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:

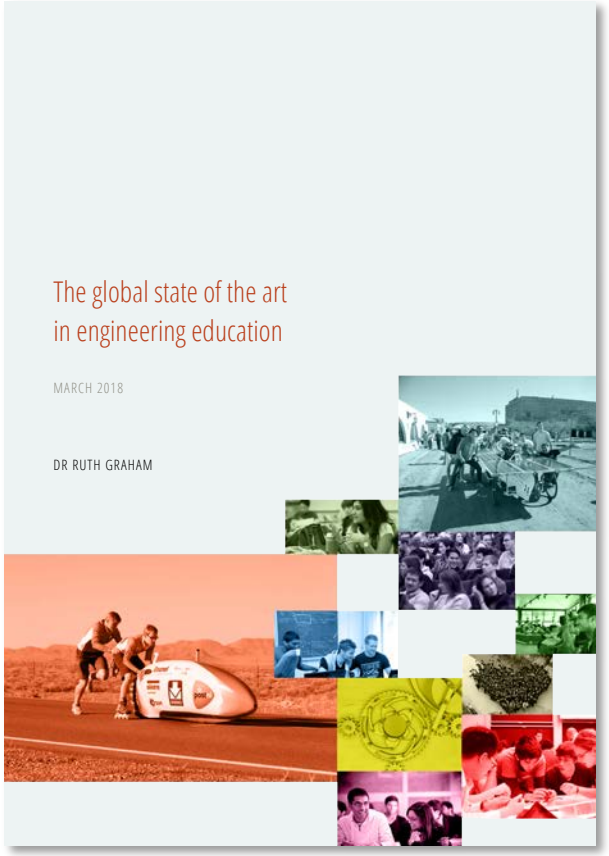
1. New generation of programs in engineering education
2. Sweeping reforms to academic promotion systems

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

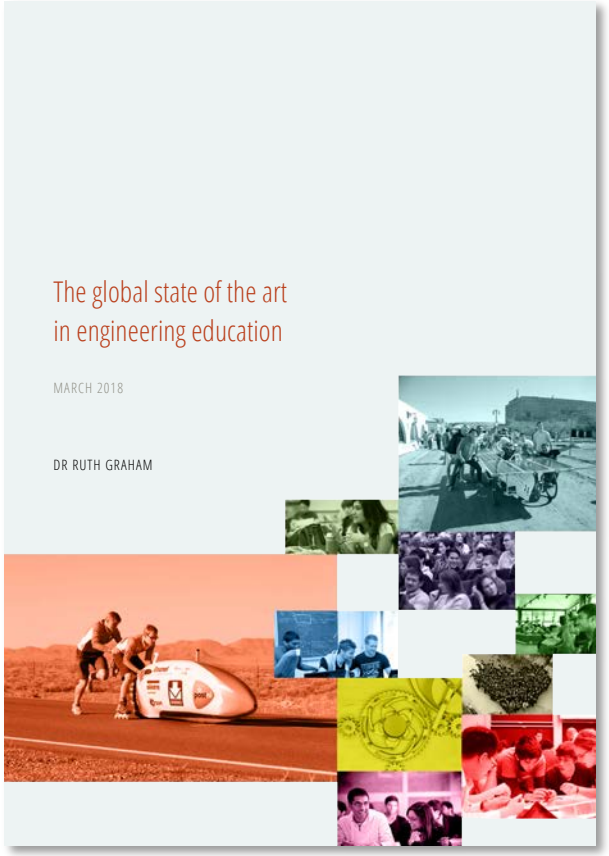
MENS ET MANUS
hand and mind

19th October 2021, SUHF

Dr Ruth Graham

After many decades of discussion within the engineering education community, the report highlighted groundswell for change...

"the study feedback suggested that the engineering education sector is entering a period of rapid and fundamental change"



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

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

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)
6	NUS (Singapore)
7	TU Delft (Netherlands)
8	Charles Sturt (Australia)
9	Tsinghua (China)
10	Arizona State (US)

Distinguishing programmatic features of the emerging leaders

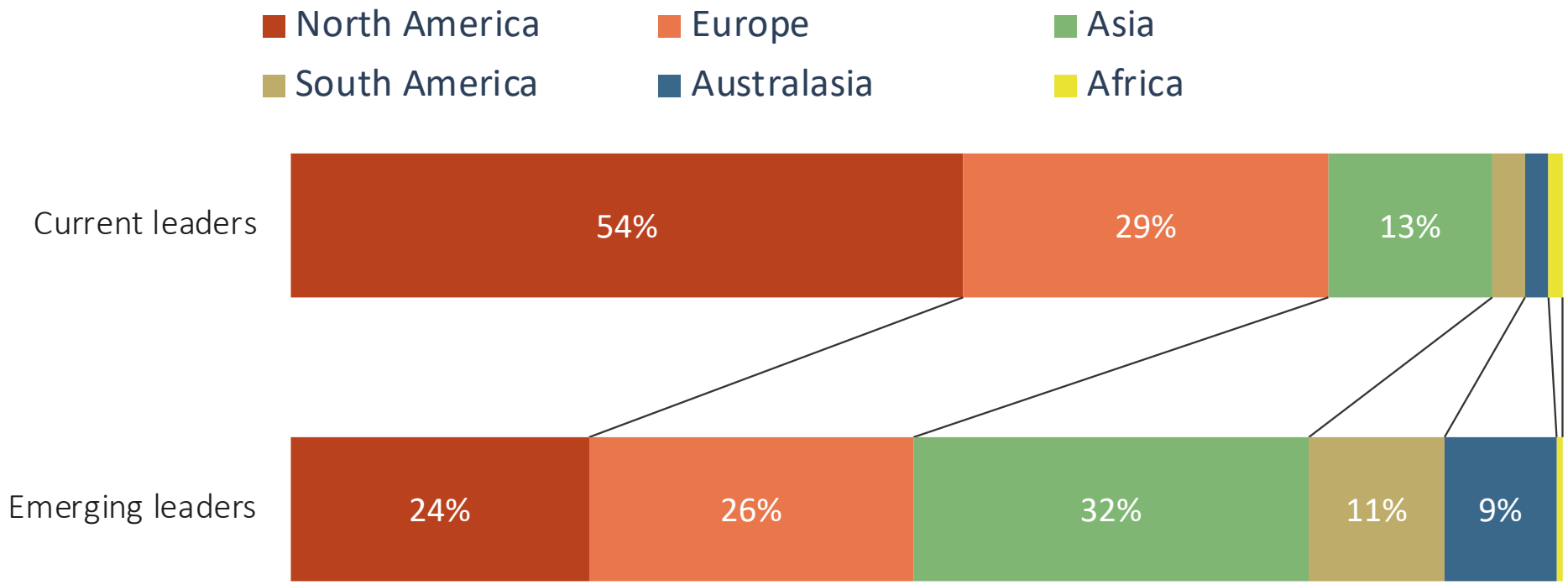
CURRENT LEADERS

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

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

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Global spread of institutions

