

Universities of the future: the impact of the pandemic

19th October 2021

Dr Ruth Graham



Outline of presentation

Impact of COVID-19 through the lens of two major HE developments:

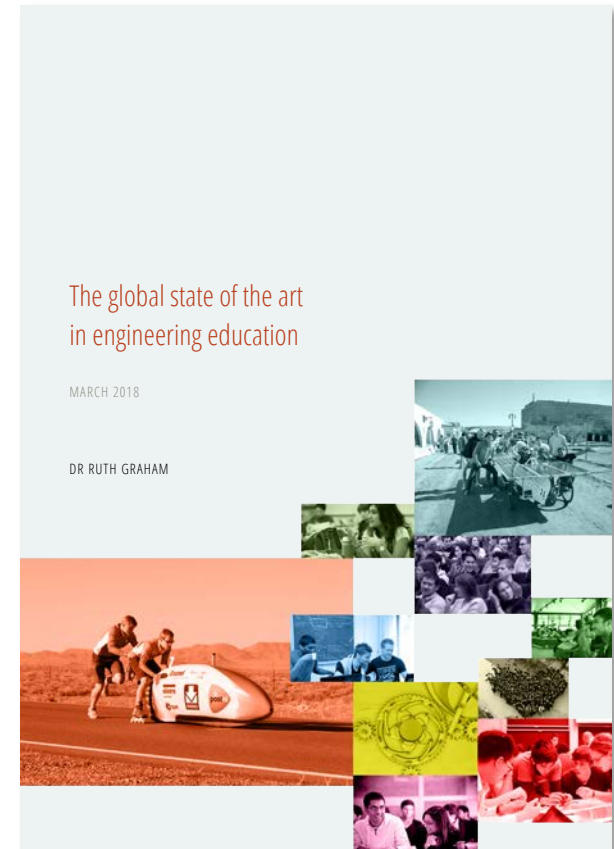
- 1** New generation of programs in engineering education
- 2** Sweeping reforms to academic promotion systems

1 New generation of programs in engineering education


Context: where were we before March 2020?

The global state of the art in engineering education

Commissioned by MIT
Published March 2018



NEET Program (New Engineering Education Transformation)

 Massachusetts Institute of Technology



MENS ET MANUS
hand and mind



The 10 institutions most frequently identified as **current leaders** in engineering undergraduate education

1	Olin College (US)	6	UCL (UK)
2	MIT (US)	7	Purdue Uni (US)
3	Stanford Uni (US)	8	NUS (Singapore)
4	Aalborg Uni (Denmark)	9	Uni of Cambridge (UK)
5	TU Delft (Netherlands)	10	Chalmers Uni (Sweden)

The 10 institutions most frequently identified as **emerging leaders** in engineering undergraduate education

1	SUTD (Singapore)	6	NUS (Singapore)
2	Olin College (US)	7	TU Delft (Netherlands)
3	UCL (UK)	8	Charles Sturt (Australia)
4	PUC (Chile)	9	Tsinghua (China)
5	Iron Range (US)	10	Arizona State (US)

Distinguishing programmatic features of the emerging leaders

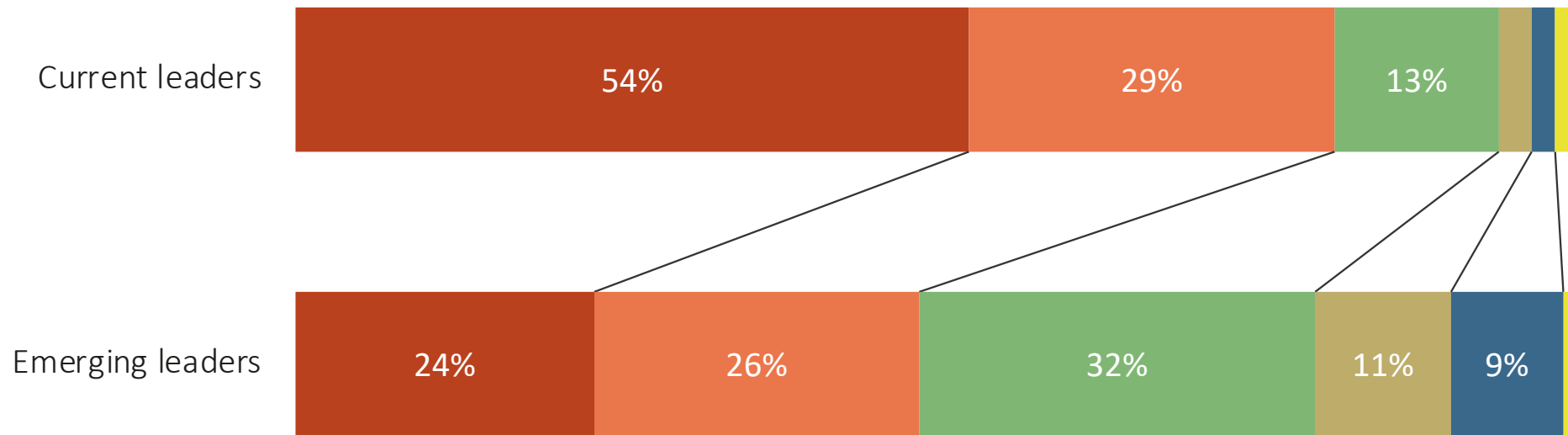
CURRENT LEADERS

Largely US and Europe based

EMERGING LEADERS

Global spread of institutions

The locations of **current** and **emerging** leaders:



Distinguishing programmatic features of the emerging leaders

CURRENT LEADERS

Largely US and Europe based

**Non-traditional practice confined to
'pockets' with course often taught in
isolation**

EMERGING LEADERS

Global spread of institutions

**Systemic/unified approach with
connectivity across the curriculum**

The 10 institutions most frequently identified as **emerging leaders** in engineering undergraduate education

1	SUTD (Singapore)	6	NUS (Singapore)
2	Olin College (US)	7	TU Delft (Netherlands)
3	UCL (UK)	8	Charles Sturt (Australia)
4	PUC (Chile)	9	Tsinghua (China)
5	Iron Range (US)	10	Arizona State (US)

The 10 institutions most frequently identified as **emerging leaders** in engineering undergraduate education

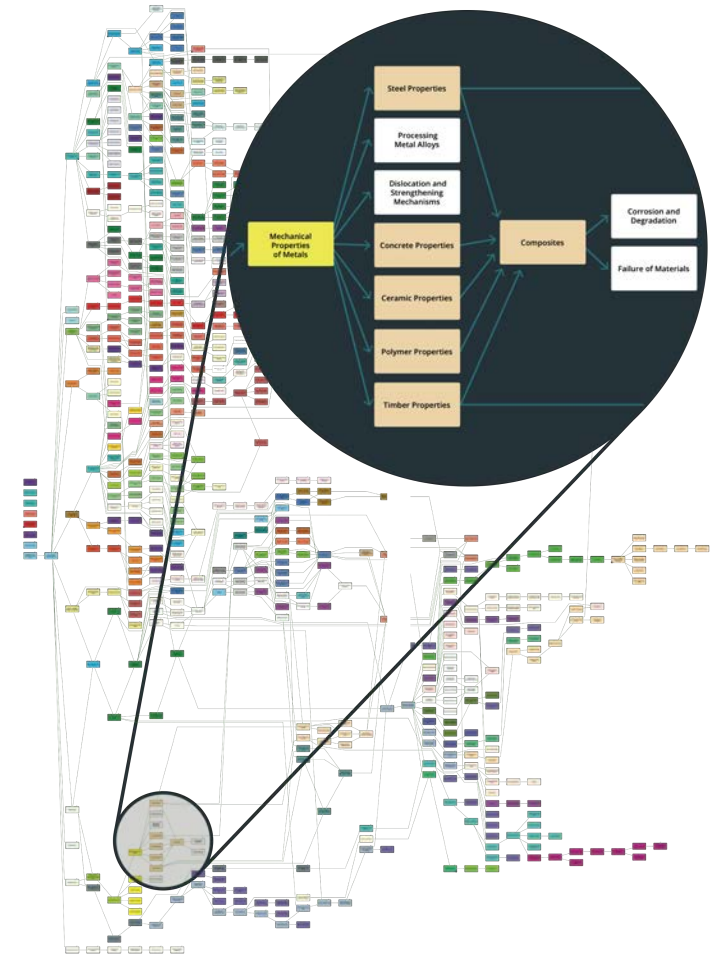
1	SUTD (Singapore)	
2	Olin College (US)	
3	UCL (UK)	
4	PUC (Chile)	
5	Iron Range (US)	
		8
		Charles Sturt (Australia)
		10
		Arizona State (US)

Systemic/unified approach – CSU (Australia)



CSU topic tree

- core engineering concepts and skills are disaggregated into discrete three-hour topics and accessed independently online by students
- the topic tree offers a visual map of the relationships and dependencies between topics and branches of engineering
- students complete 240 topics before their work placement and 600 topics by graduation



Distinguishing programmatic features of the emerging leaders

CURRENT LEADERS

Largely US and Europe based

Non-traditional practice confined to 'pockets' with course often taught in isolation

Teacher-centred approach with limited external connectivity

EMERGING LEADERS

Global spread of institutions

Systemic/unified approach with connectivity across the curriculum

Culture of student empowerment and cross-community collaboration

Distinguishing programmatic features of the emerging leaders

CURRENT LEADERS

Largely US and Europe based

Non-traditional practice confined to 'pockets' with course often taught in isolation

Teacher-centred approach with limited external connectivity

Development shaped by variety of drivers, with much of curriculum unchanged for decades

EMERGING LEADERS

Global spread of institutions

Systemic/unified approach with connectivity across the curriculum

Culture of student empowerment and cross-community collaboration

Development is typically shaped by regional needs or priorities, enabling a more visionary approach

Investment by the Chilean Ministry for Finance



Established in 2014, the Chilean government's National Agency for Innovation and Development (CORFO) launch Engineering 2030.

