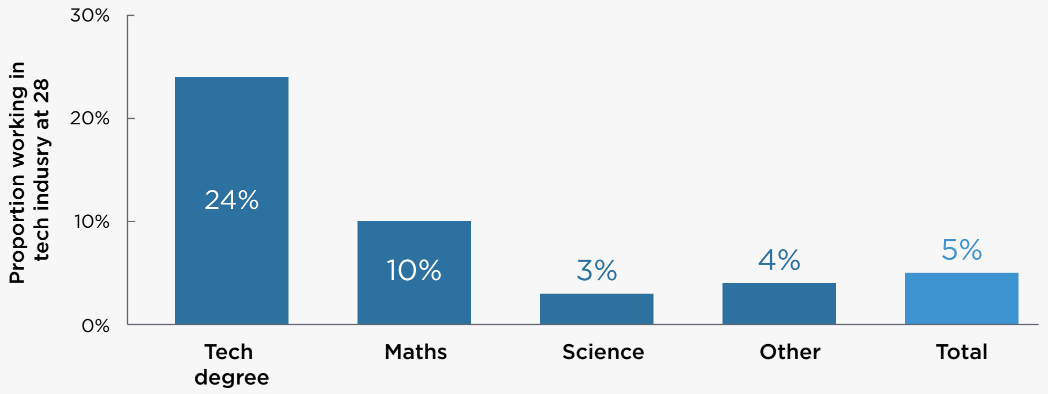
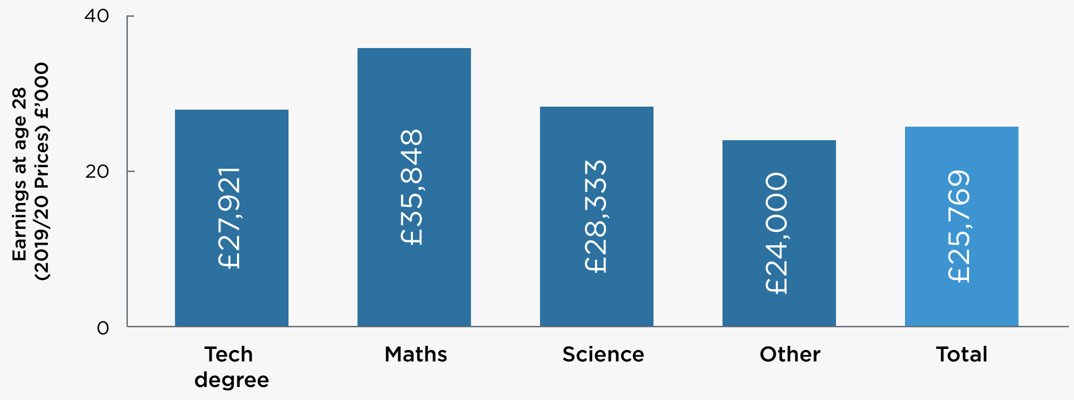


Figure 4 – Earnings at age 28 in 2019/20 by degree subject



Source for both figures: NFER analysis of LEO

Vocational qualifications in tech subjects, particularly tech apprenticeships, appear to be associated with especially favourable outcomes.

Our analysis shows that those who do Level 3 VQs in tech subjects, or tech apprenticeships, tend to have very good labour market outcomes at 28, compared to their peers who do these types of qualification in other subjects.

As we previously showed (see Figure 1), the earnings premium associated with apprentices doing a tech subject, relative to all apprenticeships on average, is particularly large, compared to other types of qualifications. Those who did higher apprenticeships in tech subjects and were employed at 28 had even higher average earnings than their counterparts who did tech degrees. Unsurprisingly, we also found that doing a tech apprenticeship (at either level) is strongly associated with working in the tech industry at 28.

Those who do vocational Level 3 qualifications in tech subjects also see an earnings premium, albeit at a smaller scale, and are more likely to work in the tech industry at 28, compared to their peers doing VQs at the same level in other subjects. We also see a link between studying a tech VQ and studying tech degrees. This is despite the fact that data from more recent cohorts suggests, as with degrees, that those who do tech subjects in Level 3 VQs have lower-than-average prior attainment.

It is important to put these results into perspective; a relatively small percentage of our analysis cohort engage in tech subjects in these types of qualifications. Nonetheless, our results are notable because they show those studying tech subjects in these types of qualifications have labour market outcomes that are comparable to their peers who did tech subjects at A-level and degree level. In part, this may be due to the effects of early specialisation, and the fact that apprentices work within employers who may later offer them a job. For apprenticeships, it may also be attributable to the fact those who do tech subjects tend to have relatively high levels of prior attainment compared to other apprentices.

This suggests that doing more to promote the benefits of VQs and apprenticeships in tech could benefit both the pipeline into tech industries and the young people who access these opportunities.

With regards to tech apprenticeships, most apprentices in the main cohort we look at would have done their apprenticeships before major reforms in the 2010s including the introduction of apprenticeship 'Standards' and the Apprenticeship Levy. Since those reforms, apprenticeship numbers have declined, including in sectors associated with tech (see technical report). The evidence here suggests that reversing the overall decline in apprenticeship starts would benefit the tech pipeline.