Systemic/unified approach with connectivity across the curriculum

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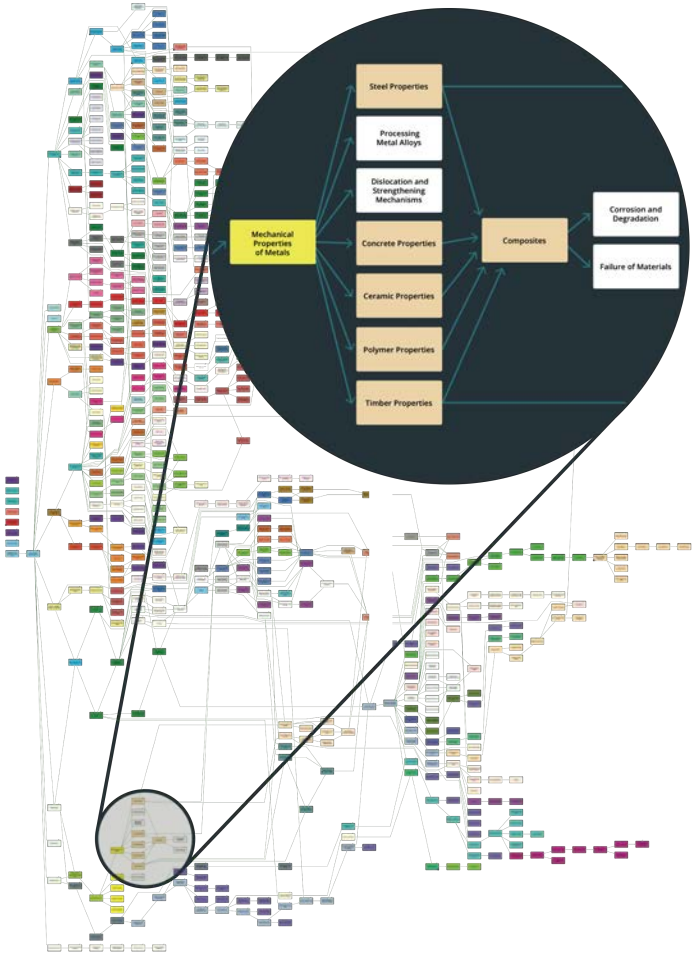
Systemic/unified approach – CSU (Australia)

CSU (AU)

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



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Teacher-centred approach with limited external connectivity

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Culture of student empowerment and cross-community collaboration

Distinguishing programmatic features of the emerging leaders

CURRENT LEADERS

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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

CORFO

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, must 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

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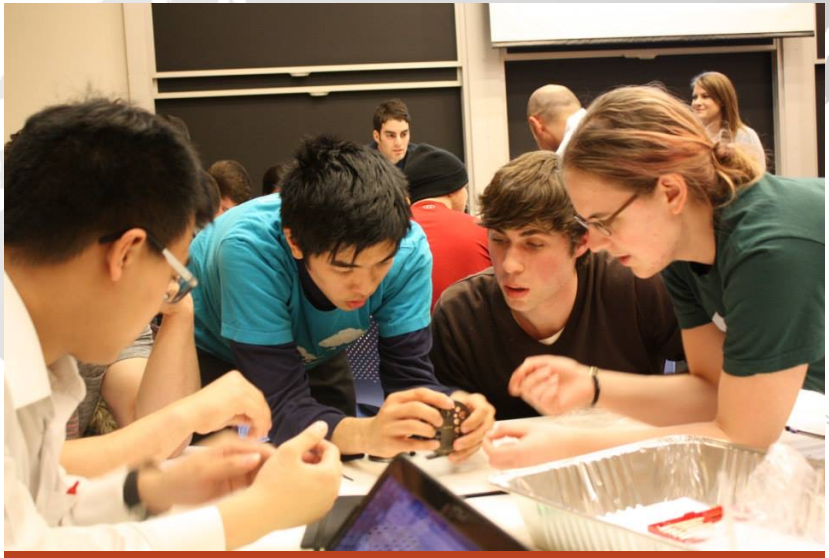

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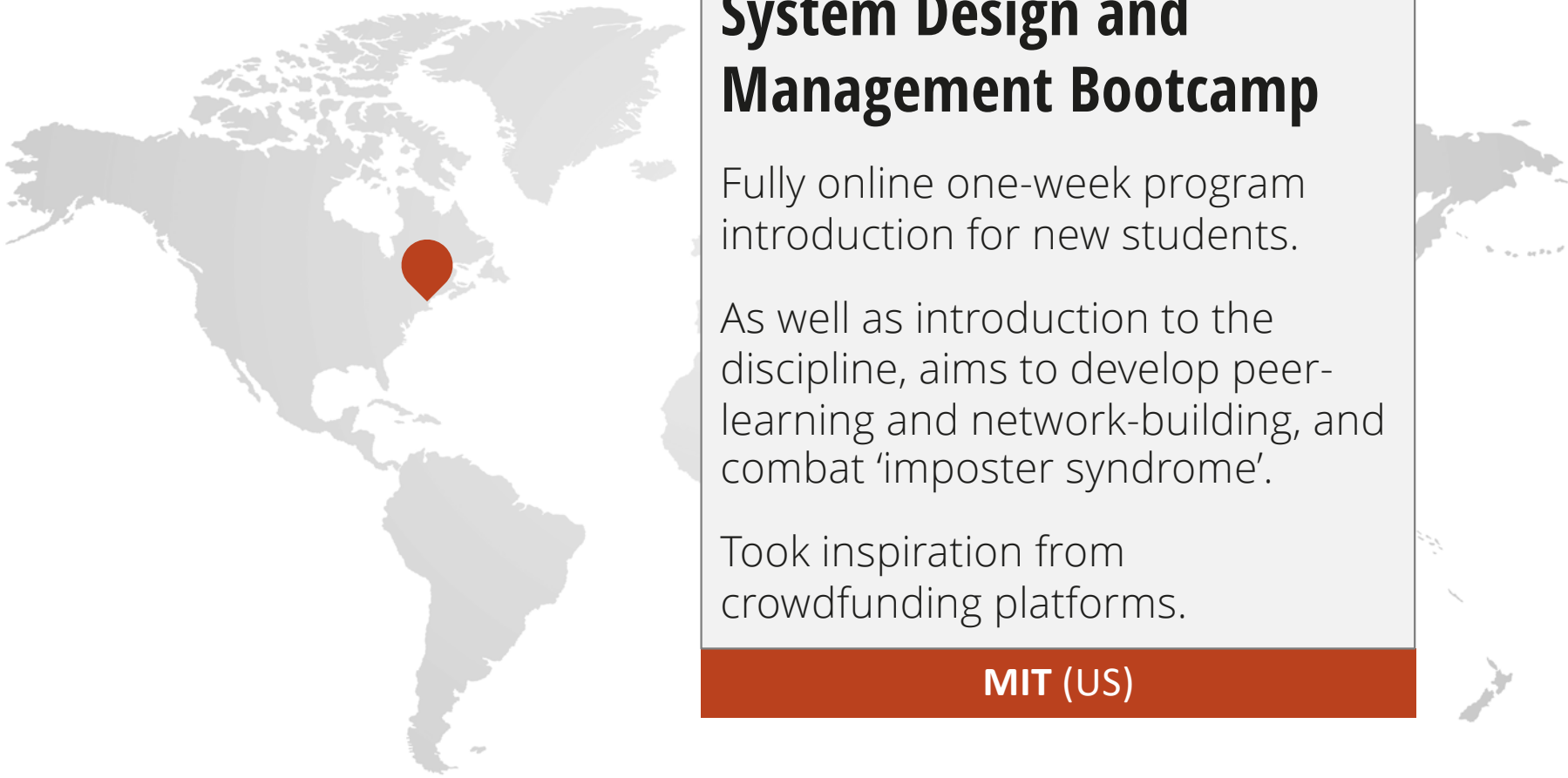

System Design and Management Bootcamp

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

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Example 2 – University Teknologi Malaysia (Malaysia)

