IOP Institute of Physics

IOP Response to the Education Committee Consultation on the Future of Post-16 Qualifications

Introduction

The Institute of Physics is the professional body and learned society for physics in the UK and Ireland, inspiring people to develop their knowledge, understanding and enjoyment of physics. We work with a range of partners to support and develop the teaching of physics in schools; we encourage innovation, growth and productivity in business including addressing significant skills shortages; and we provide evidence-based advice and support to governments across the UK and in Ireland.

Our members come from across the physics community whether in industry, academia, the classroom, technician roles or in training programmes as an apprentice or a student. However, our reach goes well beyond our membership to all who have an interest in physics and the contribution it makes to our culture, our society and the economy.

The IOP welcomes many of the governments proposed changes to post-16 qualifications. The need to strengthen physics-related technical pathways and training is highlighted in our recently published workforce skills report[1] (Unlocking the potential of physics skills) which demonstrated that demand for physics skills spans all skills levels, with more than half of physics-demanding roles not requiring an academic degree. However, this support is tensioned against two significant concerns.

Firstly, the IOP is concerned that the general physics content available to students (across all education and skills pathways) has been narrowed and made less flexible. This constricts the growth potential of the significant contribution made by physics-based business to the UK economy. Recent research commissioned by the IOP[1] found that physics skills support a growing number and variety of jobs and underpin productive industries in every part of the UK and Ireland. 1 in 20 (or 1.85 million) jobs across the UK and Ireland make use of physics skills and knowledge. Strengthening provision of physics education and skills is therefore central to ambitions to improve economic growth, prosperity and living standards at national and local levels.

Secondly, one of the core objectives of the IOP is to promote equality, diversity and inclusion (EDI) within the physics community, both in terms of opportunities and demonstrated outcomes. A recent study commissioned by the IOP has demonstrated disparities in physics take-up based on location, gender, race, social class and disability[2]. The IOP has concerns that the proposed changes have a number of potential associated EDI risks that could exacerbate this problem.

A more detailed account of the basis for these concerns is provided in response to the consultation questions below.

[1] https://www.iop.org/strategy/productivity-programme/workforce-skills-project#gref
[2] IOP Limit Less report 2020

1. The experience to date of those taking or delivering T Levels, and any changes to T Levels that may be needed to ensure they are accessible to all students.

Of all the T Levels, the science T Level has the most relevant physics content, and has been available since autumn 2021. As a result, we have little data on the experience of those taking or delivering the science T Level to date. We will, however, be monitoring the development and roll-out of this qualification and will provide analysis and feedback in due course. After careful review of the proposed changes, the IOP has a number of concerns regarding the accessibility of T Levels to all students that we highlight here:

- If entry requirements for T Levels are set as equivalent to those for A Levels then this will leave some students, who currently pursue non-A Level courses, without the option to study physics at level 3 (please see our answer to question 3 for further details).
- Physics-based industry placements will be in high demand, or unavailable in some regions due to science and engineering industries being unevenly distributed and mapping poorly onto areas of high population. A recent IOP commissioned report has demonstrated the uneven distribution of industry and highlighted areas of particular concern such as London[3]. This will put heavy travel requirements onto students and will be more likely to limit accessibility of science-relevant T Levels to students from disadvantaged groups.
- The BTEC assessment process places more emphasis on assignments in comparison to T Levels, where heavier emphasis is placed on written examinations. T Level qualifications will be less accessible to students whose performance is affected by the stress of written exams, but who will perform equally well in the workplace.

2. The strengths and weaknesses of the current system of post-16 qualifications, with reference to A Levels, T Levels, BTECs and apprenticeships, in preparing young people for work or further and higher education.

The IOP has identified a number of risks that the current system of post-16 qualifications poses to those sectors which depend on physics skills and knowledge such as engineering and construction, health and science, and digital and finance. These risks are likely to be similar to those faced by sectors that depend on other science disciplines. A recent study commissioned by the IOP[4] found that physics makes a significant contribution to the UK economy with physics-based industries accounting for 10.6% of all UK GVA (valued at £229 billion in 2019). Therefore the risks identified below not only raise concerns because they limit progression routes, but also have the potential of causing long-term detriment to the UK economy.

