IOP Institute of Physics

IOP Statement on the DfE's review of post-16 qualifications at level 3 in England

The Review

In 2019 the Department for Education (DfE) launched a review of post-16 qualifications at level 3 and below. It outlined that T levels and A-levels should be the programmes of choice for 16- to 19-year-olds taking level 3 qualifications. Building on this, in October 2020 the Department launched two second consultations which set out proposals for future level 2 and 3 qualifications.

The aim of the two reviews was to: "simplify the system so that young people and adults have clearer choices, with improved lines of sight to skilled employment or further study, and so that employers and students can have confidence that every single qualification offered is high quality".

Through consultation, the DfE invited comment on proposals jointly created by the Department and the Institute for Apprenticeships and Technical Education for the qualifications needed alongside T levels and A-levels, and how these will meet the high levels of quality that are needed to support students to fulfil their potential and meet the needs of employers.

How does this impact physics?

As the DfE announced the move towards T levels and A-levels for level-3 provision, the IOP identified that this would result in the termination of BTEC qualifications. A number of STEM BTEC qualifications teach physics and act as a pathway to studying higher education (HE) in a physics subject, or a career in physics; most notably, BTEC Applied Sciences and BTEC engineering. The IOP believes the removal of funding from BTECs will reduce the coverage of physics at level 3 and numbers studying the subject, disproportionally impacting those from under-represented groups.

Physics is a core science which underpins many areas of UK society; from emerging technologies to energy and carbon-neutral alternatives, as well as travel infrastructure and research and development innovation. It is imperative that physics is taught in schools and offered to all at level 3, so that students from all backgrounds have an attractive option to continue studying physics. These provisions are necessary in order to retain numbers in the subject and allow them to learn the content they need to go on to a career in the sector. This is vital to supporting the nation's economy, innovation, Net Zero goals and STEM workforce needs.

What next?

In light of this, the IOP reviewed the consultation and the impact of the termination of applied qualifications at level 3, and responded to the consultation. The IOP is now advocating for the retention of funding for BTECs in science subjects. This statement details the IOP's concerns in full.

For more information, contact policy@iop.org.

Summary of the IOP's concerns

The IOP welcomes science T levels as a new opportunity for students to study specialised and specific STEM topics at level 3, and the progression route this provides for these students directly into specialised STEM occupations.

However, the IOP is concerned that the proposals will reduce coverage of science education at level 3.

- The new T levels are highly specialised full-time level 3 courses, which provide a direct route into specific technical occupations.
- The T level options most closely relating to physics focus on Laboratory Science and Metrology, or Engineering. These new qualifications do not cover the full range of physics content seen in the syllabus of Applied Science BTECs or the Physics A-level, two courses which largely overlap in content. Moreover, there is no T level offer that includes the ability to study all three sciences.
- The narrow focus within the T level reduces the coverage of physics at level 3 comparatively to the broad range of content which was taught on the STEM BTECs.

The IOP is concerned that the proposed changes will limit the ability of some students to study level 3 STEM subjects, particularly those with lower prior attainment in written examinations.

- Students currently have the option to study an employer-led and workplace-based Advanced Apprenticeship provision at level 3 (equivalent of 2 A-levels), or classroom-taught level 3 provision of A-levels or vocational qualifications (BTECs and Diplomas). These options cater to a range of students with different skills, backgrounds and interests. Classroom-based science provisions are well-used pathways for many students. These qualifications enable successful progression either directly into the workforce or into HE, and evidence shows these students have good longitudinal outcomes.
- Around 25,000 students study vocational classroom-based science qualifications every year, of which around 9,000 study BTEC Applied Science full time, a course which is the equivalent of 3 A-levels and which provides students with the UCAS points to study most STEM HE courses, including those in pure physics and maths. Some 93% of BTEC Applied Science students went on to HE in 2017. The majority of these students have lower attainment at level 2 based on written examinations, and do not meet the entry requirements to study A-levels.
- The DfE has said that T levels will be 'rigorous' and 'equivalent' to A-levels. It is therefore likely that T levels will have high entry requirements similar to A-levels, making them out of reach for many of the students who currently study vocational qualifications full time.
- If full-time BTEC Science qualifications were removed, many of these ~9,000 students will not have an option to study classroom-based science at level 3. This will create a provision gap which reduces numbers studying physics and STEM at level 3 and beyond, and directly disproportionally impact those with lower prior attainment at level 2 based on written examinations.
- The remaining ~16,000 students study smaller applied qualifications, often the size of one A-level, alongside other courses, such as A-levels. For these students, this qualification is an important opportunity to build STEM knowledge and retain interest in these subjects. Removing smaller applied qualifications will discontinue this broadening of STEM education to those who do not study science as their core subject. It will reduce the reach of science