Aiming to drive economic growth through technology innovation, the initiative targets Chilean engineering schools as an incubator for this talent. Over \$200m (US) has already been invested, most of which is focused on educational reform.

2030 ENGINEERING STRATEGY

Hallmarks of future leaders:

- Student choice and flexibility
- Multi-disciplinary learning
- The role, responsibilities and ethics of engineers in society
- Global outlook and experiences
- Experiential open-ended problem solving that is rooted in real industrial and societal challenges
- Development of skills and mindsets: critical thinking, adaptability, team-working, creativity, innovation and entrepreneurship

1 New generation of programs in engineering education

Looking forward: what is the impact of COVID-19?

Three areas of feedback from engineering community on COVID-19 impact:

Concern: Innovations will be diluted as engineering schools revert to teacher-centred delivery

Question: How can we deliver effective collaborative learning in an online mode?

Prediction: The sector will change fundamentally... we are not going back to how things were before

Summary of CEEDA study. Two project outputs, both open-source:



report charting the lessons learnt from the current period of 'emergency teaching' due to the COVID-19 pandemic, and how this experience might impact the trajectory of engineering education in the future.



website showcasing examples of best practice in engineering collaborative and/or project-based learning that are delivered partially or fully online during this period of 'emergency teaching'

Challenges faced during 'emergency teaching':

- Student social isolation, anxiety and mental health
- Internet and power connectivity when students away from campus
- Faculty exhaustion and stress from constant 'state of emergency'
- Establishing community, connectivity and peer-learning in online delivery
- Fostering 'unscripted' student-to-student interactions
- Assessing student learning online
- Supporting authentic experiential and hands-on experiences

Challenges faced during 'emergency teaching':

- Student social isolation, anxiety and mental health
- Internet and power connectivity when students away from campus
- Faculty exhaustion and stress from constant 'state of emergency'
- Establishing community, connectivity and peer-learning in online delivery
- Fostering 'unscripted' student-to-student interactions
- Assessing student learning online
- Supporting authentic experiential and hands-on experiences

Example 1 – MIT (US)



Example 1 – MIT (US)



System Design and Management Bootcamp

Fully online one-week program introduction for new students.

As well as introduction to the discipline, aims to develop peer-learning and network-building, and combat 'imposter syndrome'.

Took inspiration from crowdfunding platforms.

MIT (US)

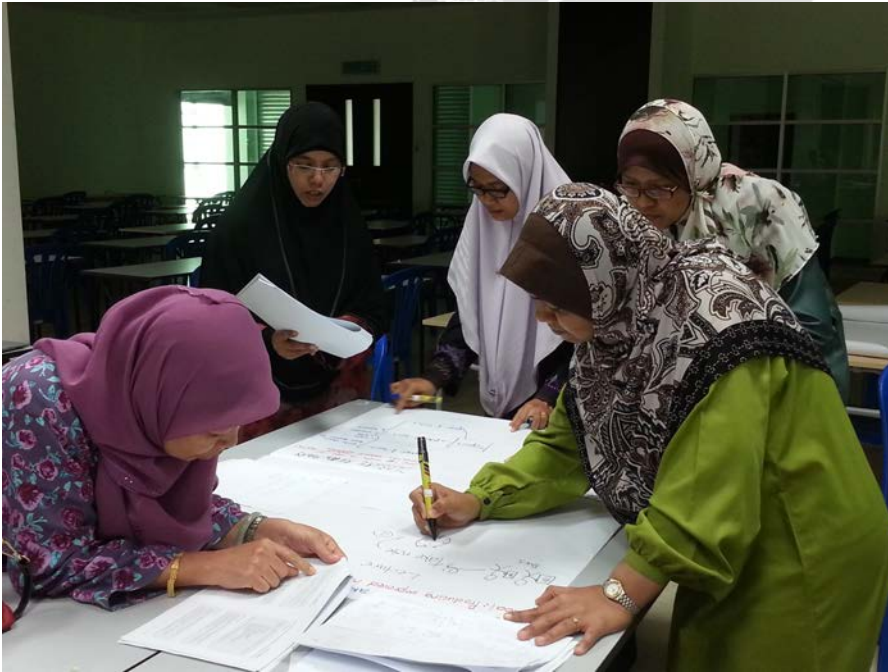
Anticipated future directions for engineering education:

- **Blended learning:** greater use of immersive and digital technology
- **Campus learning spaces:** from lecture theatres to project/community spaces
- **Collaborative teaching teams:** greater innovation, prominence of UGTAs
- **Shared teaching resources:** using the best materials globally
- **Horizon-scanning:** coordinated strategy development and external engagement
- **Sustainability and social justice:** more explicit focus within and outside curriculum
- **Global and inter-connected projects:** bringing together students and external partners from across the world
- **Broadening of student learning outcomes:** resilience, empathy and identity

Anticipated future directions for engineering education:

- **Blended learning:** greater use of immersive and digital technology
- **Campus learning spaces:** from lecture theatres to project/community spaces
- **Collaborative teaching teams:** greater innovation, prominence of UGTAs
- **Shared teaching resources:** using the best materials globally
- **Horizon-scanning:** coordinated strategy development and external engagement
- **Sustainability and social justice:** more explicit focus within and outside curriculum
- **Global and inter-connected projects:** bringing together students and external partners from across the world
- **Broadening of student learning outcomes:** resilience, empathy and identity

Example 2 – University Teknologi Malaysia (Malaysia)



University Teknologi Malaysia



Example 2 – University Teknologi Malaysia (Malaysia)

Introduction to Engineering

Project merged with programming, to establish larger teaching team.

Sustainability project for students to calculate carbon footprint.

Embedded empathy between teammates throughout the project

University Teknologi Malaysia

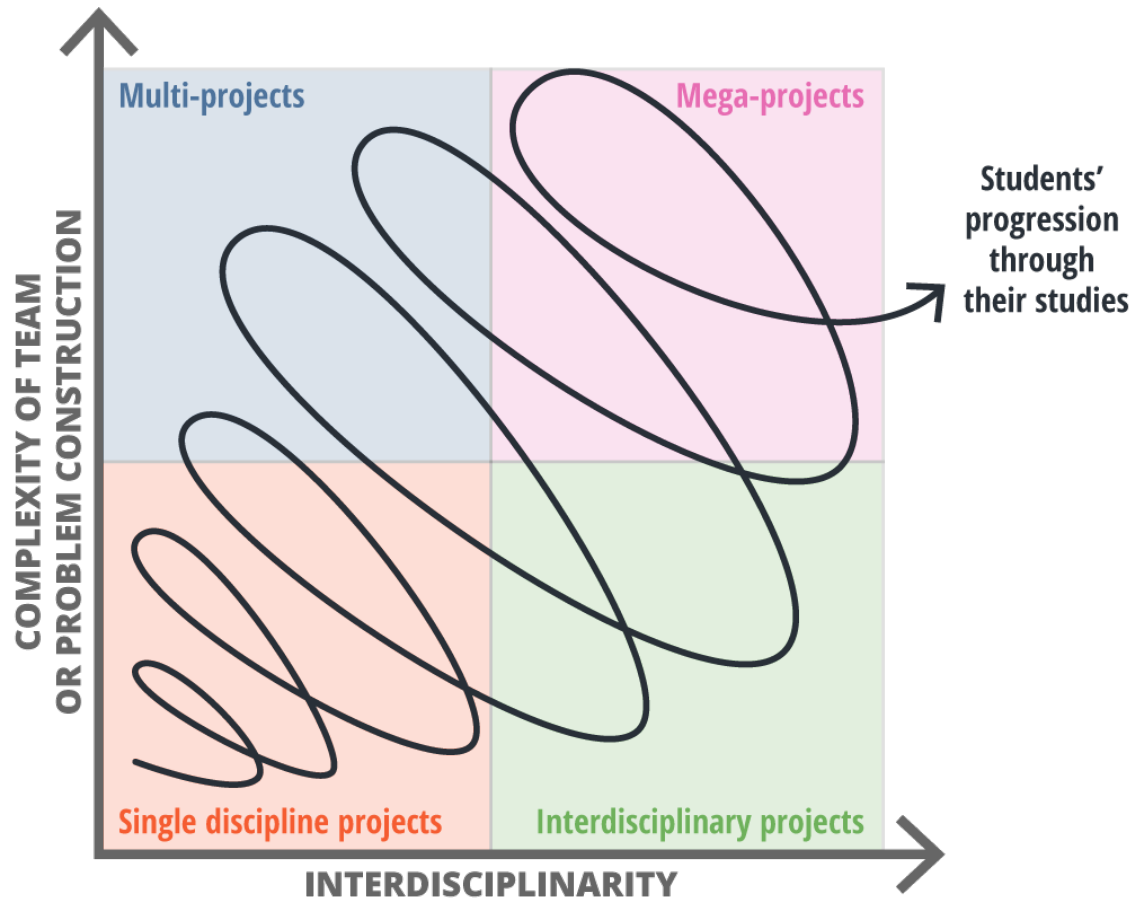
Anticipated future directions for engineering education:

- **Blended learning:** greater use of immersive and digital technology
- **Campus learning spaces:** from lecture theatres to project/community spaces
- **Collaborative teaching teams:** greater innovation, prominence of UGTAs
- **Shared teaching resources:** using the best materials globally
- **Horizon-scanning:** coordinated strategy development and external engagement
- **Sustainability and social justice:** more explicit focus within and outside curriculum
- **Global and inter-connected projects:** bringing together students and external partners from across the world
- **Broadening of student learning outcomes:** resilience, empathy and identity

Example 3 – Aalborg University (Denmark)



Example 3 – Aalborg University (Denmark)



Mega-projects

Building in complexity – technical, societal and inter-disciplinary – as students progress.

Nurturing flexibility, problem-solving and collaborative thinking.

PBL competencies

Nurturing and tracking progressive learning outcomes.

CEEDA: Collaborative engineering learning in the digital age

www.ceeda.org

The screenshot displays the CEEDA website interface. At the top left is the CEEDA logo (four overlapping circles in green, blue, purple, and orange) with the text 'Collaborative Engineering Education in the Digital Age'. To the right are navigation links for 'Home', 'Case studies', and 'About'. The main content is divided into two columns. The left column, titled 'What is CEEDA?', contains a paragraph describing the website's focus on global best practice in collaborative and/or project-based engineering learning, particularly during the 'emergency teaching' period. Below this text is a collage of images showing students working in a lab, using a microscope, and in a video conference. The right column, titled 'Latest CEEDA case studies', features two case study cards. The first card is for MIT, USA, with an approval date of April 2021. It is divided into two parts: 'Part A. Best Practice Activity' (Design Challenge One) and 'Part B. Institutional Context' (Lessons learnt from emergency teaching). The second card is for Aalborg University, Denmark, with an approval date of March 2021. It also has two parts: 'Part A. Best Practice Activity' (Giraf Project) and 'Part B. Institutional Context' (Lessons learnt from emergency teaching). Each card includes a 'Read' button for both parts.

What is CEEDA?

The Collaborative Engineering Education in the Digital Age website showcases examples of global best practice in collaborative and/or project-based engineering learning that are partially or wholly delivered online. It forms one element of a wider study looking at the lessons learnt from the current period of 'emergency teaching' and how this might impact the trajectory of engineering education in the future.

Latest CEEDA case studies

MIT, USA APPROVAL DATE: April 2021

Part A. Best Practice Activity
Design Challenge One

Design Challenge One builds peer-learning and connectivity amongst students that have not met before face-to-face.

Part B. Institutional Context
Lessons learnt from emergency teaching

Hands-on, experiential learning has been a major priority at MIT during the period of emergency teaching.

[Read Best Practice Activity](#) [Read Institutional Context](#)

Aalborg University, Denmark APPROVAL DATE: March 2021

Part A. Best Practice Activity
Giraf Project

The full cohort of 60 students must self-organise and work together to develop an app for autistic children.

Part B. Institutional Context
Lessons learnt from emergency teaching

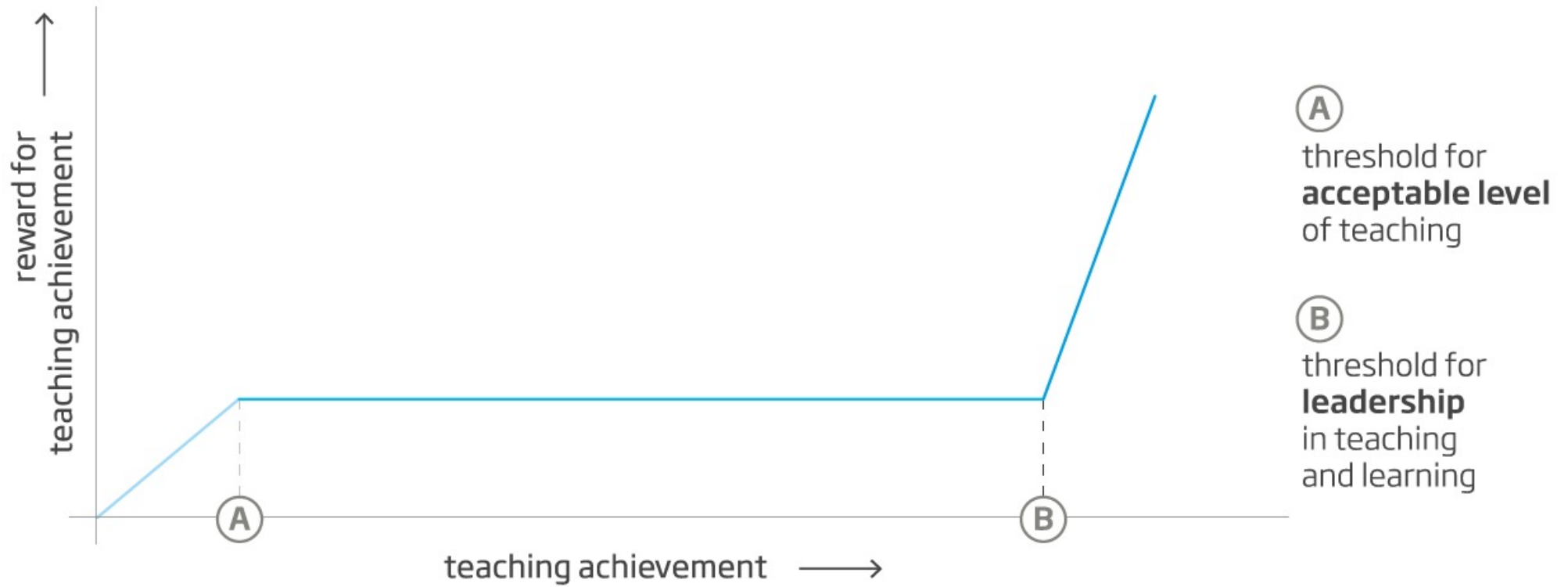
A major focus is to progressively expose students to projects of increasing complexity and interdisciplinarity.

[Read Best Practice Activity](#) [Read Institutional Context](#)