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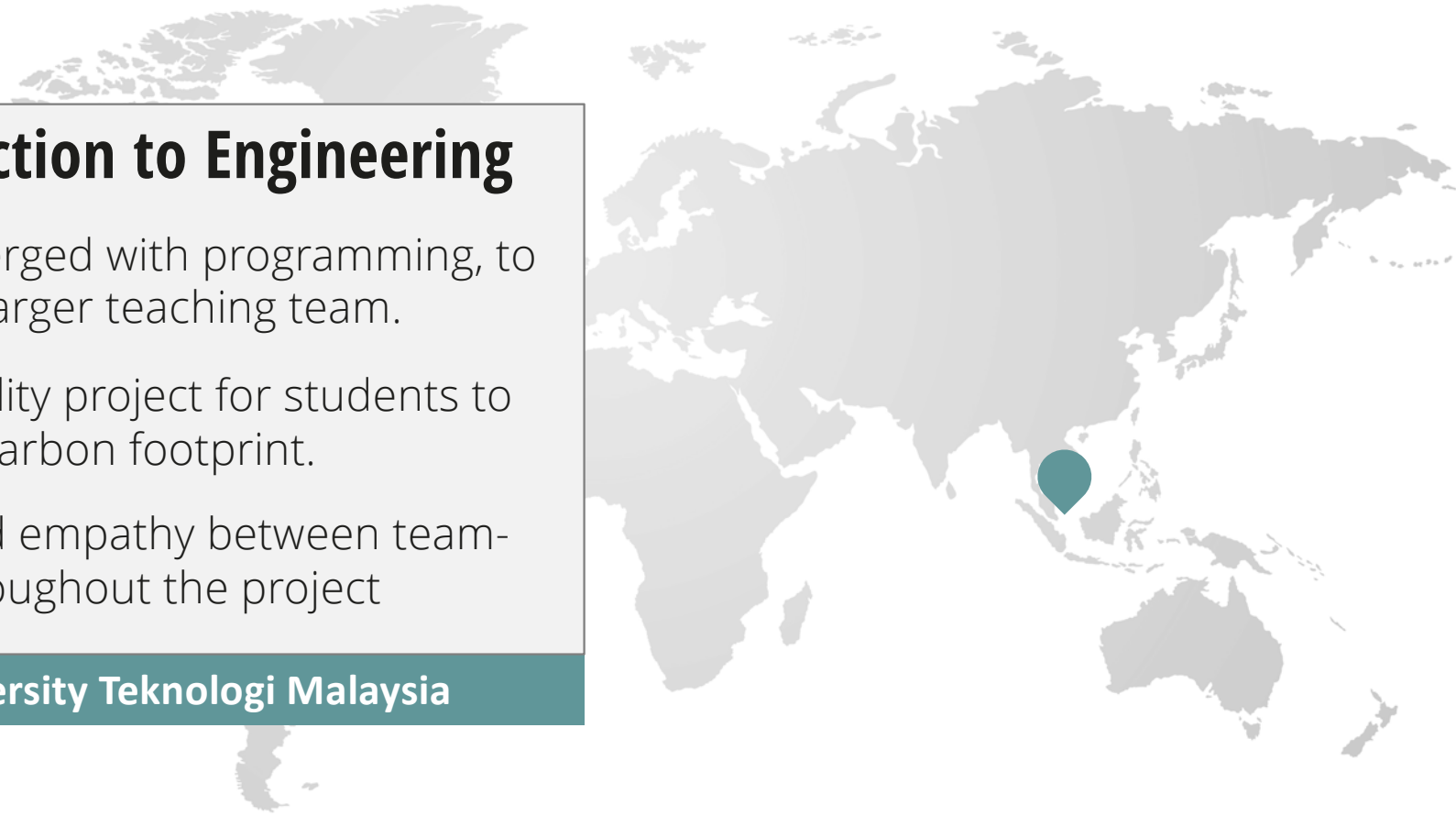

Introduction to Engineering

Project merged with programming, to establish larger teaching team.

Sustainability project for students to calculate carbon footprint.

Embedded empathy between team-mates throughout the project

University Teknologi Malaysia

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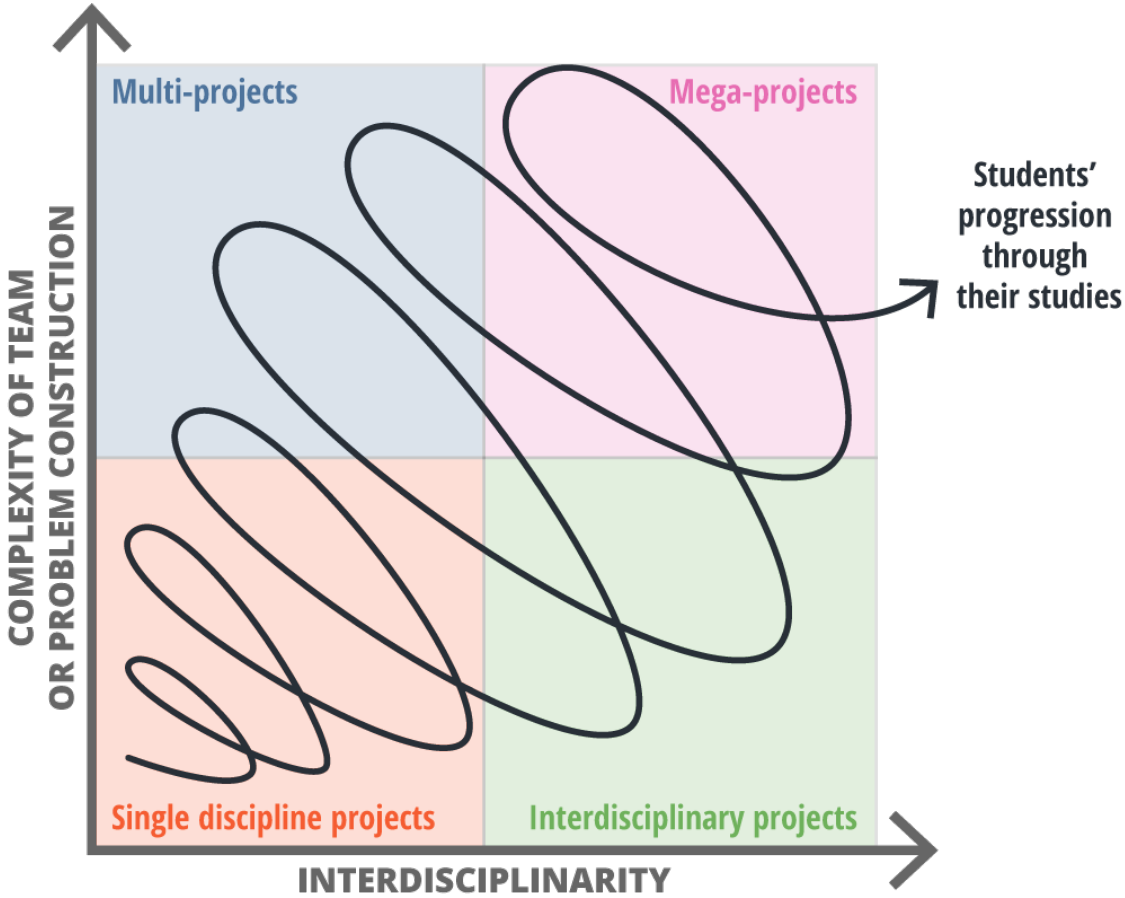