knowledge and disallow pupils to continue their interest, limiting their future potential in the sector.
- The IOP is concerned that the narrow focus of STEM T levels will appeal to only a small proportion of students who have a clear idea of their future career, and therefore reduce the number of students progressing in STEM study.

The IOP is concerned that the proposals will disproportionally impact students from disadvantaged backgrounds.

- According to a Centre for Vocational Education Research (CVER) study, students who progress to HE from a BTEC are more likely to have been from disadvantaged backgrounds. This suggests the vocational route is an important route into HE for these students.
- The consultation's equalities impact annex identifies the groups that are most likely to be impacted by the proposals in the consultation are students from SEN backgrounds, students who receive free school meals, students from Asian and black ethnic backgrounds, male students and students from the most disadvantaged backgrounds (using the Income Deprivation Affecting Children Index).
- The IOP believes that the provision gap created by the removal of BTEC qualifications will disproportionally impact these groups, making studying a STEM subject at level 3 more difficult for those from disadvantaged backgrounds, and worsen representation.

The IOP is concerned that the proposals will reduce numbers progressing into pure STEM subjects at HE.

- The current classroom-based level 3 provision supports a number of progression routes. There is substantial overlap between the content of science A-Levels and BTEC Applied Science, allowing these students to finish the course with a similar knowledge base, having learnt using different methods which suit different learning types. These two routes cater for students with different skills and outcomes at level 2, and the BTEC affords students the opportunity to learn level 3 content and progress either into HE or the workforce after qualification.
- Alongside A-level students, where a large proportion of students progress to HE, most of those studying BTEC science progress to HE (93% in 2017). These students largely study STEM subjects. Currently, 27% of students studying Biological Sciences at HE are from a BTEC course, 9% of those studying Physical Sciences are from a BTEC , and 3% of Mathematical Science students are from a BTEC. However, the coverage of topics in the T level curriculum means that these students will struggle to progress into the mentioned pure STEM subjects at HE.
- Students who face a provision gap due to the discontinued BTEC qualification will not have access to STEM qualifications at level 3, and therefore won't be able to progress into STEM HE. This will reduce the numbers of STEM graduates and exacerbate existing STEM skills shortages.

The IOP believes that, due to the discussed issues, removing funding for BTECs at level 3 will exacerbate STEM shortages. The IOP therefore does not support the removal of funding from applied level 3 qualifications (such as BTECs), if the only remaining provision is A-levels, T levels and Apprenticeships.

The IOP's concerns in full

1. The IOP welcomes the development and delivery of level 3 T levels, and the opportunities these provide to STEM students to follow occupational maps into the workforce

The IOP welcomes science T levels as a new opportunity for students to study specialised and specific STEM topics at level 3, and the progression route this provides for students directly into these specialised STEM occupations. In the coming years, occupational maps, which map pathways to the occupations available to students from specific technical courses such as T levels, will allow students to follow a simple pathway through education into specialised STEM occupations.

However, the IOP believes that for the sciences, this route should be additional to the existing comprehensive classroom-based provision of science A-levels and applied qualifications, and workplace-based Apprenticeships, which collectively provide students from all backgrounds a route into science.

The current provisions cater to a range of students with different skills, backgrounds and interests, and are well-used pathways for many students. These qualifications enable successful progression either directly into the workforce or into HE, and evidence shows these students have good longitudinal outcomes.

T-levels in science are due to commence teaching in a limited number of schools and colleges in September 2021, with the first students completing their two-year course in summer 2023. The consultation proposes removing funding from existing courses in summer 2023.

