

1. Provider context

Imperial College London ('the College') is a community of problem solvers dedicated to finding innovative solutions to the world's biggest challenges¹, including climate change, infectious diseases and data security. Our education and our research in science, engineering, medicine and business are characterised by the four distinctive capabilities set out in our Academic Strategy²: we are transdisciplinary, externally engaged, entrepreneurial and quantitative.

Our students stand at the heart of our community and of our transformative mission. As future leaders in academia, in healthcare, in industry and in business, they are one of the most powerful means that we have of putting our mission into effect. As innovators today, they are working in partnership with us to transform their education, driving change in our curriculum, in our pedagogy and in our approach to student support.

Imperial's graduates have a long and consistent record of high achievement, measured both by employability and by graduate salary, and over the TEF assessment period we have retained our place as the UK's number one university for graduate employability³ in The Guardian University Guide (2018 to 2023). Over the course of the last 10 years, we have increasingly recognised the need to match the high standard of the outcomes that our students achieve and the excellence of the education that they receive with a high-quality student experience.

In delivering our mission, we work closely with our Students Union – the Imperial College Union, referred to below as 'the Union'. Details of our collaborative relationship are included in **SE7** below. Partnership with the Union has been central to achieving the transformative change that has occurred during the TEF period and will continue to be central to the on-going process of continuous improvement that is now required.

The development and delivery of the student experience during the TEF period has been guided by our Learning and Teaching Strategy, which was launched in 2016-17. The Strategy was developed in partnership with the Union, under the leadership of the Vice-Provost (Education and Student Experience), the President of the Union and the Deputy President (Education) of the Union. Over the course of the TEF period, £31.6m has been invested in transforming the student experience through our Learning and Teaching Strategy.

One of the great successes of our Learning and Teaching Strategy has been the StudentShapers initiatives, through which students are funded to work collaboratively with our staff to re-design elements of our provision in order to drive improvements in student experience and outcomes. This is described more fully in **SE7**. It is our partnership with our students that has given rise to the huge improvements that we have seen in student satisfaction over the last two years, and our recognition as 'University of the Year' and 'University of the Year for Student Experience' by The Times and Sunday Times Good University Guide (2022)⁴; and 'University of the Year' by the Guardian University Guide (2023).⁵

Important differentiators of the student experience at Imperial – over and above disciplinary excellence – include the fact that we, as an institution, are both international and entrepreneurial. As leaders in their fields, our graduates will need to work in multinational, multicultural teams, and we endeavour to ensure that their experience at the College prepares them to do so (see **SO4**). Equally, they will require entrepreneurial skills, and our extensive co-curricular programme of entrepreneurial experiences and opportunities gives them the opportunity to develop these skills early in their careers.

The period of the COVID pandemic was one of considerable achievement for the College. Building on the strong foundations of partnership that had been established in the preceding years, we worked together with our students to find innovative solutions to unprecedented problems. We are particularly proud of the

way in which we pivoted to remote delivery at the beginning of the pandemic, and of our approach to timed remote assessments and our associated no detriment policy, that were designed jointly with our students.

Post-pandemic, it is clear that the undergraduate experience at Imperial must remain in essence an in-person experience, with a high level of staff contact in lectures, classes, tutorials and labs. Equally, we are continuing to work closely with our students to identify ways in which remote delivery of some aspects of our provision can enhance that in-person experience, to ensure that in-person contact time is used to best effect.

Imperial's main campus is in South Kensington, where most of our science and engineering departments are based. Our undergraduate medical students are based at Charing Cross Hospital for a substantial part of their programme, and undertake placements at hospitals across London. Our campuses at White City and at Silwood Park in Berkshire are primarily research and postgraduate campuses, but provide important opportunities for undergraduates to undertake research projects and advanced study in a professional environment. As a London-based institution, we recognise the challenges that our students face in respect of, for example, accommodation, transport and the cost of living, and the need for us to work even harder to ensure that they have a positive life-changing experience during their time at Imperial.

Imperial has a devolved governance structure, with each of our four faculties (Natural Sciences, Engineering, Medicine and Business) enjoying a high degree of autonomy. Within the broad parameters set by the College through Senate and its committees, faculties, departments and individual programme and module leaders have discretion as to how education is provided, with specialist support provided by central functions such as the Educational Development Unit, and the Digital Media Lab. The strength of this approach is that it leverages our community's entrepreneurial and innovative character: there are always initiatives under way at multiple levels to improve our provision and to share best practice. Throughout this submission, examples of department-based activities are provided as evidence about how educational policy is translated into practice.

The provision covered by this submission includes Bachelor's and integrated Master's degrees in engineering and the sciences, and a six-year medicine (MBBS) programme with an integrated BSc. Only 22% of students at Imperial follow a 'traditional' three-year programme. Imperial College Business School (ICBS) contributes modules to over 75 undergraduate degree programmes each year and offers a year-long 'with Management' programme available to students on many of our science and engineering programmes as well as the intercalated BSc for medical students.

The Union and the College have worked collaboratively in developing our separate TEF submissions. The College and Union teams preparing the submissions have met weekly since mid-November to share data and other information for inclusion in the submissions. This reflects the excellent established working relationship between us. The submissions remain separate, and under the sole editorial control of the submitting party.

A Note on Metrics

Due to the data methodology used in the TEF, metrics for Business and Management are presented for the College. In fact, our Business School does not admit undergraduates, and the data arises from students on 'with Management' programmes in our faculties of Natural Sciences, Engineering and Medicine.

Data for Biomedical Sciences includes data for two separate programmes, one of which has been discontinued, and one of which is new. There has been no provision on the old programme (which was discontinued due to not meeting the College's high expectations of quality and outcomes) during the TEF period, but its performance is still reflected in the employability metric.

2. Student experience

Teaching, Feedback and Assessment, Content and Delivery (SE1, SE2)

As part of our Learning and Teaching Strategy, we have committed to key goals for education at Imperial, including:

- To deliver programmes which prepare students for the rapidly changing nature of careers.
- To use technology to offer flexible education with a global reach.
- To expand continuing education opportunities for professionals and enable life-long learning.
- To foster greater collaboration across our academic disciplines, further embedding our research into education.
- To design a diverse range of teaching, learning, experiential, and assessment approaches that recognise, support and attract students from all backgrounds.
- To employ creative thinking in the use of physical and virtual space to maximise the student experience.⁶

We have undertaken a 'Curriculum Review' of all 106 of our undergraduate programmes either during or immediately prior to the TEF period. The Review has included the removal of material which is no longer deemed essential, in order to combat legitimate feelings of overload, to make space for reflection and innovation, and to facilitate the inclusion of new material at the frontiers of knowledge. This review of content has been accompanied by a review of pedagogical method, with an increased emphasis on student engagement, through group work, peer-to-peer learning, and active learning techniques in labs, lectures and workshops; increased use of digital resources is enhancing classroom learning and providing a rich and flexible blended learning experience. The students whose continuation, completion, employment and satisfaction data contribute to the College's TEF metrics include both students who followed the old curriculum, and those on the new curriculum. The first year of the new curricula launched in 2019-20, therefore the only TEF metrics which reflect these students' experience is year 4 of the continuation metric and year 4 of the NSS metrics, where a small proportion (24.9%) of our 2022 qualifiers were on three year programmes.

