IOP Institute of Physics

IOP Response to the Department for Education's Review of Post-16 Qualifications at level 3 (Second stage)

Consultation Response

Context

Last year, 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 is 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 invites 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 fill their potential and meet the needs of employers.

The IOP have responded to this consultation. This document details the response in full. For more information on the IOP's policy positions on this issue, and the evidence supporting these, see the IOP's policy statement.

For more information, contact policy@iop.org

About the IOP

The Institute of Physics (IOP) is the professional body and learned society for physics in the UK and Ireland. The IOP's mission is to inspire people to develop their knowledge, understanding and enjoyment of physics, support the development of a diverse and inclusive physics community, and raise public awareness and understanding of physics. As a charity, the IOP seeks to ensure that physics delivers on its exceptional potential to benefit society.

Full list of questions:

Note – The IOP have responded to consultation questions which are relevant to the coverage of physics and STEM education at level 3, and student access. These are highlighted below.

Question 6: Do you agree that the two groups of qualifications needed for 16-19 year olds choosing technical provisions should be…

Question 7: Do you agree with the following funding criteria for the other technical qualifications we propose to fund for 16 to 19 year olds…

Question 8: Should the Institute create additional T Levels for pathways or occupations featured on the occupational maps? If so, please indicate the pathway(s)/occupation(s) and explain why

Question 9: Do you agree with our approach to removing funding approval for qualifications that overlap with T Levels, described in paragraphs 52 to 66? Are there any other factors we should consider when deciding whether a qualification overlaps with T Levels?

Question 10: Do you agree that the types of small qualifications described in paragraphs 71 to 73, that should typically be taken alongside A levels, should be funded?

Question 11: Do you agree with our proposal that performing arts graded qualifications, core maths, advanced extension awards and Extended Project qualifications should continue to be funded?

Question 12: Are there any other types of qualifications that we should continue to fund to be taken alongside A levels?

Question 13: Do you agree that the group of qualifications described in paragraphs 79 to 80 should be funded to be taken as alternative programmes of study to A levels?

Question 14: Do you agree with our proposal the IB Diploma should continue to be funded?

Question 15: Do our proposals for academic qualifications for 16 to 19 year olds (set out in paragraphs 67 to 82) provide opportunities to progress to a broad range of high quality higher education?

Question 16: What additional support might students need to achieve the new high quality offer at level 3?

Question 17: What additional support might SEND students need to achieve the new high quality offer at level 3?

Question 18: Are there level 3 qualifications that serve the needs of SEND students that cannot be met by the proposed qualification groups in the new 16 to 19 landscape?

Question 19: Do you agree with our proposal to fund the same academic options for adults as 16 to 19 year olds?

Question 20: Do you agree with our proposal to fund the Access to HE Diploma for adults (as well as for 16 to 19 year olds in exceptional circumstances)?

Question 21: Do you agree that the principles described in paragraph 104 are the right ones to ensure qualifications meet the needs of adults?

Question 22: Do you agree with our proposed approach to making T Levels available to adults?

Question 23: Do you agree with our proposal that T Level Occupational Specialisms should be offered as separate standalone qualifications for adults?

Question 24: Do you agree that the groups of qualifications for adults outlined in this chapter should continue to be funded?

Question 25: What occupations fall outside the scope of the occupational maps but are in demand by employers (as described in paragraph 116 above)?

Question 26: Do you agree with our proposed approach to reforming technical qualifications?

Question 27: Is there anything else we should consider when implementing our proposed approach?

Question 28: Do you agree with the proposed approach to qualifications in apprenticeship standards?

Question 29: Do you agree with our proposed approach to reforming academic qualifications?
Question 30: Is there anything else we should consider when implementing our proposed approach?

Question 31: What support is needed to smooth the implementation of the proposed reforms?

Question 1: Name

Institute of Physics (IOP)

Question 2: Email address

policy@iop.org

Question 3: What is your role and in which capacity are you responding?