A-level tech subjects are an effective route into doing a tech degree, working in the tech industry, and achieving higher early career earnings. Combining them with maths and science, and taking computer science (or ICT), leads to the strongest outcomes.

We have already seen there is an earnings premium associated with studying tech A-levels, relative to A-level student earnings on average. In Figure 5, of those who were working and turned 28 in 2019/20, people with tech A-levels earned over £27,500, more than the average A-level student. Studying maths (without tech) is associated with the strongest earnings of all the subjects.

Looking closer at combinations of subjects, we see that studying tech without maths or science is less predictive of strong earnings. Those who did this earned less at age 28 than the average A-level student. On the flipside, adding tech subjects to maths and sciences was strongly predictive of higher earnings. Those who did this earned more than £35,000 in 2019/20, the highest average of any group we looked at.

In the technical report, we also see a similar pattern when we look at those who go onto work in the tech industry. Of those who studied tech subjects at A-level, around 8% were working in the tech industry in 2019/20, but this rose to 13% when tech subjects were combined with science and maths, whilst those that did tech without maths or sciences were unlikely to do tech degrees.

Looking more closely at tech subjects, we see that holders of a computer science or ICT A-level[7] earned an extra £2,000 at age 28 compared to average earnings for all A-level students. For DT A-levels, the average premium was around £1,000. Studying CS/ICT is also correlated more strongly with working in the tech industry at 28 than DT.

A possible explanation of these results is that, in this data, those with tech A-levels are much more likely to do tech degrees, which we have previously shown are associated with higher earnings than the average degree. This is particularly true if they combine them with maths A-level and/or do CS/ICT A-level. As shown in Figure 6, 11% of those who did tech subjects at A-level went onto do a tech degree. This proportion rose to 18% if we look specifically at those who did tech subjects with maths, or 17% for those who did CS/ICT.

The results may also be partially explained by the fact that, in data on a recent cohort, we see that those who do tech A-levels, and particularly those who do maths or science, have comparatively high levels of GCSE attainment. Nonetheless, the trends suggest that encouraging take-up of CS A-levels alongside maths would be beneficial for individuals and the tech pipeline.

Engagement with tech A-levels has been relatively flat recently, although there has been some improvement in computer science (GOV.UK, 2024). Only about half of A-levels or AS-level providers offered computer science in 2021/22, suggesting that there is room for improvement (Scott et al., 2024). There is a shortage of computer science teachers in schools and colleges, which may partially explain their limited availability (McLean and Worth, 2025; Hill, 2025). Ongoing efforts to address these shortages are critical.

[7] The cohort of interest, age 18 in 2009/10, may have had access to a computer science A-level or an ICT A-level. Since then, the ICT has been discontinued.

Figure 5 – Average earnings at age 28 for A-level students who studied different subject combinations