The IOP is calling for the T levels to be operating for a number of years and a longitudinal impact assessment to be completed in order to establish the new provision's impact on student outcomes. This must be completed before removal of any other existing provision is considered. Not to do so would otherwise risk removing a tested pathway for students, in favour of provision which may not support all students.

2. The IOP is concerned that the proposals will reduce coverage of science education at level 3

There is currently good provision for students from all backgrounds to progress into level 3 STEM study from level 2 which leads to successful outcomes at both level 4 in HE, and longitudinally in the workforce. As well as the employer-led and workplace-based Advanced Apprenticeship provision at level 3 (equivalent of 2 A-levels), A-levels and vocational qualifications are popular classroom-taught qualifications. Around one in five level 3 science provisions is in a vocational qualification[1].

For STEM, the majority of the available vocational provisions (~95%) are from BTEC National Applied Science, which exists in various sizes and forms, making this a substantial route of study. Around 25,000 students study vocational science qualifications at level 3 each year. Within this group, around 9,000 students study a full-time vocational course such as BTEC Applied Science (equivalent

[1] Joint Council for Qualifications (2020) 'GCE A Level & GCE AS Level Results Summer 2020' https://www.jcq.org.uk/wp-content/uploads/2020/09/A-Level-and-AS-Results-Summer-2020.pdf, Pearson (2020) 'Grade Statistics – June 2020 – BTEC Nationals (2016 suite)' and 'Grade Statistics – June 2020 – BTEC Nationals (2010 suite)'

to 3 A levels). The remaining 16,000 study an applied science module alongside their full-time study (such as a smaller BTEC worth one A-level, whilst studying A-levels).

However, the IOP believes that the proposals to remove funding from level 3 BTEC Science qualifications will result in the reduction of coverage of physics and science education at level 3. The new T-level in science; 'Health and Science: Science', which is most likely to be selected by those interested in science and physics, has substantially less physics knowledge content than the full time BTEC Applied Science qualification. This T level will have four different pathways[2]:

- Laboratory Sciences
- Animal Sciences
- Food Sciences
- Metrology Sciences.

Whilst all of the sciences will have some representation in the laboratory sciences route, there is not a route which teaches a general physics syllabus. Physics is mainly represented by the specialist option of Metrology. The omission of a general physics option and content in the qualification means this does not mirror the currently relatively equal and broad option of modules across the three core sciences in BTECs, such as General Applied Science.

Moreover, Metrology content does not provide physics students with a broad physics education, and will specifically prepare students for technician roles within measurement science. This will only attract students looking to progress along this specific pathway, and not support students looking to progress in other technical areas of physics. The IOP therefore believes that removing funding for BTECs, and funding T levels, will result in a reduction of physics content taught at level 3.

Differently, many students progress from BTEC Applied Science to a degree in Engineering, whilst others progress to a degree in Physics from a BTEC in Engineering. The Engineering, Manufacturing, Processing and Control T level will have the following pathways:

- Production technologies
- Manufacturing technologies
- Processing technologies
- Materials technologies

This option leads students into specific manufacturing and technician roles such as welding and upholstering, and, alike to the science option, does not include core physics content which could enable students to study pure physics at HE level. This course has little overlap with the current physics content in the Engineering BTEC, and does not provide students with a broad knowledge base of physics. The new T levels in science and engineering therefore also create a significant gap in the provision of physics content.

Vocational science qualifications have historically had the modular options to study an equal proportion of biology, chemistry and physics, and courses can be tailored through module selection. Whilst all of the sciences will have some representation in the laboratory sciences route, there is not a route which teaches a general physics syllabus. The T level option therefore asks students to select a biology/chemistry route or a physics/engineering route at 16, where historically around 20,000 full-time students have studied physics in conjunction with either biology and chemistry (9,000 annually on the BTEC Applied Science) or engineering (10,600 annually on BTEC Engineering). It is therefore a concern that students who wish to study physics or an option which generally teaches all

[2] In 2018/19 there were 401 apprentices starting level 3 Laboratory Technician apprenticeships, 9 Animal Technologist apprenticeship starters, 83 Food Technologist apprenticeship starters and 16 Metrology Technician apprenticeship starters.

three sciences equally, but either do not want to study the A-level or Apprenticeship route, or are unable to due to grade requirements, will not be catered for if the current BTEC Applied Science is removed.