Role:

The Institute of Physics (IOP) is the professional body and learned society for physics in the UK and Ireland. The IOP's mission is to inspire people to develop their knowledge, understanding and enjoyment of physics, support the development of a diverse and inclusive physics community, and raise public awareness and understanding of physics. As a charity, the IOP seeks to ensure that physics delivers on its exceptional potential to benefit society.

Capacity:

The IOP is making this submission to the DfE' second stage review of post-16 qualifications at level 3, on behalf of the Institute's membership. The IOP comprises 23,000 members from across the physics community: in industry, academia, the classroom, technician roles or in training programmes. It also works with a range of partners to support and develop policy positions and recommendations, aimed at encouraging a diverse and thriving sector. The policy recommendations in this submission reflect the views of the IOP's membership, as well as leading figures in the physics community.

Question 5: Would you like us to keep your responses confidential?

No, the IOP gives consent for this representation to be published.

Main questions

Question 6: Do you agree that the two groups of qualifications needed for 16-19 year olds choosing technical provisions should be…

A) **Qualifications providing occupational competence against employer-led standards which are not covered by T Levels. We propose to fund high quality technical qualifications that deliver occupational entry-level competence or full occupational competence in occupations suitable for 16 to 19 year olds which are not covered by T Levels. Like T Levels, these qualifications will be aligned to employer-led standards. Qualifications will be considered for funding if they meet the quality standard set by the Institute, and any additional criteria set by the Department. We would expect fewer qualifications to meet the high quality bar than are currently available.**

B) **Additional specialist qualifications. We propose to fund high quality qualifications that develop more specialist skills and knowledge than could be acquired through a T Level alone, helping to protect the skills supply in more specialist industries and adding value to the T Level offer. These qualifications should dive deeper into particular occupational areas, focusing on specialist skills that are valuable to employers. For example, a qualification in marine engineering, which builds on the Maintenance and Operations Engineering Technician standard covered by the Maintenance, Installation and Repair T Level.**

No.

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. However, the IOP 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.

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. 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 in this group there is an overrepresentation of students from disadvantaged backgrounds studying full-time vocational courses in comparison to A-levels.

The new T levels are highly specialised full-time courses which provide a direct route into a specific technical occupation. This narrow focus will appeal to only a small proportion of students who have a clear idea of their future career, and will limit the ability for students to study a range of science content and progress into other science areas post-qualifications.

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. The T level options most closely relating to physics focus on Laboratory Science and Metrology, or Engineering, manufacturing, processing and control. 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.

If full-time BTEC Science qualifications were removed, many of these ~9,000 students will not have an option to study science at level 3, due to the high entry requirements of A and T levels. They may not wish to progress through the Apprenticeship route, as this is very different in nature to classroom study; often requiring travel, taking up to five years to complete and equivalent to only two A-levels, where the full-time BTEC is equivalent to three. Some of these students may not have access to an Apprenticeship placement locally.

This will create a provision gap which reduces numbers studying physics and STEM at level 3 and beyond, and directly disproportionally impacts those with lower prior attainment at level 2 based on written examinations. The IOP therefore does not support the DfE's proposals to remove funding from applied subjects at level 3, as this will diminish diversity and inclusion in physics.

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.

Due to the limitations for industry placement in some regional areas (a core element of the T level), the T level route may not be available or suitable for all of the students who are seeking an alternative to the discontinued applied route. This issues could also limit students instead selecting the Apprenticeship route.

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. This change will reduce the numbers of STEM graduates and exacerbate existing STEM skills shortages.

Question 9: Do you agree with our approach to removing funding approval for qualifications that overlap with T Levels, described in paragraphs 52 to 66?

Are there any other factors we should consider when deciding whether a qualification overlaps with T Levels?

The IOP does not agree with this approach, because it will mean removal of funding for BTECs in science, which play a vital role in science education at level 3.

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, result in fewer students studying physics content and STEM qualifications at level 3, and disproportionally impact those from disadvantaged backgrounds. This will reduce numbers working in STEM in the workforce; a crucial risk which threatens UK innovation and productivity.

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. Different to 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.