Mega-projects

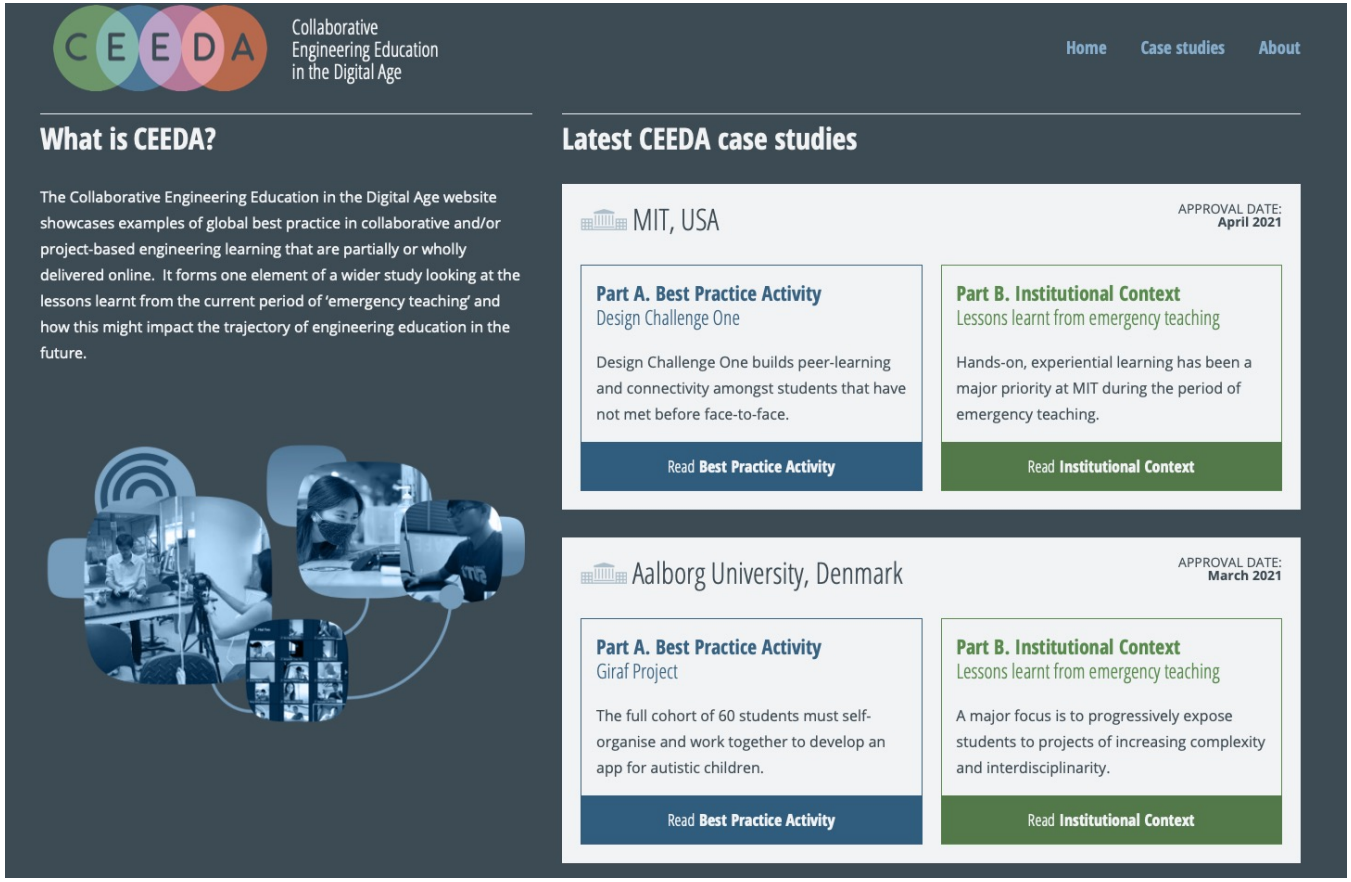
Building in complexity – technical, societal and inter-disciplinary – as students progress.

Nurturing flexibility, problem-solving and collaborative thinking.

PBL competencies

Nurturing and tracking progressive learning outcomes.

CEEDA: Collaborative engineering learning in the digital age

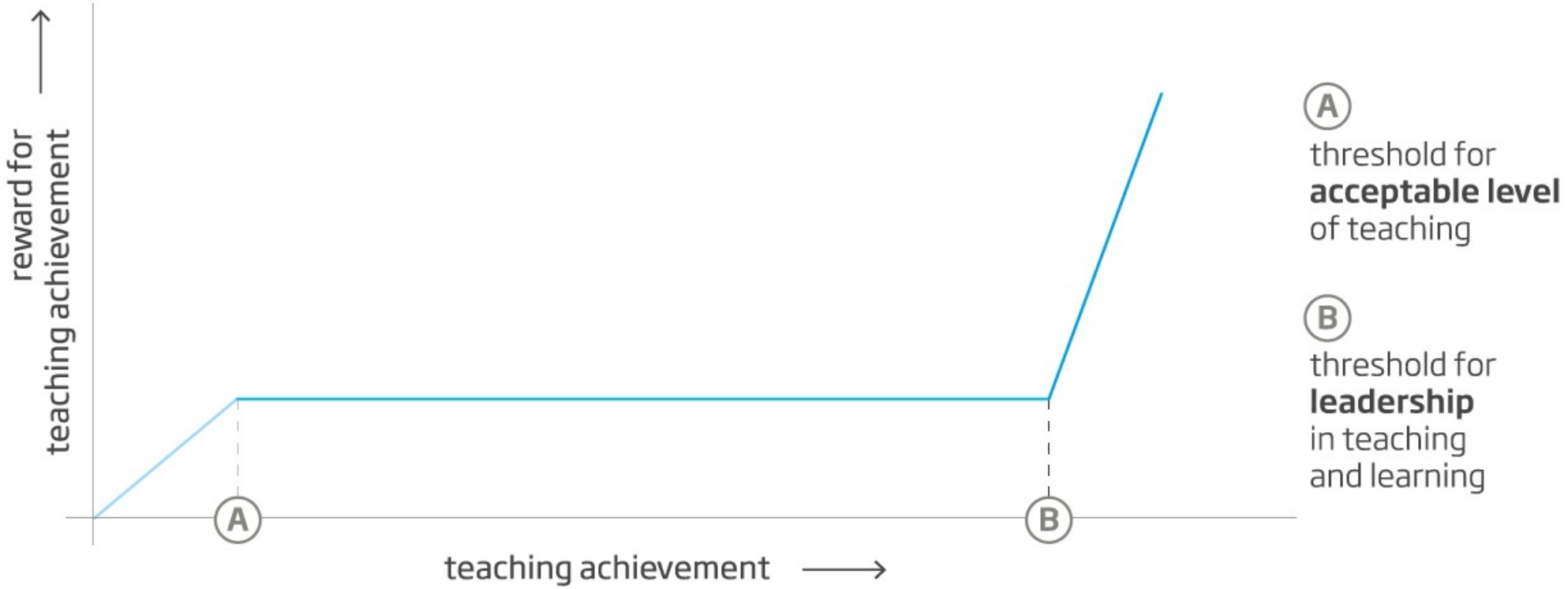


www.ceeda.org

2 Sweeping reforms to academic promotion systems

Context: what was happening before March 2020?

reward for
teaching achievement
teaching achievement


reward for
teaching achievement
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B
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threshold for
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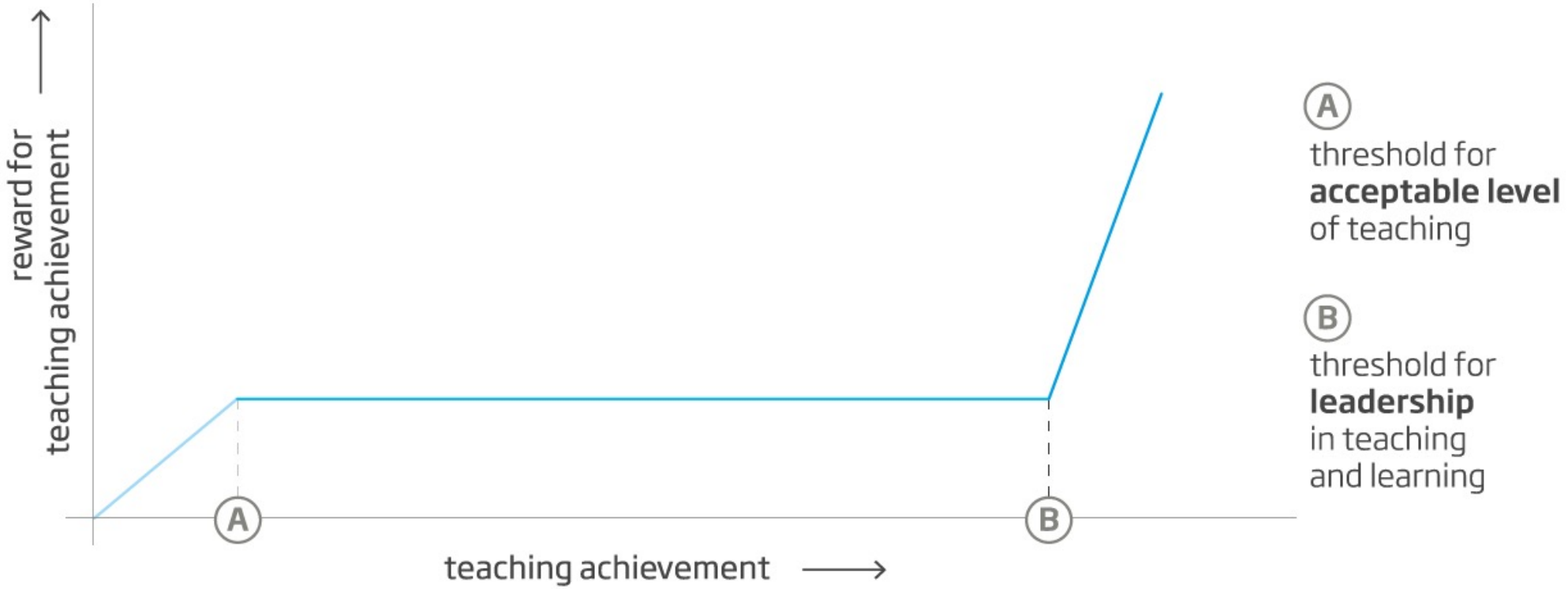
Challenges:

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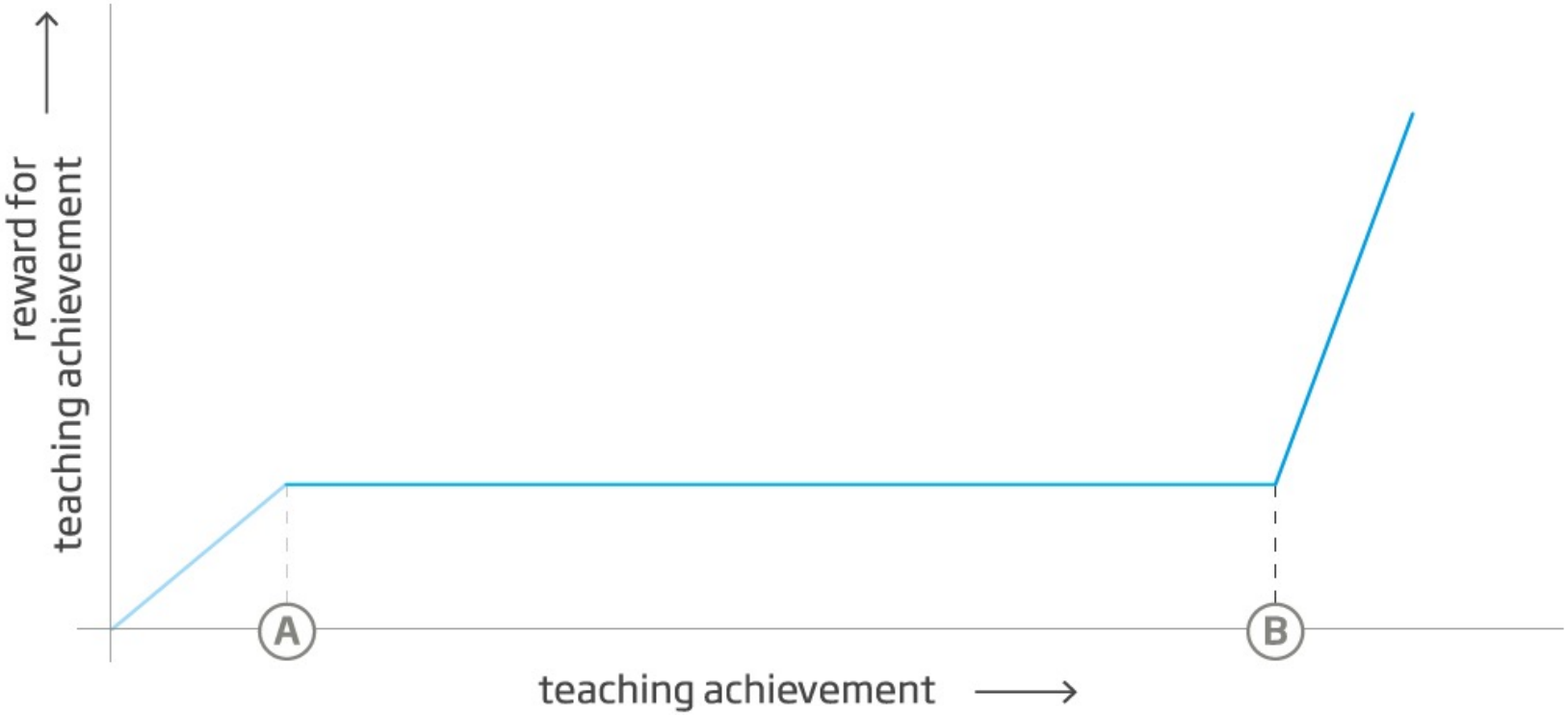
Challenges:

- 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



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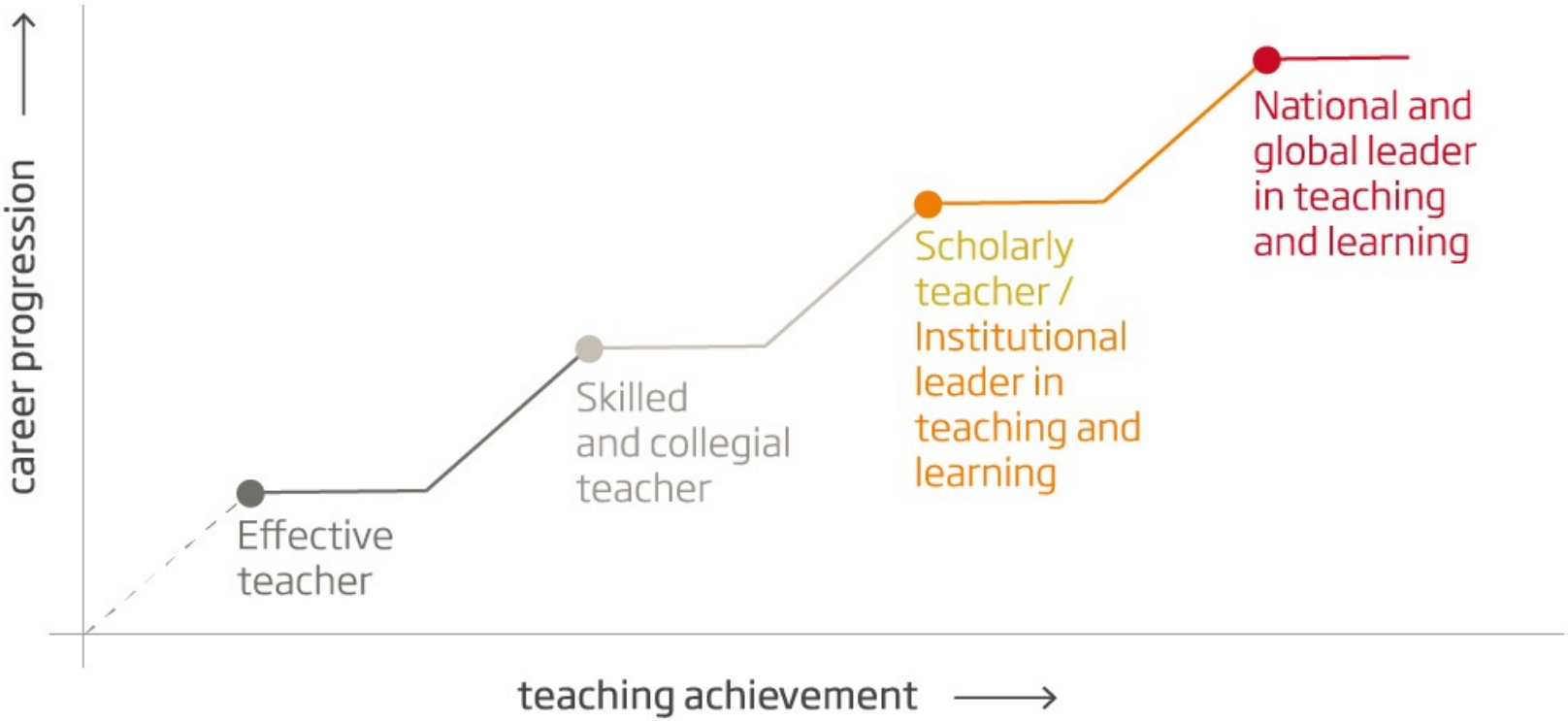