Alongside Curriculum Review, we maintain rigorous Business as Usual Quality Assurance Processes. All programmes are subject to desk-based annual monitoring, with Programme Directors and Heads of Department required to comment where key data (e.g. NSS results, module evaluation results, external examiner reports) show any material change in performance (either negative or positive). These reports are considered by Faculty Education Committees and the Quality Assurance and Enhancement Committee. As part of the annual review process, the Vice-Provost (Education and Student Experience) considers the observations and recommendations set out in external examiner reports. The departmental annual monitoring reports are considered by student representatives and accessible to the Union Deputy President (Education), ensuring that students are kept informed of developments within their respective departments. These processes provide a key source of intelligence for the College on how students view the content of their programme, particularly in terms of the volume and relevance of content.

We have a programme of periodic Departmental Reviews that examine the overall strategy of a department, including the quality of the student experience and student outcomes, and the extent to which both the education and research of the department remain at the cutting edge of the discipline and oriented (as appropriate) towards our world-changing mission. In general, we aim to

review Departments shortly after the appointment of a new Head of Department, once they have had time to take stock and develop a strategic plan. However, we are also able to trigger a Review out of the normal sequence where there is cause for concern. Following the release of the last set of NSS results, we triggered a review of the Department of Physics, since its results, reflected in the TEF metrics, have not seen the same improvement as we have seen elsewhere in College. A review panel, involving five external members, some appointed explicitly for their expertise in education, and with student representation from the Union President has now met and is finalising recommendations. Whilst the implementation of change is clearly outside of the TEF period, the Review stands as an example of our willingness to initiate major change where the data show that our provision is not at the standard to which we aspire.

Over 60 per cent of our undergraduate degrees are professionally accredited. Maintaining appropriate content is a key requirement of accrediting bodies, both in terms of the material covered, and the way in which that material is delivered – e.g. through labs and placements. For example, when visiting the Dyson School of Design Engineering, the Institution of Design Engineers found ‘the industrial engagement is excellent, and the Industrial Advisory Board provides strong input helping to guide development and innovation within the programmes’ and ‘the high level of research exposure integrated into the programmes’;⁷ the Department of Computing was commended by the British Computer Society for ‘the embedded nature of peer mentoring, peer review, real world context, industrial involvement and teamwork within the courses’.⁸

We are currently conducting a mid-way review of our Learning and Teaching Strategy, re-casting it in light of the unprecedented changes in the environment that have occurred since 2016, and refocusing our efforts onto those areas (e.g. Assessment and Feedback – see below) where we have not seen the improvements that we had hoped for. We are mindful of the pressures the academically demanding nature of our degree programmes can place on students, and are continuing to optimise our assessments in this next review. In the first phase of Curriculum Review more formative assessments were introduced to lessen the workload on students of end of year examinations, however we understand that this has not been an improvement for all students and are seeking to refine this. We have made improvements in some programmes, such as Medical Biosciences where we responded to student feedback that there was too much assessment and have adjusted this accordingly.

One of the distinguishing factors of the student experience at Imperial is the high level of contact our students have with academic staff. (Over the TEF period, we are one of the top ten institutions for Student Staff Ratio⁹ and over 80% of our teaching staff are on teaching and research contracts.) Our undergraduates are intensively taught through a combination of lectures, seminars and problem classes, laboratory and clinical practical sessions, and tutorials, with the precise mix depending on the subject being studied. Typically, students can expect to be in timetabled lectures, seminars or classes for between 20 and 25 hours per week. In addition, most students will spend substantial amounts of time undertaking guided practical work in laboratory sessions, supported by teaching and technical staff. The balance shifts away from lectures and classes towards research-related work in the later years of the programme.

Most lectures are recorded using the *Panopto* video platform, allowing students the opportunity to review the lecture at their own pace after it has been delivered. All recorded lectures are automatically closed-captioned. Lectures themselves are increasingly interactive, with both flipped elements, and opportunities for small group exercises within the lecture – and we have been re-fitting our lecture theatres with furniture appropriate for this use.

Lectures are supplemented by seminars, problem classes and workshops, which provide an opportunity to explore material in more detail, normally in medium sized groups. The nature of these classes varies with the subject, but for many of our disciplines, problem classes form an important part of the mix. Students prepare in advance of the class by working through a set of problems at their own pace, which are then worked through together in class. These sessions present a useful opportunity for formative assessment, often involving peer assessment.

In our science and engineering programmes, we make extensive use of practical laboratory teaching. Laboratory practicals are guided activities that take place in specialist facilities, with both teaching staff and specialist technical staff on hand to support students, but with students working independently in small groups. These are designed to enable students to acquire the essential techniques and transferable skills they will require in the later stages of their degrees and, for many of our graduates, their careers. These sessions are also designed to promote an understanding and appreciation of science and engineering as critical practice, rather than as merely a set of established facts. We have been commended by our professional accrediting bodies on the standard of laboratory facilities that we provide.

In our medical programme, students undertake a blend of theoretical study and patient contact from the beginning. Years 1 to 3 focus on the integration of science and clinical knowledge and skills, with patient contact beginning with 'Patients, Communities and Healthcare' modules, leading onto extended clinical placements in 'Medicine and Surgery' and 'Medicine in the Community'. In Year 4 all students take a BSc pathway. Years 5 and 6 centre on preparation for practice as a Foundation Doctor in the NHS, with a range of clinical placements in primary and secondary care settings. Students also undertake a period of pre-foundation assistantship during which they are embedded in a clinical team.

As a research-intensive university, Imperial has many specialist facilities that students are able to access during their studies. We are also able to leverage our (often research-led) relationships with industry to provide access to facilities that allow the application of knowledge and skills gained through traditional teaching to genuinely open-ended real-world problems. This is achieved through 'Authentic Learning Experiences', such as:

- The **Constructionarium**, a Civil Engineering programme covering 'constructability for design.' Students form companies of c. 20 students to manage and build scaled down versions of real engineering projects (e.g. 1:10 Gherkin skyscraper) at a bespoke construction site provided and supported by the Construction Industry Training Board. Students are supported by Imperial staff and joined onsite by engineers from industry partners. The course aids the transition from theory to practice, converting students of engineering to student engineers. The project has been adopted by over 20 UK universities, owing to its unique project-based learning approach. The Construction Industry Training Board has supported the Constructionarium since its launch in 2004, offering evidence that the skills acquired on the Constructionarium are highly valued by our industrial partners and employers. The Joint Board of Moderators continues to note that Imperial is unusual in graduating all Civil Engineering students with hands-on construction site experience.
- The **Chemical Engineering Discovery Space**, where students benefit from an unparalleled hands-on educational experience, with a four-storey high state-of-the-art Carbon Capture Pilot Plant representing a scaled-down chemical engineering plant. The facility provides students with real-world plant operation experience, giving them the chance to control the industrial-standard plant, learning key skills such as how to start up the facility

and shut it down as well as how to operate it safely and efficiently.

- The **Mass Casualty for Remote Medicine**, a project which gives students access to a simulated mass casualty scenario, in this case the aftermath of an explosion which takes place at a nightclub. The student in this scenario will take on the role of a first-line responder who is responsible for triaging people who have different levels of injury. Students experience a scenario that they might not otherwise encounter during their medical training, or that can be difficult to create outside of using virtual reality.

Our strong research base also enables us to offer a wide range of specialist elective (normally final year) modules which are closely aligned to the research interests of particular members of academic staff. Examples include the modules 'From Molecules to Medicines' in the Department of Chemistry, which we deliver in partnership with GlaxoSmithKline and the London School of Hygiene and Tropical Medicine, 'Tissue Engineering and Regenerative Medicine' in the Department of Bioengineering and 'Stochastic Differential Equations in Financial Modelling' in the Department of Mathematics.