The IOP is calling for the retainment of a classroom-taught option at level 3 which covers all three of the core sciences. This option must be open to students with lower previous attainment at level 2 based on written exams, and offer progression for students into HE.

3. The proposed changes will limit the ability of some students to study level 3 STEM subjects, particularly those with lower prior attainment in written examinations

The IOP believes that removing funding for BTECs and applied qualifications at level 3 will mean that, whilst some of the students who typically studied this route will in future study the A- or T level route, many will be left without an option to study physics or science in the classroom at level 3, as the science T level, narrow in focus, does not cater to their needs and the high entry requirements of both T levels and A-levels do not permit them. The IOP believes that these proposals will create a provision gap for those with lower prior attainment in written examinations at level 2.

The alternative route for full-time students if funding for vocational subjects were removed

Many of the students who ordinarily study vocational science subjects as their full-time course at level 3 do not qualify to study A-level sciences based on their attainment in written examinations at level 2, due to the entry requirements of A-levels. Around 9,000 of the 25,000 students who study a BTEC in Applied Science each year study this subject full time, a course which is equivalent to 3 A-levels. Removal of funding for full-time applied qualifications in science would require this group to seek an alternative full-time qualification.

The Apprenticeship is an important provision at Level 3 and a valuable route for students progressing into the STEM sector, channelling students directly into the workforce, providing them with paid work, and an option to progress into higher levels of study. The provision provides these students with unrivalled workplace experience and practical skills. Workplace-based science provisions are distinct from those taught in the classroom; level 3 work-based qualifications often require travel, take up to five years to complete and are equivalent to only two A-levels, where the full-time BTEC is equivalent to three. The practical differences between Apprenticeships and the applied courses currently available may mean that many of the students who have historically studied BTECs may not wish to progress through the Apprenticeship route, particularly as it only provides the student with the equivalent of 2 A-levels. Currently nearly all of full-time BTEC Applied Science students progressed to HE in 2017 (~93%), and therefore, this option many not fulfil these students' progression needs, as it may limit the ability of these students to progress directly into HE. Lastly, others may not have access to an Apprenticeship placement locally.

It is therefore assumed that many BTEC students would instead favour another provision, such as A-levels or T levels. The DfE transition matrices show that 93% of A-level students have an average GCSE score of 5 or more, whereas 75% of BTEC extended diploma science students have an average GCSE score of less than 5[3]. This shows that students studying BTEC science have substantially lower GCSE grades than A-level science students. Indeed, the DfE transition matrices show that the

[3] Department for Education (2020) 'Transition matrices 16-18: 2019' https://www.gov.uk/government/publications/16-to-18-level-3-value-added-ready-reckoner

average GCSE grades on entry to the BTEC Extended Diploma in Applied Science barely overlap with A-level students' grades on average; the top of the interquartile range is about one grade below the bottom of the interquartile range for A-levels (50% of BTEC students' average GCSE grades are between ~3 and ~5, 50% of A-level science students' average grades are between ~6 and ~8).

Most students presently studying BTEC National Applied Science or Cambridge Technical Applied Science would not meet the GCSE requirements for science A-level study or any new level 3 courses with comparable grading to A-level sciences. There is no evidence that if the BTEC route were removed, A-level entry requirements would reduce. Moreover, the most common attainment for A-level science students with an average GCSE score below 5 is grade E, with substantial numbers failing (grade U). Students awarded grades E and U in science A-levels are unlikely to progress directly to higher levels of study. This is the rationale for schools and colleges accepting few students with lower GCSE scores onto science A-levels. The profound differences in attainment show that science A-levels and full-time level 3 applied general qualifications in science are catering to different groups of students. The differences in the two routes caters for all students by providing them with a full-time level 3 course which allows progression into HE and the workforce.

This channels the students who would have taken a full-time science applied qualification into the T level option. However, it is likely that many of these students would not be admitted to T level courses as the DfE have stated that T levels will be more 'rigorous' and 'equivalent' to A-levels. This may mean that T levels will have similar entry requirements to A-levels. Therefore, of the ~9,000 who study applied science as their sole qualification annually, it is unlikely that all of these students would qualify for either A-level study or T level study, as just 7% of those with an average GCSE score of less than 5 study A-level physics.