[3] IOP Work Force Skills Report

[4] https://www.iop.org/strategy/productivity-programme/physics-and-economy

System-level Concerns:

- IOP research[3] has shown that there is a distinct need for physics-specific skills and knowledge across the UK economy. Interventions should aim to strengthen the provision of substantive subject knowledge relevant to both academic and technical routes.
- There is no planned technical qualification that teaches a general physics syllabus (see T Level specific concerns below). This means that for students taking these courses, there will be a reduction in the breadth and flexibility of possible physics pathways, and fewer opportunities for students with an interest in physics to study general science at level 3 compared to the current range of options which includes courses like the 'general applied science' BTEC.
- This will mean that the ability of students to transition from technical pathways to a physics-heavy higher education course will be difficult unless very specific combinations of academic and technical courses are taken at level 3.
- Currently, many shorter courses available at level 3 allow students to maintain an interest/knowledge in STEM subjects alongside non-STEM subjects and this provides a way for students to build STEM multidisciplinary skills. Removing such courses will narrow access to these skills and knowledge.
- Given the significance and likely impact of the proposed changes, universities will need time to alter their application requirements and curricula.
- The transition and defunding process is quick and may not be long enough to enable universities, further education colleges and training providers to respond without putting students at risk in an intermediate timeframe, while evidence of the successes/failures of the new technical routes are still being determined. The IOP strongly encourages the Department for Education to carry out longitudinal studies to better understand these successes/failures.
- IOP welcomes the proposed support to students such as interactive careers maps. However, the changes associated with science-relevant education pathways are complex and students may not have the visibility, support, school infrastructure or access to technology they need to make suitably informed and appropriate decisions during the transition period.
- The above three points are more likely to impact students from disadvantaged groups (see our response to question 4 below).

T Level Specific Concerns:

- T Levels cover and are assessed on a narrow breadth and depth of physics relevant course content (metrology, lab science, production and manufacturing components of T Levels). This means that with the replacement of BTECs with T Levels, there has been a reduction in the breadth and flexibility of possible physics pathways.
- The above points will mean that the ability of students to transition from T Levels to a physics-heavy higher education course will be difficult unless very specific academic courses (such as A Levels and AS Levels in Physics and Maths) are taken in combination at level 3 (and which would prove too burdensome for many students).
- T Levels are suitable for only a narrow range of occupations, which means that students are required to make choices leading to specific careers at the age of 16 – when many prefer to keep their options broad. This could result in low uptake, or many students left in a career path they no longer aspire to.

- If entry requirements for T Levels are set as equivalent to those for A Levels then this will leave some students who currently pursue alternate courses without the option to study Physics at level 3.
- Physics-based industry placements will be in high demand, or unavailable in some regions due to science and engineering industries being unevenly distributed and mapping poorly onto areas of high population. This will put heavy travel requirements onto students and may result in a gradual reduction in the requirement to undertake placements – which would undermine the value of T Levels.
- The regional distribution of industry will also effect private sector demand for particular courses and therefore course availability. Students' options for study will be determined by where they live rather than the career they aspire to.
- Insufficient placements may result in a lack of uptake of science T Levels, with no alternative for those that have previously studied alternative courses – diminishing the overall STEM skills pipeline at level 3.
- The above points in combination may result in physics-based businesses being underserved by the T Level specialisms and pathways.
- A lack of parity between T and A Levels (in terms of content or depth rather than prestige) will block some routes of progression. For example, the increased occupation-specific content will not prepare T Level students well for progressing into higher education in pure science degrees, and universities may not accept these students onto pure science courses without additional bridging courses. This may reduce total numbers of students studying higher education STEM subjects and exacerbate STEM skills shortages. If fewer higher-tariff universities accept T Levels then there is the risk of the development of a two-tier system.

3. The benefits and challenges the Government's proposed changes to Level 3 qualifications would bring, with reference to any implications for BTECs and routes into apprenticeships.

The IOP welcomes the change to a simpler, more understandable set of options for vocational qualifications. However, we have a number of concerns regarding the replacement of BTECs:

- Data shows that BTEC students, on average, get lower grades at GCSE – which would limit their access to A Levels, or T Levels if entry requirements are set as equivalent to A Levels (50% of BTEC students average GCSE grades are between ~3 and ~5, 50% of A-level science students average between grades ~6 and ~8)[5]. Despite this their longitudinal outcomes are equivalent to those of A Level students[6]. The suggested changes are therefore reducing accessibility of level 3 education for these students.
- The majority of current students studying applied science BTECs have historically passed mainly into higher education (approximately 93% in 2017). Lower achieving students at level 2 will therefore also have their higher education progression options reduced (any transition programmes will delay them by at least 1 year).