Almost all students undertake a research project as part of their final year of study. Research projects are genuinely open-ended and novel, i.e. they are not 'dummy' research projects where the lead investigator already knows the outcome, or with a predetermined correct answer. At the same time, they are generally lower-risk projects, given the need to ensure that all students are able to demonstrate that they have achieved the relevant learning outcomes. A minority of students choose to undertake a critical evaluation of the literature instead of a research project. These are carefully selected to ensure that students are exposed to cutting edge research and are particularly appropriate in areas where a practical project would not be feasible because of the timescales involved and technical knowledge required in certain types of research.

Our degree programmes utilise a variety of methods of summative assessment, including traditional closed book exams (essay, short answer and computer-based), open book or take away exams, coursework and/or laboratory work, group and individual projects, assessed tutorial material and problem sheets, oral and poster presentations (individually or in groups), dissertations, literature reports and essays, multiple choice tests and (in Medicine) clinical assessments. Additionally, our programmes include opportunities for formative assessment, e.g. through problem classes (where answers prepared in advance of the class are peer assessed and discussed as a group). Increasing use is made of purely formative laboratory practical assessments.

Over the TEF period, the College has seen a marked improvement in its NSS results, including for Assessment and Feedback, where our performance against benchmark has improved (from 7.3 percentage points below benchmark in year 1 to 4.0 percentage points below benchmark in year 4). However, we recognise that with 100% (92% in year 4) of statistical uncertainty materially below benchmark, this is an area requiring significant additional attention. As indicated above, it is a principal focus of the second phase of Curriculum Review. As a first step, the Anatomy of Assessment¹⁰ project, which started in January 2022, provides staff and students with an interactive database of good assessment practice from across Imperial, annotated to give insight into the design and implementation of different assessment methodologies. Other initiatives which are underway to address performance include the following:

- In Mechanical Engineering, a collaboration with the Centre for Academic English has sought to improve the quality of feedback on long-form lab reports.¹¹
- The Educational Development Unit has published a guide titled 'Engaging students with feedback they can use',¹² which provides suggestions for making feedback more engaging

and effective, talking through the purpose of feedback, the components of useful feedback, the importance of clear and supportive language, and how to engage students with feedback. This is based on research, for example, the Centre for Higher Education Research and Scholarship (CHERS) has published research on the role of language and culture in international students' interpretation of feedback.¹³

- In the Department of Materials, a system was introduced for students to easily flag concerns with the content and timeliness of assessment and feedback. This enabled the department to identify both concerns with particular modules, assessments or markers, and more systematic issues such as deadline clashes and periods of work overload. A particular need was identified to ensure that students and staff had a common understanding of assessment rubrics, and a project to involve students in co-designing the rubric was piloted. As a result of these interventions, the NSS Assessment and Feedback metric has improved by 15.7 percentage points between 2019 and 2022.
- The Department of Life Sciences (DoLS) has implemented the 'Changing feedback culture of personal tutors and students using an e-portfolio' project, funded by the Pedagogy Transformation Fund. Since 2021-22 its implementation and impact on learning and student-staff interaction is being iteratively researched and refined. The project involves 1,020 students across three academic years and 87 personal tutors.
- The DoLS has also improved the assessment process with the move to team-based learning in the Years 1 and 2 Statistics modules. As part of this approach, peer feedback was implemented and delivered in a timely manner, allowing students to then act on the feedback they received during the module. The methods were evaluated and have recently been published,¹⁴ finding that the improvements in self-efficacy resulting from team-based learning was correlated with an improved summative test mark. The whole year cohorts of Year 1 (149 students) and Year 2 (135 students) participated in this action research.
- NSS scores for assessment and feedback for the Department of Chemistry have shown significant improvement over the last three years, rising by 20.4 percentage points to 66.6% agree in NSS 2022, alongside improvements in every TEF NSS metric in this period. The marking of lab reports was a common issue raised by students, and the Department has worked collaboratively with its students to change the marking scheme so that it is more meaningful to the students and achieves greater consistency between multiple markers.

COVID19

We want to draw particular attention to the educational experience which we gave our students during the COVID19 pandemic, especially during the first lockdown. The lockdown began during one of our Assessment Periods. Scheduled examinations had to be re-engineered as remote assessments at a day or two's notice. We acted decisively to introduce timed remote assessments, and subsequently agreed a 'no detriment' policy with our students. These adjustments were commented on favourably by our external examiners.¹⁵

We quickly established a new decision-making body, the Education and Student Operations Group (ESOG), which met daily initially (reducing to three times a week later on). ESOG brought together staff and students, strengthening collaborations across functions and staff groups. It was immensely successful in increasing our agility and facilitating innovative solutions to difficult problems. With a large number of overseas and other students who had nowhere to be except on campus, one key focus was on ensuring that students who could not leave London had their basic physical needs met. We created a free meal programme offering three meals a day delivered to their door for students who were self-isolating in halls, and we provided Christmas and Pancake

Day packages for students who had to remain in halls over the holidays. We provided free online exercise classes for our students, and, once permitted, in-person personal training programmes for students in halls. For those students in halls who were able to go home, we reimbursed rents.

A key challenge was to develop an alternative to labs and fieldwork that would give our students the hands-on experience that they needed, enable them to meet their learning outcomes, and satisfy the requirements of accrediting bodies.

The *Lab-in-a-Box* initiative involved redesigning experiments to optimise them for a remote setting, maintaining key elements and learning outcomes, supported by online introductions, demo and drop-in support sessions. For example, the Department of Materials produced kits with four packets of small plastic balls to build crystal structures and a specially-designed molecular building system, which replicate crystallography labs from home.¹⁶ In the Department of Physics, a student-staff innovation team developed several Lab-in-a-Box experiments including looking at electrical waves under different conditions.¹⁷ The Chemistry Lab-In-a-Box Team won the 2022 Royal Society of Chemistry Team Prize for Excellence in Higher Education.¹⁸ The Science Museum has requested Labs-in-a-Box for its archive.¹⁹

We developed *Virtual Fieldtrips* for our Earth Science and Engineering students, using video-gaming technologies to deliver eleven fieldtrips remotely for a total of c. 2250 student days. The platform was also used to deliver c. 70 different practical sessions in ten non-field modules, in both 2020-21 and 2021-22, to c. 200 students each year. Mean student outcomes in 2020-21 remote-taught field-modules were in all cases within 0.5% of the mean for equivalent physical modules over 2019-2022. Similarly, mean marks for physical fieldtrips after virtual trips were -0.5% to +1% of equivalent pre-pandemic fieldtrip marks. Student survey responses (internal and NSS) were overwhelmingly positive about their experience. We are continuing to explore how use of the platform can be integrated into our core offering post-pandemic.

Research, Professional Practice, Employer Engagement (SE3)

Imperial has the best research environment in the UK (ranked first in REF 2021); being in that environment is a key part of the student experience at Imperial. Over the TEF period 80% of staff teaching at Imperial are also researchers, and so our students have regular engagement with practising researchers on a daily basis. Particularly in their later years, for project work and for labs associated with specialist modules, students will find themselves working in active research laboratories alongside PhD students and post-docs. In this way, our students are introduced to science, engineering and medicine as critical practices as well as bodies of knowledge.

