



Bulletin 12

# Skills shortages in the UK economy

May 2023

# Key Highlights from the Bulletin

Six months on from our last Skills Shortage Bulletin, economic and social conditions remain challenging, and skills shortages continue to depress productivity in the UK. There are however, as we explore in this edition of the bulletin, indications that given the right initiative positive steps can be made towards achieving national growth goals and reach net zero targets.

- Government and employer leadership is immediately required. **The Learning and Work Institute reports spending on skills in England will still be £1 billion lower by 2025 than in 2010.** ReWAGE summarises two of their recent reports, arguing the **UK lacks government leadership and necessary investment** to provide particularly opportunities for the **development of intermediate skills** which drive productivity growth.
- Our feature on '**Green Jobs**' emphasises that while there is enthusiasm in the labour market to tackle the climate emergency, a lack of leadership by government is limiting the essential development of skills required to reach net zero targets. The scale of the skills gaps that will need to be tackled if we are to meet important net zero targets is staggering. To replace gas and oil boilers with heat pumps, for example, the number of trained heat pump engineers will need to **more than double every year over the next six years.** In their contribution, **Mitsubishi Electric** reflect on their role in advocating for green skills to meet this demand. The scale of this challenge is hardly unique to the heating, ventilation, and air conditioning sector. Government must show leadership to secure labour market participation pathways for a diversified labour force. **Green Edge**, highlight the **role that LSIPs can play, with a particular focus in facilitating green productivity agendas** given the right data.
- The lack of value attributed to creative skills and sectors is critically scrutinised by contributors. **The House of Lords Communications and Digital Committee** recently published a report detailing the central place of **creative industries to national prosperity, accounting for £115.9 billion.** The Committee however warned that 'government complacency' and the Department of Education's 'lazy rhetoric' around 'low-value' creative courses was damaging the sector's competitiveness and skills shortages were dampening growth. Further evidence of the strength of creative subjects is provided in the **British Academy's contribution, evidencing how graduates of such courses make high value contributions to the labour market.**

- The lack of confidence in many forms of education to cultivate valuable skills needs to be addressed in education itself. The **Edge Foundation's research into 14-18-year-old's understanding of employability skills development** indicates that young people **need help to articulate how their educational experiences are developing valuable skills**. The strength of these skills might be evidenced by future research drawing on a new tool we feature in this edition: **the Department of Education's own new interactive dashboard**, using Longitudinal Educational Outcomes data to track the outcomes such as earnings trajectories of 3.6m individuals who completed their GCSEs in England between 2002 and 2007.
- Looking forwards, the **National Foundation for Educational Research introduces their new report indicating how higher skills jobs and healthcare roles will offset the loss of many jobs** displaced by the adoption of automation and AI in the workplace.

Indeed, these immense shifts in the labour market have already begun, as will be explored by the Skills and Employment Survey 2023. The survey will investigate how the experience of work has been affected by the turbulence of the last six years following the last survey in 2017 (which we featured in [Bulletin 2](#)).



Workers are facing some of the biggest shifts to their working practices for a generation. The Cost-of-Living crisis and current economic turbulence have quickly followed the global pandemic and Brexit. These have presented huge challenges as well as creating opportunities to develop new ways of working.

Despite these seismic changes, there is still a lack of robust data to inform employers, policymakers and academics as they look ahead to the future of work. We hope that the Skills and Employment Survey will provide those robust and authoritative insights needed to ensure productivity, as well as employee wellbeing, are at the heart of decision-making on the future direction of work in Britain.

**Professor Alan Felstead**

Co-director of the Wales Institute of Social and Economic Research and Data (WISERD),  
Cardiff University

The survey is led by Cardiff University with researchers at UCL, the Universities of Oxford and Surrey, and the National Centre for Social Research, and funded mainly by the Economic and Social Research Council (ESRC).



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# Raising the bar: increasing employer investment in skills to boost living standards

## Naomi Clayton, Learning and Work Institute

Following Rishi Sunak's statement as Chancellor in last year's Spring Statement that the government would consider further intervention to encourage employers to invest in training, some anticipated that there would be a related announcement in the Spring Budget this year.

The [former Chancellor recognised](#) the importance of adult skills to productivity and economic growth and that "UK employers spend just [half the European average](#) on training their employees". Yet this year's Budget focused on boosting business' investment in plant and machinery, and R&D.

The Budget as a whole contained relatively little on skills. There were small boosts to sector-based work academies (SWAPs) and skills bootcamps but no additional funding for skills budgets. Higher inflation wipes out £200 million of planned spending rises in real terms and means that government spending on skills in England will still be [£1 billion lower by 2025 than in 2010](#).

### Investment in skills is critical to driving up productivity and living standards

Stalled productivity growth has stalled increases in living standards – and means that the UK has seen almost two decades of lost wage growth. The [latest forecasts](#) show that wages are not expected to return to their 2008 level in real terms until 2026. If wage growth before the financial crisis had continued, real average weekly earnings would be [£11,000 higher](#) per year than they are today.

Human capital and skills are critical to driving up the UK's productivity and wages. And employer investment in skills plays a central role: employers' own investment in training is larger than public investment and skills need to be used at work in order to boost productivity.

### But employer investment has been declining

The best firms invest in their staff, but collectively, we're falling short. Our research shows that employer investment in training fell more sharply during the pandemic than after the financial crisis, with over 40% of services firms reporting a decline in training expenditure. Employer investment in skills was falling in the decade prior to the pandemic. Employers delivered 99 million training days in 2019. If 2011 levels were maintained, they would have delivered 20 million more. Matching the EU average for investment would mean UK workers benefiting from an extra £6.5 billion investment in their skills each year.

Not only do we invest too little overall, investment is skewed toward those with the highest qualifications; you're four times more likely to get training at work if you have a degree-level qualification than if you have no qualifications.

### The current system is not doing enough to incentivise investment

Despite well-intentioned efforts – and almost £7 billion per year in government support for employer skills – fewer people are accessing job-related training and employer investment has declined.

Debates on the role of employers in skills often focus on how the publicly-funded system can best meet their needs rather than how we can incentive employer

investment, including through the tax system. Initiatives have focused on mechanisms for employer design of qualifications, employer involvement in identifying skills priorities and planning and reforms to apprenticeships.

The main focus of government investment is the apprenticeship system but without sufficient incentives to influence employers' choices, we've seen a fall in opportunities for new starters and those with lower qualifications. The levy system also risks distorting patterns of training, with some employers shoehorning training into apprenticeship when other options might be more useful.

The government also provides tax incentives amounting to over £1 billion per year through Corporation Tax and for self-employed people. Again, these passively follow employer choices meaning most of the value goes to training the already highly qualified.

### Employer investment in and use of skills to be a key part of long-term plans for growth

Low growth and high uncertainty over the last decade will have held back employer demand for skills. Part of the answer, then, is a return to greater certainty and a successful plan to grow the economy, including supporting employers to invest in people and capital. We need a clear policy framework jointly, developed across political divides and in a social partnership, rather than the short-term chop and change of initiatives we have seen over previous decades. Within this, government

should 1) broaden the apprenticeship levy and 2) introduce a new Skills Tax Credit.

**1. Broaden the Apprenticeship Levy.** Accredited training should be eligible for levy funding because it can be just as valuable. To avoid overspend or restrictions on SME funding, widening the scope of the levy needs to come as part of a wider set of reforms agreed with employers and trades unions to widen the reach of the levy (either more firms paying it or a higher contribution rate). We also need to improve completion rates (just over one in two apprentices finishes their apprenticeship), widen and reduce inequalities in access (potentially ringfencing part of the levy for young people and those with fewer qualifications) and improve quality (reducing the high number of apprenticeship standards by broadening their scope in line with other countries).

**2. Introduce a new Skills Tax Credit.** We should replace the current Corporation Tax deduction for training spend, which disproportionately benefits firms investing in their already highly skilled employees. In its place we should introduce a new Skills Tax Credit, modelled on the successful R&D tax credit. This would allow employers to deduct 230% of the cost of accredited training and apprenticeships from their tax liabilities, with a higher rate for businesses employing people in poorer areas or investing in vital skills like digital, numeracy, literacy or green skills. We should also review the effectiveness of other tax incentives for firms, such as lower employer National Insurance contributions for employing young apprentices.