The only remaining option for these students would be to select a non-STEM subject or to study a Transition Programme[4] to ready them for Level 3 STEM education, adding an additional year to their study, and keeping them at level 2. These students currently benefit from good progression routes from the BTEC system, whereby they progress directly to level 3 though an education system which fosters vocational development, and enables many to progress to HE directly. The system results in good outcomes for students. However, through the Transition Programme, in future students with lower prior attainment must unnecessarily undertake an additional year of study, delaying their progression to paid employment, requiring support at home for longer, and taking them out of step with the pace of progress of their peers (many of whom will move on to HE whilst they are still in their delayed second year of level 3 study).

Due to the lack of provision for this group to progress directly to level 3, and the drawbacks of a route which leads this group into an additional year of study at level 2, the IOP believes that the proposals mean this group will not have a viable and attractive option to study STEM at level 3. The IOP is thus concerned that this will lead to many of these students selecting another subject which is not STEM based, reducing the numbers studying STEM and progressing into the workforce.

The alternative route for part-time students if funding for vocational subjects were removed

Annually 16,000 students study an applied science alongside other studies. For these students, this qualification is an important opportunity to build STEM knowledge and retain interest in these subjects. Some students study an applied qualification alongside science A-levels, and use this as a tool to build practical knowledge and skills. For others, this qualification is the only selected STEM

[4] T Level Transition Programme Document; Education and Skills Funding Agency (2020-2021).

option in their curriculum, and it is vital exposure to science skills and knowledge which could encourage a future career in STEM or a multidisciplinary technical area such as nursing.

Removing smaller applied qualifications will discontinue this broadening of STEM education to those who do not study science as their core subject. It will reduce the reach of science knowledge and disallow pupils to continue their interest, limiting their future potential in the sector.

Disproportional impact of the provision gap

Based on the knowledge that Apprenticeships may not fulfil the needs of, or appeal to BTEC students; as they may not be accepted onto, or succeed on, A-level courses (there is no evidence that entry requirements for A-levels will reduce); and as the alternative T level is designed to be of the same standard as A-levels and may have equally high entry requirements, the IOP believes that this provision gap will be particularly acute for those with lower attainment at level 2.

Question 9 of the consultation proposes removing funding from qualifications deemed to overlap with T levels, which may threaten popular applied science qualifications. Later in the consultation (paragraph 87) there is an explicit acknowledgement that applicants seeking to study applied general qualifications will need to take different qualifications if the proposals are enacted. However, the paragraph goes on to acknowledge that these students tend to have a lower prior attainment than A-level students.

> 87. *We recognise that our proposals will mean that some students will need to study more-stretching level 3 qualifications in future. This may include students who would have taken an applied general qualification or other applied or vocational qualifications as an alternative to an A-level, as these alternatives are currently disproportionately taken by students with lower prior attainment on average than A-level students.*

Lastly, the IOP has concerns on the uptake of the T level in physics, which may mean fewer students study physics at level 3. As mentioned, the T level most relevant to physics is highly specialised in metrology. This narrow focus may be off-putting to students, as many aged 16 seek a more comprehensive subject of study which allows them to progress into a broader range of careers. The T levels further have a limited and specific career progression route, due to the narrow range of occupations these are designed to channel into. Whilst this is appealing to some students, many young people seek a broad range of options, or are unsure aged 16 which direction they want to progress into. The IOP is concerned there will be low uptake due to fear of committing to a specific route which doesn't share the flexibility seen in vocational and A-level qualifications.

4. The proposals will disproportionally impact those from disadvantaged backgrounds

According to the Centre for Vocational Education Research (CVER) study, students who progress to HE from BTEC are more likely to have been from disadvantaged backgrounds. This suggests the vocational route is an important route into HE for those from disadvantaged backgrounds.

The consultation's equalities impact annex identifies the groups that are more likely to be impacted by the proposals in the consultation. For young people aged 16-19, this includes students from SEN backgrounds, students who receive free school meals, students from Asian and black ethnic backgrounds, male students and students from the most disadvantaged backgrounds (using the Income Deprivation Affecting Children Index).