Alongside our research-rich curriculum (described above), the College offers a significant number of opportunities for students to engage with research on an extra-curricular basis. Our Undergraduate Research Opportunities Programme (UROP) offers students the opportunity to undertake a research experience (typically during the summer vacation) in one of the College's research groups. Approaching 10,000 students have participated in UROP since its launch in 1980, with 592 Imperial undergraduates participating in 2020-2021. We provide UROP bursaries targeted at students of Black heritage in order to increase participation by that demographic.²⁰ Examples of UROPs undertaken in 2022 include 'Development of conductive, injectable hydrogels for cartilage regeneration to treat osteoarthritis non-invasively' (Bioengineering) and 'Finding communities in global climate data' (Mathematics). Our International Research Opportunities Programme (IROP) offers students the opportunity (and funding) to spend the summer conducting research at one of the College's international partner institutions. Between 2018-19 and 2021-22, 52 students completed an IROP exchange.

Over the TEF period our undergraduates have been authors on over 170 published research papers in peer-reviewed journals.

Imperial offers a number of competitions and selective programmes which enable students with the greatest interest and enthusiasm for research and innovation to take their work even further. For example, the Make-a-Difference (MAD) competition, which has been running since 2014, provides an opportunity for students to work in multi-disciplinary teams to develop low-cost technologies with the potential for societal impact. The top teams are given funding, space and a bursary to work on their idea to the proof-of-concept stage for eight weeks over the summer. The teams then compete for prizes up to the value of £7,000 at the Grand Final in October, including an Accelerator Prize which is awarded to one team to assist them in further developing their project beyond the reach of the MAD competition and lab placement. In 2022, over 100 undergraduate students from across the College attended the initial Ideas and Teambuilding Workshops, and over 70 students formed teams and applied to take part in Stage 1. Five teams, 18 students in all, undertook a summer lab placement and competed in the final event in October 2022.

As important as experience of an active research environment is exposure to professional settings outside of academia. All departments at Imperial have extensive (often research-based) links with industry, and we leverage those links to involve employers in the design and delivery of our undergraduate programmes – whether through departmental industrial liaison committees, international advisory boards with industrial representation, or through joint delivery of educational experiences such as the Constructionarium (see above) and the Shell Techno-Economic project – a one day role-play exercise delivered by Shell at their own premises for the Chemical and Mechanical Engineering cohorts. Many of our departments also host senior scientists and engineers from industry as ‘Professors of Practice’ who make an important contribution to our educational programmes.

Many of our students undertake their final year projects in industrial settings. For example, the Design Engineering programme has links with over 80 companies who support a compulsory six-month final year industrial placement. Visiting Professors drawn from industry also provide a valuable resource to ensure our programmes remain relevant to employers.

Staff Professional Development (SE4)

The College supports the professional development of its teachers through the Educational Development Unit which offers a flexible suite of programmes enabling those who teach at Imperial to access the support they need, when they need it. This includes taught postgraduate programmes up to Master’s level in University Learning and Teaching, and a series of stand-alone workshops covering topics such as course design, pedagogy and learning outcomes.

Probationary Lecturers at the College are required to attend a programme of compulsory training, comprising a mix of central provision, covering standardised materials and College expectations, and local provision, covering materials specific to the teaching and assessment modalities of particular programmes.

The College offers the Postgraduate Certificate, Postgraduate Diploma and Masters of Education in University Learning and Teaching for free to all staff who teach or support learning.²¹ The Postgraduate Certificate is a practice-centred flexible course that develops participants as reflective practitioners and builds on the introductory workshops and participants’ previous experience. The Postgraduate Diploma takes this further, enabling participants to expand their knowledge of teaching through critical engagement with wider educational theory. Participants progressing to the Master’s level receive training and support in education research methodology

and undertake a research project which addresses a need within the College. In the academic year 2020-21 there were a total of 134 staff actively engaged across all of the programmes (PG Cert 54, PG Dip 48 and MEd 32).

The College *Supporting Teaching Accreditation and Recognition* (STAR) Framework is an *AdvanceHE* accredited continuing professional development programme for those who teach and support student learning, and is Imperial's pathway to applying for fellowship of the HEA. The Framework has been designed to recognise and reward all staff – academic and professional – at Imperial who can demonstrate an ongoing commitment to developing their professional practice in teaching within higher education. In the last five academic years, 867 College and NHS staff have attended workshops under our STAR Framework. This has led to the award of 565 fellowships (340 AFHEA, 189 FHEA and 36 SFHEA).

The majority of staff teaching at Imperial are employed on a traditional, permanent 'teaching and research' academic contract. Candidates for academic promotion are required to demonstrate achievement in four areas: education, research, leadership and management, and profession and practice. Contributions are expected in all areas, although the balance between areas is not prescribed. The criteria for promotion state that 'progression up the career ladder to Professor will involve a broadening of the contribution to education, from excellence in teaching delivery, through to the organisation and management of Departmental education and student support activity, leadership on educational matters at Faculty and/or College level and in educational transformation (e.g. curricula development, innovative use of technology enhanced learning and, where appropriate, education research).'

Staff whose main focus is teaching and learning and who do not undertake research as part of their duties belong to the 'Learning and Teaching' job family. This includes both staff who teach and staff who support teaching through as, for example, learning technologists – recognising the contribution of a range of jobs and skills to our educational delivery.

Imperial has made significant progress over the last 10 years in raising the status of teaching to equal that of research. Schemes such as the President's Awards for Excellence in Education²² and the Union Awards (led by the Union) recognise outstanding contributions from individuals and teams. Our annual Festival of Learning and Teaching is a collaborative, celebratory forum of educational innovation and achievement across the College, attended by staff and students.

Supportive Learning Environment (SE5)

The College is committed to providing effective academic and pastoral support to its students. Our overall performance on the NSS metric is in line with our benchmark (-0.9%), though we recognise that subject-level and split metrics indicate that we have scope for improvement in this area.

For a student at Imperial, the most important unit of organisation is the academic department: this is the unit with which they will primarily identify, and so it is through departments that our 'front-line' student support is delivered.

Every science and engineering department at Imperial provides personal and academic tutoring to students in small groups on a regular basis. The tutorial system delivers pastoral support, integrative learning, study skills, exam preparation skills and careers advice. In some cases, academic and personal tutoring are combined, whilst in others they may be delivered separately. In each department, these arrangements are overseen by a Senior Tutor, who also assists with more complex cases and can step in if a tutorial relationship has broken down. At the next level up, Faculty Senior Tutors have responsibility for ensuring the delivery of consistent, high quality

support for students in their departments. Tutorial support for students on the Medical Biosciences programme is delivered in a similar manner.

The personal tutoring programme for medical students is designed to address the unique pressures and experiences which they face. Year 1 and 2 medical students receive support from Academic Tutors who offer study skills advice and individualised support to help each student reach their potential. In the final four years they are supported by an Imperial Tutor, for one-to-one support. These tutors are based in a clinical setting and are given protected time in their job plans (a half day per week) to see their tutees. Appointments are bookable by students through an online scheduling system. The Academic and Imperial Tutors are supported by a team of experienced welfare staff within the School of Medicine offering enhanced support packages such as study skills tutoring or clinical mentorship to students facing challenges during the programme. Students also have a BSc supervisor in year 4; each BSc pathway also has a welfare tutor; and students have an academic mentor. Intercalating BSc students are also offered the same high standard of welfare support.