Government policy designed to ensure the skills system meets employer needs and encourages them to invest in skills has been subject to constant churn over recent decades. Despite well-intentioned efforts, these policies have not managed to reverse long-term declines in employer investment in training and often now reinforce existing inequalities rather than tackling them. We need a long-term plan for economic growth that aims to increase employer investment in skills and level up opportunity as a central component. That means reforming the levy and introducing a new Skills Tax Credit to incentivise investment.

**Naomi Clayton**  
Learning and Work Institute

# Expert group turns its attention to skills shortages

## ReWAGE

ReWAGE, an independent group of experts specialising in work and employment, recently published two reports that offer a new perspective on workplace progression and skills development. The reports highlight the challenges experienced by both employees and employers, examine why this has wider implications for the UK as a competitive force, and offer potential solutions.

### Upskilling and reskilling adult workers

Authored by ReWAGE co-chair Professor Irena Grugulis, ReWAGE's evidence paper - [Upskilling and reskilling adult workers - the problem of employer demand](#) - finds that there is an urgent need to upskill and reskill adult workers to enable the UK to meet new challenges facing its future prosperity and productivity.

Despite the increase in individual skills and qualifications, job design has failed to keep pace and many workers in the UK report that their skills are under-used and their

level of autonomy has fallen dramatically. Issues include an increase in jobs that have been designed to be 'worker-proof', a drop in employer-funded training and drastic cuts to government Further Education funding.

Recommendations include using Local Skills Improvement Plans to extend employers' involvement in training design, engaging local and national stakeholder groups in actively improving job design, and using independent advice on skills to drive policy – such as building on work already being done by the Unit for Future Skills (UFS) in the Department for Education.





## How to address skills shortages at the intermediate skills level

A second paper, authored by ReWAGE expert Professor Terence Hogarth, highlights the need for more workers with intermediate skills to take up roles in the professional and technical sectors in the UK.

[How to address skills shortages at the intermediate skills level](#) finds that the demand for intermediate level skills, such as those required in technician and associate professional roles, has been increasing over time in the UK, yet skills supply has struggled to keep pace. This is reflected in a raft of hard-to-fill vacancies in the types of jobs that drive productivity growth, potentially affecting the UK's ability to compete with countries such as Germany and the Netherlands which invest in these skills.

Solutions include empowering individuals to undertake training to update and reskill as necessary - such as through Individual Learning Accounts, providing supportive careers guidance to people in

work as well as those out of work, providing guidance to employers about the skills their workforces need to meet future demands for skills, and reducing the net cost of apprenticeship training to employers to make them less risk averse when it comes to investing in this form of training.

The two papers were commissioned and funded by the [Gatsby Foundation](#).

*ReWAGE is an independent body based in the Institute for Employment Research at the University of Warwick and co-chaired with the University of Leeds. It brings together an Expert Group of over 30 senior experts from universities and research organisations from across the UK. ReWAGE is funded by the [ESRC](#), with further funding provided by other organisations for specific outputs.*



We need to have an honest appraisal of these problems. Successive governments and employers all agree that training is valuable, but as the statistics demonstrate, this is not backed up with practical action. Employers are choosing to compete by designing jobs that require few or no skills meaning that training can be minimised or omitted. While this may cost employers less in the short-term, limiting workers' progression and development will not only alienate employees, but will also decrease the UK's ability to adopt new work practices and technologies in the longer term, hampering its ability to keep pace with international competitors.

In addition, workers with intermediate skills have long been regarded as a key constituent part of a high skill, high value economy. In countries with good productivity records, the percentage of employees working in intermediate level skilled jobs is higher than in the UK. If the UK wants to compete by increasing the numbers of those employed in intermediate level skilled jobs, then the supply of intermediate level skills will need to keep pace.

**Professor Irena Grugulis (Leeds University)**  
ReWAGE co-chair

# Making complex labour market data accessible and engaging

**Oliver Anderson, Department of Education**

The Department for Education (DfE) has recently published an interactive (R-shiny) tool to allow individuals to look at main activities and earnings trajectories of individuals after leaving compulsory education.

This exciting new 'dashboard' from DfE uses the Longitudinal Educational Outcomes (LEO) dataset to track 3.6m individuals who did their GCSEs in England between 2002 and 2007. It draws on [previously published analysis](#) that tracks these individuals after they completed compulsory education over a 10-15 year period.

The analysis shows comparisons by various different socioeconomic, demographic and education factors. It has splits by Free School Meals (FSM) eligibility, Income Deprivation Affecting Children Index (IDACI) quintile, ethnic group, special educational needs (SEN) status, gender, region, first language and key stage 4 attainment. There is an additional split by education level (graduates versus non-graduates and level 3 to 5 versus level 2 or below) if you wish to see differences within (broad) education levels (select 'choose a population').

## The interactive tool

I strongly believe that this data has wide-reaching implications across the education system, but is often difficult for busy colleagues to access and interpret. I wanted to address this and make it more accessible and easy to use. We designed an [R-shiny interactive tool](#) which allows individuals to look at two things:

- Main activities: education and labour market yearly activities over 10-15 year period after Key Stage 4 (KS4)/GCSEs.
- Earnings trajectories: of those in employment over 10-15 year period after KS4/GCSEs.



Anyone can go in and choose the group they are interested in, then create charts (earnings or 'main activities') and even download the data. I am hoping it gives more exposure to the data and increases impact of the analysis. I believe it is a good exemplar of what can be done with LEO data (and education admin data) and am hoping it will be useful outside DfE for a range of individuals.

## Main activities

Main activities of individuals for key stage 4 cohorts 2001/02 to 2006/07 over 15 years.

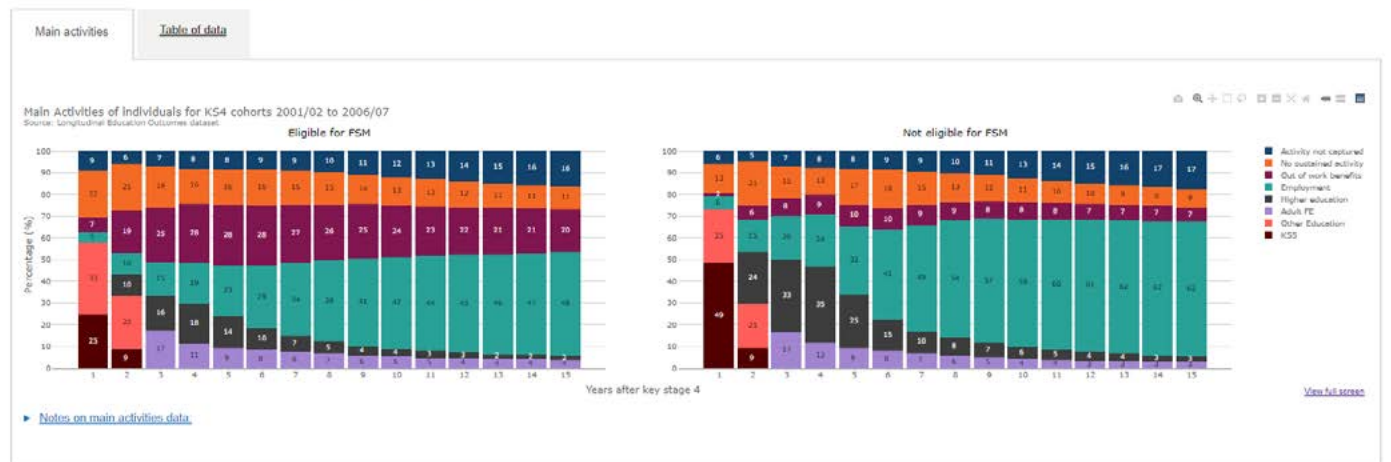
The graph shows this data as a 100% stacked column chart where the x-axis is Years after key stage 4 and the y-axis is Percentage of population, with activities categorised by colour.

Choose a population:  Select a sub-group:  Select breakdown(s):

You have selected the **FSM eligibility** sub-group for **All Individuals**. With specific breakdown(s) of **Eligible for FSM & Not eligible for FSM**.

