

IOP Institute of Physics

Rt Hon Nadhim Zahawi MP
Secretary of State for Education
Department for Education
20 Great Smith Street
London
SW1P 3BT

22/04/2022

Dear Secretary of State,

I am writing to outline the Institute of Physics' (IOP) thoughts on your recent Schools White Paper. We welcome many of the provisions announced, but we are concerned that the plans do not tackle the major problems facing physics education.

In recent research commissioned by the IOP and published in our Physics and the Economy report¹, we demonstrated the importance of physics for the UK economy. For example, in 2019 the physics sector² accounted for 11% of total UK gross domestic product (GDP). In particular, this report highlighted the high labour productivity of workers in the physics sector – at £84,300 per worker. Furthermore, we have evidenced significant unmet demand for physics skills³. In combination this analysis shows that physics is a critically important subject for economic recovery and will drive opportunities for levelling up. As a gateway subject that is prized by employers and admissions officers, studying physics provides a plethora of prospects for school leavers' future success.

Despite this undoubted value of the subject, physics education remains in crisis and many students, often those in more deprived areas, are denied the opportunities that studying physics provides - 70% of A-level students come from just 30% of, more advantaged, schools⁴. The IOP has identified two main contributors to this crisis; negative stereotypes and prejudices that limit student choices and a severe shortage of specialist teachers with the necessary knowledge to be high-performing physics teachers. Teacher recruitment and retention statistics show physics to be hardest hit of any subject⁵, with initial teacher training reaching just 22% of its target last year⁶. The IOP supports, and has been instrumental in developing, the initiatives to recruit engineers to physics teaching and the roll out of the Subject Knowledge for Physics Teaching pilot to retrain in-service teachers. However, more needs to be done to provide a wider, more diverse range of students with genuine

¹ [Physics and the Economy – 2022 findings | Institute of Physics \(iop.org\)](https://www.iop.org/strategy/productivity-programme/workforce-skills-project#ref)

² Defined here as physics-based industries whose enterprises demonstrate ongoing research and development which consistently makes use of physics knowledge (and the R&D activity can be expected to significantly affect the fortunes of businesses within the industry), or where underlying technology supporting the industry requires significant physics knowledge for continued operation

³ <https://www.iop.org/strategy/productivity-programme/workforce-skills-project#ref>

⁴ [IOP Limit Less report 2020](#)

⁵ [CBP-7222.pdf \(parliament.uk\)](#)

⁶ <https://www.gov.uk/government/statistics/initial-teacher-training-trainee-number-census-2021-to-2022>

opportunities to study physics, taught by high quality in-field teachers. Our recommendations for how to achieve this are outlined as follows:

Create fairer and more inclusive classroom cultures by implementing measures to fight negative stereotypes and prejudices that limit student opportunities.

The white paper has included laudable objectives around levelling up and targeted support for those falling behind. However, it misses an opportunity to amplify impact on improving student outcomes in a cost effective way by creating fairer and more inclusive classroom cultures. In our report, Limit Less⁴, the IOP has studied the limiting effect of negative stereotypes and prejudices that face students daily, and is calling for measures to help break down these social barriers to opportunity. We ask the government to mandate that schools develop evidence-based whole school equity action plans (WSEPs), and to require Ofsted to inspect progress against these plans to ensure they really do provide ‘opportunity for all’. WSEPs are a useful tool for schools to strategically coordinate their engagement with, and maximise benefit from, a number of the provisions outlined in the white paper - including the additional maths and English support; the strengthened guidance on careers and educational pathways; and the new teacher leadership training opportunities.

Implement a systematic approach to subject-specific CPD to ensure that there are enough, well-equipped physics teachers to provide high quality physics education and consequent opportunities for all students.

The white paper is right to note that the quality of teaching is the “single most important in-school factor in improving outcomes for children”. Recent research on timetables and deployment indicate that a shortage of physics teachers forces nearly 50% of schools to deploy out-field teachers to teach physics at GCSE level⁷. This affects students’ attainment, their enthusiasm for physics, and the chances of them choosing physics beyond 16. In Subjects Matter⁸, we recommend a systematic approach to subject-specific CPD in all subjects to improve quality, retention and the number of out-of-field teachers who are retrained in service.

The Royal Society has noted that subject-specific CPD provision in England compares unfavourably with other high performing countries⁹ and there are wide regional variations in its provision and take-up¹⁰. A fully-funded, systematic approach to developing teachers’ subject capabilities – encompassing both their content knowledge and their knowledge of how to teach their subject will ensure that all teachers have access to time-appropriate, quality assured professional development and improve student outcomes¹¹. It will also improve retention and provide a structure in which to increase the intensity and scope of in-service retraining programmes that develop new, in-service specialist teachers where they are needed.

We recommend that at least 50% of teacher CPD should be focused on (or in the context of) the subject and, based on the Wellcome Trust’s recommendations, that every teacher has access to 35 hours of professional learning per year. In light of this, we think that 500,000 events for 460,000 teachers is too modest a target, and it is important that meeting this target doesn’t become a tick-box exercise. We further ask that the government build on the experience and evidence of existing and previous CPD providers – including professional bodies – to build the elements of a system that

⁷ [shift-learning-science-timetable-models-research.pdf \(iop.org\)](https://www.iop.org/shift-learning-science-timetable-models-research.pdf)

⁸ <https://www.iop.org/about/publications/subjects-matter#ref>

⁹ <https://royalsociety.org/-/media/policy/Publications/2022/2022-01-31-sci-uplift-DfE.pdf>

¹⁰ <https://tdtrust.org/2018/01/18/post-code-lottery-teachers/>

¹¹ <https://cms.wellcome.org/sites/default/files/2022-02/final-cpd-challenge-evaluation-report.pdf>

can oversee, quality control and support career-long subject-specific CPD for all teachers. These elements are described in Subjects Matter⁸.

Establish strong governance mechanisms for the new arms-length body as it develops and ensure both educational and subject matter experts play a pivotal role in shaping its outputs and activities.

The IOP sees the proposed arms-length curriculum body as a great opportunity for enhancing teaching quality. However, we have significant concerns that if its implementation is rushed without sufficient attention to how it will work alongside and support pedagogical best-practice, then it may in fact contribute to a reduction in teaching quality. We therefore recommend that the department sets aside a designated planning period to draw upon existing education sector expertise. And we call for the arms-length body to be governed in a way that draws upon professional body expertise to ensure accountability for the quality of teaching its activities facilitate.

Similarly, we recommend that the new arms-length body works closely with subject experts to develop the curriculum map and determine how best to address teachers' and students' needs through the planned resources. Specifically, we recommend concentrating more on adaptable resources with exemplifying sequences rather than over-reliance on off-the-shelf lessons. Such off-the-shelf materials may give the illusion of saving teachers time and effort but in fact be counter-productive in the longer term if not used as part of a coherent and integrated approach. The curriculum resources should be planned and designed to support teachers as professionals and contribute to their professional development rather than aiming to replace them.

Thank you for taking the time to read through our concerns and recommendations regarding the schools white paper. The IOP would be delighted to be of more assistance during the further development and implementation of the provisions.

Yours sincerely,



Dr Lisa Jardine-Wright, IOP Vice-President for Education and Skills