Central to Imperial College's Learning and Teaching Strategy is the commitment to make teaching and learning more inclusive for all. As part of the Teaching Toolkit,²³ the College website includes detailed content²⁴ designed to enable members of the Imperial learning community to develop their understanding of what inclusive learning and teaching means and learn how they can design their programmes to improve inclusivity. The College provides the workshop 'Making teaching more inclusive' for both new and experienced staff to help them consider how inclusive their teaching is of all learners and to explore how they can best facilitate inclusive learning and teaching across the whole range of their work.²⁵ The College has also developed an online course for university teachers on strategies for supporting the learning of students with Specific Learning Differences (SpLD),²⁶ which is being shared across the sector to help teaching staff.

We have Inclusive Pedagogy Champions to encourage and support widespread adoption of good practice related to inclusivity and accessibility among members of Imperial who design, produce and/or deliver learning and teaching materials. Inclusive design and delivery are key factors in meeting our students' diverse needs, objectives and preferences. The responsibilities of an Inclusive Pedagogy Champion include, for example, supporting the College-wide rollout of Blackboard Ally and its ongoing use in promoting good accessible practice; acting as a local focus for queries about inclusive and accessible pedagogic practice and signposting colleagues to appropriate services for advice and training and disseminating good practice; and, linking College disability and equality, diversity and inclusivity agendas to faculty and department level priorities with respect to teaching and learning issues and developments.

Our Equality, Diversity and Inclusion (EDI) Seed Fund supports staff and students to implement ideas that create an inclusive institutional culture at Imperial. Examples of projects funded in 2020-21 and 2021-22 include: mental health awareness explainer videos; activities to raise awareness of hearing impairments and the D/deaf community; 'STEM mentoring: career choices and tips from inspiring women in science'; 'Inclusive work experience: improving communications for people living with impairments'; and 'Intersectional (Career) Outcomes: EDI Programmes and Placement Strategies'.

We recognise that for some student groups, such as students with disabilities, additional support at College level is necessary to supplement departmental provision. The Disability Advisory Service (DAS) assists both prospective and current students with advice and support, and signposts other support available within the College. DAS advisors provide guidance on appropriate evidence of

disability, accessing funding for disability-related support, and ensuring that students have the support that they need to access all aspects of their programme.

A range of individualised adjustments and support are available, including additional exam arrangements; library support and extended loans; specialist study skills tutorials; specific inclusive technology software and training which enables students to develop independence by supporting their literacy, academic writing and organisational skills; dyslexia/SpLD peer support groups; Disabled Students' Allowances for eligible students of all domiciles (replicating the government's scheme for home students only); in-house screenings for indicators of a specific learning difference, and autistic spectrum conditions, and where appropriate referrals for a full assessment by an educational psychologist. Screening for autistic spectrum disorders is particularly important as these students are more likely to be drawn to STEM programmes. DAS also provide targeted support to students who fall below the full diagnostic threshold, for example, offering study efficiency webinars and one-to-one study efficiency sessions. The majority of lecture theatres are equipped with lecture capture equipment with automatic closed-captioning, which supports inclusion and independence in note taking for all students but particularly those with disabilities. Within a student's department, departmental disability officers can help facilitate additional exam arrangements and support within the department.

Our support for disabled students includes support for their housing needs, including enabling students who need to stay in College accommodation for the whole of their programme to do so, providing adapted accommodation in halls, and offering an accommodation subsidy to all students who need to live in our more expensive accommodation on the South Kensington campus.

The College recognises that mental health represents an increasing challenge for our students. Demand for the services of the Student Counselling and Mental Health Advice Service is high, and this can lead to long waiting times. To address this, we have supplemented our established team of Mental Health Advisors with Mental Health Intervention Officers who provide early intervention and support departments with guidance and training. We have also introduced faculty-level Student Wellbeing Advice teams who are able to support cases that are too complex to be dealt with at departmental level but which do not need to be escalated to the Counselling Service.

As well as increasing the mental health and wellbeing support that we offer to students, we are also determined to address the causes of stress at College. We know that our students find our programmes highly and sometimes overly demanding. Curriculum Review was intended to address this by making space and time in the curriculum for integrative learning and assessment. In the second phase of Curriculum Review, we will continue to address workload and stress concerns by further adjusting the balance of formative and summative assessment, and by partnering with students to design assessments that reduce stress levels.

Physical and Virtual Learning Resources (SE6)

The College's TEF metrics for learning resources consistently demonstrate a very high level of satisfaction with these at Imperial, with the last four years' NSS scores above 87%, and the positive difference to benchmark increasing over the TEF period, with years 3 and 4 materially above the benchmark (6.0 percentage points above in year 3 and 3.9 percentage points above in year 4). All but two of the split metrics are above benchmark, and those two are within the lower materiality threshold. Narrative comments, together with our own surveys, also suggest that students value both our physical and our digital resources.

As part of our Learning and Teaching Strategy, the College developed a Digital Learning Strategy to allow us to establish a robust technical infrastructure, to develop a large catalogue of digital

content, and to enable large numbers of teaching staff to become confident in teaching online, supported by a fully professional media team with access to versatile professional quality studios. Although this investment was initially focussed on programmes outside of the scope of the TEF (Masters and non-accredited programmes), the fact that we had a cadre of educational technologists on staff, coupled with Strategic Teaching Fellows in departments (funded through the Learning and Teaching Strategy) was crucial in enabling us to respond as quickly and as well as we did to the circumstances of the COVID19 pandemic. In particular, we had the capacity to quickly develop materials that were pedagogically appropriate to remote delivery – e.g. using short videos followed by interactive material, rather than simply streaming recordings of lectures.

Following the return to in-person, on-campus teaching, we are now focused on transferring the lessons that we learned during the pandemic to the 'new normal', seeking to understand how digital content can augment in-person teaching. This can be as straightforward as using pre-recorded segments for the transmission of knowledge, freeing up in-person time for discussion and conceptual learning (the UG Medicine programme has been transformed into a fully blended programme); or it can be as sophisticated as the use of Virtual and Augmented Reality technology to teach fluid dynamics to Chemical Engineering students.²⁷

Imperial's Library Services provides a range of facilities and services to its students, including access to both physical and electronic learning resources. There is a library on most campuses, and the configuration of library space, including the provision of group spaces, silent spaces and bookable rooms, has been developed with iterative input from students. The Central Library, Charing Cross Library, Chelsea and Westminster Library and Silwood Park Library are open 24 hours a day. Central Library can accommodate c. 1,400 students at a time. In 2021-22, over 1,164,000 visits were made to the College's libraries.

Students are given access to the same full range of services and content which we provide to our research community. They are, in effect, users of a research library, and there are a number of benefits to this:

- All users have access to a range of resources such as journals (>143,000), databases (>6,000), books (>192,000) and eBooks (>304,000) which were acquired based on faculty research requirements and recommended course reading. Our spending on these resources is above the national and Russell Group average.
- We make the same generous book loan allowance (40 books) available to staff and students.
- We provide unlimited document delivery free at the point of need to all students.
- Undergraduate students have access to Spiral, Imperial's Open Access digital repository.

Imperial has invested heavily in digital resources over the years which meant that when the pandemic hit, our predominantly digital collections remained available to students for research and study. Once restrictions lifted, our staff supplemented this with a "scan and send" service from our print collections.

A key part of our Learning and Teaching Strategy has been to invest £34m in our physical teaching and learning spaces. Whenever we re-design student spaces, we involve students as co-designers through our StudentShapers programme. (See **SE7**).

Investments include:

- A major refurbishment of the Central Library to create a modern study space configured for the way in which today's students work.