For details of the definitions of the breakdowns used, please refer to the technical report: [Technical Report for Education and Labour Market Pathways of Individuals \(LEO\)](#)

**!** Due to the nature of rounding, the percentage breakdowns do not always sum to 100%.



## Earnings trajectory

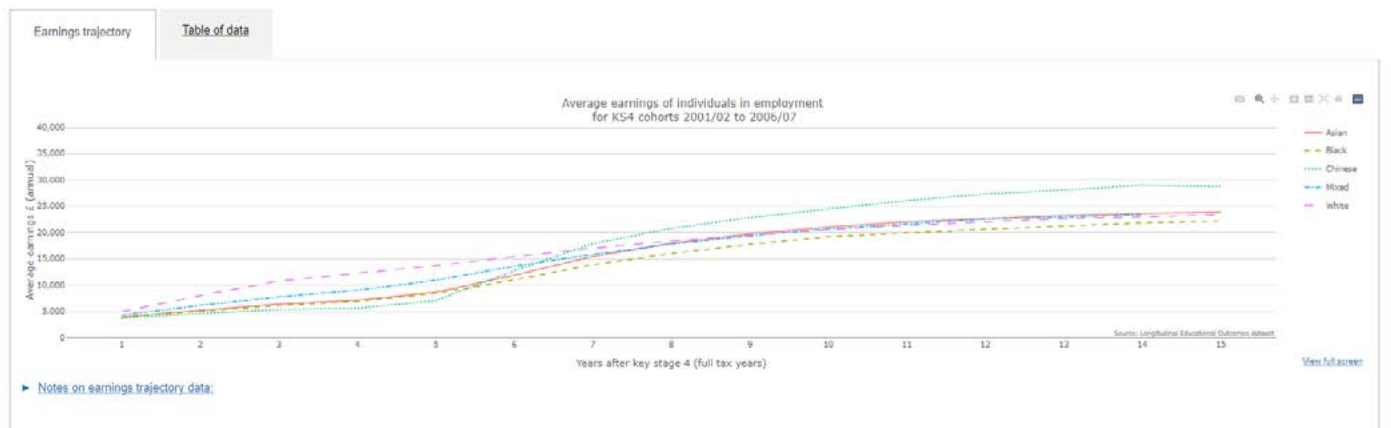
Average earnings of individuals in employment for key stage 4 cohorts 2001/02 to 2006/07 over 15 years.

The graph shows this data as a line chart where the x-axis is Years after key stage 4 and the y-axis is Average earnings.

Choose a population:  Select a sub-group:  Select breakdown(s):   Compare with all individuals

You have selected the **Major ethnic group** sub-group for **All Individuals**. With specific breakdown(s) of **Asian & Black & Chinese & White & Mixed**.

For details of the definitions of the breakdowns used, please refer to the technical report: [Technical Report for Education and Labour Market Pathways of Individuals \(LEO\)](#)



## The LEO dataset

The LEO data extract connects education administrative data with employment and earnings and out of work benefits administrative data. You can find out more about the dataset [here](#).

It was made available to external researchers via the Office of National Statistics Secure Research Service (ONS SRS) by the DfE in 2022.

## Capacity and capability building of external researchers in the LEO data

Administrative Data and Research UK (ADR UK) is funding a partnership between the Centre for Education Policy and Equalising Opportunities (CEPEO), University of Warwick, Institute for Fiscal Studies (IFS) and DfE to develop and enhance the LEO data.

The overall objective is to enhance usability and usefulness of LEO data, by:

- Creating and making available via ONS SRS new research-ready datasets
- Building capacity in the knowledge, understanding and analysis of LEO data, especially amongst early career researchers
- Working with policy colleagues to identify, address and disseminate answers to important policy-relevant research questions using LEO.

If you are interested in the LEO data please use the [interactive tool](#) and or [get in touch](#).

*Oliver Anderson is a social scientist with 15 years' experience, of which almost 10 years is education analysis. He is an employee at the DfE but will soon be joining the CEPEO on a 12 month secondment.*



# The Skills Imperative 2035

**Dr Lisa Morrison Coulthard, Research Director, NFER**

By 2035, higher skilled jobs and healthcare roles are set to offset the millions of jobs displaced by the adoption of automation and artificial intelligence in the workplace.

A number of megatrends and events are expected to shape the world of work in the coming decades. These include Brexit and the COVID-19 pandemic, as well as longer-term trends such as the adoption of technology in the labour market, and major demographic and environmental change.

Understanding the types of skills needed most for work in the future, and how this demand will be met, is essential. However, the nature of this transformation and its implications for the workforce are not currently well understood. These gaps in the evidence need to be addressed. Without evidence-based long-term planning to help affected workers re-skill / upskill and to help young people to develop the right skills while in education, there is a real risk the current skills mismatch will be further exacerbated.

## Looking to the future

The aims of the NFER [The Skills Imperative 2035: Essential skills for tomorrow's workforce](#) research programme is to fill this evidence gap. [The literature review published in March](#) 2022 highlighted that these megatrends are expected to change the role workers play in the labour market, both in terms of their jobs and the skills needed, with a greater demand for skills that complement the new technology.

The [second suite of reports cover a series of future labour market projections](#) produced by The Institute for Employment Research (IER) at Warwick University, working in collaboration with Cambridge Econometrics (CE). These reports highlight the potential impact of these megatrends on the size and composition of the labour market in 2035.

## The structure of the labour market will undergo substantial changes

The projections show the economy is changing slowly but steadily and inexorably in favour of the service sectors. By 2035, there will be significant changes in the skills required to succeed in the labour market.

The projections also indicate that the adoption of technology in the labour market is forecast to affect millions of jobs by 2035. Job losses are expected to be focussed among largely male dominated, blue collar manual occupations, especially in areas where automation is possible, as well as among less skilled white-collar non-manual occupations. This includes jobs such as elementary administration, secretarial, and related occupations such as receptionists and personal assistants. This is a key group who are likely to need re-skilling so they can find other jobs elsewhere in the labour market.

However, far from being all doom and gloom, faster technological change and improving the provision of social services will also create many more new job opportunities. These are likely to offset the jobs displaced due to the adoption of technology, in particular in higher skilled jobs and healthcare roles. There are projected to be 2.6 million new jobs by 2035, the majority of which will be taken by women.

## There will still be many opportunities, even in declining occupations

Most of these new jobs - nearly 90 per cent - will be in professional and associate professional occupations. Science, research, engineering, and technology

professionals will experience the largest net increase in job openings (+0.90 million) between 2020-35, followed by health and social care associate professionals (+0.60 million).

In contrast, there will be reductions in employment levels for administrative and secretarial jobs and skilled trades. Elementary administration and service occupations are expected to see the largest employment decline by 2035 (-0.52 million), followed by secretarial and related occupations (-0.20 million).

However, the projections show that the level of replacement demand (meaning job openings created by workers leaving the workforce for reasons such as retirement, caring, etc.), are generally much larger than net changes in occupations. The future labour market will, therefore, continue to be very dynamic, creating new employment opportunities even in declining sectors and occupations.

### A more qualified workforce

The workforce is also projected to become increasingly well-qualified. More young people are anticipated to continue their education and acquire more and higher-level qualifications, replacing those who are leaving the labour market who are generally less qualified.

Consequently, the number of economically active people with a postgraduate degree level (or equivalent) is projected to double from 2020 levels to about 8.3 million by 2035.

### The need for co-ordinated action led by government

Given the nature of the challenges presented by these projected labour market changes, it is essential that there is co-ordinated action led by government. NFER recommends that under the Cabinet Office, a cross-cutting body is established, to work effectively across government departments and with employers and other relevant stakeholders to ensure that the detailed implications of these changes are understood; as well as how best to ensure a strategic cross-sector response, drawing on views and expertise from across and outside government.

Moreover, assessment is also needed at a regional and local level to determine what these projections mean for employment and output growth in specific sectors or industries and what action industry leaders and regional and local partners, need to take.

For more information, please visit the [Skills Imperative 2035 webpage](#).



In October 2022, NFER released its second suite of reports under its strategic research programme called 'The Skills Imperative 2035: Essential skills for tomorrow's workforce'. The aim of this programme is to identify the essential employment skills that people will need for work by 2035. The latest reports outline future labour market projections, highlighting the impact of a series of megatrends and events. These are expected to fundamentally reshape the labour market in terms of the nature of the jobs workers do and the type of skills that they will require.

**Dr Lisa Morrison Coulthard**  
Research Director, NFER

# SHAPE Skills at Work: The value of expertise and skills from the social sciences and humanities

## The British Academy

In late 2022 the British Academy, the UK's national academy for the humanities and social sciences, published its *SHAPE Skills at Work* report, showcasing the exciting careers and achievements of a broad range of SHAPE (Social Sciences, Humanities and Arts for People and the Economy) graduates.

Through a collection of case studies, the report gives voice to the compelling evidence presented in the Academy's previous *Skills Programme* publications – *The Right Skills* and *Qualified for the Future* – and illustrates how SHAPE skills lead to success not just for individuals but also for society and the economy. This work provides the evidence base for the work the Academy undertakes to drive skills development for the UK workforce through SHAPE disciplines, and highlight the contribution these skills make to the economy and society.