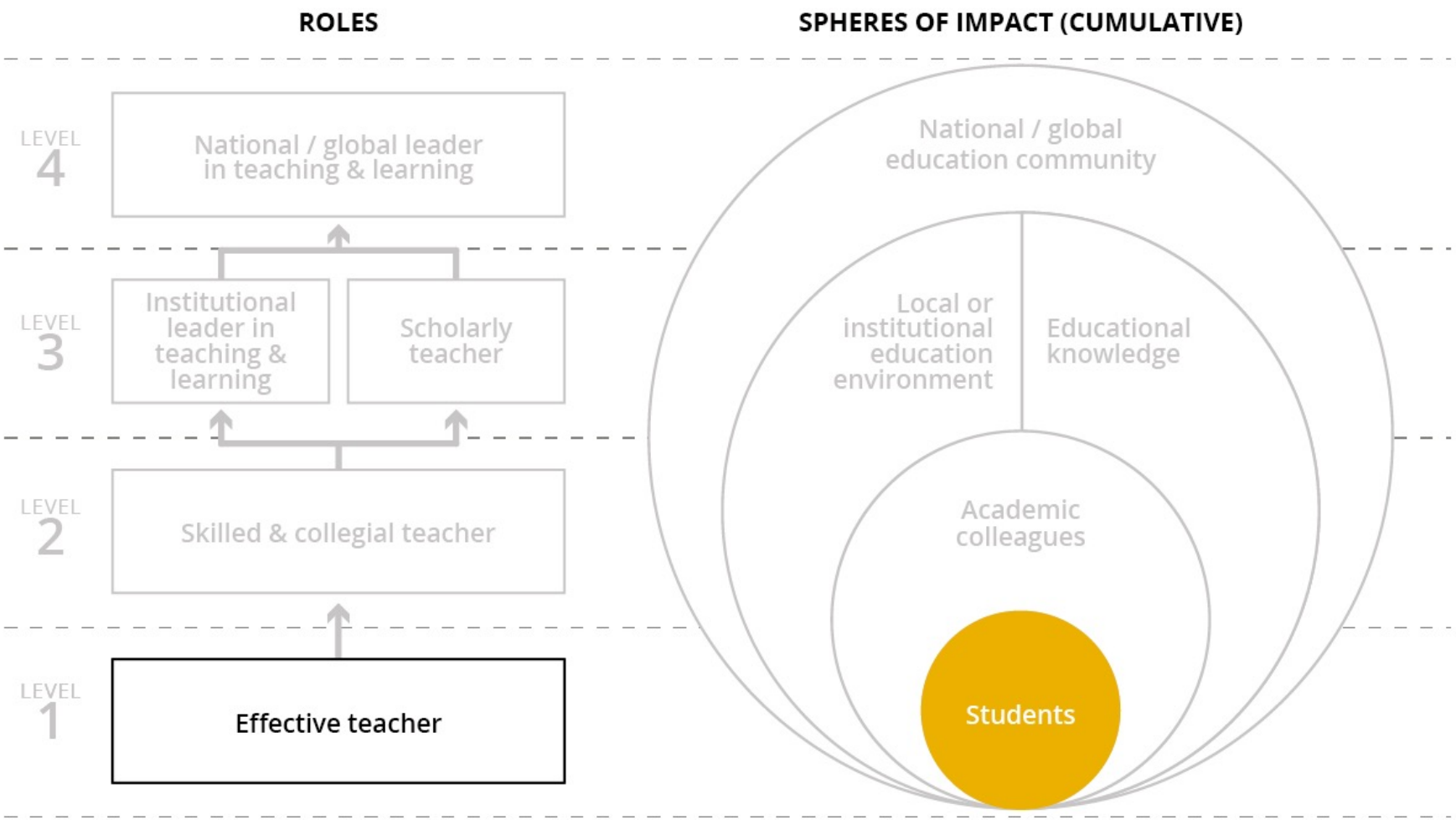
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Effective teacher
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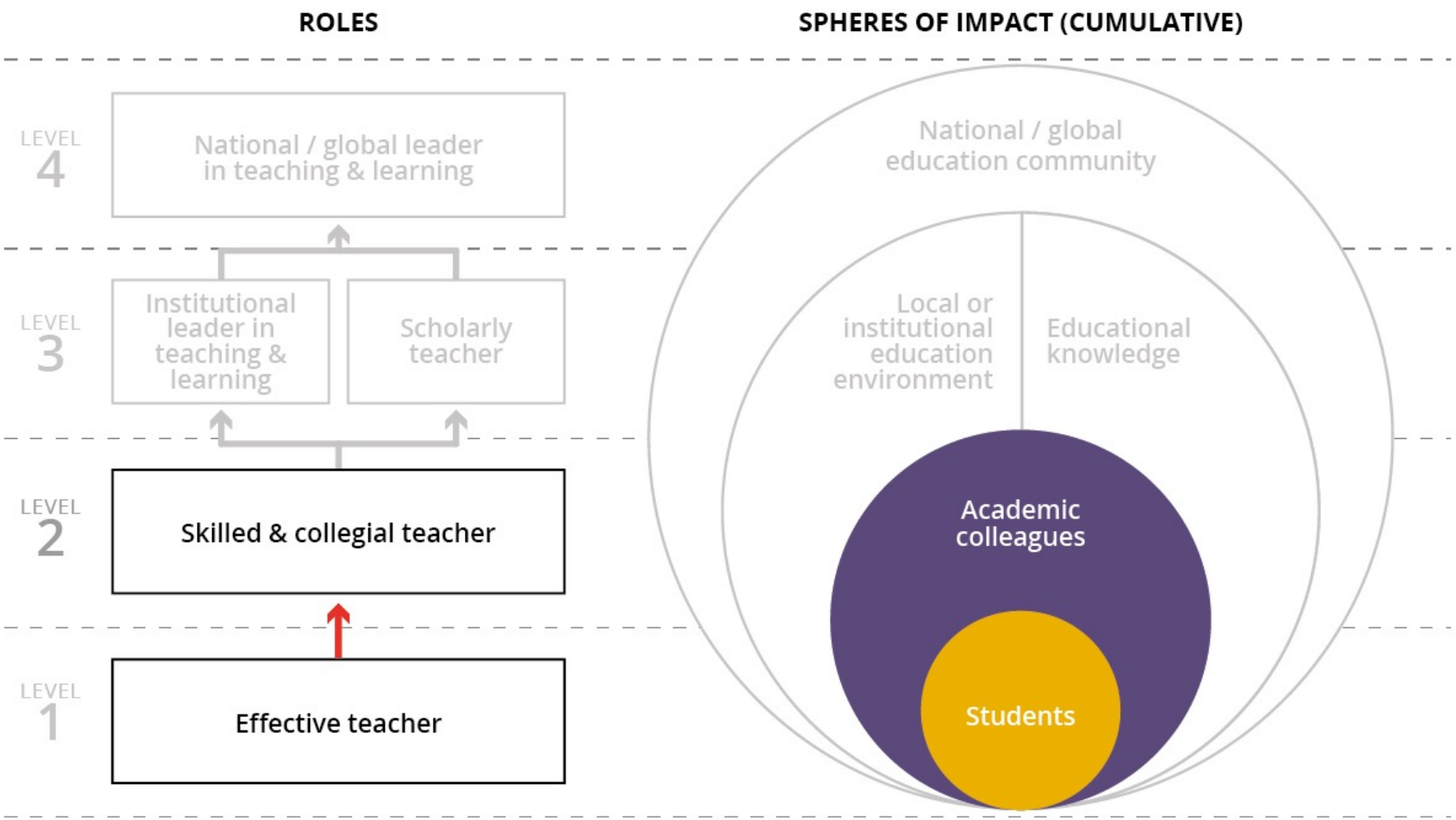
Local or institutional education environment
Educational knowledge
Academic colleagues