For STEM, the majority of the available vocational provisions (~95%) are 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 to 3 A levels). The remaining 16,000 study an applied science module alongside their full-time study (such as smaller BTEC worth one A level, whilst studying A-levels).

The consultation identifies that some students study multiple vocational subjects which are often worth less than an A-level, such as the equivalent of a full, or half, AS level. The consultation acknowledges that many students study these smaller qualifications alongside other qualifications. However, students studying BTEC Extended Diploma in Applied Science are unlikely to be studying any other level 3 qualification, as this subject is worth the equivalent of 3 A-levels.

The impact report says that the proposals are likely to remove **62%** of qualifications which are not A-levels which currently have enrolments from students aged 16-19. In science this proportion will be higher, which threatens a reduction of classroom-based physics content being taught at level 3, both for those on a full-time applied course, and those studying smaller BTEC qualifications alongside their other qualifications.

The new science T level (Health and Science: Science) which is most likely to be selected by those interested in science and physics, and has some overlap with the BTEC, will have four different pathways; laboratory science, food science, animal science and metrology science.

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. This current system is flexible and allows students to select from a broad and comprehensive range of science modules, to enable a student to select a broad science education or to concentrate more specifically on a number of science areas.

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.

Alternatively, students interested in physics could study the Engineering, Manufacturing, Processing and Control T level. This T level will have the following pathways: production technologies, processing technologies, manufacturing technologies and material technologies.

This option leads students into specific manufacturing and technician roles such as welding and upholstering, and does not include core physics content which could enable students to study pure physics at HE level. It also may not appeal to students who are looking to study technical areas of physics, due to the lack of content included in the syllabus, or students looking to study the sciences more broadly.

The T level options 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 or 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 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 narrow focus of T levels 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.

Based on the evidence available in the consultation document, 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 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 does not permit them.

If applied qualifications at level 3 were removed, STEM qualifications at level 3 would consist of the employer-led and workplace-based Advanced Apprenticeship provision at level 3 (equivalent of 2 A-levels), classroom-taught A-levels, and T levels.

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 student's 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 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. 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 average GCSE grades on entry to BTEC Extended Diploma in Applied Science is substantially below that of A-level sciences and barely overlaps; such that 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 between grades ~6 and ~8).

This profound difference in prior attainment shows that science A-levels and full-time level 3 applied general qualifications in science (which equate to 3 A-levels) 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. 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.

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 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 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.*

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 two measures of disadvantage used in the report are those in receipt of Free School Meals (FSM) during schooling, and the Income Deprivation Affecting Children Index (IDACI). The impact statement reports that 11% of students on level 3 qualifications whose funding is proposed to be removed were in receipt of FSM compared to 8% in receipt of FSM in those qualifications who will retain funding, as they take other routes such as A-levels. The IDACI data is broken down into quintiles of deprivation by IDACI score. Of those students taking qualifications whose funding is to be removed, 24% were in the lowest (most deprived) quintile of IDACI, compared to 18% of students who are in the lowest quintile taking the qualifications for which funding will be retained.

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'*.

The 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, those affected are more likely to be:

- Students from SEN backgrounds
- Students who receive free school meals
- Students from the most disadvantaged backgrounds (using the Income Deprivation Affecting Children Index)
- Students from Asian and black ethnic backgrounds
- Male students

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 female who progressed to HE were from non-white British backgrounds). This shows that this is a route selected by comparatively greater proportion of students of from this group.

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 disadvantages 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.

In its 2018 response to the DfE's consultation on the implementation of T level programmes, the IOP flagged this issue in response to question 11. ***How can we support students to access work placements relevant to their course in areas where there are no employers to offer work placements nearby?***

> "Employers within the science and engineering sectors in the UK are not evenly distributed geographically, often clustering around universities or transport links. And they do not map well onto large population centres. While providers of relevant T levels will likely be found in clusters around such employers, they will not all be (and perhaps should not all be), and so there will be a number of students required to travel to access placements. Additionally, it may be that for reasons of capacity there will not be local placement opportunities even for