The SHAPE graduates interviewed as part of the *SHAPE Skills at Work* report are employed in fulfilling careers across a wide range of sectors, from financial services and education to media and technology. They include a Product Lead in a multinational technology firm, a Chief Sustainability Officer for a 'big six' energy company, a Consultant in software engineering, and a Director of Strategy for an NHS Foundation Trust.

The report finds that SHAPE graduates are:

- 1. Employed across the UK economy.** The small sample of case studies included in the report offer insights into over half of sectors in the UK Standard Industrial Classification hierarchy, illustrating the breadth of skills developed by SHAPE graduates.
- 2. Utilising highly valued skills in a variety of sectors,** with case study participants demonstrating skills in communication and collaboration, attitudes and behaviours, and research and analysis.

- 3. Motivated by the breadth of perspectives and career flexibility that SHAPE disciplines offer.**
- 4. More likely to have developed creative and social skills during their degree,** in comparison to graduates who have studied STEM subjects.
- 5. Contributing to innovation across the economy.** Over half of the UK's leading startups have been founded by SHAPE graduates and 50% of the leaders of FTSE100 companies have backgrounds in SHAPE, ranging from Business and Management to Modern Languages and History.
- 6. Recognised as employable by a wide range of businesses.** A global survey of 1000 business leaders found that companies with successful talent recruitment were more likely to hire graduates with non-STEM degrees. Business leaders also identified their most in-demand skills as problem solving, creativity and teamwork.
- 7. Leaders in the civil service.** Just over 80% of successful candidates in the civil service Fast Stream and Fast Track programmes have degrees in SHAPE and other non-science disciplines.
- 8. Passionate about their disciplines,** ambitious to make positive differences, and intellectually curious about different societies and perspectives.

*SHAPE Skills at Work* gives voice to findings from the Academy's first skills report, *The Right Skills* (2017), which presented the core set of skills gained from the study of SHAPE disciplines. These can be divided into three core areas: **communication and collaboration;**

**research and analysis;** and **attitudes and behaviours**, as shown in Figure 1. The research involved analysing a range of sources including Quality Assurance Agency (QAA) Subject Benchmark Statements, and the Economic and Social Research Council and Arts and Humanities Research Council training frameworks, which describe the skills individuals studying SHAPE should develop. The case study participants from *SHAPE Skills at Work* also articulated additional skills and aptitudes that they felt were nurtured through their SHAPE education. These are clustered around three themes: **understanding people, entrepreneurialism** and **interdisciplinary insight and capabilities**, captured in Figure 1.

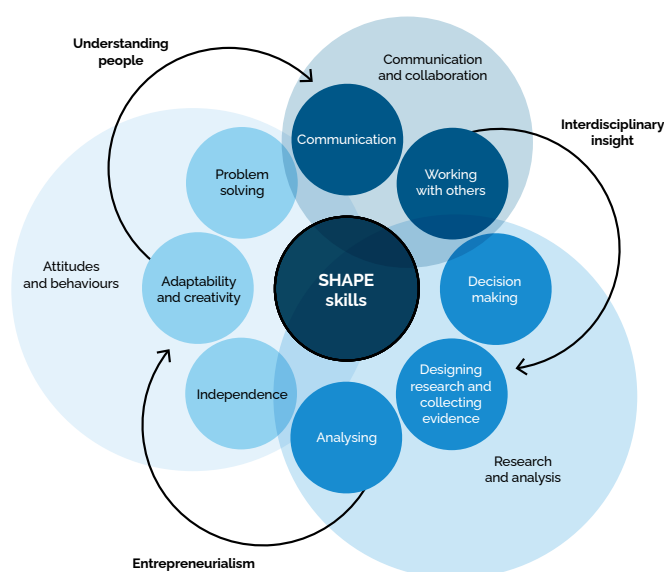
*SHAPE Skills at Work* also builds on *Qualified for the Future* (2020), which uses quantitative evidence to show the strong demand for SHAPE skills in a rapidly evolving economy and society. SHAPE graduates underpin key sectors of the UK economy, with eight of the ten fastest growing sectors employing more graduates from SHAPE than other disciplines. While starting salaries are

lower, SHAPE graduates make strong progress up the career ladder into roles attracting higher salaries. SHAPE graduates are also more likely to change sector and role voluntarily, suggesting greater flexibility and choice as they build their careers. The creative and social skills SHAPE graduates develop during their studies and careers are strongly aligned with in-demand skills identified by business leaders, as shown in Figure 2.

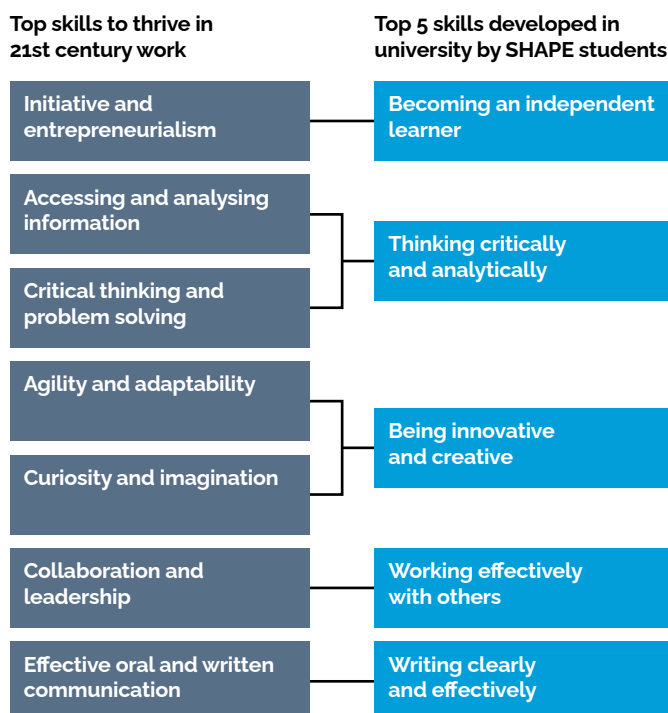
While *SHAPE Skills at Work* completes the British Academy's Skills Programme, the Academy continues to research the value and impact of SHAPE disciplines and skills, and monitor the health of SHAPE disciplines through the SHAPE Observatory. We are also pleased to be engaging with organisations such as the Department for Education's new Unit for Future Skills on issues of mutual interest related to future skills demand.

For more information, please visit the British Academy's [Policy website](#), or contact the Academy's Higher Education & Skills Policy team at [policy@thebritishacademy.ac.uk](mailto:policy@thebritishacademy.ac.uk).

**Figure 1: Core SHAPE skills as identified in *The Right Skills* (2017) and by *SHAPE Skills at Work* (2022) case study participants**



**Figure 2: SHAPE skills and future work, reproduced from *Qualified for the Future* (2020)**







Philosophy taught me how to view an issue from multiple perspectives while being able to reach my own conclusion and clearly articulate it to others. These skills have been invaluable in building products, helping to draw upon the diverse perspectives of all collaborators while working towards a singular objective. When working in a fast-evolving space such as machine intelligence it's helpful to draw upon the creativity and rigour that philosophy equips you with, enabling you to find novel approaches and remain undaunted by wide-open possibilities."

**Oli Gaymond**

SHAPE Graduate, Product Lead for Android Machine Learning, Google

# The perspectives of learners: how are schools developing employability skills?

**Kat Emms, Education and Policy Senior Researcher, Edge Foundation**

This research published in February this year, follows Phase 1 of the Joint Dialogue project. Phase 1 aimed to identify which skills employers are looking for in young people, and to consider what skills are being developed in different school settings, and how this might translate or transfer into a workplace setting. This consisted of the perspectives of employers and teachers and culminated in the 2018 report '[Joint Dialogue: How are schools developing real employability skills?](#)'. The second phase of the project focuses on the *perspectives of the learners*.