Students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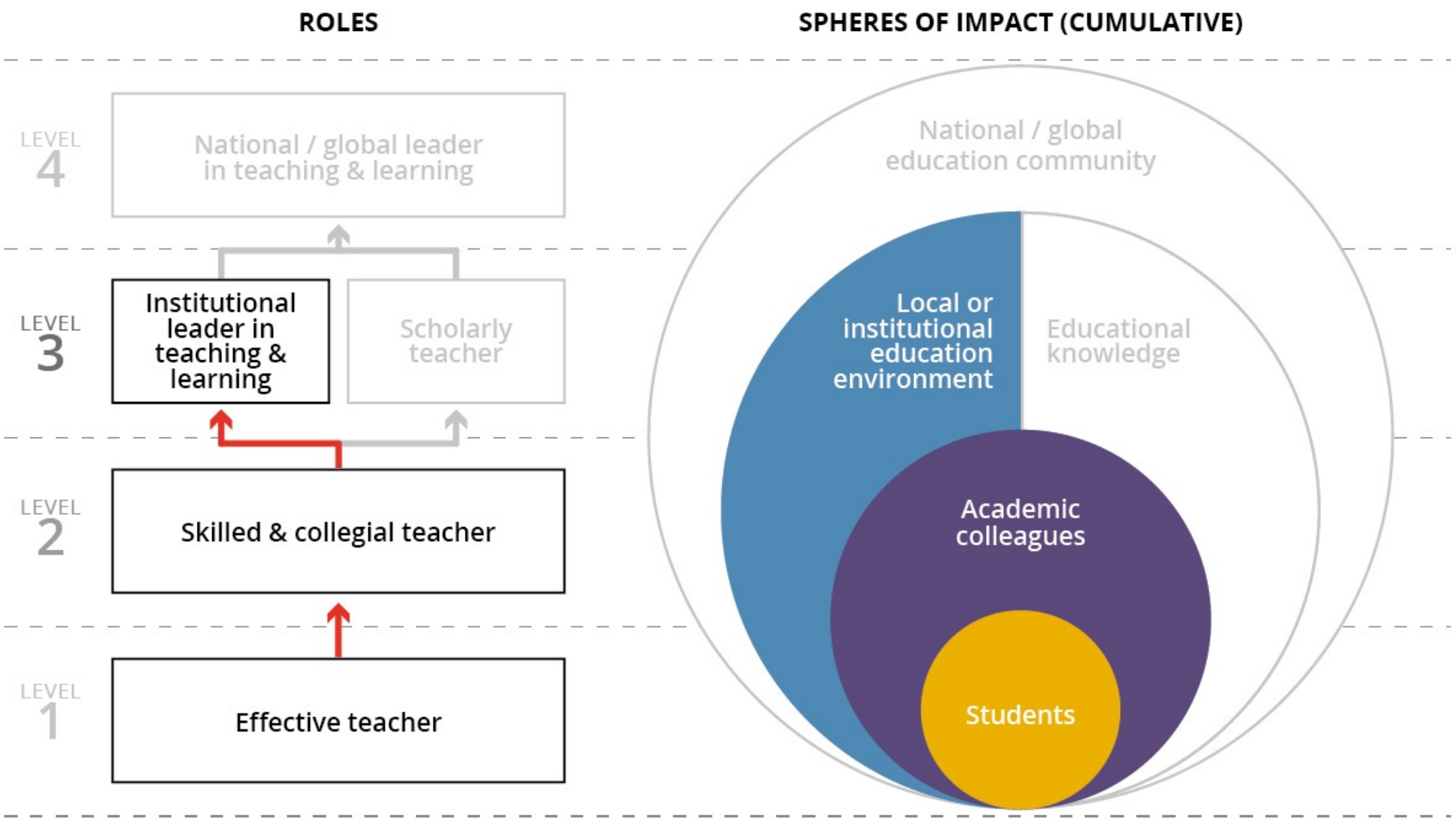
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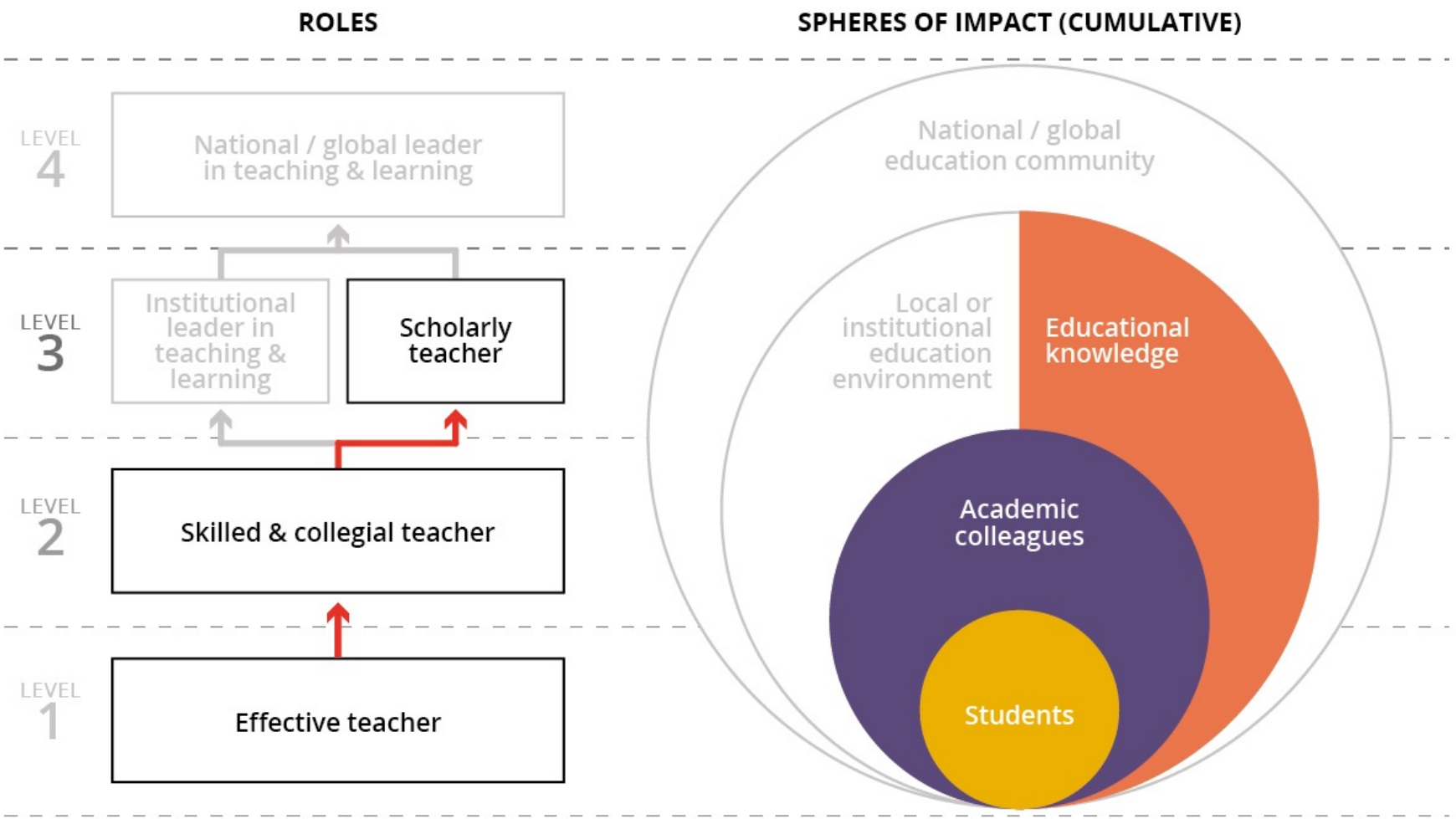
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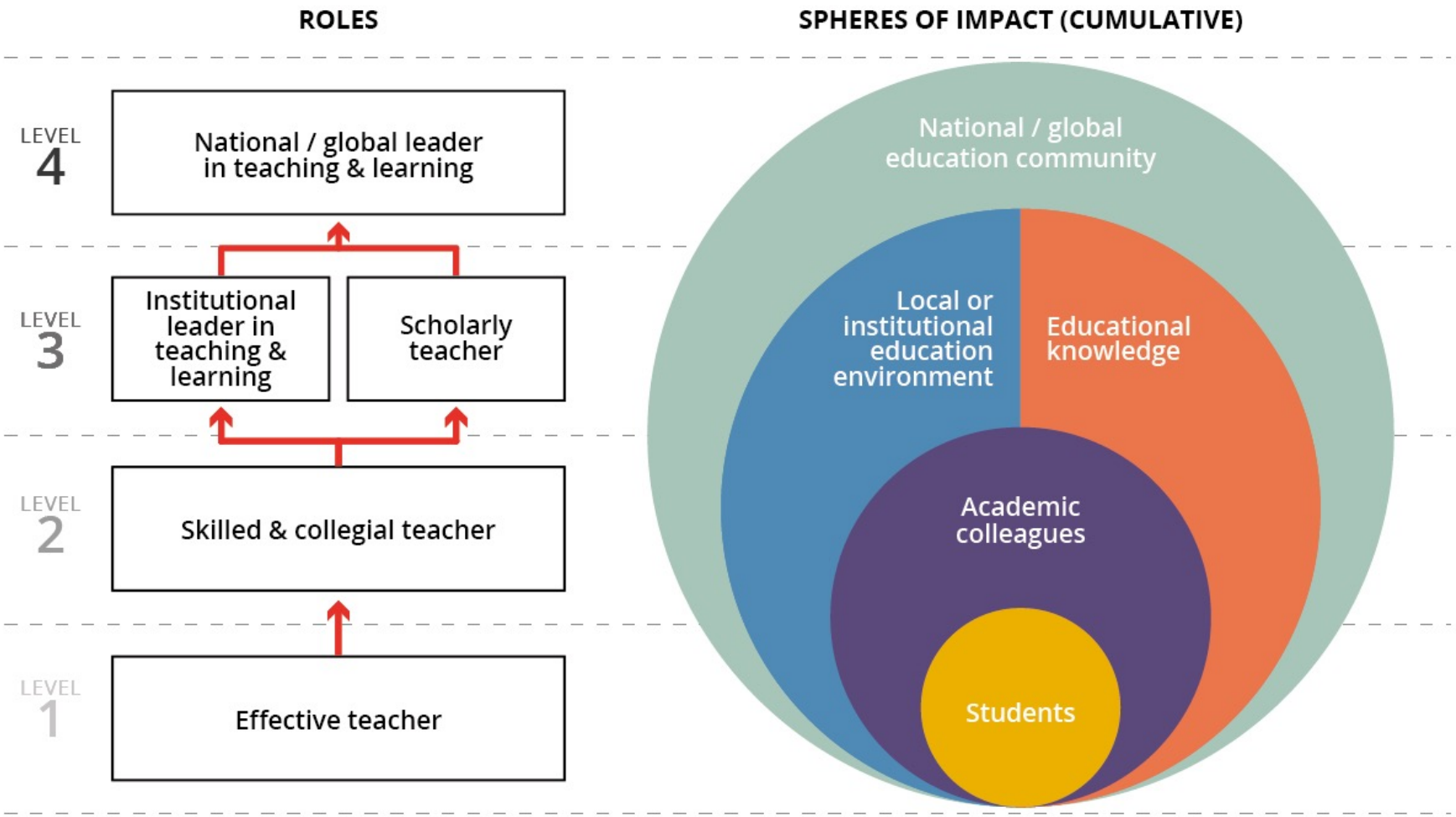
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Institutional reform: UCL (UK)