[5] DfE transition matrices

[6] Centre for Vocational Educational Research (2019) 'BTECs, higher education and labour market outcomes using the Longitudinal Education Outcome (LEO) dataset'

- The above two points will mean that fewer students will/can choose STEM subjects at level 3 and beyond, which will have knock-on effects for STEM skills in general.

The IOP would like to see an increase in the number and level of science apprenticeships, and widened access to them. This will require a focussed programme to stimulate both supply of and demand for science apprenticeships. We have identified a number of barriers to this aim:

- Workplace-based science apprenticeships often require travel, can take as long as 5 years to complete and are equivalent to only two A-Levels. In combination these considerations may reduce the attractiveness of science-based apprenticeships in comparison to other disciplines.
- Many physics-based businesses do not offer placements or apprenticeships. This may be an indicator that apprenticeship funding/provision may be insufficient for physics needs.
- The above point will exacerbate regional disparities in the availability of physics-based apprenticeships. This will have consequences for disadvantaged groups (see our answer to question 4).
- Creating new apprenticeship standards takes time, and may not be compatible with the timelines put forward for the governments changes to technical pathways . This could further exacerbate the availability of physics-based apprenticeships in the shorter term.

The IOP supports the increased role for employer-based standards and stronger governance through the Institute of Apprenticeships and Technical Education. However, we would urge the government to take seriously the following risks associated with these changes:

- Employers have a critical role to play in setting standards and ensuring a skills pipeline that supports future technical roles vital to the UK's economic ambitions, including those relevant to achieving net-zero and responding to the 4th industrial revolution. It is important that the requirements placed on employers are proportionate and not overly burdensome, so that they can focus on providing effective input and play their part in maintaining and raising standards.
- The remit that the Institute of Apprenticeships and Technical Education is provided with to assure that new approved qualifications have a "distinct purpose" and are "truly necessary" is open to wide and subjective interpretation and should be narrowed. While the aim of the reforms is to provide a simplified and accessible structure to qualifications, they exist in a complex educational, training and employment environment, and whether or not a qualification is truly necessary will have a strong dependence on any number of these factors.

The IOP has recently published a report outlining the importance of subject-specific teacher continuing professional development (CPD) for boosting UK economic growth and levelling up (Subjects Matter)[7]. The report makes the following three recommendations:

Governments should

1. Improve professional standards through a systematic approach to developing teachers' subject knowledge for teaching
2. Fund, develop and implement a national system of subject-specific CPD in each subject

[7] Subjects-Matter-IOP-December-2020.pdf

3. Establish an entitlement for teachers which ensures that at least half of their professional learning is subject-specific

A challenge facing the education system will be to ensure that relevant subject-specific CPD is available to those teaching both academic and technical post-16 qualifications, to help ensure parity of esteem between the respective pathways

4. The extent to which the Government's review of level 3 qualifications will impact disadvantaged groups, students from minority ethnic backgrounds, students known to the care system, and students with special educational needs or disabilities, and what measures might be put in place to mitigate any negative impacts

After reviewing the proposed changes to the level 3 qualifications with regard to the impact on disadvantaged groups, we draw attention to the following issues:

- Travel and accommodation requirements/costs for non-local T Level placements will adversely affect vulnerable students or financially disadvantaged students. Due to the specific nature of T Level courses, this may also be an issue for students wishing to take a particular course that is not locally available. Sufficient financial support will be needed and government should aim to keep travel requirements to a minimum (including by providing incentives for major employers to localise opportunities).
- IOP welcomes the proposed support to students such as interactive careers maps. However, the changes associated with science-relevant education pathways are complex and students may not have the visibility and support they need to make the right decisions during the transition period. The available education and skills routes, key decision points and the benefits of different qualifications should be clarified so that students can make informed decisions.
- The BTEC assessment process places more emphasis on assignments whilst the A Levels and T Levels place greater emphasis on written examinations at the end of the two year course. This combination caters for students with different skills and outcomes at level 2, while preparing both sets for higher education. The changes proposed by government in phasing out BTECs may adversely affect students who perform less well under the stress of written examinations (but who go on to achieve equal outcomes) and result in lower diversity within the pipeline.
- The IOP has a number of concerns about the impact on disadvantaged groups of the post qualification admissions system (please see our response to question 6 for further details).
- A 2019 CVER study[8] found that students who progress from BTEC to higher education are more likely to be from disadvantaged and SEN backgrounds – with gender, racial and regional disparities too. The IOP is therefore concerned that, in combination with the above points, the removal of the BTEC may contribute to reduced diversity in higher education.

