

## Learning and Teaching Strategy condensed:

The principle aim of the new learning and teaching strategy (LTS) is to deliver “innovative teaching for world class learning”. Ultimately the goal of the LTS is to improve students’ education. Education should not solely be about the transmission and retention of facts. Rather, it should involve the 3Cs: curiosity, critical thinking and creativity. Effective education should prepare students to handle concepts, evidence and ideas – bridging the gap between superficial engagement and deeper understanding.

The LTS aims to provide graduates with 21<sup>st</sup> century skills, equipping them for future careers and helping them become the leaders of tomorrow. The aims of the LTS can be split into those targeting students and Imperial itself:

Regarding students, the LTS aims to:

- Ensure graduates are efficacious, independent learners, with deep conceptual understanding of their subjects. This will enable them to:
  - Approach challenges with the 3Cs: curiosity, critical thinking and creativity
  - Apply these skills to tackle complex challenges
- Give students a strong personal and professional identity

Regarding Imperial, the LTS aims to ensure that Imperial:

- Is recognised globally as an outstanding university for its respective disciplines
- Is recognised as a leader in technology-enhanced education
- Combines pedagogy with a focus on community (more below)
- Treats education with the same rigours and evaluation as it does research
- Collaborates with students, viewing them as partners

While ambitious, the LTS aims are achievable given Imperial’s pool of talented educators and support staff. Our diverse student community can also contribute to implementing the strategy, especially when students are viewed as partners. In addition, the LTS builds on pre-existing examples of successful educational practice at Imperial. These include:

- Team-based learning (TBL): Engineering and Molecular biology
- Facebook live-streams: Nuclear Chemical Engineering
- Preparing students for the working environment: Chemical Engineering
- Lego bricks: Chemistry to build mass spec.
- Online MBA: Business school

Such innovations to teaching will be done at a subject/departmental level, ensuring that departments are able to pick the most appropriate teaching modality for their students. These innovations will be continually evaluated to determine which pedagogy is most suited for individual subjects/departments.

The LTS comprises four major areas:

1. **Curriculum review and assessment:** cutting out all unnecessary content to ensure that taught material is both necessary and manageable. In addition, Imperial will introduce a modular structure of taught content. This will give students the chance to access modules from other disciplines, broadening their knowledge base beyond their own subject. The curriculum review will ensure that space is left in timetabling for all students to engage with extra-curricular activities like volunteering, Horizons, or entrepreneurship. These activities will receive credit. Finally, the LTS recommends that past exam papers, marking schemes

and model solutions are made available for all coursework and exams

2. **Pedagogy transformation:** increasing the amount of interactive teaching through TBL, flipped classrooms etc.
3. **Digital and online curricula:** supplementing existing curricula by adding digital and online teaching methods. If content is made available before scheduled teaching time, interactions between staff and student can be more effective. This also includes developing physical spaces to ensure that these new teaching methods can be delivered.
4. **Community:** fostering an environment where differences in student background and cultures are celebrated. This area overlaps with new teaching methods: for traditional, didactic lecture based teaching, differences between students may be a hindrance, making it harder to deliver content in a 'one size fits all' process. However, in teaching 'by discovery', differences between students is an advantage, as each unique background may provide a unique solution to problem or unique point of view. A strong sense of community not only aides learning, but also contributes to positive wellbeing. The focus on group work aims to develop students' soft skills, in addition to reducing a results-focussed competitive culture. Finally, there is evidence to show that students learn better in an inclusive environment

Imperial will continually evaluate and publish the results of these changes to education, aiming to join MIT and Harvard at the forefront of leaders in the field. In order to facilitate this, Imperial will appoint of Professor of Education, with further appointments of Professors of Education in the science, engineering, medicine and business faculties to follow. Part of the bigger goal of this strategy is to create a supportive environment, where teaching excellence is equal to research excellence.

The LTS outlines that Imperial is keen to see its students as partners by working with them to shape their own education. Students will be encouraged to work with College to develop new teaching practice. In addition, they will be employed as teaching assistants (graduate and undergraduate), both in classrooms and in an online capacity.