## What happened in Phase 1 of the project?

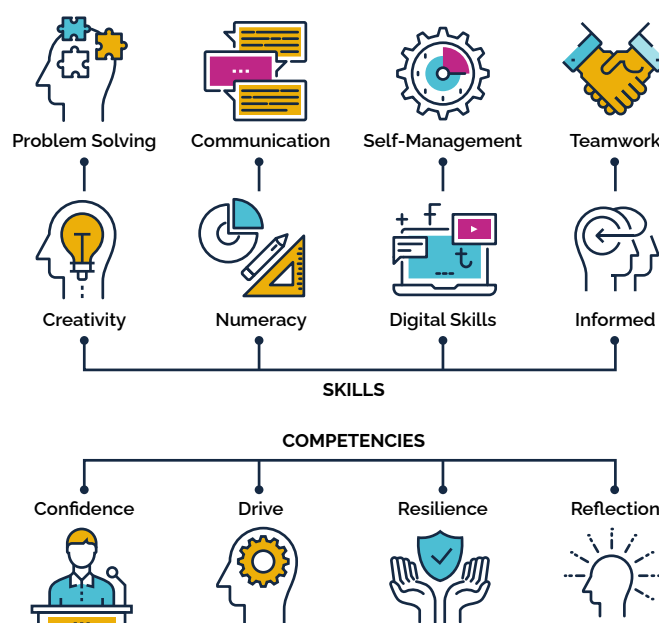
The research project started as a collaborative project between Education and Employers, the Edge Foundation and the National Education Union and published findings in 2018. It was driven in response to an issue frequently raised by employers on the range of 'employability skills' school leavers need above and beyond formal qualifications. Yet there is limited shared dialogue and clarity around which employability skills are important, and what they mean to employers themselves. The research included an in-depth literature review, focus groups with employers, followed by a survey of secondary school teachers.

Through the literature review and interview data, seven employability skills and four competencies were identified as most frequently cited. These were *problem solving, communication, self-management, teamwork, creativity, numeracy, digital skills, being informed (about the world of work), confidence, drive, resilience, and reflection*.

Over 600 secondary school teachers across England were surveyed for their understanding of how students may be developing the identified skills and competencies while at school, whether through:

*classwork, homework, assessments, extra-curricular activities, interacting with peers, at other times/ lessons/activities throughout the school day; or even whether instead they were not developed within the school system.*

Findings from Phase 1 can be found in '[Joint Dialogue: How are schools developing real employability skills?](#)'



## Phase 2 – The learners' perspectives

Phase 2 of this project investigates how learners see their skills and competencies developing in school. It sought to understand learners' perceptions and experiences of developing employability skills, as well as identifying which skills they consider vital to their future. It aimed to:

- understand specifically where young people believe they are being supported to develop 'employability' skills in school – for instance, whether through classwork (e.g. preparing a presentation as a team in a geography class), 'extra-curricular' activities such as after-school clubs, or opportunities outside of the school context;
- investigate whether learners acknowledge employability skills development supported by their schools and whether/how they can articulate and evidence this.

The data for this research project draws on:

- survey responses from 67 learners in Years 10 –Year 13 (aged 14-18)
- focus group interviews with 21 learners in attendance at a school or sixth form college in England
- focus group interviews with learners across two schools for learners with Special Education Needs and Disabilities (SEND).

All learners who participated in this study were those who had remained on an 'academic track' in a school setting rather than pursuing a vocational route (i.e. Further Education college, apprenticeship). The purpose of selecting learners on an 'academic' track was to reflect on the extent to which employability skills are featured within the curriculum and school life.

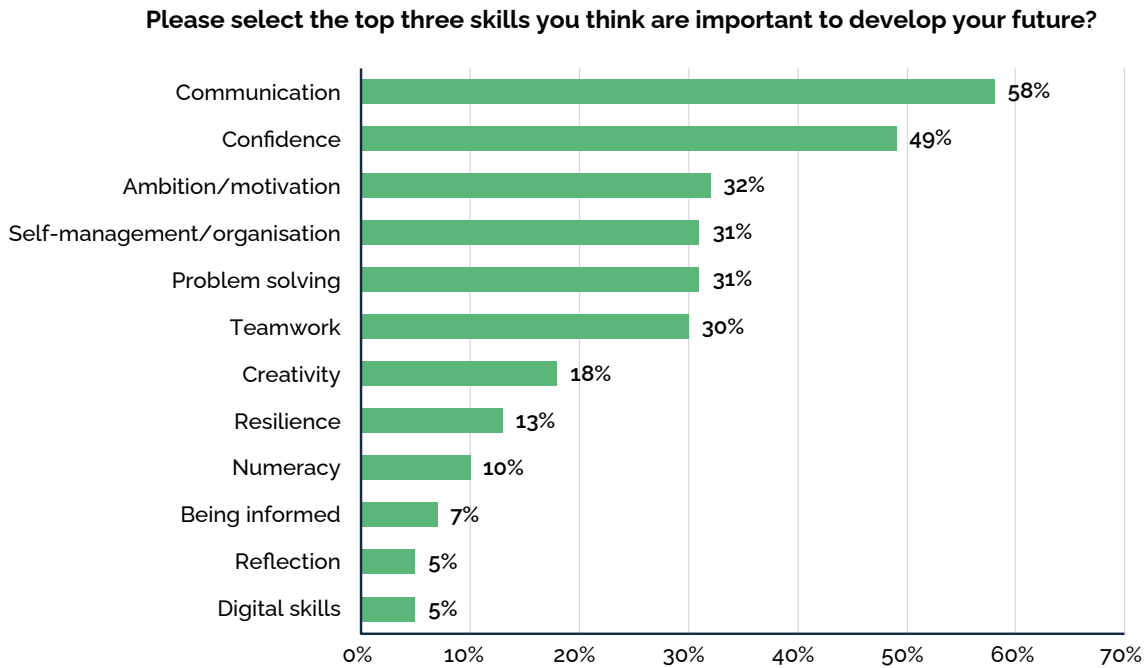
The findings presented in this research suggests that learners understand employability skills to be important, they knowledgeably use the jargon of skills development and have clear views on which skills they believe important for their further study, training or employment. However, they were less able to provide specific examples of how they were developing specific employability skills. This is a crucial point when young people are being interviewed for education/training courses and employment. Offering real examples of employability skills practice suggests that the young person consciously engaged with skills development and can consequently articulate that experience.



## Which skills do learners think are important to develop?

Communication skills, in its broadest sense, was seen as the most important skill to develop by the learners from the focus groups and survey. Digital skills, on the other hand, were seen as one of the least important to develop. Potentially this could be due to young people believing that their digital skills are already well-developed, and therefore not important to develop further at school. However, as has been found in other research (e.g. Dabbous et al., 2022), students' perceptions of their digital literacy is not necessarily in line with what is required of them in school and in the workplace. This research suggests that students believe themselves to be 'digital natives' and therefore already possessing the ability to skilfully use computers. However, the level of this skill is debatable, and worryingly almost a quarter of the students (22.4%) in the survey said digital skills were not being developed in school.

**Figure 3:** Survey results: 'Select the top three skills you think are most important for you to develop' (n=67)

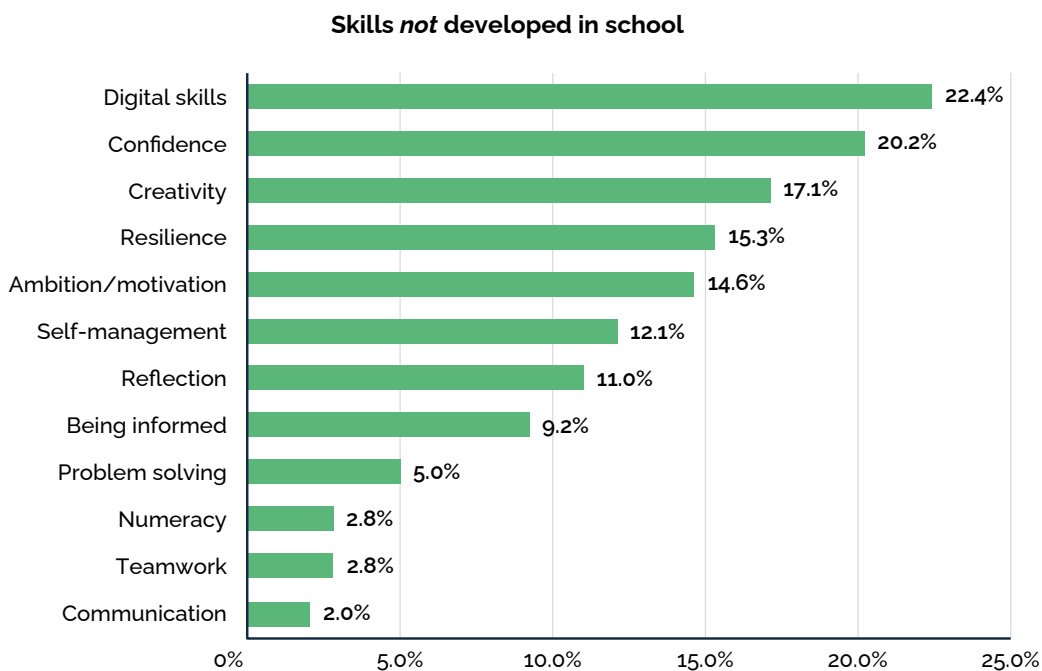


### Which skills are not being developed?

Overall, digital skills, confidence, creativity and being informed were skills highlighted by survey respondents and interviewees as not being developed in school,


suggesting that schools could place more emphasis on developing these as they have all been deemed important employability skills (see Figure 4).