2 Sweeping reforms to academic promotion systems

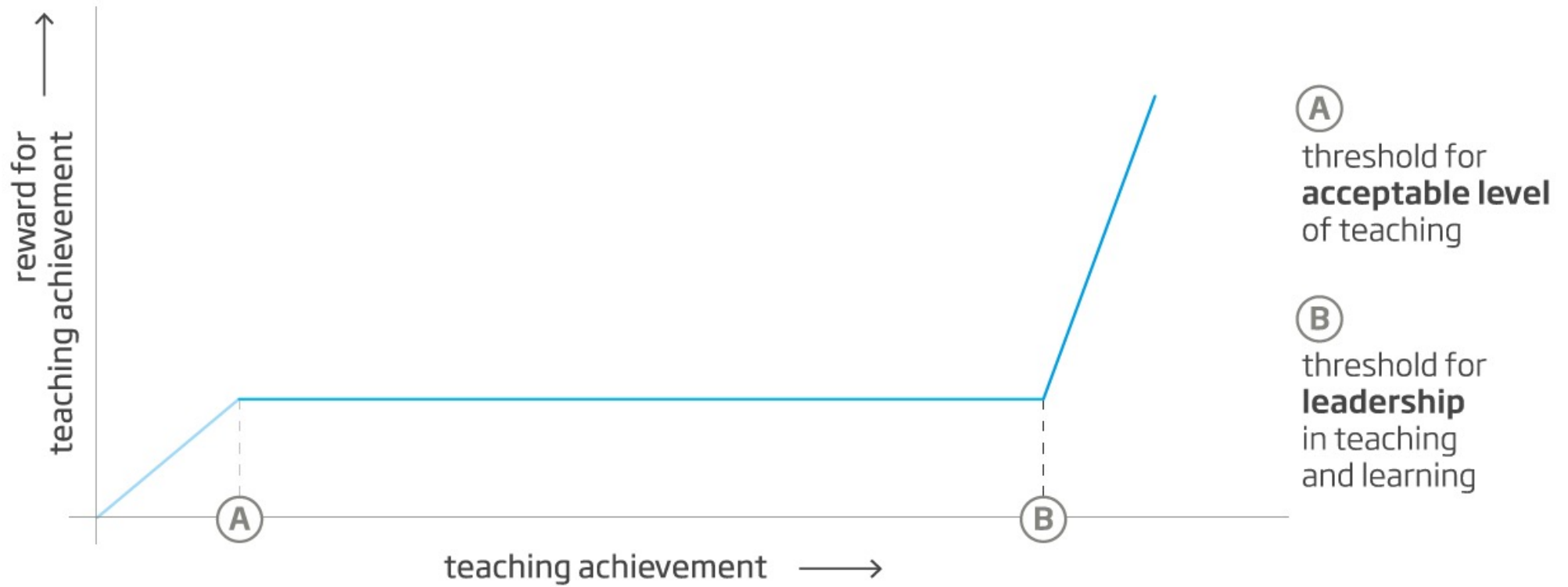
Context: what was happening before March 2020?





Challenges:

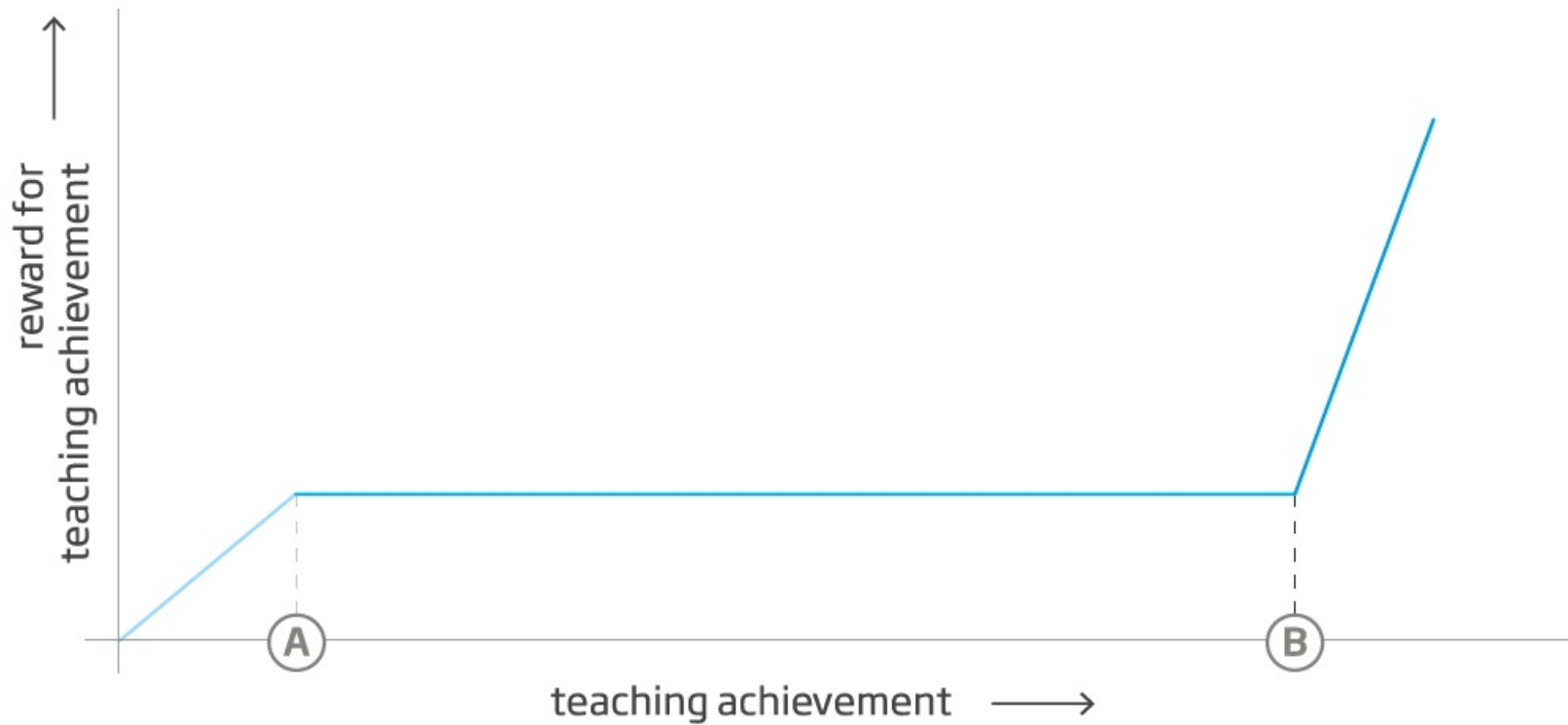
- › the absence of clear and accepted **definitions** of progressive 'levels' of teaching achievement that punctuate each stage of the career ladder



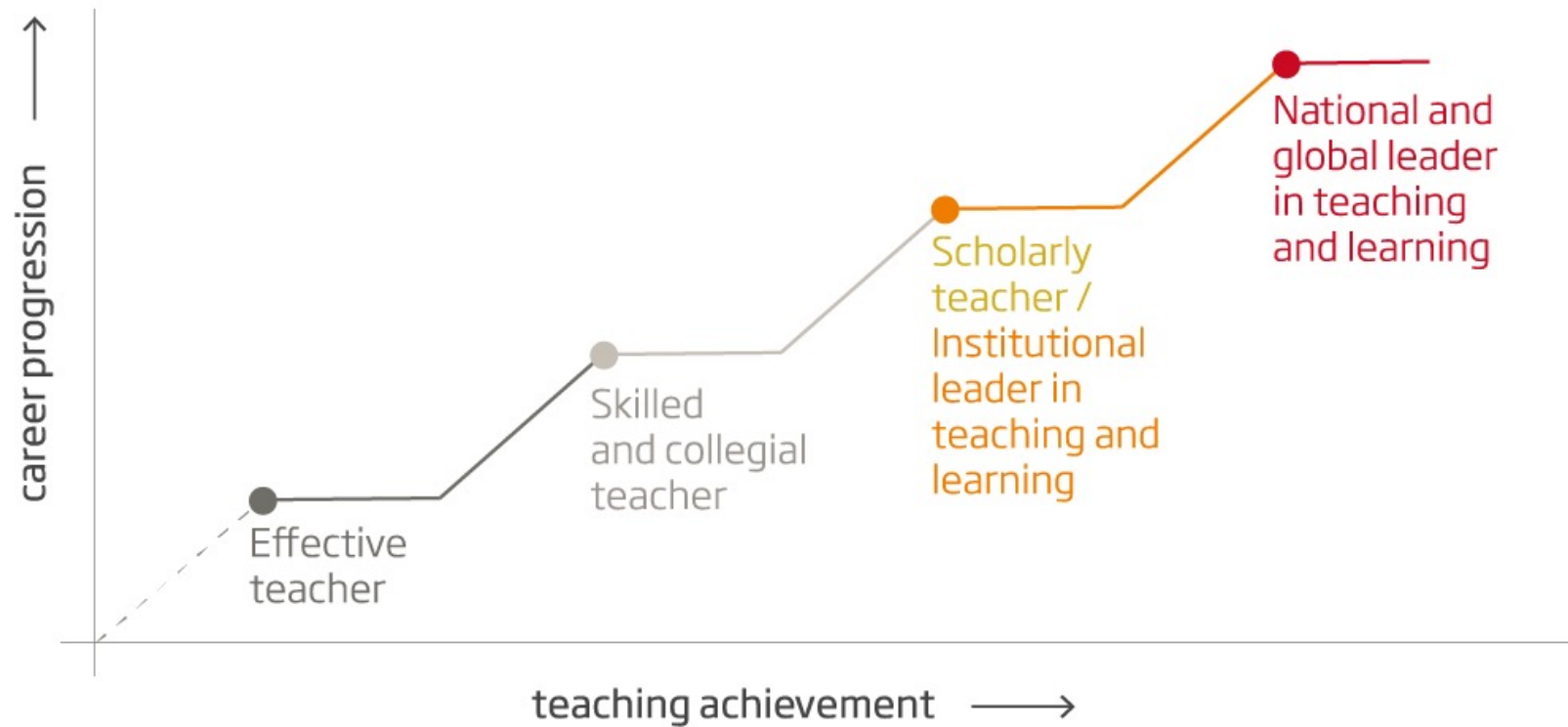
Challenges:

- › the absence of clear and accepted **definitions** of progressive 'levels' of teaching achievement that punctuate each stage of the career ladder
- › the inadequacy of the forms of **evidence** currently used to demonstrate and evaluate the teaching contribution of academics at each stage in their career progression

The Career Framework for University Teaching



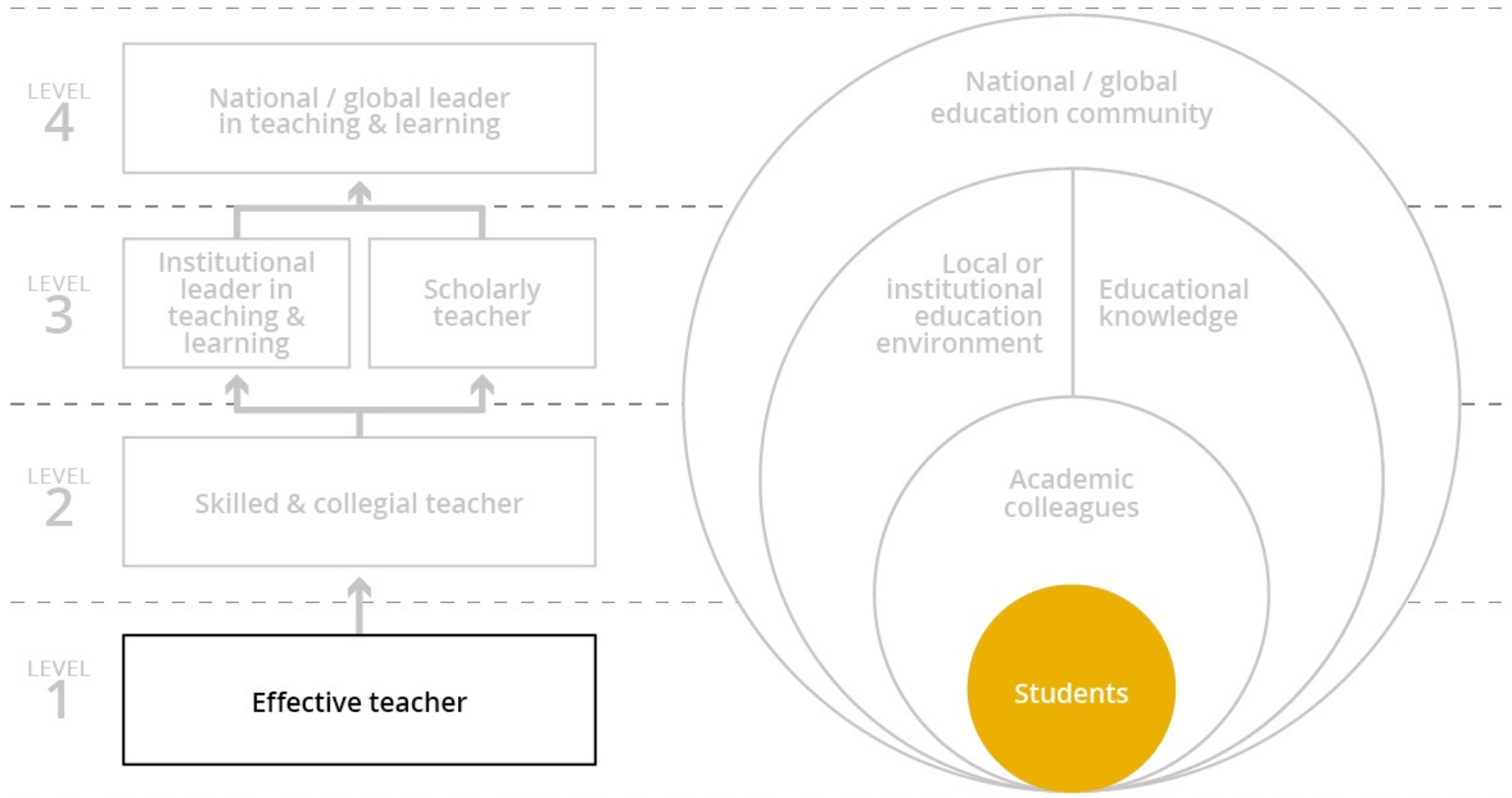
The Career Framework for University Teaching





ROLES

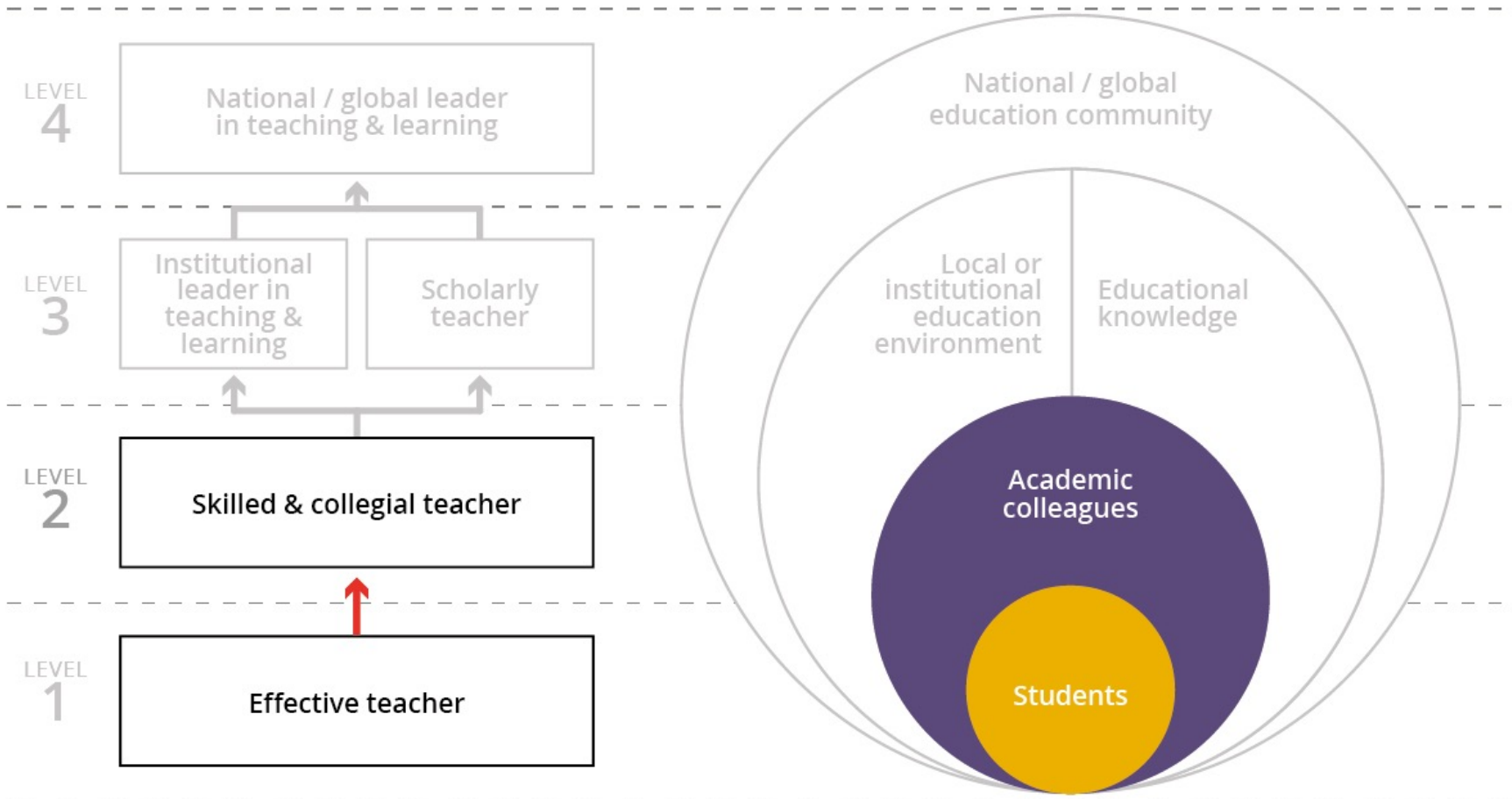
SPHERES OF IMPACT (CUMULATIVE)