> those students at providers who are clustered around relevant employers. As such, overall there will likely be a large number of students that will need to travel significant distances, some requiring overnight accommodation to attend work placements.
>
> There must be an additional source of financial support available to students to attend work placements if it can be demonstrated that unreasonable cost will be incurred; there cannot be a system which requires students suffer financially for a compulsory element of their qualification.
>
> Students requiring overnight accommodation for work placements should also be able to access logistical and pastoral support. A significant proportion will likely be under 18 years old and so will require further support.
>
> The aim should be to reduce the requirement to travel for placements to a minimum. Placement provision should be monitored, and a programme to engage local employers and to incentivise placement opportunities in low-take up areas should also be considered."

The IOP re-asserts these asks, and 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. The issues raised here show that the proposed change may make studying a STEM subject more difficult for those from disadvantaged backgrounds, and worsen representation. The IOP does not support the DfE's proposals to remove funding from science courses with significant enrolments by students from disadvantaged or under-represented backgrounds.

Question 12: Are there any other types of qualifications that we should continue to fund to be taken alongside A levels?

Yes**.**

The IOP is calling for the retention of funding for science BTECs. Please see the IOP response to question 9 for an explanation of why this is important for the coverage of physics education, the numbers studying physics at level 3, and diversity and inclusion.

The IOP has noted that there are relatively few qualifications in science at level 3.

In reality, fewer science qualifications exist than detailed in the consultation. For example A/AS level physics is listed as 10 separate qualifications, because there are five syllabuses provided by the four awarding organisations, each syllabus has AS level and A-level certification (5 x 2 = 10). Universities and employers consider them as a single subject with the AS level as a subset of the A-level.

Moreover, there are currently relatively few level 3 science qualifications on the 'ESFA List of Qualifications approved for funding'. This number totals **134**:

- There are a number of **A-level or AS level science** (46) (Biology, Chemistry, Environmental science, Geology, Physics and Psychology) and **science access qualifications** (53 qualifications, 9 awarding bodies).
- There are seven **applied general qualifications** in science available in a range of size contributing 21 to the list (of which BTEC's are included).
- The smaller qualifications (half or full A-Level size) are normally part of a mixed programme, perhaps including A-levels. The three larger qualifications form all, or the main part of, a student's study programme.

Therefore, due to this low number, it is important for STEM education that, beyond qualifications which are taken alongside other qualifications at level 3, that there remains a number of options to study physics and science which collectively will allow all STEM students to continue to study the sciences full-time beyond level 2 into level 3, and for all students to be able to progress into STEM HE subjects and the workforce.

Question 15: Do our proposals for academic qualifications for 16 to 19 year olds (set out in paragraphs 67 to 82) provide opportunities to progress to a broad range of high quality higher education?

No.

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 based, having learnt using different methods which suit different learning types (see response to question 9 for evidence on the differences between typical students studying A-levels and BTECs, and their distinct needs). 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.

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. 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).

Indeed, the CVER report referenced in the consultation document (see report here) shows that all BTEC students progress to HE in significant proportions. This progression is highly subject dependent, and there are particularly high proportions progressing from BTEC National Applied Science. The report shows that BTEC students in science have good outcomes both into level 4+ study and longitudinally, showing that the present vocational qualifications are effective. Changing this system threatens the success of these students.

The IOP believes that the termination of funding for BTECs and resourcing of T levels will reduce access for students to STEM HE, and will exacerbate the shortage of STEM skills in the workforce. This because the proposals appear to remove funding for applied subjects, such as BTECs, however the majority of those who study BTEC Applied Science (93% of BTEC Applied Science students in 2017) progress to HE, whereas the T level route does not appear to support progression to HE, rather into the workforce. Evidence for this is detailed now.

As discussed, most (c. 90%) of the students on applied STEM courses progress to HE. The Pearson (2019) 'BTEC Applied Science entries to university in 2017' document shows that these students largely study STEM subjects; with Nursing and other subjects allied to medicine being the most popular fields of HE study.

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 occupational specific knowledge and skills. This suggests that 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 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 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.