#### **Teaching methods – moving from passive to active learning:**

There is a need to move away from traditional, lecture based teaching, as this didactic teaching process do NOT yield the best results. The LTS outlines the need to move towards a more active learning process, which has been shown to increase exam scores and reduce the likelihood of failing exams. These active teaching methods can be applied to different settings:

- Lectures: Students are given material before the lecture to review → quiz done during the teaching to gauge knowledge → this drives the direction of focus
- Labs: Rather than "following a recipe", students should be encouraged to partake in designing the experiment

There are several facets to active learning:

- Guided preparation for students, meaning that time spent with lecturers afterwards is as effective as possible
- The transferable skills students learn through active learning can be applied to new situations. Students should feel that being wrong is OK
- Reflection time to consolidate and contextualise their learning

In addition to improved exam outcomes, active learning offers other benefits:

- Accommodates differences in starting points between students
- The interactive process offers the chance to correct misconceptions, integrate perspectives and provide real-time feedback
- By shifting the onus of learning from teacher to student, active learning can accommodate the rotation of teachers between modules, helping to tackle some of the issues surrounding space
- Ultimately the process focusses on broader goals beyond just passing tests

One of the key parts of an Imperial education is that it is heavily research-based. Research-based education is an important addition to more passive forms as it develops a number of skills, not only useful for passing exams but also for life. For example, students learn to appraise evidence before acting, work as part of a team, and deal with ambiguity. It also equips students to deal with mistakes, helping them to accept that problems are rarely solved in one instance, and that it is normal to feel challenged.

The LTS aims to incorporate further research within education at Imperial, so that all undergraduate students will undertake research as part of their degrees. In doing so, students will gain deep understandings of their subjects and develop resilience for when things don't go to plan. In addition, students will also appreciate the wider picture of their work, and its implications on society. Finally, the LTS outlines the need for students to communicate their findings to both an academic and lay audience. This will give students the chance to develop their communication skills, an important quality not only for university, but life beyond.

### **Inclusive teaching – education for the many, not the few:**

There is a wide diversity within the student population of Imperial, with half of students from outside the UK. This is important because this diversity brings a risk of students feeling isolated and lacking a sense of belonging, which has been shown to impact their education. The LTS aims to make learning and teaching at Imperial more inclusive by:

- Recognising cultural differences between students, and using this as a positive so that students feel they belong
- Creating equal opportunities for students to succeed during their time at Imperial
- Removing barriers to learning, so that no group of students is (dis)advantaged. This may be through the use of learning capture/captioning, or making lecture notes available in advance. It may also be through the implementation of new teaching approaches, including the shift to more interactive teaching – using group learning, for example
- The shift towards culture-mixed group learning outlined in the LTS has the benefit of improving inter-cultural communication between students, helping to build a sense of community within the cohort
- Ensuring the aforementioned curriculum review and redesign develops a new curriculum that is inclusive, recognising differences between students. As previously described, these differences can be an asset, especially where teaching involves the application of concepts to real-life settings
- Commissioning social science research and using this to introduce evidence based policies to counteract unconscious bias in individuals

**Technology enhanced learning:**

The LTS aims to supplement existing teaching practice with digital and online material. One such avenue is the use of so-called “blended learning”. This combines online- with face-to-face learning. Rather than lectures, students are given online and digital material to study before the teaching session. Classroom time can then be spent on more interactive teaching methods, such as smaller group teaching, which allows students to directly interact with staff, facilitating real-time, two-way feedback. Other methods of technology-enhanced learning include the use of programmes like Mentimeter, which can provide real-time feedback to lecturers on how students are finding the lecture. Furthermore, the use of such technology can create both international and multi-site classrooms, helping to combat space issues and develop a sense of community.

The LTS aims to develop Massive Online Open Courses (MOOCs), Small Private Online Courses (SPOCs) and Continuing Professional Development (CPD). A MOOC is an online course that students can access for learning. This deals with the issues of space, location and availability, making learning available to students from all backgrounds and locations. In addition to course content, a MOOC has facilitators and enables students to connect with each other during the learning process. Rather than completing assignments, course participants are asked to interact with the material and each other, aiming to develop deeper learning. All work is shared between students, encouraging them to work with and for each other, contributing to the student community. A SPOC is a version of MOOC used locally on-campus.

**Funding:**

To enable such innovation to occur, the LTS notes that funding will be available to all departments at Imperial. Departments will be required to bid for funding, thereby demonstrating commitment from senior staff, which hopefully will ensure that proposed changes will come into effect. Funding will continue to be available for Graduate and Undergraduate Teaching Assistants (G/UTAs). Finally, the LTS indicates that Imperial will establish a new scheme that awards grants to students who work with staff to influence education within departments, akin to the “Changemakers” scheme at UCL.

**Potential barriers to change:**

The LTS outlines a paradigm shift in our approach to education. However, the LTS also recognises potential barriers to making these changes. Firstly, although there is strong evidence that interactive learning is more effective than traditional didactic teaching, there is a risk that this evidence may make academics feel they’re doing things wrong. This may lead to resistance to proposed changes. Secondly, academic staff may value their role as researchers more than that of teachers.

In order to combat these potential barriers, the LTS recommends that staff and departments should be supported in the transition, and staff feel that leading the change in education is a prestigious pursuit.

**Summary:**

The LTS outlines steps needed to improve the education of the students of Imperial. With work between staff and students, Imperial can replicate its success with research, and become a world leader in the exciting field of education.