

IOP Institute of Physics

IOP Response to the Public Accounts Committee Inquiry: Developing workforce skills for a strong economy

Institute of Physics

The Institute of Physics (IOP) is the professional body and learned society for physics in the UK and Ireland, with an active role in promoting co-operation in physics around the world. We strive to make physics accessible to people from all backgrounds.

Our submission to the Committee provides evidence about the contribution of physics to the economy and to employment, and sets out the changes needed to bolster the development of physics skills so physics can play an even greater role in driving productivity, prosperity and economic growth throughout the UK.

The value of physics

Many of the biggest changes in our lives have been made possible by physics: mobile phones, the internet, medical imaging devices and electric cars, for example. Physicists can help us tackle the challenges our world faces, like dealing with climate change and feeding and caring for a growing global population.

Measuring the performance and growth of the physics sector between 2010-2019, the IOP and the Centre for Economics and Business Research found that, in 2019 alone, physics directly generated £229bn gross value added (GVA), equivalent to 11% of total UK gross domestic product (GDP). Within the UK physics sector, there are more than 2.7m full-time employees¹ – accounting for 10% of total UK employment, and labour productivity in the sector is strong, at £84,300 per worker, per year. Industries reliant on physics include energy, healthcare, telecommunication, manufacturing, transport, aerospace and defence.²

To unlock and realise the full benefits of the new industrial era, it is necessary to ensure that enough people have the essential skills to drive innovation through research and development, to grow businesses and create opportunities in new industrial sectors. Ensuring the supply of these skills has the potential to boost productivity, prosperity and economic growth throughout the UK.

The opportunity for the UK

The UK's economic growth and future prosperity is dependent upon people in all parts of the country having the knowledge and skills needed to realise their full potential in productive employment. Education and training in physics open doors to fulfilling careers across a range of critical industries, from engineering and construction, to health and science, to digital and finance. With demand for physics skills growing and now in excess of pre pandemic levels, targeted action to strengthen the skills of the current and future workforce is needed to drive economic growth and recovery.

In addition to their broad utility across the economy, physics knowledge and skills have a critical role to play in fuelling technological innovation and the green industrial revolution. However, skills shortages threaten to derail plans to increase investment in physics-based R&D and innovation,

¹ This figure refers to roles within Physics Based Industries which may or may not include a requirement for physics knowledge and skills.

² <https://www.iop.org/sites/default/files/2022-02/IOP-Contribution-of-Physics-to-UK-Economy-new.pdf>

causing delays to projects and missed business opportunities, with only 11% of physics innovators reporting that they experienced no difficulties recruiting.³

The UK Government has made a commitment to increase the UK's R&D intensity so that investment levels reach 2.4% of GDP and are closer to those of leading economies. For the UK to fully seize the opportunities offered by increased investment in R&D, we need an equally dramatic increase in the scale and diversity of the skilled workforce to fuel progress.

Demand for physics skills is set to grow⁴ meaning that, without an increase in the availability of physics skills, existing shortages will be exacerbated, and will seriously limit physics' potential to deliver long-term economic and societal benefits. We share the conclusion from the National Audit Office's report that having a sufficiently skilled workforce is critical to the country's economic success and to achieving wider government aims such as greater equality of opportunity. Coordinated action and investment in the development of the current and future workforce is needed now if the UK is to build more innovative, green economies and secure a more prosperous, sustainable future for everyone.

A clear example of this is in relation to quantum technology, recognised as one of the transformative technologies that will have a critical role in underpinning the next wave of innovation. To maximise the economic and societal benefits of quantum, government departments need to work together to create an integrated national skills programme for quantum technology spanning all educational stages and retraining. There should be a key focus on technical education to ensure that supply can meet demand and that opportunities are available for people with different skills, from all backgrounds, to play roles in this new sector, including consideration of upskilling, reskilling, and CPD approaches.

Unlocking the potential of physics skills

In late 2021, the IOP commissioned Emsi Burning Glass to provide new insight on the use of physics skills in the UK and Irish economies, including how it varies across occupations, industries and regions, and whether employers' needs for physics skills are being met.⁵

Their report concluded that:

- **Physics skills support nearly two million jobs⁶ (approximately 1 in 20 UK jobs) and underpin productive industries in every part of the UK**, with the highest concentration of jobs in Scotland (with 16% more in Scotland than the UK average would suggest). Strengthening provision of physics skills is therefore central to ambitions to improve economic growth, prosperity and living standards at national and local levels.
- **Demand for physics spans all skills levels:** while high-skill-level roles are seeing the fastest growth – with the number of jobs for physical scientists, for example, growing by 40% between 2010 and 2020 – more than half (53%) of physics-demanding jobs do not require a degree, with a sizeable minority (46%) typically requiring intermediate-level qualifications such as A-levels, Highers and apprenticeships.

³ <https://www.iop.org/strategy/productivity-programme/innovation-survey>

⁴ <http://www.ncub.co.uk/insight/state-of-the-relationship-report-2018/>

⁵ <https://www.iop.org/sites/default/files/2022-01/IOP-unlocking-the-potential-of-physics-skills.pdf>

⁶ This figure refers to roles that include a requirement for physics knowledge and skills and which may or may not be within physics based industries.

- **Significant unmet demand for physics skills exists**, with a substantial number of physics-demanding roles at any one time – nearly 9,000 high-duration vacancies in mid-2021, having quickly recovered to pre-pandemic levels – being hard to fill. This is impacting employers' ability to grow and innovate: separate IOP-commissioned research found that two-thirds of physics-based businesses reported suspending or delaying R&D/innovation activities in the past five years due to skills shortages.
- **There is strong, sustained growth in demand for physics skills** – particularly outside of the scientific sector, with a significant proportion of hard-to-fill vacancies being for digital, and business and finance roles – reflects their importance, but is likely to exacerbate existing skills shortages in the coming years.

Consequently, action to bolster development of physics skills among the current and future workforce is needed now, to help governments fully seize the opportunities offered by increased investment in R&D and deliver on ambitions to build more innovative, productive and green economies. This includes:

- Urgently developing a genuinely cross-Government strategy to tackle the workforce skills shortage, specifically recognising the interdependencies between the Department for Education as the lead department for skills and the departments responsible for physics-based industrial sectors (both established and emerging).
- Addressing shortages of specialist physics teachers so that everyone has access to high-quality teaching. This will require creative solutions, including bolstering initiatives that the IOP has been instrumental in developing with Government, such as a pilot to recruit engineers to physics teaching and the roll out of the Subject Knowledge for Physics Teaching pilot to retrain in-service teachers.
- Linked to this, investing in a systematic approach to subject-specific professional development in the sciences, underpinning teacher retention.
- Challenging misconceptions about physics and the jobs it provides access to, which deter some young people, and supporting informed choices.
- Ensuring availability of a variety of physics education and training pathways, as well as complementary transferable and digital skills development, all informed by close engagement between educators, employers, and researchers and innovators.
- Incentivising employers to invest in employees' upskilling and reskilling.
- Ensuring interventions aimed at strengthening provision of physics skills move beyond the level of 'STEM skills', given the distinct labour market demand for physics observed.