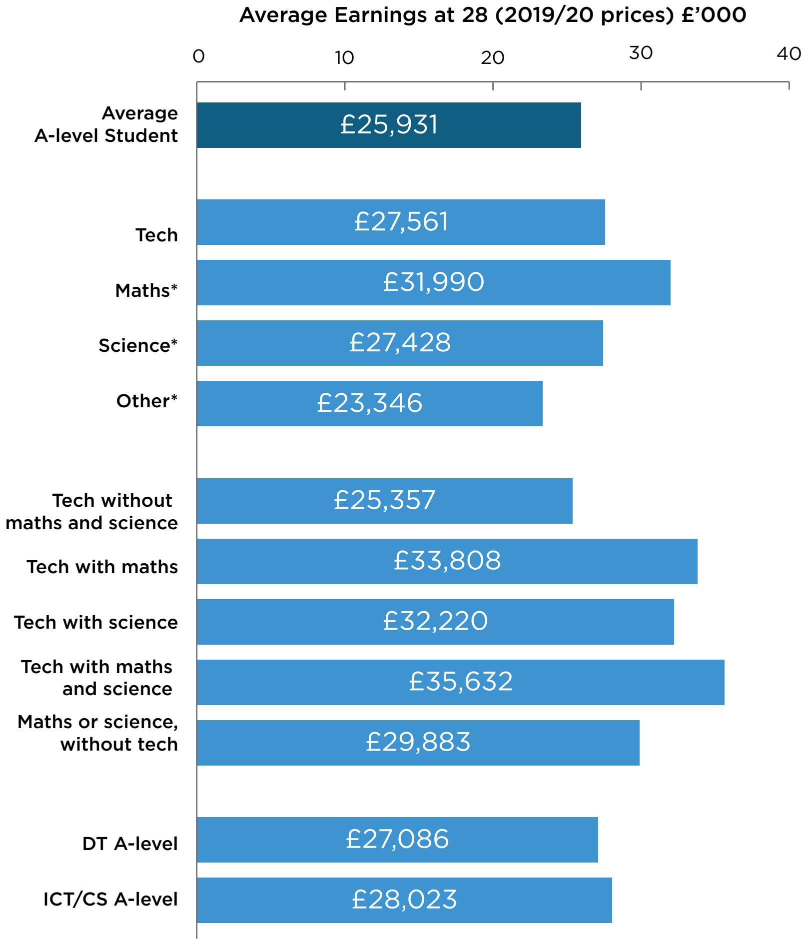
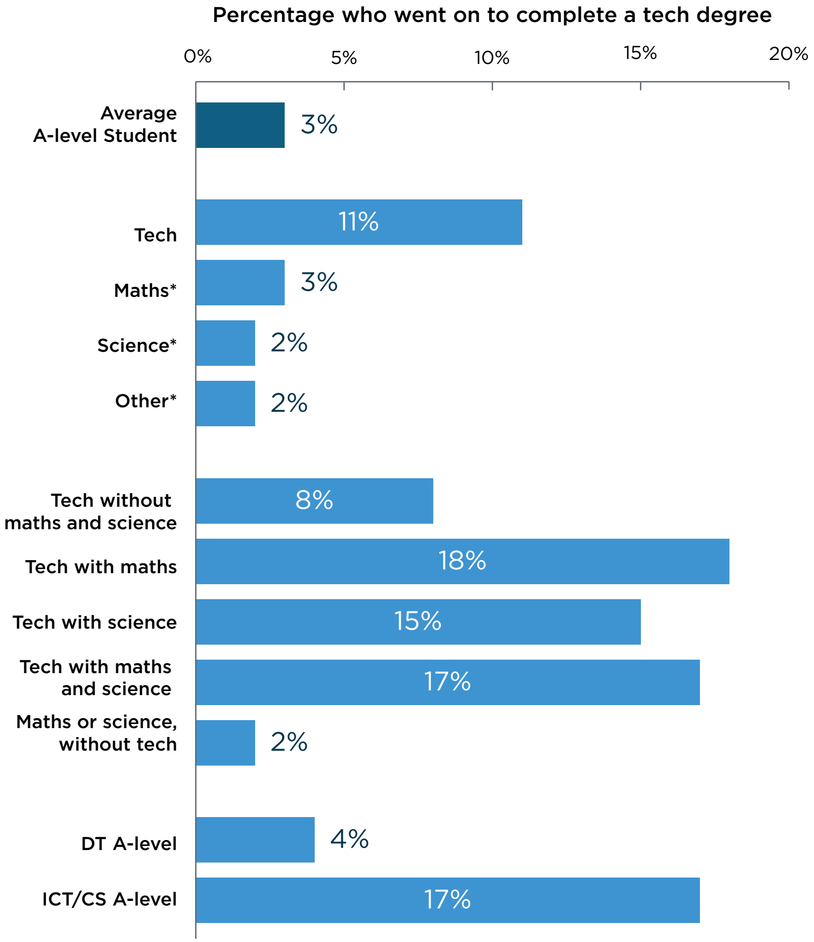


Figure 6 – Proportion of A-level students that took tech degrees, by different A-level subject combinations



Source for both figures: NFER analysis of LEO. Subject categories marked * are mutually exclusive, with students placed in the first category applicable to their subjects, from top to bottom, starting with tech subjects. For example, "Science*" includes people who did an A-level in Science, but not an A-level in Tech or Maths.

GCSEs in tech subjects are an important first stepping stone in the tech pipeline.

Efforts to encourage more students to engage in tech subjects at A-level and beyond may also benefit from encouraging take-up at GCSE. As shown in Figure 7, 13% of those who did tech GCSEs in around 2007 went onto do a tech A-level. Amongst students who did not do a GCSE in a tech subject, the figure was 8%. Alternatively, looking at the A-level tech cohort, the majority of students doing an A-level in tech had previously done a GCSE in tech. Furthermore, nearly half of those who did a Level 3 VQ in tech in that cohort had done a GSCE in tech.