ROLES

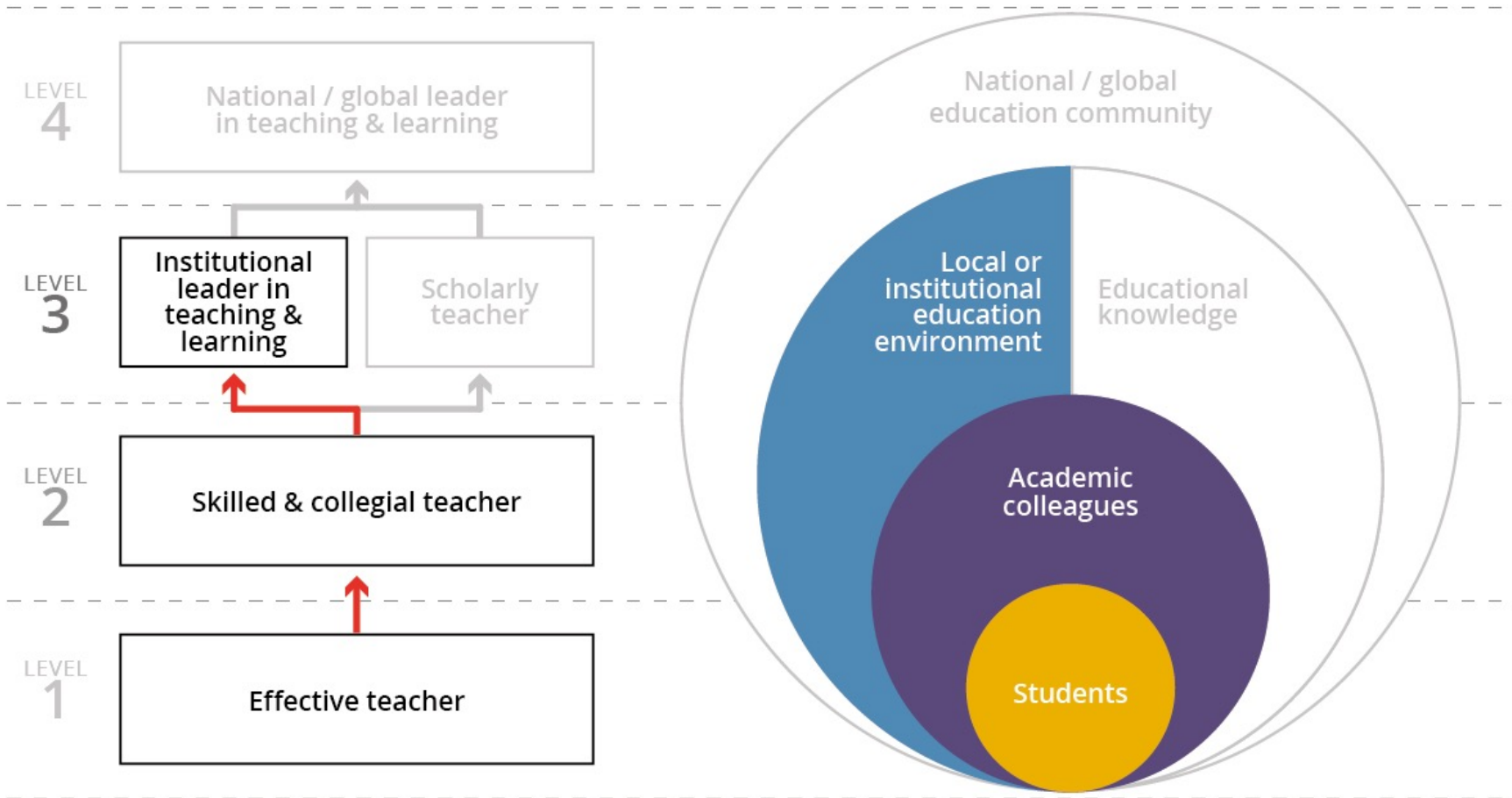
SPHERES OF IMPACT (CUMULATIVE)





ROLES

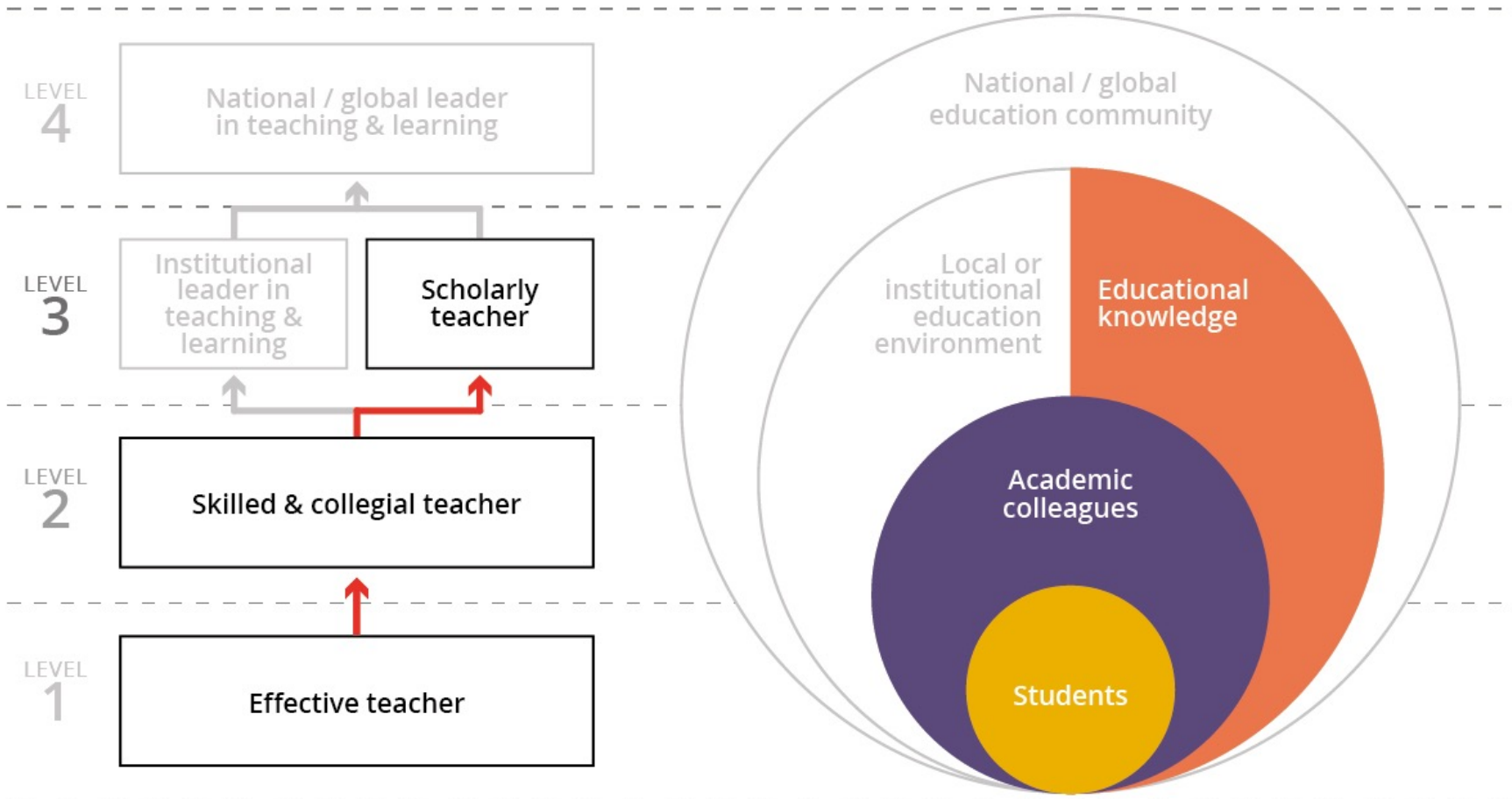
SPHERES OF IMPACT (CUMULATIVE)