- Refurbishment of two floors of a former research building to provide 415 flexible 'GoStudy' spaces for students – including space for silent and group study, and 'breakout' space. Utilisation is rising with a peak of 83%.
- Transformation of our formal teaching spaces from spaces designed for didactic presentation into flexible spaces. These support traditional lectures, interactive learning and teaching including group work, and flipped lectures.
- Redesign of 'transitional spaces' to facilitate student study and interaction. Through StudentShapers we learned how important spaces in and around lecture theatres and building entrances are to our students. Through careful redesign we are turning natural places of congregation into productive and valued spaces for informal learning.

Engagement with Students (SE7)

The College is committed to working with students as partners, and to seeking and acting on their feedback from students. We recognise that although our overall performance for the Student Voice is in line with our benchmark (+1.9 percentage points), the picture is more mixed when considering subject-level and split metrics.

Imperial partners with students in different ways and at different levels in order to ensure that the student voice is always front and centre in our joint efforts to improve the experience and outcomes of our students. The Union convenes a network of over 200 Academic and Wellbeing Representatives at year group, department and faculty level, and Horizons Representatives (see **SO4, SO5, and SO6**). These representatives work through the Student-Staff Committee structure and in other, less formal ways, to ensure that the student voice is ever-present at the local levels. The Deputy President (Education) of the Union is a member of each of the four Faculty Education Committees, along with the Faculty student representatives in the faculties of Natural Sciences, Engineering and Medicine. In addition, the Deputy President (Education) is also a member of the College's Education and Student Experience Committee, and the President of the Union is a full member of Council, Imperial's governing body.

We recognise the importance of partnering with a range of students, including those who are less engaged in the formal democratic structures for student engagement. Our StudentShapers programme (part of our Learning and Teaching Strategy) supports a range of projects to co-design new initiatives related to education, assessment and the student experience. There have been 139 projects since 2018, involving 432 students from every Faculty. Examples include: Department of Physics 'Redesigning the Physics Teaching Laboratory for the 21st Century'; Department of Chemistry 'The Chemical Kitchen – a new approach to gaining laboratory skills'; Department of Materials 'Re:Fresher: A-level physics and chemistry'; Earth Science and Engineering: 'Building digital geological models'; Faculty of Medicine: 'Extending authentic assessment – a feasibility study'. Students undertaking a StudentShapers project receive additional financial support from the College.

Partnership with students has been particularly crucial to the success of Curriculum Review. For example, the Department of Design Engineering involved students throughout the process, initially as partners in the full-programme evaluation and data visualisation project, then in collaboration to secure StudentShapers funding on two initiatives: 'Pop-up' workshops and 'Closing the Loop' feedback days. Year and programme representatives gave input and feedback on Curriculum Review developments over four meetings, before revised documents were submitted. The issues were explored further where needed in formal student-staff committees and on an ad-hoc basis

before initial results of student input to the Curriculum Review were presented to the wider student body.

The College works closely with the Union to agree and implement joint action plans arising from the NSS. This collaborative approach aims to ensure that the student voice is at the centre of the College's NSS response and that the College and the Union are fully aligned on priorities for improving on weaker areas of performance. By engaging students as partners in the action planning process, we have gained a more detailed understanding of where the greatest impact on the student experience can be achieved.

3. Student Outcomes

Tailored Approaches for Success (SO1)

The College is passionate about enabling all its students, whatever their background, to succeed in and progress from their studies. This is borne out by our Learning and Teaching Strategy and our strong student outcomes TEF metrics. We achieve this through a combination of the curriculum, which looks to develop the skills for jobs not yet known; links with industry and employers; guidance on inclusive teaching and learning; opportunities to push learning further by leveraging our world class research environment; and also being supportive of an environment which looks to innovate, as shown by our Excellence Fund for Learning and Teaching Innovation.

Underpinning success for all students are guidance and strategies available from the College's Educational Development Unit. A *Teaching Toolkit* on inclusive learning and teaching covers topics such as inclusive educational design, preparing students for learning, managing inclusive learning environments and making assessment and feedback inclusive. The *Student Success Guide*²⁸ provides an on-line one-stop-shop for resources to support students through their undergraduate study, including help with the transition from school to university, study skills such as note taking in lectures, and signposting to College services such as mental health services, careers, and library services.

The College has developed a 'Differential Outcomes Dashboard' to allow us to monitor outcomes for students from different demographic groups. This dashboard is used by College, Faculty, and Departmental leadership teams to identify good practice to share and areas of underperformance to investigate and address.

Degree programmes at Imperial are designed to progressively develop the skills that students will need in the workplace, with structured opportunities for open-ended independent learning and discovery provided at strategic points during the programme. For science and engineering students this culminates in a significant piece of independent work during a student's final year of study, which varies in form depending on the subject studied and the length of the degree. Students enrolled on a Bachelor's degree will typically undertake either an open-ended research project or (in a minority of cases) a literature review, which exposes them to the cutting edge of research in their chosen sub-field. Students enrolled on an integrated Master's degree undertake more substantial independent work, either through an extended project, or a combination of more than one project (e.g. an individual project and a group project, or a research project and a design project). Our links with employers and industry are described in **SE3**.

As part of Curriculum Review, we developed *spiral curricula*, where a topic is taught and then returned to regularly to recap and develop ideas further, gradually increasing the difficulty, giving an opportunity to apply it to later work, and integrating knowledge. For example, The School of Medicine has developed an innovative spiral curriculum for students embarking on the six-year

MBBS/BSc in Medicine programme. Subjects such as life sciences, child health and development, and clinical paediatrics from conception to adulthood are threaded through the six years, with an increasing emphasis on the provision of a longitudinal undergraduate experience.

Following our success in diversifying our student body in line with the commitments made in our Access and Participation Plan, we are paying careful attention to the particular needs of students from 'non-traditional' backgrounds. The *Supporting the Identity Development of Underrepresented Students* project in CHERS has explored the lived experiences of STEMM students from underrepresented groups and has collaborated with those students to co-develop resources to enhance an inclusive and supportive learning environment.

A three-year project in the Faculties of Medicine and Natural Sciences: "Thriving, not just surviving: how do we build diversity and inclusivity into the undergraduate student experience?" explored community building and creating a more inclusive and welcoming environment, to ensure that students from under-represented groups gain as much from their Imperial experience as the better represented groups. Twenty student co-creators were involved over the course of the study, which ran from October 2019 to September 2022. An *Inclusivity Survey* gauges student experience, feelings towards the College and problems students are undergoing, and informs the approach to supporting under-represented students. An early action arising from the survey is the launch of *Imperial Inclusion Town Halls*, where both students and staff can speak about their experiences and discuss organisational culture and barriers for under-represented students.

A pilot initiative in the Faculty of Engineering²⁹ seeks to address lower levels of progression and retention among widening participation (WP) students from pre-enrolment to progression into the second year of undergraduate study. The programme focuses on four key areas identified from data and consultation with students: academic progression, retention, enrichment, and belonging. The first stage of the project is the pre-enrolment residential programme, which is designed to support cohort building, develop soft-skills and provide students with the opportunity to engage with lecturers and current students from their chosen departments. The intention is that this will build a sense of belonging in advance of the start of term. This stage has recently been completed, with over 50 students participating in a residential in autumn 2022.