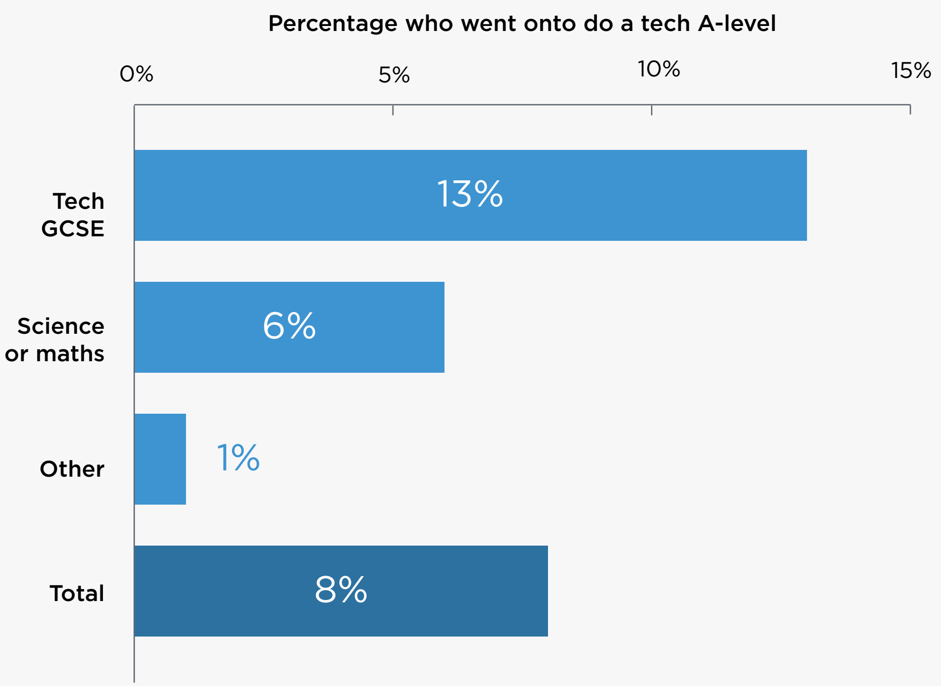
Our data also shows those who do tech GCSEs have earnings at age 28 which are substantially higher, on average, than their peers. This is likely to be, at least in part, because those who do tech GCSEs have higher prior attainment at KS2, on average, compared to their peers and may have earned more regardless of whether they studied a tech GCSE or not (see the technical report for more details). If better performing schools are more likely to offer tech subjects this might also contribute to the earnings premium associated with having previously studied a tech GCSE.

In our main analysis, those who took tech GCSEs will have done ICT GCSE (or DT). ICT has since been replaced by Computer Studies GCSE. We tended to find relatively limited differences between those who took ICT GCSE and those who took DT.

Whilst computing is a compulsory part of the national curriculum, it is not compulsory for students to do a computer science GCSE, nor do all schools offer it. Research in 2018 suggested around 80% of providers offer the subjects (Kemp and Berry, 2019). In recent years, around 12% of each Key Stage 4 cohort has been entered into a computer science GCSE. The same figures suggest a long-term decline in engagement with DT at GCSE.

In summary then, we can see from the LEO data that GCSEs are an important part of the tech pipeline, given the strong link between studying tech GCSEs and then going into study a tech subject at A-level or Level 3. However, take up of tech GCSEs is relatively limited, partially because not all providers offer these subjects. If more can be done to increase take-up of tech GCSEs, the data suggests this could have a positive knock-on effect on take-up at more advanced levels.

Figure 7 – Proportion of the 2007 GCSE subject cohort who went on to complete an A-level in a tech subject



Source: NFER analysis of LEO

Section 3:
Accessing tech subjects and tech jobs

So far, we have looked at the employment outcomes that follow when students study tech subjects and routes into studying tech subjects. We now look at how these patterns differ depending on the students' gender, economic background and ethnicity. Before reviewing the data, we explain how this analysis works, and how to interpret it.

Disparities analysis: An explainer

In this section we focus on the differences in outcomes between different groups. We examine disparities between gender, different ethnic groups, and people from different socioeconomic backgrounds.

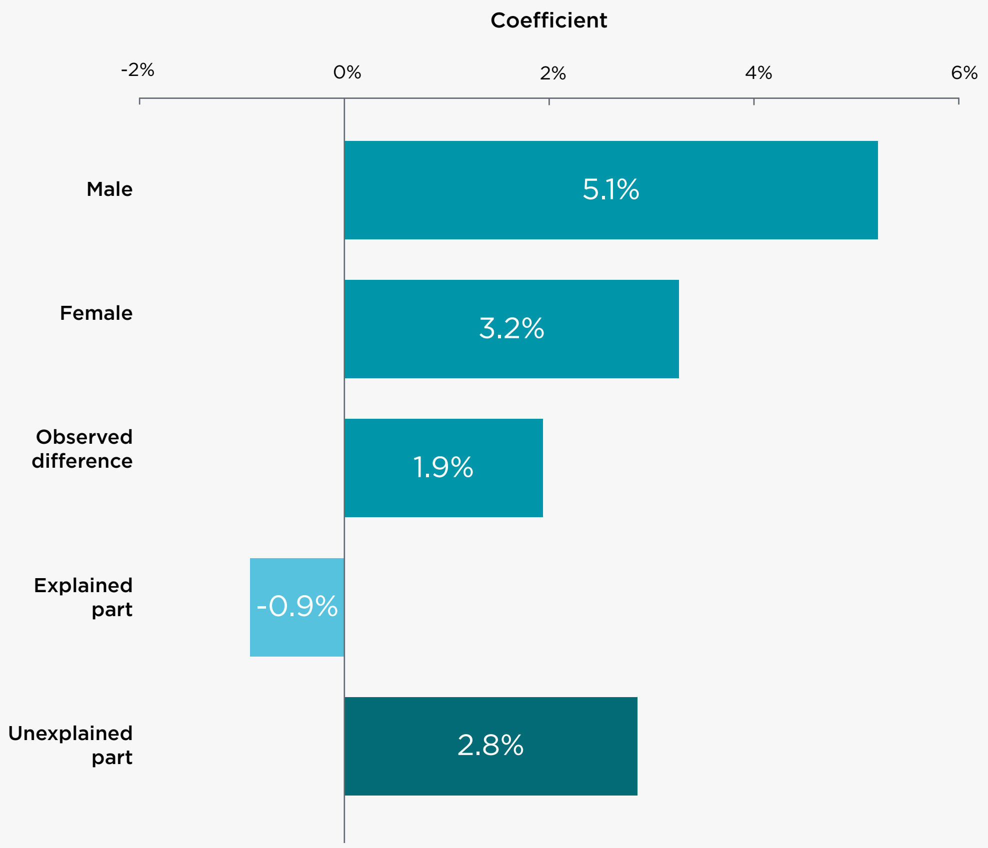
Average differences between groups, for example between genders, can be split to show how much of the gap is due to differences in observed characteristics which vary by gender and how much is left 'unexplained' by those characteristics, meaning it is due to other differences outside of this list. The characteristics we account for include prior academic attainment, characteristics of people's schools, and geography (see the technical report).