**Figure 4:** Which skills are not developed in school? (n=67)



## How are young people developing skills?

In general, participating young people struggled to offer clear examples of how they have developed employability skills or give examples of how they use them day-to-day. Some skills were easier to discuss with them, such as communications and team working. In these cases, learners were able to offer examples of how they developed them and how they used them in different contexts. However, some of the skills young people found harder to articulate, for example determination. This finding from mainstream schools contrasted somewhat with the students at SEND schools. SEND learners appeared to be able to give clear examples of activities where they are developing certain skills. There was evidence at the SEND schools that skills were often referred to in lessons by teachers, and skills development was directly linked to activities and learning outcomes which were articulated to learners. For instance, students are told at the beginning of their lesson that it will focus on their leadership skills:



After lunch we do skills lessons like leadership sessions – we speak about different types of leaders from different parts of the world and see which ones we like. We then have lots of social and leadership activities, for example we have walkie talkies and we go out into groups into town and give instructions to each other about where to go."

**(Year 11, SEND school)**

In terms of where students felt they developed certain skills, there were particular contexts that were highlighted more than others. For instance, homework and assessment were mentioned as beneficial for developing skills such as resilience. Problem-solving skills were highlighted as being developed particularly in the classroom, however this tended to be only in certain subjects, such as maths, science and geography. Teachers in Phase 1 perhaps overemphasised the role of classwork in students' employability skills and competency development. According to the teachers' survey, 'classroom' was the number one place where employability skills and competencies were developed, except when developing self-management, where 'classroom' came second after 'homework' (Kashefpakdel et al., 2018, Chapters 5.1 and 5.2). Instead, learners in Phase 2 emphasised the value of interacting with their peers and assessments, where employability skills were developed.

Extra-curricular activities were widely acknowledged amongst learners as being important in the development of employability skills. This was most confidently discussed by learners with clearer examples given. However, constraints of the curriculum such as homework and examinations, particularly for sixth-form students, were discussed as limiting the amount of time available for extra-curriculum activities once they move to the final stage of their schooling. Teachers surveyed in Phase 1 likewise commented on the limited time available in school to engage in extra-curricular activities and creative subjects.

This research has highlighted some of the gaps in young people's employability skills development and where this is missing within the school day. There also seems to be a disconnect between the 'skills development' language learners use and the extent to which they can articulate their experiences. It is hoped that this research will shed light on how young people could be supported within school to develop their skills further in order to better prepare them for their future and for the workplace.

# At risk: our creative future

## House of Lords Communications and Digital Committee

The House of Lords Communications and Digital Committee published their report '[At risk: our creative future](#)' into the future of the creative industries sector in the UK in January 2023.



The report affirms the central place of the creative industries, including music and performing arts, museums, publishing, gaming, and film, to UK national prosperity. The sector includes as many as one in eight businesses across the UK and accounted for £115.9 billion, almost 6% of the UK's entire Gross Value added in 2019. As the report stresses, this was a contribution exceeding that of 'the aerospace, automotive and life sciences industries combined'.

However, the committee has warned that 'government complacency risks undermining the UK's creative industries in the face of increased international competition and rapid technological change' over the next 5-10 years. One area the committee has indicated requires greater government attention is the acute skills shortages afflicting the sector, directly contributing to depressing growth potential. The committee has

called on the government to facilitate improved data gathering initiatives and instigate an evidence-based coordinated approach between government departments and across providers and industry.

### Skills shortages

Drawing on witness evidence, the committee has outlined the skills shortage problem but argued that far more work is required in assessing and measuring its scale. Witnesses reported 88% of employers in the sector struggle to recruit high-level skills such as 'creative skills, technical skills, cultural management skills and business skills' compared to 38% across the economy, and that this was having an inhibitive effect on growth. One animation studio reported having to turn away work because of a lack of skilled workers. International competition and increasing mobility

of skills due to remote working has compounded shortages. The consequent resourcing difficulties impact SMEs especially hard, which constitute a large portion of the creative industries sector. Despite these tangible difficulties, the report highlighted a paucity of data and lack of centralised metrics evaluating the scale of skills shortages in creative industries. Existing data collection strategies of the Department for Education (DfE) were inconsistent, and this had impacted investment in and concern around creative courses in higher education that might be able to address these shortages.

The committee reported that the education system is currently inadequately preparing young people and other learners for careers in creative industries. They were particularly concerned that creativity and creative subjects are insufficiently prioritised in the curriculum and classroom. Agreeing with and drawing on the recent [House of Lords Unemployment Committee report on youth unemployment](#), the committee particularly singled out the introduction of the English Baccalaureate (EBacc) in 2010, which had made creative and interdisciplinary teaching 'much harder' in secondary schools. This, the Unemployment Committee reported, had serious consequences for skills provision for the creative, green, and digital sectors.' In creative industries, GCSE entries in creative and technical subjects have fallen, with Design and Technology declining precipitously by 70% between 2010-21.

The digitisation of creative industries means there is a 'growing need for individuals with both creative and digital skills' that witnesses reported such courses were well placed to provide.

The de-prioritisation of the needs of the creative economy has had consequences for careers advice too, which the Committee described as 'patchy and disjointed'. Tutors were provided with insufficient guidance and struggled to obtain up-to-date and relevant knowledge of the way learning activities interlinked with skills priorities in the creative industries given how quickly technological change is transforming the sector. For example, one witness reported that teachers and students did not seem to know a programming language like Python had exciting uses beyond designing websites in screen industries, 'whether it is Star Wars or Marvel', which use 'Python at the back-end to create all the visual effects on that film'.

Given the potential economic contribution technical and creative skills possess, the committee called the government to recognise much more strongly the 'serious commercial proposition' they represent. The Committee in particular criticised the DfE's 'lazy rhetoric' around 'low-value' denigrating creative courses in higher education. Witnesses aired further frustration with government's apparent reluctance to marry this imperative with its otherwise aligned levelling up agenda and future growth plans.



We would certainly love to see more opportunities for those vocational, technical, creative subjects to come further forward in the curriculum—things like the young apprenticeships that used to exist and which were incredibly popular as an opportunity for 14 to 16 year-olds to have a taster of a creative industry or a technical subject so that they might then go on to compete for an apprenticeship at 16 ... We would certainly like to see things like strong BTECs and strong stand-alone qualifications continue. ...

We sometimes worry about overemphasising preparation for work, but it is important to think about the skills we are talking about. Actually, we want those skills in our partners, families and neighbours—good communication and good problem-solving.

### **Olly Newton**

Executive Director of the Edge Foundation,  
giving oral evidence to the Committee

# Green Jobs and Skills Shortages



In this feature, we explore a number of perspectives on skills shortages and opportunities arising from government net zero targets. Concerted effort will be required immediately across the skills landscape from employers and government in order to tackle these challenges.



# Green Edge, Local Skills Improvement Plans: data, green skills, and assessing progress

**Dr Michael Cross, Co-Author of The Green Edge**

[The Green Edge](#) produces a weekly post and podcast (now listened to in over 30 countries) focused on green skills, jobs and employment. It also produces a monthly summary of reports, and operates a data portal. All resources are provided on an open access, free subscription basis.

Across England, 38 Local Skills Improvement Plans (LSIPs) are currently being drawn-up largely by Chambers of Commerce, with the aim of having the plans approved by the Secretary of State for Education by the summer of 2023. Each of these two-year plans is seeking to place employers at the heart of their local skills systems and facilitate direct and dynamic working arrangements between employers and providers. The plans will set out the key changes needed in a local area to make technical skills training more responsive to employers' needs. Here, the process and outcomes are almost equally important.