The impact report accompanying the consultation states:

> *107. '..the proposals are anticipated to particularly affect students who have previously received free school meals, as they are more highly represented on qualifications we expect no longer to be offered, than those expected to remain.'*
>
> *108. 'Similarly, table 5 demonstrates that using the Income Deprivation Affecting Children Index, enrolments on the qualifications no longer expected to remain, are more likely to be from the most disadvantaged backgrounds, than those on the remaining qualifications.'*
>
> '*we estimate that the equivalent of around 4% of 16- to 19-year-olds currently studying at level 3 may not be able to progress directly to level 3 study following the reforms',* and *'there is a risk that they may be worse off in terms of labour market outcomes and progression'*.

In addition to social background, the CVER report found that students who progress to HE from BTEC are more likely to be from "non-white British backgrounds" (23% of males and 24% of females from cohorts progressing to HE were reported to be from non-white British backgrounds) compared to those who progress to HE from A-level (where 19% of males and 20% of females who progressed to HE were from non-white British backgrounds). This shows that this is a route selected by a comparatively greater proportion of students from this group. This evidence suggests that the outlined provision gap will be more acute for these groups, reducing numbers from under-represented and disadvantaged groups studying and progressing in STEM.

Evidence suggests that disproportionally large numbers of students in disadvantaged regions study the applied route at level 3. As the qualifications with greater proportions of students from disadvantaged backgrounds are removed, this will have a particularly large impact in some specific disadvantaged areas. Where large proportions of students seek the T level route, there will be high competition for industry placements in these areas (a core element of the T level). In regions with lower numbers of physics-based industry placements, regardless of competition, students may be unable to access a placement. Without access to this, students will not be able to complete their placement and experience the workplace element of the course. This could threaten success on the course and application numbers.

The IOP is campaigning for equality, diversity and inclusion (EDI) in STEM through the Limit Less campaign, which seeks to encourage students from all backgrounds to consider studying physics, and does not support any proposal which removes funding from science courses with significant enrolments by students from disadvantaged or under-represented backgrounds.

5. The proposals will limit the potential for some students to progress into pure STEM subjects at HE

The current classroom-based level 3 provision (A-levels and applied routes such as BTECs) supports a number of progression routes. There is substantial overlap between the content of science A-Levels and BTEC Applied Science, allowing these students to finish the course with a similar knowledge base, having learnt using different methods which suit different learning types. One of the key differences between the routes is the assessment method, where the BTEC has a number of assignments whilst the A-level is examined through one written examination at the end of the two-year course. These two routes cater for students with different skills and outcomes at level 2, and

the BTEC affords students the opportunity to learn level 3 content and progress either into HE or the workforce after qualification[5].

Alongside A-level students, where a large proportion of students progress to HE, most of those studying BTEC science progress to HE (93% in 2017). These students largely study STEM subjects; with Nursing and other subjects allied to medicine being the most popular fields of HE study[6]. Whilst most BTEC Applied Science students progress to applied and vocational degrees, the content of BTEC National Applied Science is sufficient for successful progression to pure science degrees The CVER report referenced in the consultation document[7] shows that students progress to HE from BTEC National Applied Science in significant proportions: In 2017 BTEC science students progressed to a range of degrees, including 67 to physics (41 from extended diploma), 600 to engineering, 307 to chemistry (66 from extended diploma) and 898 to biology (172 from extended diploma).

The BTEC route offers good longitudinal outcomes to students. When students' characteristics are taken into account, earnings differentials for degree study are similar for the BTEC and A-level route[8], suggesting long-term outcomes are equal for both routes. The good outcomes of students both into level 4+ study and longitudinally shows that the present vocational qualifications are effective. Changing this system threatens the success of these students.

As identified, some of the students who would have studied a full-time science BTEC may instead study a science T level, where grades permit. At odds with the current route of students from level 3 study, the T Level science pathways will have less content overlap with science A-levels. The course will cover fewer topics of physics, and include more occupation-specific knowledge and skills. This suggests that the new T level may not be conducive of progression for students onto pure science degrees.