ROLES

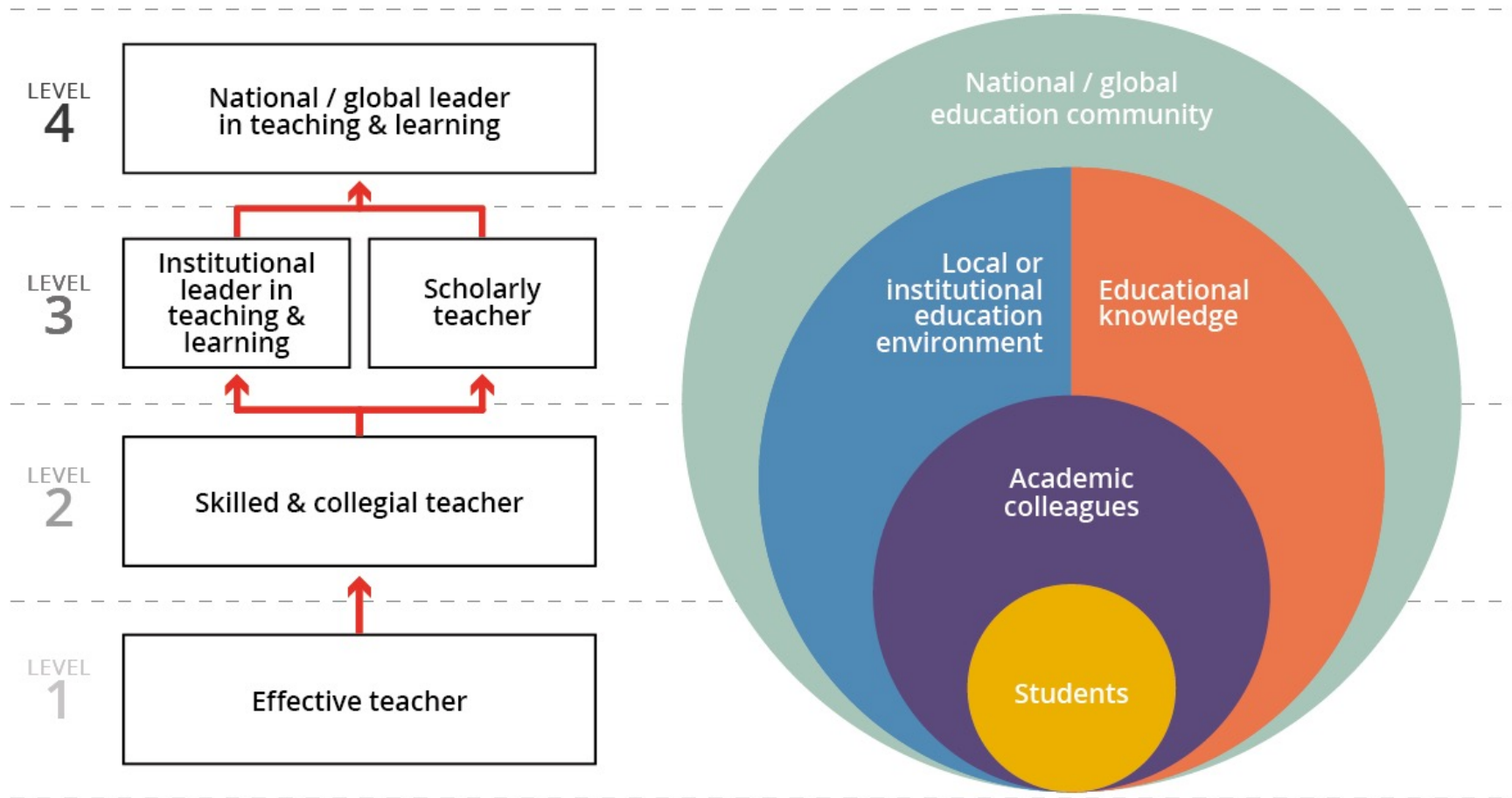
SPHERES OF IMPACT (CUMULATIVE)





ROLES

SPHERES OF IMPACT (CUMULATIVE)



Institutional reform: UCL (UK)



Institutional reform: UCL (UK)

UCL Academic Careers Framework

In 2017, UCL launched its Academic Careers Framework for 2017/18 promotion round.

The Framework focuses on the candidate's impact across four domains: teaching, research, institutional citizenship and enterprise/external engagement. Candidates must identify which of these four domains is: a threshold ability, a core ability and an extended/specialist ability.



National collaborations for change:

- **Netherlands:** 'bottom up' collaboration, building on agreement of Rectors of Dutch research universities
- **Denmark:** following a bottom-up model for change to career pathways, led by Danish university leaders
- **Malaysia:** government-led initiative, asking all Malaysian universities to implement new academic career pathways
- **Norway:** development of 'pedagogical merit' system to support the reward of teaching

2 Sweeping reforms to academic promotion systems

Looking forward: what is the impact of COVID?

Impact of COVID-19:

- Anecdotal feedback that COVID-19 is exacerbating existing inequalities in academic community
- Amongst universities not already engaged in this space, COVID-19 does not appear to have had an impact on desire for change
- Amongst universities already making change (or planning change), it appears to have accelerated and/or reinforced the need for reform
- **Teaching Cultures Survey will capture impact in 2022**

15,659
participants

10
countries

21
universities



**Average
institutional
response rate**

32%



Survey focus

- 1. Trust in the system:** perceived institutional commitment to rewarding university teaching
- 2. The levers for change:** the role of university teaching in key institutional processes
- 3. Promotion priorities:** the role of university teaching in promotion to full professorship
- 4. Aspirations:** expectations and desires for change to how university teaching is rewarded

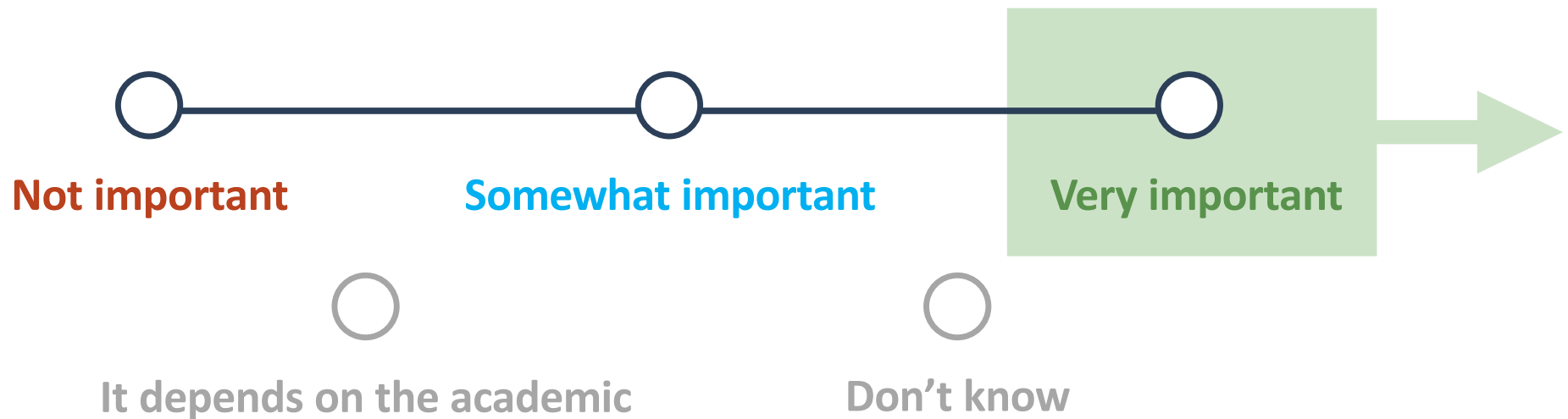
Promotion criteria to full professorship

“How important **would you like** each of the following activities to be for promotion to full professor at your university (for a typical academic on a research/teaching contract)?”

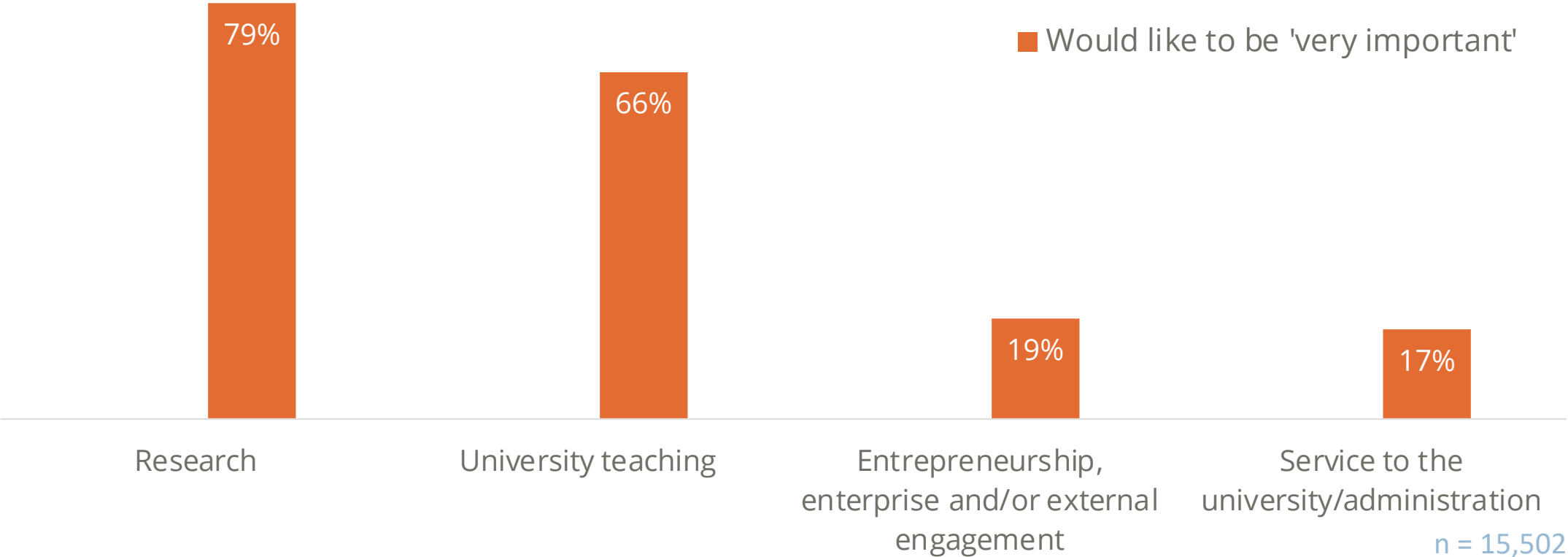
1. **university teaching**
2. **research**
3. **entrepreneurship**, enterprise & external engagement
4. **service** to the university / administration