The Faculty of Natural Sciences is piloting programmes that target specific demographics to provide students with additional support. Programmes include the Women in STEM series which provides female mentors and opportunities for networking in the Physics and Mathematics departments; the Mathematics department which organises the Black in Maths workshop, in which alumni of Black and Mixed heritage speak about their experiences. The Blakett Lab Family³⁰ is a social enterprise that began at Imperial and supports Black students at the College through academic and social mentoring. The enterprise also looks to ensure that students have a wider support network in place during their studies and connects students with role models in academia.

In 2021-22, the College launched the Presidential Scholarships for students of Black heritage³¹, available to Black students who meet the criteria for one of the College's contextual admissions schemes. The scholarship covers the full cost of tuition for the duration of the student's programme and mentoring support.³²

The College is particularly aware that students from non-traditional backgrounds may be disadvantaged in the job market compared to their peers from traditional backgrounds, due to factors such as lack of social capital, absence of professional role models at home, and not having access to a network of contacts. Imperial's Careers Service, in collaboration with the Union and its liberation officers, has a tailored offering (co-designed with our students through a series of

StudentShapers projects) intended to address this gap for specific student demographics, including widening participation, LGBT+, BAME and neurodiverse students, and women in STEM.³³ Since 2016-17, the Careers Service has run a work shadow scheme targeted at first-year students from disadvantaged backgrounds. In 2020-21 it was adapted to an online format and 268 first-year students with no or limited previous work experience had a one-hour, professional conversation with an employer, gaining an understanding of a professional environment, and exposure to the world of work. Programmes such as the Alumni Mentoring Scheme and the Professional Projects Fund (which offers students a £1,400 bursary to allow them to pursue a four-week summer project with a third sector or charitable organisation) also prioritise these demographics. In 2020-21, 160 students were paired with 70 alumni mentors. In addition, the SME Internship Fund supports students in gaining experience in SMEs, with a series of internships sponsored by the Enterprise Lab, the College's dedicated entrepreneurship training centre for students and postdocs (12 students in 2021-22). Awareness of other career opportunities is also important for under-represented students, with a range of events including the Black Graduate Careers Conference³⁴ which focuses on the potential benefits of studying a postgraduate degree, and includes workshops to help students choose the right one for them.

The Careers Service works closely with the Disability Advisory Service to ensure provision is accessible, providing a shorter referral process for a longer appointment for students with a disability. Bespoke sessions for students with a disability and neurodiverse students are also available.

Continuation and Completion (SO2)

The College has outstanding TEF metrics for both continuation and completion.

For continuation, the College metrics are all either above benchmark or within 2.5 percentage points of a >95% benchmark, thus being considered 'outstanding' under the TEF guidance, with the exception of students in receipt of free school meals, where the indicator value is 93.7% against a benchmark of 96.6% (-2.9 percentage points). We note the range of statistical uncertainty is wide for this metric.

For completion, the 35 out of 39 reportable metrics are either above benchmark or within 2.5 percentage points of a >95% benchmark, thus being considered 'outstanding' under the TEF guidance. The remaining four metrics; ABCS Q1, non-UK, Computing and Students with a disability are in line with benchmark.

We have described in **SO1** above the measures that we take to support the success of students from non-traditional backgrounds and disabled students. We will continue to work in partnership with our students to ensure that these groups are able to achieve the same outcomes as their peers.

Progression (SO3)

Our graduates are highly prized by industry, and have one of the highest average starting salaries in the sector. The attractiveness of the knowledge and skills developed as part of an Imperial education is demonstrated by Imperial retaining its place as the UK's number one university for graduate employability in The Guardian University Guide (2018 to 2023)³⁵ and is also top for graduate prospects in the Times and Sunday Times Good University Guide 2023.³⁶

For progression, we have 38 reportable metrics and of these 34 have indicator values in the top decile across all reportable split metrics for all providers, showing an extremely strong performance. The College's benchmarks are also very high (ranging from 81.1% to 97.7%; 90%

average), with 34 in the top decile, and 28 in the top 5% of benchmarks across the sector. The benchmarks for the College are therefore very challenging but our indicator values show an extremely strong performance:

- ‘Medicine and Dentistry’ (our six year MBBS programme) and ‘Ethnicity Other’ have benchmarks at or above 95% and indicators within the materiality thresholds. Following the TEF guidance, both of these represent outstanding performance.
- 24 of our 38 progression metrics have a benchmark of 90% or higher, and all but two (Ethnicity Other and Ethnicity Black) have an indicator value above the corresponding benchmark. Ethnicity Other is considered an outstanding performance (see above) and Ethnicity Black has only a -1.6 percentage point difference from benchmark.
- All bar one of our metrics have an indicator value within or above the materiality thresholds. ‘Materials and Technology’ has a difference to benchmark of -2.6 percentage points and corresponds to our Department of Materials. It is worth noting that the Department’s contribution to benchmark is very high at nearly half (44.4%) and the statistical uncertainty distribution is wide (-11.9 to + 6.7 percentage points difference to benchmark) reflecting the small numbers of students (80 over three years).

Educational Gain (SO4, SO5, SO6)

At Imperial, we aim to equip our students with the knowledge, skills and behaviours which they will need to become leaders in their chosen fields in industry, business and academia. For many, this will be in professions that don’t yet exist, addressing global challenges that we don’t yet fully understand or even recognise. Our Imperial Graduate Attributes³⁷ are a set of core competencies that our graduates should possess on successful completion of their programmes. Our aim for our graduates is that they will:

- Demonstrate deep conceptual understanding of their chosen discipline;
- Work effectively in multi-cultural, international teams and across disciplinary boundaries;
- Approach challenges with curiosity, critical thinking and creativity;
- Innovatively apply their skills to tackling complex real-world problems;
- Understand and value different cultures and perspectives;
- Have developed into independent learners with high self-efficacy;
- Display a strong sense of personal and professional identity.

The mix of lectures, seminars, tutorials, labs, authentic learning experiences and project work described in *Academic Experience and Assessment* above is designed to enable students to develop these attributes. Our core curricular offering – in many cases accredited by a professional body – promotes not only *cognitive gain*, but also *soft skills development*, and *employability and career readiness* – a combination that is highly valued by our graduates and employers.³⁸

In addition to our core curricular programme, the College offers students a wide range of co-curricular and extra-curricular activities to enhance their learning, develop cross-disciplinary awareness, and develop their self-efficacy and personal and professional identity.

Through our I-Explore programme, launched in 2020, all Imperial undergraduates will take a for-credit module from outside of their subject area in either year 2 or year 3 of their programme. This may be a module from another STEMM (Science, Technology, Engineering, Maths and Medicine) discipline, Business for Professional Engineers and Scientists (BPES), a humanities-based module from our Horizons programme, or a multi-disciplinary project.

The BPES programme offers undergraduates in science and engineering the opportunity to gain an understanding of the financial, strategic, and operational context of their core subject. It aims to equip students with knowledge and skills that will broaden the career options open to them and increase their flexibility in the workplace.

The Imperial Horizons Programme offers modules focused on Humanities, Social Sciences, Languages, and Global Challenges. As well as taking modules on a non-credit basis outside of normal timetabled hours, our students can now take a range of Horizons modules 'for credit' through I-Explore. The Global Challenges programme has been recognised as one of the top ten educational initiatives in Europe for the integration of sustainable human development into undergraduate teaching and won a Global Dimension in Engineering Education Award in January 2015.

There are a range of extra-curricular opportunities which support the development of the Graduate Attributes. The Union supports students developing a range of specialised and transferable skills through its recognised clubs and societies. At present, there are 400 clubs and societies, of which 72 are in the 'Academic Related' profile category. These societies are student-run to a high standard set by the Union and engagement levels are high with 75% of undergraduates involved in at least one activity.