The analysis enables us to understand the extent to which the observed gap is driven by the characteristics included in our model. Where the gap is largely 'explained' by observed characteristics, this suggests a greater focus should be on those characteristics. An 'unexplained' gap points to other factors driving the outcome.

Let's look at an example. In Figure 8, we can see that 5.1% of boys in our analysis cohort (those in England with GCSEs who turned 18 in 2009/10, of which around half are boys) studied a tech subject at A-level, compared to 3.2% of girls. As such, the observed gap, is 1.9 percentage points, towards boys. Figure 8 tells us that this gap is not well explained by other characteristics included in our model which vary between boys and girls. Instead, the observed gap is left 'unexplained', suggesting it is attributable to other unobserved factors. The confidence intervals – a measure of statistical uncertainty – are also shown on the chart. In LEO population data, the number of observations tends to be high, resulting in narrow intervals, but in APS results (shown below) there is more uncertainty.

It is important to consider which other factors – not measured in the data - could explain the unexplained gaps. In our example, we cannot say with authority what causes a large unexplained gender gap. For example, it may reflect boys' greater preference for tech subjects. Alternatively, it could be because boys tend to be encouraged more to engage in tech subjects or aspire to jobs in the tech industry. It could be a mixture of these things or something else not measured in the data.

Figure 8 – Decomposition of completing an A-level in tech by gender



Source: NFER analysis of LEO

In the rest of this report, we include a summary of the results of our disparities analysis, across multiple outcomes. For more detailed results, see the technical report.

For girls and women, there appear to be systematic barriers to engaging in tech subjects and jobs in the tech industry. These may reflect differences in subject and job preferences between men and women, discriminatory approaches, something else, or a combination of factors, suggesting intervention is needed.

Table 2 shows that, in the cohort of people who turned 28, there is a significant gap between boys and girls at each stage of the pipeline into tech.

Amongst those who have GCSEs, around 5% of boys completed an A-level in a tech subject, compared to 3% of girls. We see a similar gap in engagement with Level 3 VQs in tech subjects. For advanced apprenticeships, the gap was even larger in relative terms; boys are seven times more likely to start an advanced apprenticeship in a tech subject than girls. We also see the gap widening from A-level to degree level; boys are around four times more likely do a tech subject at degree level than girls.

These gaps remain once we move up to employment outcomes (measured at age 28). Amongst employed adults, men were more than twice as likely to be working in the tech industry than women. Furthermore, amongst those working in the tech industry, men's yearly earnings were higher on average, by around £4,000, or just under 15%.
In the technical report, we show similar results from the Annual Population Survey, looking at tech occupations. We also see that, of those working in the tech industry at age 24, 40% of young women were still working in the industry at age 28, compared to 51% of men.

Table 2 also shows us that these gaps are not explained by other characteristics that vary between gender groups. We consistently see throughout the results that the 'unexplained gap' is of a similar scale to the observed gap. This means that the other factors included in our model, such as geography, ethnicity and prior attainment, do not account for the gaps we see between boys' and girls' outcomes. Indeed, in some cases the unexplained gap is larger than the observed gap – this means that, given other factors (e.g. girls' better prior attainment) we would predict that girls would be more likely to progress along the tech pipeline than boys, but they do not. We do, however, show in the technical report that girls often have higher completion rates on qualifications in tech subjects than boys, once they start them.

These results point to there being systematic access barriers which affect female engagement with tech subjects, access to tech industries and earnings in tech jobs. These findings may reflect differences in students' preferences, with boys having a greater preference than girls for tech subjects and working in tech industries – and being more attracted to apprenticeships in tech subjects too. Alternatively, it may be that females may face discrimination when being encouraged (or discouraged) to take tech subjects, applying for tech jobs, apprenticeships, promotions and/or pay rises. The data is unable to distinguish between these hypotheses and further research is required to discern between these explanations.