Promotion criteria to full professorship

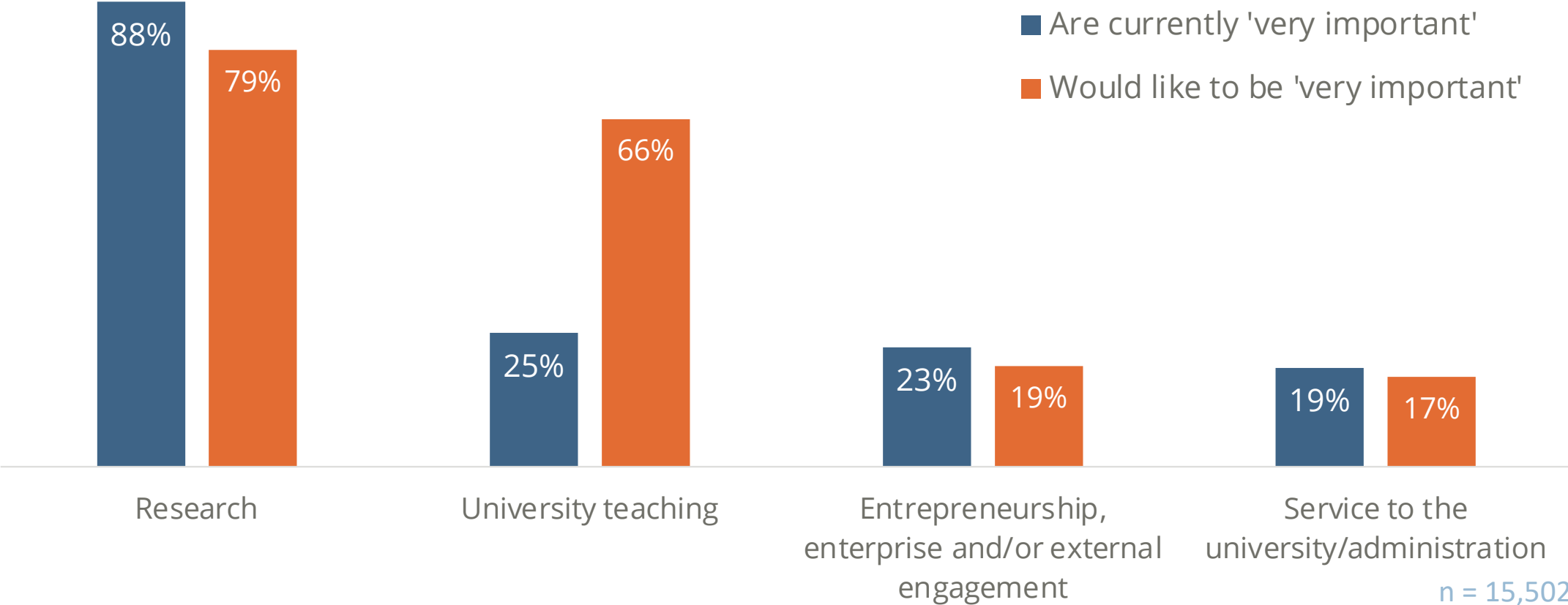
“How important **would you like** each of the following activities to be for promotion to full professor at your university (for a typical academic on a research/teaching contract)?”



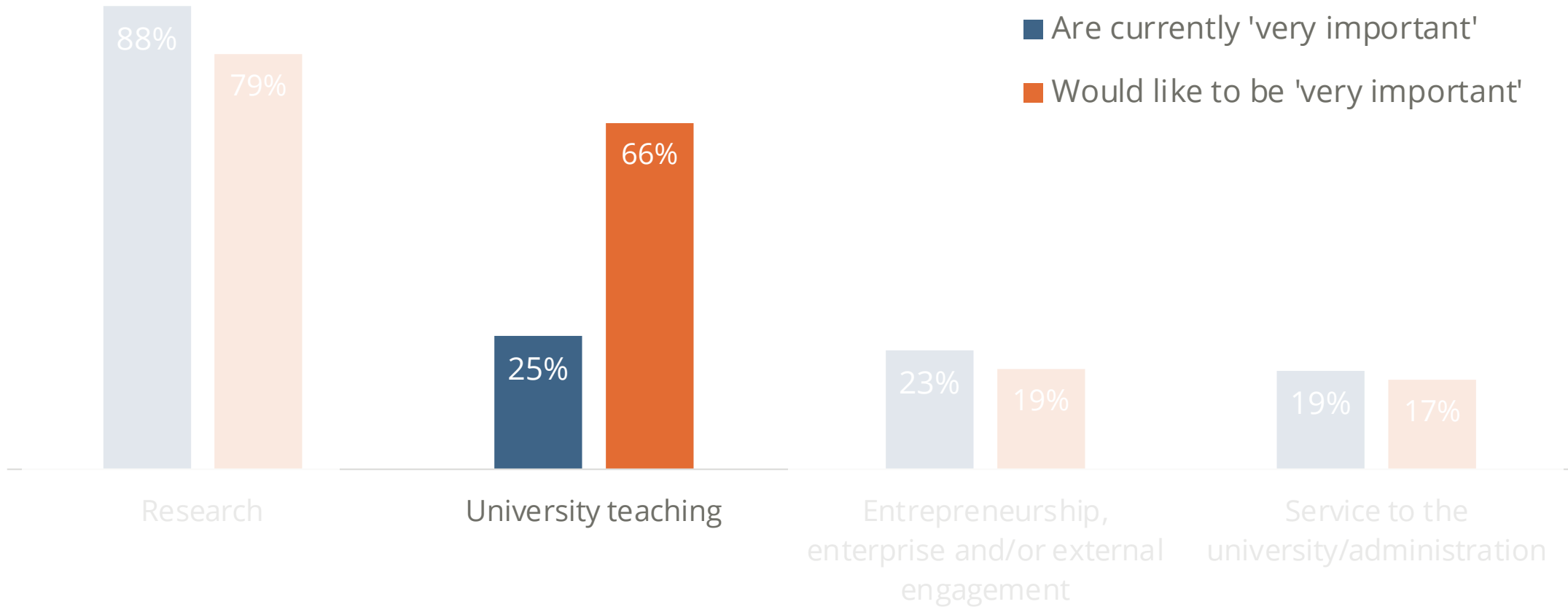
Respondents who would like each activity to be very important



... respondents who report each activity currently is very important



n = 15,502



Teaching Cultures Survey 2022:

- 22-25 universities participating from 11 countries
- New universities include UCL (UK) and University of Wollongong (Australia)
- Surveys run February-May 2022, with findings released in July 2022

Home About Framework Survey Meetings Resources

Advancing teaching

Global Initiative to improve the recognition, reward and evaluation of university teaching

Latest updates

Overview

Universities across the world are striving to enhance the quality of the student experience; central to this mission is the establishment of an academic culture that celebrates, rewards and supports university teaching achievement. Advancing Teaching is a global initiative to improve the reward, recognition and evaluation of university teaching. It is working with universities across the world to support and inform change to academic career pathways and institutional recognition systems. All information and resources developed through the Advancing Teaching initiative are open-source and available for use by any institution or individual.

Career Framework

The Career Framework for University Teaching is a resource to inform change to the institutional reward and recognition of university teaching

[Learn More](#)

Global survey

21 universities worldwide are currently participating in the Teaching Cultures Survey, which tracks the academic teaching culture

[Learn More](#)

Annual meetings

Since 2016, leaders and change makers from universities across the world have come together for an annual meeting

[Learn More](#)

www.advancingteaching.com

National collaborations

This set of videos showcases five countries that have established, or are in the process of establishing, national collaborations to reform university reward and recognition systems. Although each takes a different approach, all incorporate a major focus on improving the evaluation and reward of university teaching.



Introduction



Sweden



Malaysia



Denmark



Norway

Coming soon:
Netherlands

Well-regarded university reward systems

A number of universities in the Advancing Teaching network have already implemented systemic reform to their academic reward and recognition systems. The videos below provide an overview of three that have been particularly influential, from: UCL (UK), the University of Wollongong (Australia) and Lund University (Sweden).



UCL (UK)



University of Wollongong
(Australia)



Lund University (Sweden)

Thank you