While the LSIPs cover the whole local economy, they will be seeking to pick-up on developments across the new economy (made-up of 48 sub-sectors split equally between products and services) and the net zero economy (16 sub-sectors, Table 1). Defining the green and net zero economy is not straightforward, and the existing Standard Industrial Classification system has great difficulty in coping with new and emerging sectors. To address this deficiency, Data City has developed a Real Time Industrial Classification system which is then used to classifying 5 million business across 350 categories. This helps to address one data challenge as it identifies almost 20,000 business in the net zero economy compared to around 2,300 business sampled by the Office of National Statistics' (ONS) low-carbon and renewable energy economy database. This rich source of finely tuned data has been widely used by the Grantham Institute, the Resolution Foundation, Centre for Cities, and WPI Economics in their work to understand the net zero economy.

The next challenge is delving into the content of new jobs and skills across the new and green economy, and this is being met using new taxonomies developed by organisations like Nesta and Lightcast which both use online job postings like the European-based Skills-Ovate. In addition to this there are the major occupational information systems: ESCO (European Skills, Competences, Qualifications and Occupations database) and O\*NET (USA Occupational Information Network). Both are available online at no cost. Similarly, the Office of Qualifications and Examinations Regulation (Ofqual) maintains a full register of all regulated qualifications (irrespective of their level or size) [which captures new and emerging skills down to relatively small education and training packages](#).

Taken together, fine-tuned industry and sector data matched with detailed occupational data means that it is possible to both define, measure, and monitor how and where the green economy is developing. It is these data sources that allow LSIPs to be based on as near accurate picture of what green work exists, how it is changing, and what skills are required to undertake it. When you know the tasks, skills, abilities, and competences of a job it is possible to devise appropriate education and training curriculum. At a slightly more aggregate level, it is possible to examine how an existing job compares to a new and emerging one and so look at how someone can make a job switch or career change. For example, we can start to plot how workers from one sector, say, oil and gas extraction can move into offshore wind and other related renewable sectors.

**Table 1: Net zero economy taxonomy**

Sub-sector	Definition
Agri-Tech	Companies developing technologies and services transforming traditional agricultural practices
Building and Building Technologies	Companies providing technology and services for increased energy efficient in buildings
Carbon Capture	Companies dedicated to carbon capture, storage, and utilisation
Low-Emission Vehicles	Companies focusing on the development of technology and infrastructure for electric vehicles
Energy Cooperatives	Energy producers where citizens have ownership over the energy source
Energy Storage	Companies providing services and technology to capture energy for use at a later time
Grid, Demand Side Response and Efficiency	Organisations dedicated to energy management and energy infrastructure development
Heating	Companies supporting low-carbon heating
Diversion of Biodegradable Waste from Landfill	Companies focusing on landfill management
Low-Carbon	Companies providing energy from low-carbon sources
Pollution Control and Migration	Companies providing services and technology for the mitigation of pollution
Renewables	Companies providing energy from renewable sources
Waste Management and Recycling	Companies dedicated to solid waste removal, management, and processing
Low Carbon Consultancy, Advisory, and Offsetting Services	Companies providing environmental consultancy for the low-carbon economy
Green Finance	Structured financial activity aimed to create a better environmental outcome
Renewable Energy Planning Database (REPD)	A list of companies generated based on the REPD – a database of renewable energy projects over 150KW to capture additional renewable energy businesses

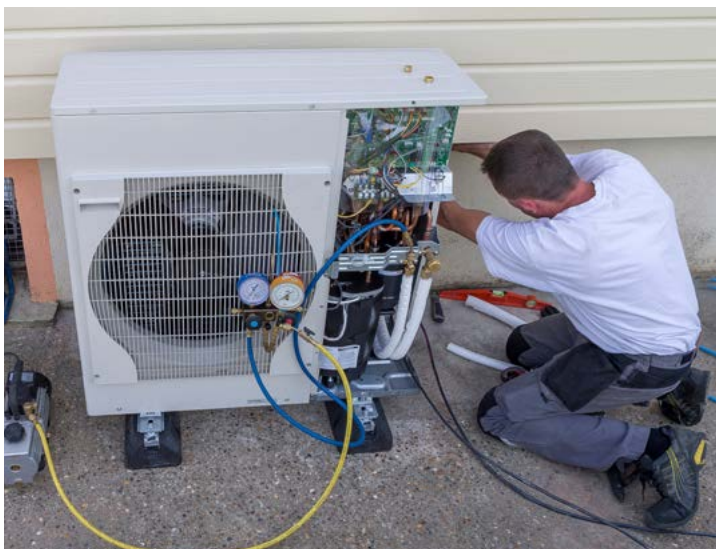
Source: [Data City](#)

Two further uses of these combined data sets, sector and occupation, are:

1. to devise new and emerging occupational maps much like those of IfATE (Institute for Apprenticeships and Technical Education), and inform careers advisory and guidance work. And,
2. to develop effective green skills policies based on a robust set of assumptions (Table 2).

**Table 2: Green Skills Policy – Assumptions**

Green skills are mostly well-known existing skills
Most jobs will have a green component
Existing job holders will do most of the green work
Green projects will draw in vast numbers of people
Green skills do not standalone
Green skills can be seen through changing job titles
Emerging green jobs draw in over-qualified people
Green skills are relevant across the whole of society
Essential to have a responsive green skills education and training infrastructure
A shift to sustainability and circular economy principles needs a mindset shift



## Heat pump engineers: the scale of the challenge

In the UK, heating our homes is a significant contributor to the country's climate emissions, accounting for 15% of total emissions. Almost all UK homes rely on burning gas or oil. Heat pumps are the best low carbon alternative, and have found widespread use in Sweden and Norway. They run on electricity and collect from surrounding air, water, or ground, rather than generate heat. **Plans to meet UK net zero targets by 2050 require swapping 25 million of the 4 million oil and 23 million gas boilers for heat pumps.** However, there are significant barriers that must be overcome to reach this target.

In 2022 NESTA (National Endowment for Science, Technology and the Arts) published a report *How to scale a highly skilled heat pump industry* outlining the scale of the challenge and arising skills shortages. Heat pumps have high up-front and ongoing costs, and the net zero targets require installing 600,000 heat pumps a year by 2028, a twenty-fold increase in current installation numbers. This will require the current pool of just 3000 trained heat pump engineers to increase to at least 27,000 by 2028, **more than doubling the number of engineers annually over the next six years by training 4,000-6,000 new engineers every year.**

To meet this huge challenge, NESTA called on the government to show leadership and take initiative to develop clearer routes into the industry, collaborate and fund new CPD and courses with Further Education colleges to attract new entrants and upskill experienced gas engineers, and increase the diversity and productivity of the industry. It also called on heating manufacturers to consider getting more directly involved in training engineers.

# Case study: Is upskilling the quick answer to meeting Net Zero targets for heating?



## Mitsubishi Electric

Society faces a serious challenge in recruiting the next generation of engineers to join the heating, ventilation and air conditioning (HVAC) sector, and part of the answer lies in highlighting the importance of what remains a fairly hidden yet essential profession – one that plays a significant role in helping us on the road to net zero.

HVAC touches every part of our built environment with skilled engineers responsible for making sure we are comfortable, whether in the home, at work, shopping, eating out, or even working out in the hotel gym. Heating accounts for almost a third of all UK carbon emissions, so changing how we heat our buildings is critical to tackling climate change and reaching net zero.

Until we solve the conundrum of encouraging new talent into the industry, can we aid our progress to net zero by helping existing heating engineers to upskill to install renewable heat pumps? And in doing so, can we raise the profile of this vital, unseen sector to encourage more school leavers to consider it as a career?

Consumers are more environmentally conscious and are demanding greener decision-making from businesses. This is supported by ever-increasing regulations pushing towards more energy-efficient buildings and equipment.

The British government has set [an ambitious goal of 600,000 annual heat pump installations by 2028](#). This requires a tenfold increase in the number of installations over the next five years, but however ambitious, reaching this target is essential to achieving net zero carbon emissions by 2050.

The focus is now on transforming the landscape by decarbonising how we heat buildings. This requires a move away from oil and gas towards renewable solutions like heat pumps. With around 90% of UK homes

technically already capable of being heated with a heat pump, they can play a huge role in tackling climate change and reaching net zero. But, while regulators are pushing towards this goal by, for example, [banning gas boilers in new build homes from 2025](#), there's a distance between the theory and the practical implementation. The main barrier here is skills.

Heat pumps need to be designed, installed and commissioned correctly for each individual application, and this is where training and support are so important. Fortunately, the heating industry already has a strong base of installers and plumbers who already have the required skills - it's about adapting them to fit technology that works in a different way from fossil fuels.