[8] cverdp024.pdf (lse.ac.uk)

The IOP commissioned a study on the factors affecting diversity in physis to inform our Limit Less campaign[9]. The significant changes taking place at level 3 will change the teaching environment. It is important that teachers' standards and training are adapted to suit this new environment. This is an opportunity for the government to respond to three of the IOPs recommendations from our Limit Less campaign:

- Revising teachers' standards to set out an expectation that teachers will address injustice in their professional practice and actively dismantle sexism, racism, homophobia, ableism and classism in their own work and their schools.
- Ensure that all teachers are trained in inclusive teaching and tackling injustice so that they achieve these robust standards. This should be in both their initial teacher education and their continuing professional development.
- Mandate nurseries and schools to develop whole-school equity plans that: i) are informed by their collection of ongoing data and evidence including students' choices; and ii) promote equity and equality for young people in underrepresented groups.

5. The benefits and disadvantages of introducing a baccalaureate system in post-16 education that allows students to take a variety of subjects, including both academic and vocational options.

The IOP has not systematically studied the benefits and disadvantages of the baccalaureate system and will not, therefore, respond to this question at this time.

6. The benefits and disadvantages of a post-qualifications admission system.

DfE's review of post-qualification admissions outlined two potential models. Model 1 proposed post-qualification applications and offers, with a longer application window created by moving results dates forward to the end of July and higher education term dates back to the first week of October. Model 2 proposed pre-qualification applications with post-qualification offers and decisions. Applications would be made during term-time (as now), but offers would be made after results day. The IOP position on these options is that neither model will significantly improve the admissions system and that an impact assessment of each proposed model should be carried out, including of the advice and guidance provided to students. Our position was informed by consultation with members, who highlighted the following issues:

- Predicted grades have been shown to be inaccurate, leading to student-university mismatch. Underpredicting disproportionately affects students from less privileged backgrounds.
- There has been a rise in unconditional offers from universities which has led to some students taking places they are not suited to. This has resulted in poorer student outcomes and retention. This is more prevalent among students from disadvantaged backgrounds who, due to having poorer predicted grades may be discouraged from

[9] https://www.iop.org/sites/default/files/2020-11/IOP-Limit-Less-report-2020-Nov.pdf

accepting conditional offers from higher tariff. This has knock-on effects for diversity in the pipeline.

- Model 1 puts too much time pressure on exam marking and does not allow sufficient time for appeals. It is challenging for higher education institutions both financially and administratively, and forces students to make their applications quicker and out of term (which will increase disadvantage for students without access to support). It may also encourage informal offers from universities.
- The proposed model 2 would help prevent formal unconditional offers but may also encourage informal unconditional offers. Model 2 wouldn't help with the implications of predicted grades, and also places more stress on students waiting for their results.
- Neither model considers the soft decision making element of selecting and applying to universities. Much of the decision-making will already have been made prior to the application process and is therefore susceptible to misinformed guidance, which will disproportionately affect students from less privileged backgrounds. This effect is damaging to physics which is widely considered to be a difficult subject.
- IOP recommends that the government consults on a different model, whereby instead of using predicted grades, students apply to universities earlier in the year using grades achieved in regular formal assessments or exams, such as a new subject-specific National Reference Test.
- IOP concerns on this subject are outlined in full on our website[10].

7. International good practice examples of systems for post-16 education and qualifications.

The IOP has not systematically studied international good practice examples of post-16 education and qualifications and will not, therefore, respond to this question at this time.

[10] IOP-Response-to-DfE-Review-of-Post-qualification-Admissions-Reform.pdf