Imperial has a particular focus on developing students' entrepreneurial skills, and this is reflected in the extra-curricular activities which our students choose. From 2018-19 to 2021-22, the College generated over 190 graduate start-ups.³⁹ Our Enterprise Division, which has responsibility for corporate liaison at College level, and which supports our academic staff in commercialisation of their research and their relationships with industry, also includes student entrepreneurship in its core mission. The Enterprising Students team runs the Imperial Enterprise Lab, the College's dedicated entrepreneurship training centre for students and postdocs. The physical space provides a co-working location and events space for users to develop their ideas with access to a community of expert advice. The team provide year-round extra-curricular programmes, masterclasses, and community events, combined with one-to-one advice from over 150 expert coaches and mentors, to help our community explore new ideas and bring them to life.⁴⁰ Programmes include WE Innovate, a pioneering university wide initiative for early-stage women innovators, the Venture Catalyst Challenge, a three-month entrepreneurial bootcamp with a £90K prize fund, and the Imperial Venture Mentoring Service. Each year, the Enterprise Lab engages over 2,500 students, alumni and early career researchers. From 2018 to 2021 the Lab has seen 194 incorporations and our community have collectively raised over £226 million in external funding. The entire portfolio has 2118 employees. The Lab is complemented by the Imperial Advanced Hackspace, which brings together students, researchers, staff, and corporate partners from all backgrounds, disciplines and levels of expertise to collaborate, experiment and innovate. In one space it provides resources including electronics, wood and metal, workshops, a bio lab, a wide variety of prototyping tools, and experts who can provide one-to-one mentoring. In 2021-22 there were 732 new undergraduate sign ups, with a total of 1,065 undergraduate members in that year. Members rate the Hackspace very positively, at 4.92 out of 5 (98%).

The *Imperial Award*, a joint initiative of the College and the Union, is a programme encouraging personal development through students' reflection on their curricular, co-curricular, extra-curricular and personal experiences during their time at Imperial. Students record their activities in an on-line portfolio; reflect on how these activities have contributed to independent, open-minded thought, effective teamwork and self-awareness and active management; and produce written reflective statements on how their activities have contributed to their personal development in each area.

The Award is intended to enable students to gain the maximum benefit from the wide range of experiences that are available to them during their time at the College, and to develop the habit of self-reflection which will continue to be important to them throughout their careers. 811 undergraduate students participated in the award between 2018-19 to 2020-21.

The College is committed to adopting an evidence-based approach to our educational offering. During Curriculum Review, we took evidence from students, alumni and employers to enable the curriculum to be engaging, relevant and stretching and to develop disciplinary knowledge alongside transferable skills which will be applicable in any future employment or further study. We developed an Education Evaluation Toolkit to evaluate the impact of our provision on students' self-efficacy, sense of belonging, agency (i.e. capacity for action), and development as learners and professionals. The Toolkit provides advice on design of questionnaires and interviews, as well as a standard College question bank.

To enable us to measure students' educational gain and progress in their learning across the institution, we are investing in institutional data infrastructure and analytical capability to support the development of learning analytics and to offer data-derived insights to enhance learning, teaching, assessment and the experience of staff and students. Most higher education learning analytics dashboard systems are predicated on predicting drop-out and creating early warning systems; to streamline services and minimise costs; or to support regulatory reporting. By contrast, Imperial has aimed to use learning analytics to offer an enhanced student experience, and to better know and support our students. This initiative will allow us to evidence student educational gain, engagement and progress and show the data in dashboards to both staff and students, allowing them to be active agents in their own learning. This initiative echoes our educational approach and integrates educational expertise, disciplinary research and methodological skills from our academic faculty in areas such as machine learning and AI, in partnership with students.

The College analyses student outcome metrics (continuation, completion and progression) at Department and programme level. This analysis includes examining the differences in these measures for students in different demographics ('split metrics'). This data is available to departments through our Differential Outcomes Dashboard and is considered annually by the College's Education and Student Experience Committee and as part of the annual monitoring exercise for our programmes (described in Academic Experience and Assessment above).

The College also uses a range of surveys to monitor and evaluate the student experience and ensure the student voice is captured formally. These include module evaluation surveys, an annual Student Experience Survey which gathers feedback on a range of College services and on the Union, and an annual survey of bursary recipients which, as well as enabling us to evaluate the Imperial Bursary, gives a further opportunity for students predominantly from 'widening participation' backgrounds to express their views on their experience at Imperial. In 2021-22, 2,354 undergraduate students responded to the Student Experience Survey representing a 25.9% response rate:

- 69.3% of undergraduate students (1,288) who responded agreed or strongly agreed with the statement, 'By learning alongside researchers who are experts in their fields, Imperial students gain the practical, entrepreneurial and intellectual skills to tackle societal problems'.
- 79.5 % of undergraduate students (1,369) who responded agreed or strongly agreed with this statement, 'the College provides a broad range of activities, services and support for students beyond their studies, helping them develop their wider talents'.

Finally, the College evaluates learning gain and gathers evidence for the design of interventions through specific projects designed to increase our understanding of the factors that contribute to the success of particular groups of students in particular disciplines:

- The *Belonging, Engagement and Community Project*,⁴¹ which has now been running for five years, is a cross-departmental, longitudinal project that investigates how students understand and construct their own sense of belonging to, and engagement with, various potential 'communities'. The project utilises a range of methods, such as questionnaires and semi-structured, longitudinal interviews, as well as more innovative approaches to capture unique insights (including 'walking' and 'vox pop' interviews). This study also contributes to the ongoing and wide-ranging evaluation of the Learning and Teaching Strategy, which has amongst its aims that students are encouraged and empowered by their studies to adopt an outward-looking perspective when thinking about their place in and contributions to a global community. One of the publications that has arisen from this project, *The role of pedagogy and the curriculum in university students' sense of belonging*,⁴² captured the views and experiences of 486 respondents to a Qualtrics survey, followed by interviews with 32 students (11 of whom then participated in a follow-up interview). One of the findings from the project was that students', identified by tracking students pre- and post- lockdown, was that their sense of engagement didn't change with the move to online learning. This reinforces the finding in the NSS that the College worked effectively to engage students during the pandemic and help them feel part of the wider Imperial community.
- The *Strengthening Learning Communities Project*⁴³, initiated in 2020, investigates the underlying causes of lower attainment by demographic minorities and/or under-represented groups in Physics, and implements targeted interventions with the aim to alleviate such gaps. A ten-year database of student marks across all assessments in the Department of Physics was built and is being used to identify gaps in attainment across socio-demographic groups – initial analysis has highlighted gender gaps in final degree classification, and we are now exploring how these gaps emerge across different modules and years of study, with a view to identifying patterns of teaching and assessment that give rise to larger and smaller attainment gaps, and driving the development of a more inclusive curriculum.

At Imperial College, through our established links with industry, we have a very clear understanding of what employers are looking for in our graduates, and an equally clear vision of how we go about equipping our students with the knowledge, skills and behaviours that they need to succeed in the workplace. During their time at the College, our students will acquire a very high level of subject knowledge. They will also learn the skills to apply that knowledge to real world-problems, working in multi-cultural, multi-disciplinary teams, deploying their entrepreneurial skills to translate their solutions to real world application. We continue to review our curricula, our pedagogy and our use of technology to ensure that our students remain amongst the most employable graduates in the UK.

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