Here are three ways the industry can build advocacy for green skills:

### 1. Underline how green jobs are future-proofed

The green industry is already a major employer. According to an International Renewable Energy Agency 2020 report, there were already 11.5 million jobs worldwide in renewable energy alone. The United Nations International Labour Organization says this is just the start and that a shift to a greener economy could create an additional 24 million jobs by 2030. Embracing the green economy is not only necessary for the environment but can help future-proof employment opportunities and create new ones.

## 2. Showcase the financial benefits to installers

Upskilling has financial advantages in addition to giving installers future stability. Home and business owners are increasingly picking “green” heating solutions, with an estimated 50% rise in heat pump installs in 2021. By extending the range of services provided, installers with the expertise to fulfil this rising demand can tap into this upswing to find new areas of growth for their business.

Installers can also stand out from competitors by giving consumers useful information on renewable heating and become recognised as authorities in the industry.

## 3. Make training easily available

By upskilling, installers can maximise existing skills and benefit the future of their business. The training is flexible, through a mixture of online learning and virtual workshops. This blended style helps installers gain a comprehensive understanding allowing them to pick the subject up faster. Online training can be completed in their own time, so installers can future-proof their business. It's all about applying existing knowledge in new ways rather than gaining totally new skills.

For the UK to reach net zero, installer education and training are essential. Not only will installers become familiar with heat pump technologies as gas boilers become obsolete, it will also help highlight the career opportunities to new generations of heating engineers.

With specialised training programmes emphasising future-proofing installers' abilities, Mitsubishi Electric is prepared to assist in making this investment as seamless and advantageous as possible. These programmes will help businesses become more profitable and sustainable. Find out more about the training programmes on our website.



We're working hard to emphasise how easily installers can upskill to work with heat pumps. They already have a vast amount of knowledge and practical skills. With a little bit of additional training to fit around their busy schedule, installers can quickly be at the forefront of the heat pump revolution. This training will allow them to reap the financial benefit of being able to meet the rising demand for heat pumps and – ultimately – help the UK achieve its sustainable goals.

The Covid pandemic meant that we needed to find different ways of delivering training for our products and this led to the complete revamp of the entire programme. Now, we use a mixture of online learning, live webinar training, and 'hands-on' live equipment training, where we can explore real-world issues. This not only means that we can now reach about ten times as many engineers as before, it's also more convenient for our customers, who can choose when to do the training. An additional benefit is our trainers now have more time to plan so we have added additional courses and additional product types to offer even more choice for our customers.

### Lance Hitchins

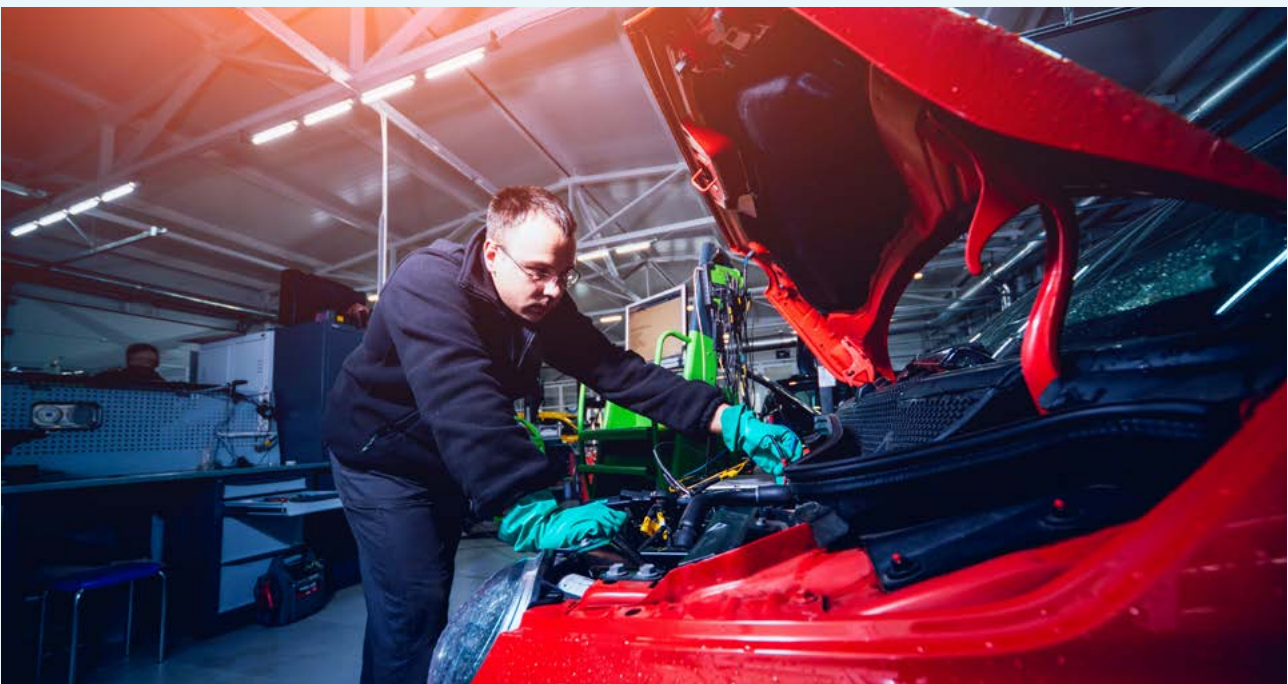
Head of Customer Training at Mitsubishi Electric UK

## Electric vehicle technicians: diversification and upskilling

In other sectors, similar skills shortages arise from the shifts in technologies required to meet net zero goals. Electric vehicles represent a particularly high-profile initiative. The government announced in 2020 the sale of new petrol-diesel cars will be banned from 2030. To meet net zero targets, 32 million internal combustion engine vehicles will need to be replaced with low carbon alternatives, primarily battery electric vehicles.

The [Social Market Foundation \(SMF\) in its 2022 report \*A vehicle for change: Upskilling the UK's technicians to service and repair electric vehicles\*](#) identifies potential skills shortages arising in the automotive aftermarket in pursuit of net zero. There is cause for some optimism, as there is currently a surplus of well-trained technicians to meet existing and near-future demand for services following the original sale of vehicles for parts, equipment, service, and collision repair until 2026. Subsequently however **a shortfall will arise of up to 25,100 trained technicians by**

**2030.** To meet this demand and to address the shrinking, undiversified, and aging workforce, the report argues that unfavourable cultural perceptions of the sector need to be addressed. Interventions to secure a green talent pipeline should include campaigns, improved careers advice, and prioritisation of green jobs in apprenticeship policy. The shift to electric vehicles emphasises electrical and computer-based skills over mechanical skills and is likely to make the sector more attractive for a broader range of young people. This shift in skills also requires accessible and formal CPD paired with regulation and accreditation. The move away from petrol-diesel vehicles must be accompanied by secure affordable, reliable, and convenient charging infrastructure and support for independent and small workshops. Like NESTA, SMF calls on the government to clarify and build confidence in its medium-term plans for the phasing out of harmful technologies.



## 'Climate quitting' and young people's attitudes to green jobs



Recent research is evidencing the strength of commitment of young people to ensuring their contributions to the labour market are aligned with efforts to tackle the climate crisis. A 2022 [survey conducted by KPMG identified](#) what they described as **widespread 'climate quitting' influencing employment decisions for almost half of UK office workers** as they search for more environmentally friendly jobs. Their survey of 6000 UK adult workers, students, and apprentices indicated that across the labour market 46% wanted the company they worked for to demonstrate a commitment to tackling environmental and social challenges. 55% of those aged 25-34 were most likely to value such commitments from their employers, with similar proportions of 18-24-year-olds (51%) and 35-44-year-olds (48%). Across the sample,

one in five reported they had turned down a job offer from companies whose commitments did not align with their values, rising to a third of 18-24-year-olds. Similar findings were reported in a [British Gas poll of 15-25-year-olds which found that 71% of this age group wanted a career that does not have a negative impact on the planet](#). These findings stress the importance of employers taking their responsibilities to meeting climate goals seriously as the environmental consciousness of the workforce strengthens. [Skills Shortage Bulletin 11](#) featured recent research from the Learning and Work Institute and WorldSkills UK highlighting how young people's enthusiasm to contribute action tackling the climate crisis can be supported to acquire the skills needed to support the UK's transition to net-zero emissions.



The Edge Foundation  
44 Whitfield Street  
London, W1T 2RH

T +44 (0)20 7960 1540  
E [enquiry@edge.co.uk](mailto:enquiry@edge.co.uk)

[www.edge.co.uk](http://www.edge.co.uk)