As no cohorts have progressed through the T level system yet in science, it is currently unknown whether universities will accept students with the T level qualification onto pure science degrees without a bridging course, or whether they will relax grade requirements to facilitate these students. Based on the high numbers who have historically progressed from applied routes, this uncertainty is a significant threat to the future progression route of scientists, and may lead to lower numbers studying STEM at HE, which will in turn exacerbate STEM shortages in the workforce.

As many potential STEM students will be left without classroom-based provision (due to high grade requirements for both A- and T levels and the drawbacks of a transition year), numbers progressing to STEM HE through traditional routes may naturally fall as students are unable to progress to level 3 science subjects from level 2.

Other typical BTEC students may instead progress into an Apprenticeship. This offers a more complex route into higher study, as these students will complete a course of up to five years, and finish with the equivalent of two A-levels, unlike BTECs, which equate to 3 A-levels. These students could however then progress to Higher- and Degree-level apprenticeships. This route offers benefits

[5] Pearson (2019) 'Mapping of the Pearson BTEC Level 3 National Extended Diploma in Applied Science against the Pearson Edexcel A levels in Biology, Chemistry and Physics'.
[6] Pearson (2019) 'BTEC Applied Science entries to university in 2017' document.
[7] Centre for Vocational Educational Research (2019) 'BTECs, higher education and labour market outcomes using the Longitudinal Education Outcome (LEO) dataset'
https://cver.lse.ac.uk/textonly/cver/pubs/cverdp024.pdf
[8] Note - apart from for females who studied subjects allied to medicine, where those who had followed the BTEC route earned ~20% more than those who followed the A-level route at age 28.

in that it provides greater workplace exposure, however it may take a greater number of years to complete.

Due to the significant STEM shortage and the importance of student progression into HE, the IOP is recommending that no STEM vocational qualification has its funding removed until it is known whether T level students will be eligible to progress onto key HE courses, included those in STEM and pure STEM subjects. If these students are not accepted, an applied route which caters for those with lower prior attainment at level 3 in written examinations must be maintained, to provide these students with an option to progress into HE. This route will also be vital to those who cannot access T levels, or who would rather study a broader science syllabus with a range of progression routes.

6. Removal of funding for level 3 applied science subjects will exacerbate STEM skills shortages

It is important for the UK economy and physics sector that as many students as possible are retained in STEM study and progress into the workforce. There are numerous reports identifying the need for the UK to attract more students to STEM subjects, as UK industry and research and development (R&D) need more students progressing through STEM qualifications and into the workforce to fill the substantial skills shortage in many areas of the sector. As the nation progresses into the fourth industrial revolution, the requirement for STEM skills will only increase. Vocational level 3 qualifications are a vital route to students progressing into HE and into STEM roles.

The IOP believes that removing funding for STEM BTEC qualifications will increase STEM skills shortages because:

- The narrow focus on T levels, and the high entry requirements for both T levels and A-levels, means that many students may not wish to, or cannot, study these options. Removing the vocational route will create a significant provision gap which disproportionally impacts those with lower attainment at level 2 and reduces numbers studying and progressing in STEM.
- The content-specific T levels in Health and Science and Engineering will not provide students with the broad physics education which they would have experienced in a BTEC. Furthermore, the loss of the balance of the three core science subjects in T levels, which is offered in full-time BTEC Applied Science qualifications, and the niche focus of T levels, will mean this option does not appeal to those looking to develop their knowledge across the board in science, or progress into a multidisciplinary career.
- T levels will limit the ability for many to progress into pure STEM HE subjects, with particular limitations on progressing into pure STEM subjects. This will lead to a reduction of graduates and will have a lasting impact on the talent pipeline.

Lastly, the removal of some applied subjects will threaten the transition pathway between subjects. For physics, the most relevant example of this is the crossover between physics and engineering. Many engineers require a great amount of physics knowledge. Both BTEC Applied Sciences, BTEC Engineering and A-level physics are good routes into HE and a career in both engineering and physics. Many A-level physics students progress to engineering degrees; and there is also significant progression from BTEC Applied Science to engineering at HE.

Students wishing to progress to physics degrees may alternatively take BTEC National Engineering, particularly when they are unable to progress to A-levels. This means it is important that both BTEC Applied Sciences and BTECs in engineering are retained.