Regardless of the reason(s), our analysis suggests there is a need for interventions to encourage more females to do tech subjects and consider jobs in tech.

Table 2 – Disparities analysis for gender

Boy	Girl	Raw Gap	Un-explained Gap	Total Obs.	% of Obs Girls
Completing an A-level in a tech subject (of all those with GCSEs)					
5.1%	3.2%	1.9%*	2.8%*	549,329	49.4%
Completing a Level 3 VQ in a tech subject (of all those with GCSEs)					
5.3%	2.1%	3.3%*	3.8%*	549,767	49.4%
Starting an advanced apprenticeship in a tech subject (of those with GCSEs)					
2.5%	0.3%	2.2%*	2.2%*	549,767	49.4%
Starting an undergraduate degree in a tech subject (of those with a Level 3 qualification)					
8%	2%	6%*	6%*	336,585	53%
Being employed in tech industry at 28 (of those employed at 28)					
4.7%	2.1%	2.6%*	3.2%*	442,443	49.8%
Annual earnings in tech industry at 28 in 2019/20 prices (of those employed in tech industry at 28)					
£33,880	£29,626	£4,254*	£5,131*	15,057	30.3%

* means the gap is statistically significant at the 95% confidence level

Source: NFER analysis of LEO

People from ethnic minorities are more likely to study tech subjects at most qualification levels than White people and are also more likely to work in tech jobs at 28. However, this is not always true for different ethnic minority groups. There is also some evidence that young workers from ethnic minorities are paid less in the tech industry than their White counterparts.

We now look at how outcomes differ by ethnicity, particularly how outcomes differ between those from ethnic minorities and their White peers (White minorities are in the latter group). In this summary report, we primarily focus on differences between White people and those from ethnic minorities. We disaggregate those results across different ethnic minorities in the technical report. Around 14% of the overall cohort are from ethnic minorities.

As shown in Table 3, we tend to see that students from ethnic minority backgrounds are more likely to study tech subjects than their White peers. The only exception to this pattern is apprenticeships, where our results suggest that White people are as likely, if not more likely, to engage in apprenticeships in tech subjects, and are also more likely to complete them once they have started. It is important to note that some of this data conceals heterogeneity. For example, Asian students are the most likely (6.0%) to do a tech A-level, whereas Black students have the lowest rate (3.4%), which is lower than for White students (4.2%).

The gaps we see between White and ethnic minority groups in engagement with tech subjects are generally not well explained by differences in other characteristics, such as differences in prior attainment. This potentially suggests that students from ethnic minority groups have a greater preference for studying tech subjects.

In the technical report, we show that students doing tech A-levels and tech degrees are less likely to achieve the highest grades if they are from an ethnic minority. This is largely explained by characteristics such as prior attainment and the level of disadvantage associated with each person's secondary school. It reinforces the importance of helping people from ethnic minority backgrounds reach their potential at university, by reducing earlier disparities in education and putting programmes in place to tackle the lasting effects of these disparities.

The data also suggests ethnic minority workers are more likely to work in tech jobs than White workers. Table 3 below shows that 4.4% of people from ethnic minorities were employed in the tech industry at age 28, compared to 3.3% of White people (and this is not well explained by underlying factors, such as an increased concentration of both tech industry jobs and ethnic minorities in London.) Switching to the tech industry, we can see the APS results support this finding but are not statistically significant. Overall, the results suggest that young people from ethnic minority groups may have a greater preference for tech jobs than their White peers.

However, we also see (in the technical report) that, amongst those working in the tech industry at 24, it is young White people who are more likely to still be doing so at 28. 50% of White people were doing so, compared to 39% of those from an ethnic minority, and just 33% of Black people. This could suggest that, despite ethnic minority's relative enthusiasm for finding a job in tech, it is more difficult for them to retain this place once they have found it.

Moving onto earnings in the tech industry, our analysis suggests that those who did earned around £2,000 per year (or 6%) more than their counterparts from ethnic minorities at age 28 who were working in the tech industry. Whilst this could reflect pay discrimination in the tech industry, the existing data suggests this pattern is not reflected in the observed data for young people working in tech occupations. We see that White workers earn less than their peers from ethnic minority backgrounds, although once background characteristics are accounted for, this gap disappears.

In summary, students from ethnic minority groups appear to be more likely to study tech subjects than their White peers. This leads to them being more likely to work in tech jobs although there is some evidence they also move out of the industry at a quicker rate in their early career. On pay in tech jobs, the population data appears to strongly suggest that young tech industry workers from ethnic minorities earn less than their White counterparts. That gap is not explained by background factors. The more limited survey data on workers in tech occupations suggests the difference goes the other way and is explained by background factors. As such, we conclude there is some evidence that young tech workers from ethnic minorities earn less than their White peers. Previous evidence has found that ethnic minority workers in tech are underrepresented in senior roles, which could be a factor (Tech Talent Charter, 2024). As with gender, differences in preferences between groups or workplace discrimination could be driving these patterns. More research is needed to investigate this finding and its causes further.