If students are accepted onto applied or multidisciplinary STEM HE and pure STEM HE courses, the IOP is calling for the phasing in of T levels and phasing out of alternative routes, to allow universities time to adapt to the new cohorts, and adjust their curriculum if necessary.

Question 22: Do you agree with our proposed approach to making T Levels available to adults?

Yes.

The IOP welcomes the development and delivery of level 3 T levels, and the opportunities these provide for all STEM students to follow occupational maps directly into the workforce. This opportunity should be available to all students aged 16+.

However, development of T levels for adults should not remove or replace the existing classroom-based education routes of A-levels and applied vocational course such as BTECs, as these play a significant role in providing all students with a pathway into STEM HE and the workplace. Please see the IOP response to question 9 for an explanation of why this is important for the coverage of physics education, the numbers studying physics at level 3, and diversity and inclusion.

Question 24: Do you agree that the groups of qualifications for adults outlined in this chapter should continue to be funded?

The IOP welcomes the resourcing of courses for adults which will enable adults from all backgrounds, including those with lower prior attainment, to be able to progress both into STEM HE subjects and into the workforce. These opportunities should be available to all students aged 16+.

However, no new provisions should remove or replace the existing classroom-based education routes of A-levels and applied vocational course such as BTECs, as these play a significant role in providing all students with a pathway into STEM HE and the workplace. Please see the IOP response to question 9 for an explanation of why this is important for the coverage of physics education, the numbers studying physics at level 3, and diversity and inclusion.

Question 26: Do you agree with our proposed approach to reforming technical qualifications?

No.

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, including BTECs and Diplomas, in summer 2023.

This will mean removing funding from proven, popular and successful qualifications before we have any evidence from new qualifications, and the impact these have on longitudinal outcomes for students. Changing the education provision before understanding the full impact of the change may put successive years of students' education at risk.

The IOP is therefore calling for a longitudinal impact assessment to be completed after T levels have been operating for a number of years in order to establish the impact of the new provision on student outcomes. This must be completed before any consideration is given to removing funding for any other existing provision. Not to do so would otherwise risk removing a tested pathway for students, in favour of provision which may not cater for all students.

Question 27: Is there anything else we should consider when implementing our proposed approach (for technical qualifications)?

Yes.

The DfE must consider the impact of removing funding for applied level 3 qualifications. Removal of funding for applied and vocational level 3 STEM qualifications will reduce the coverage of physics topics at level 3, the number of students studying STEM at level 3, and progression of these students into HE and the workforce.

This is because, due to the entry requirements of A-levels and T levels, many of the students with lower attainment at level 2 based on written exams will not have an option for studying a STEM subject in the classroom at level 3. If full-time BTEC Science qualifications were removed, many of the ~9,000 students who currently study BTEC Applied Science full-time will not have an option to study science in the classroom at level 3 due to the high entry requirements of A and T levels. This will create a provision gap which reduces numbers studying physics and STEM at level 3 and beyond, and directly disproportionally impacts those with lower prior attainment at level 2 based on written examinations. This lack of provision will impact the numbers progressing into STEM HE and into the workforce, increasing the existing deficit.

An additional ~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.

T levels in science and engineering include little coverage of core physics content, meaning less physics will be taught in these courses compared to currently in the STEM BTECs. The T level options most closely relating to physics focus on Laboratory Science and Metrology, or Engineering, manufacturing, processing and control. 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 option to study all three sciences; currently a popular option at BTEC which allows students to learn more about all of the sciences and specialise later at level 4. This narrow focus will appeal to only a small proportion of students who have a clear idea of their future career, and will limit the ability of students to study a range of science content and progress into other science areas post-qualifications. It may further reduce enrolment numbers onto the T level.

Due to the limited number of industry placement in some regional areas (a core element of the T level), the T level route may not be available or suitable for all of the students who are seeking an alternative to the discontinued applied route. Competition or lack of provision could leave some without provision.

