

2030 Britain ● Powered by physics

The UK must find new answers to **strengthen our economy, give hope to younger generations** and put us on the front foot in the **global technological revolution.**

IOP Institute of Physics

Physics can unleash Britain's potential

Physics-based businesses drive **11% of our GDP**

Physics skills and knowledge power nearly **2m jobs**

Physics equips young people to **understand and change their world**

Physics drives UK breakthroughs

Cancer diagnostics and treatments which **save lives**

Satellite climate trackers to help in the fight against **climate change**

Cutting-edge quantum sensors to improve **energy efficiency**

But Britain risks slipping behind if we don't act now to secure the future of physics



R&D investment is **not keeping pace** with global frontrunners

We face a **desperate skills gap** in physics-powered industries



Our **struggling education system** denies millions of children a future in physics

To unleash Britain's potential we need to:

1

Radically increase R&D investment

to match or exceed the top OECD countries and boost economic growth, productivity and job creation across all parts of the UK.

2

Equip more people with the technical skills

that a 21st century economy demands, unlocking social mobility and driving growth.

3

Tackle the barriers in the education system

that prevent too many young people enjoying the opportunities that arise from pursuing physics.

1

R&D is the engine of a thriving modern economy and society. Investment in R&D is a key driver of economic growth: it boosts business productivity, creates high value jobs, unlocks technological advancements and powers the journey towards a green economy.

Physics fuels this growth, underpinning a third of all business R&D and powering many of the world's most impactful innovations, from fibre optics that bring better connection to millions of homes across the UK to MRI that helps diagnose disease. Research commissioned by the IOP found that, in 2019 alone, physics-based industries directly generated £229bn in gross value added (GVA) or 11% of total UK gross domestic product (GDP). This means new jobs, growth and opportunity.

Physics innovation also benefits all parts of the country and all parts of our society. Every part of the UK saw growth in GVA generated by physics-based industries over the decade to 2019, with particularly strong growth in the North West and the West Midlands.

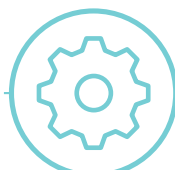
Furthermore, physics skills are central to the new industrial landscape. They offer routes

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to productive employment, and varied and rewarding careers, for people in every part of the UK, with the labour market demand for physics skills being large enough to be significant everywhere. And in the years to come, we will depend more on physics knowledge and skills to address the challenges we face, whether through improved diagnosis and treatment in healthcare, living more prosperously and sustainably, addressing our energy needs or protecting our biodiversity. In all these ways, and others, physics has the potential to improve our lives.

To unlock this powerful potential of physics, the UK needs a world-

class R&D system that is fit for the future. This means increasing R&D investment to match or exceed the top OECD countries and focusing more of that investment on ground-breaking research in physics, cutting-edge innovation, skills development, facilities and infrastructure.



2

Technical skills are at the forefront of the new economy, from green energy and nuclear industries to electrical engineering, construction and digital. So apprentices in physics-based businesses, from engineers and technicians in the space sector to sonographers that help save lives every day, have a crucial role to play in tackling the UK skills gap.

Almost 1 million, or over 50%, of physics-related roles typically don't require a degree. But this is not widely known by young people considering their post-16 options or those influencing their decisions. This lack of awareness – underpinned by challenges facing apprenticeship training providers and employers in the UK – mean not enough young people are successfully engaging with these rewarding and much-needed routes.

Our **2023 Solving Skills report** highlights that employers are not sufficiently involved in shaping apprenticeships, especially for SMEs, who often struggle with the administrative overheads.

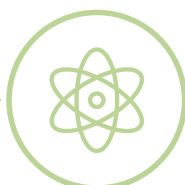
Young people also face significant barriers to choosing this rewarding path. They are not sufficiently exposed to local employers to understand the exciting local apprenticeship

Equip more people with the technical skills that a 21st century economy demands, unlocking social mobility and driving growth

opportunities that are open to them and some schools are, in effect, financially incentivised to favour promoting academic routes to keep young people and their associated funding in their schools. Over a quarter of apprentices surveyed reported financial concerns relating to their apprenticeship and over a third had to travel more than 20 miles to their training provider – while having to grapple with poor transport infrastructure and lack of locally affordable housing.

And employers report serious concerns about the diversity of physics-related apprentices, with women making up only a fifth (21%) of new physics apprentices in England, dropping to only 4%

in Scotland. Addressing this will mean tackling stereotypes and misperceptions about who can do physics and busting the myth that apprenticeships lead to 'lower status' jobs – misperceptions held by young people and the key figures that influence their decision making.



3

Tackle the barriers in the education system that prevent too many young people enjoying the opportunities that arise from pursuing physics

Too many young people are denied the rich and inspiring future that studying physics can offer because our struggling education system denies them the opportunity to pursue physics.

In particular, there is a significant and well-known problem with girls being underrepresented in physics – and the underrepresentation does not stop with girls. Young people from disadvantaged backgrounds, disabled people, LGBT+ people, and those from minority ethnic groups – particularly those from Black Caribbean heritage – are all underrepresented in physics.

This matters. Choosing to do physics gives young people the tools to understand their world and shape their future. It is therefore vital that more young people from more diverse backgrounds are supported and encouraged to do physics.

Why aren't more young people pursuing physics?

- Because too many children hear negative messages at school about physics, about themselves, and about who can do physics.
- Because hundreds of schools (and therefore tens of thousands of students) are without access to a specialist physics teacher, most often in disadvantaged areas.

To turn the tide and attract more young people from underrepresented backgrounds into physics, we must ensure all schools offer inclusive and equitable environments. Children need to hear that they can be anything they want to be from a young age, and we need teachers to tell children they can do physics and not repeat outdated, discouraging cliches.

We're therefore calling on the next government to make whole school equity plans mandatory in all nurseries and schools – underpinned by a director-led implementation unit in the Department for Education and a minister responsible to drive these efforts – along with changes to teaching standards, teacher training and CPD, and school inspections.

An inclusive environment must be backed up by high quality specialist physics teaching in all schools. Children who don't have access to a specialist physics teacher are less likely to study

physics and related subjects post-16, reflected in the fact that 70% of A-level physics students come from about 30% of schools – often in the wealthiest areas.

But last year, physics teacher recruitment in England was at its lowest level against the government's own target in over a decade, and the numbers of physics teachers leaving the profession remains stubbornly high, especially in the first five years of a teacher's career, where it is currently higher than any other subject. It is time to better recognise, promote and celebrate the value of teachers.

To have any chance of closing this teacher gap over the next 10 years, we call on the next government to value physics teachers appropriately: urgently invest in recruiting, retraining and retaining the next generation of specialist physics teachers, including addressing the root causes (such as high workload) for teachers leaving the profession.