Table 3 – Disparities analysis for ethnicity

	White	Ethnic Minorities	Raw Gap	Un-explained Gap	Obs.	% Obs Ethnic Minority
Outcomes from LEO						
Completing an A-level in a tech subject (of all those with GCSEs)	4.2%	4.8%	-0.7%*	-1.4%*	521,603	14.2%
Completing a Level 3 VQ in a tech subject (of all those with GCSEs)	3.4%	6.0%	-2.5%*	-2.5%*	522,004	14.2%
Starting an advanced apprenticeship in a tech subject (of those with GCSEs)	1.4%	1.2%	0.3%*	0.1%	522,004	14.2%
Starting an undergraduate degree in a tech subject (of those with a Level 3 qualification)	4%	8%	-4%*	-4%*	324,415	16%
Being employed in tech industry at 28 (of those employed at 28)	3.3%	4.4%	-1.1%*	-0.8%*	421,205	13.9%
Annual earnings in tech industry at 28 in 2019/20 prices (of those employed in tech industry at 28)	£33,038	£30,993	£2,045*	£4,313*	14,413	17.7%
Outcomes from APS						
Being employed in tech occupation (of everyone who was employed at age 25-30)	14.4%	16.7%	-2.3%	-0.8%	7,885	13.1%
Hourly earnings in tech occupation in 2022 prices (of everyone in a tech occupation at age 25-30)	£20.45	£22.90	-£2.45*	-£0.21	800	15.3%

* means the gap is statistically significant at the 95% confidence level

Source: NFER analysis of LEO and APS

For people from low-income backgrounds, barriers to progress along the tech pipeline relate mainly to their attainment earlier in the education pipeline.

We finally turn to disparities in progress made along the tech pipeline between people from different socioeconomic backgrounds. Table 4 shows the gap between people who received free school meals (FSM) and those that did not; this measure indicates whether someone was from a low-income household or not. Around 12% of the cohort received FSM. (In the technical report, we also show that these results are similar when we use a measure of community-level deprivation.)

On average, people from lower-income households achieve worse outcomes on most measures. For example, amongst those who complete a GCSE, students who received FSM were less than half as likely to complete an A-level in a tech subject as their peers. Amongst those working in the tech industry at 28, those who received FSM at any point during school earned 20% less than those who never received FSM. (This is a larger gap then we have seen elsewhere in this section.) However, the gaps between socioeconomic groups on other outcomes are not large; in some cases, they are even reversed. This is true, most surprisingly, at degree level, where people who received FSM during school were more likely to pursue tech degrees than their relatively more advantaged peers. However, we also found (in the technical report), that they are less likely to complete these degrees having started them.

Unlike the gender results, the unexplained gaps are generally a lot smaller than the observed gaps. This means that the other factors included in our models account for a large share of the observed differences in outcomes between economically disadvantaged students and their peers. As outlined in the technical report, reviewing the underlying results suggests that prior attainment explains more of the difference than any other factor; outcomes at later stages can be traced back to earlier ones, most notably GCSE scores.

This suggests efforts to support young adults from low-income backgrounds to access tech jobs and progress in their careers need to focus on addressing the root causes of these gaps in attainment and early-career outcomes, as well as investment in programmes that can help counteract these gaps at a later age.

Table 4 – Disparities analysis for Free Schools Meals status

Not FSM	FSM	Raw Gap	Un-explained Gap	Obs.	% Obs FSM
Completing an A-level in a tech subject (of all those with GCSEs)					
4.5%	1.8%	2.7%*	0.5%*	549,329	12.0%
Completing a Level 3 VQ in a tech subject (of all those with GCSEs)					
3.8%	3.3%	0.4%*	0.2%*	549,767	12.1%
Starting an advanced apprenticeship in a tech subject (of those with GCSEs)					
1.4%	1.2%	0.3%*	0.1%*	549,767	12.1%
Starting an undergraduate degree in a tech subject (of those with a Level 3 qualification)					
4%	6%	-2%*	-1%*	336,585	8.2%
Being employed in tech industry at 28 (of those employed at 28)					
3.5%	2.6%	0.9%*	0.2%*	442,443	10.7%
Annual earnings in tech industry at 28 in 2019/20 prices (of those employed in tech industry at 28)					
£33,182	£26,090	£7,091*	£2,569*	15,057	8.3%

* means the gap is statistically significant at the 95% confidence level

Source: NFER analysis of LEO

Conclusions

This report provides a detailed picture of the tech skills pipeline, highlighting both its benefits and disparities between different groups in their progression along the pipeline and outcomes in the tech sector. Our analysis suggests tech qualifications—including GCSEs, A-levels, vocational qualifications, apprenticeships, and degrees—support individuals to achieve higher earnings (at age 28) than their peers who studied other subjects, despite the academic profile of students who take tech qualifications tending to be lower than their counterparts who study other STEM subjects. This suggests that tech qualifications can play an important role in promoting social mobility, as well as strengthening the skills pipeline for tech employers, and providing well-paying jobs for individuals. Progression is strongest when tech subjects are combined with maths or science, particularly maths, and tech vocational qualifications and apprenticeships appear to deliver especially favourable outcomes.