Removing funding for vocational courses in favour of T levels in STEM subjects will reduce the numbers progressing to HE. Most of the students on applied STEM courses progress to HE (93% of BTEC Applied Science students in 2017). The Pearson (2019) 'BTEC Applied Science entries to university in 2017' document identifies that students largely study STEM subjects, with Nursing and other subjects allied to medicine being the most popular fields of HE study. 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. This change will reduce the numbers of STEM graduates and exacerbate existing STEM skills shortages.

Question 29: Do you agree with our proposed approach to reforming academic qualifications?

No.

The proposals from the DfE suggest that funding for applied qualifications will be terminated, whilst funding will be maintain for A-levels and Apprenticeships and introduced for new T levels. This will remove classroom provision for those with lower prior attainment at level 2 based on written exams.

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. 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 average GCSE grades on entry to BTEC Extended Diploma in Applied Science is substantially below that of A-level sciences and barely overlaps; such that 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 between grades ~6 and ~8).

This profound difference in prior attainment shows that science A-levels and full-time level 3 applied general qualifications in science (which equate to 3 A-levels) 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. 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.

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 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.

Due to these factors, the IOP is calling for the retention of funding for level 3 applied qualifications in STEM subjects.

Question 30: Is there anything else we should consider when implementing our proposed approach (for academic qualifications)?

Yes.

One of the key differences between the current provision routes of A-levels and vocational courses 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. 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 based, having learnt using different methods which suit different learning types.

The DfE has stated that T levels will be 'rigorous' and 'equivalent' to A levels. This may mean that T levels will have similar examination styles to A-levels. Therefore, this may not appeal to, or be suitable for, many students who would perform better on a course which is examined in a way which represents their skills.

In its 2018 response to the DfE's consultation on the implementation of T level programmes, the IOP flagged this issue in response to question 3. ***Do you agree with the proposed approach to assessing technical qualifications?***

> "It is incongruous to imply that the rigour of a technical qualification is dependent on an externally verified written exam. While the assessment of the core content of T level is clearly an essential part of the qualification, it is not clear why this must be done through an exam and cannot instead be done through practical means. We would welcome further information on the approach taken.
>
> Given the stated requirements for T level achievement to include level 2 qualifications in maths and English, it is not clear how re-assessing these core employability skills adds value to the qualification and may instead create barriers for provision owing to increased teaching load and excessive burden for the student. A solution should be found to avoid this double assessment.

> It is sensible to refer to the Occupational Standards being developed for apprenticeships within the assessment of T levels; there should be as much common ground as is appropriate between T levels and apprenticeships. This should also form part of the review of level 2 qualifications."

The IOP re-asserts these asks.

Question 31: What support is needed to smooth the implementation of the proposed reforms?

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, including BTECs and Diplomas, in summer 2023.

This will mean removing funding from proven, popular and successful qualifications before we have any evidence from new qualifications, and the impact these have on longitudinal outcomes for students. Changing the education provision before understanding the full impact of the change may put successive years of students' education at risk.

The IOP is therefore calling for a longitudinal impact assessment to be completed after T levels have been operating for a number of years in order to establish the impact of the new provision on student outcomes. This must be completed before any consideration is given to removing funding for any other existing provision. Not to do so would otherwise risk removing a tested pathway for students, in favour of provision which may not cater for all students.

To avoid disruption and limit student's options and progression, reforms must ensure that future provision for level 3 study will maintain the coverage of physics content in STEM courses at level 3, and provide a route for all students, to cater for those with lower prior attainment at level 2 to study STEM at level 3 and beyond.

To ensure there is not a reduction in the number of level 3 STEM students progressing to STEM HE subjects, there must remain an option at level 3 which allows students to study all three of the core sciences in an applied way, and this option must offer progression for students into level 4. The IOP is calling for the retention of level 3 applied vocational STEM qualifications, such as BTEC Applied Sciences and BTEC Engineering, to provide the students with a pathway to HE which would not otherwise be available to them.

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.

If students are accepted onto applied or multidisciplinary STEM HE and pure STEM HE courses, the IOP is calling for the phasing in of T levels and phasing out of alternative routes, to allow universities time to adapt to the new cohorts, and adjust their curriculum if necessary.