Despite these benefits, the pipeline into the tech sector is "leaky." In 2022, fewer than a quarter of secondary students studied a tech GCSE—a decline from 2006—and only a small proportion of those who do tech GCSEs progress onto tech A-levels. Further progression onto higher level tech qualifications and into jobs in tech industries is also fairly low.

Progression along the tech pipeline is also uneven: girls, white students, and those from lower-income families are less likely to study tech qualifications. Women are particularly underrepresented in the tech workforce, being less than half as likely as men to work in tech by age 28, and this can be traced back to substantial gender differences in the take up of tech qualifications. Whilst ethnic minority students are more likely to study tech subjects, they are less likely to remain in the sector, and the evidence suggests they earn less than their white counterparts. Differences for lower-income students largely reflect differences in prior attainment, highlighting the need for early and sustained interventions to ensure more disadvantaged young people access opportunities in the digital economy.

Policy and practice should focus on:

- Introducing young people to tech qualifications early to increase the number of people coming into the tech pipeline.
- Promoting Level 3 tech qualifications, including vocational qualifications and apprenticeships, as key pathways to higher-level study and employment in tech.
- Encouraging uptake of tech subjects to groups less likely to opt for these subjects, particularly girls and white students, while ensuring workplace practices support inclusion and progression for all.
- Targeting interventions to address attainment inequalities at school that limit access to tech opportunities at later stages.
- Promoting workplace and HR policies which tackle pay discrimination, particularly where it relates to differences in gender or ethnicity.

Further research is also needed to track UK tech hiring trends, understand the structural, financial and policy barriers that schools and colleges face in offering tech qualifications, and identify effective models to boost uptake of tech subjects, particularly among girls, disadvantaged students and white students. Effective, well evidenced, scalable models are vital for strengthening the skills pipeline into the tech sector and ensuring that the benefits the sector offers are evenly distributed.

References

BCS The Chartered Institute for IT (2024) Female computing students closed the gap on men in 2024, BCS.

Available at: https://www.bcs.org/articles-opinion-and-research/female-computing-students-closed-the-gap-on-men-in-2024-new-data-shows/ (Accessed: 9 October 2025).

Bocock, L., Scott, M. and Tang, S. (2025) A narrowing pipeline? What changes in UK tech hiring might tell us about future opportunities in the sector.

Available at: https://www.nfer.ac.uk/publications/a-narrowing-pipeline-what-changes-in-uk-tech-hiring-might-tell-us-about-future-opportunities-in-the-sector/ (Accessed: 11 November 2025).

DfE (2024) Unit for future skills: jobs and skills dashboard.

Available at: https://department-for-education.shinyapps.io/ufs-jobs-and-skills-dashboard/ (Accessed: 9 October 2025).

Farquharson, C., McNally, S. and Tahir, I. (2022) Education inequalities.

Available at: https://ifs.org.uk/inequality/wp-content/uploads/2022/08/Education-inequalities.pdf (Accessed: 11 November 2025).

GOV.UK (2024) Curriculum subject trends over time: curriculum and assessment review call for evidence.

Available at: https://consult.education.gov.uk/curriculum-and-assessment-team/curriculum-and-assessment-review-call-for-evidence/supporting_documents/Curriculum%20subject%20trends%20over%20time.pdf (Accessed: 9 October 2025).

Hill, J. (2025) 'Searching for a hire power', FE Week, 3 March.

Available at: https://feweek.co.uk/fe-college-teacher-shortages/ (Accessed: 9 October 2025).

Kemp, P.E.J. and Berry, M. (2019) The Roehampton annual computing education report: pre-release snapshot from 2018. London: University of Roehampton.

Available at: https://kclpure.kcl.ac.uk/ws/portalfiles/portal/339762919/TRACER_2018a.pdf (Accessed: 9 October 2025).

McLean, D. and Worth, J. (2025) Teacher labour market in England: annual report 2025.

Available at: https://www.nfer.ac.uk/media/afsn0rmb/teacher_labour_market_in_england_annual_report_2025.pdf (Accessed: 9 October 2025).

Scott, M. et al. (2024) Subject choice trends in post-16 education in England: investigating subject choice over the past 20 years.

Available at: https://www.thebritishacademy.ac.uk/documents/5468/British-Academy-report-Subject-choice-trends-post-16-education-England.pdf (Accessed: 9 October 2025).

Tech Talent Charter (2024) Diversity in tech report 2024.

Available at: https://www.techtalentcharter.co.uk/wp-content/uploads/diversity-in-tech-report-2024.pdf (Accessed: 11 November 2025).

UK Government (2025) The UK's modern industrial strategy: digital and technologies sector plan.

Available at: https://assets.publishing.service.gov.uk/media/685862e5b328f1ba50f3cea4/industrial_strategy_digital_and_technologies_sector_plan.pdf (Accessed: 11 November 2025).

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