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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**

Teaching Cultures Survey

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

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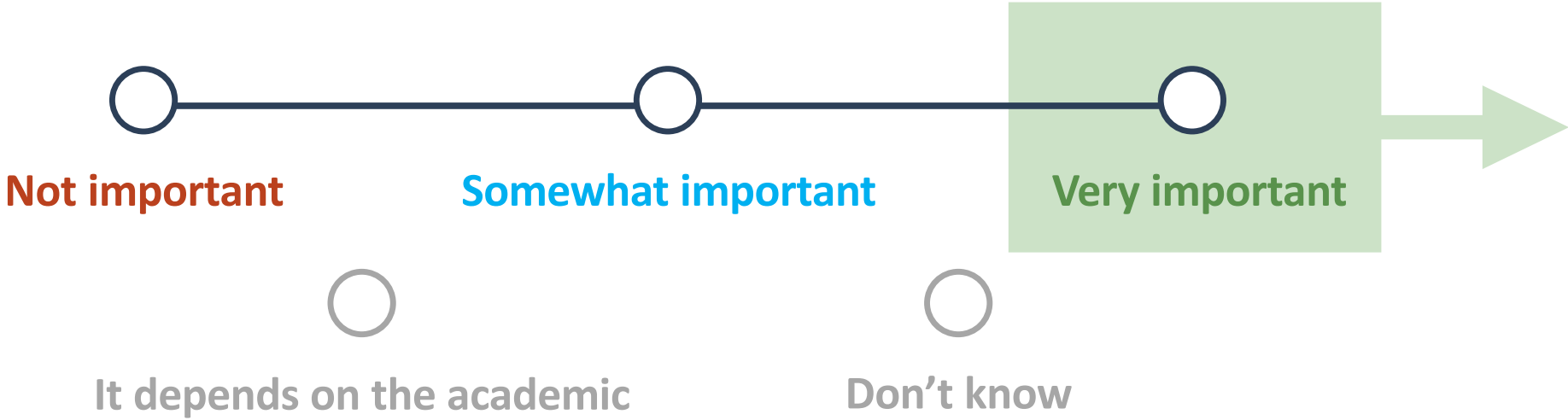
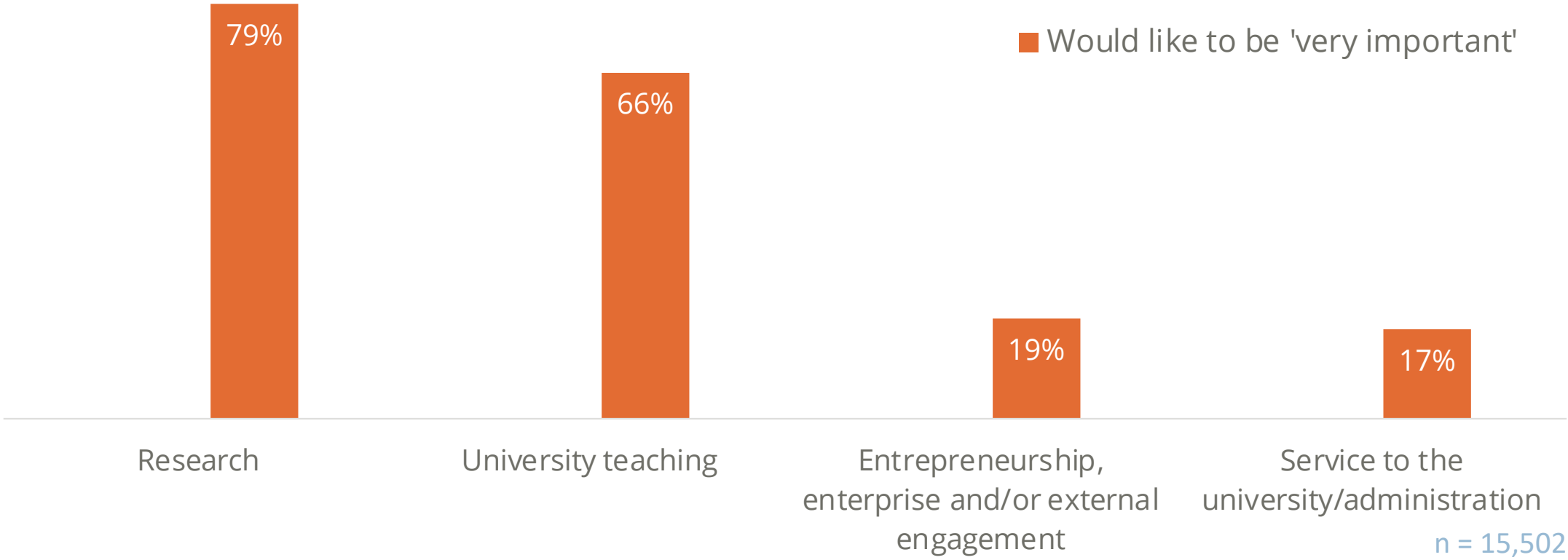
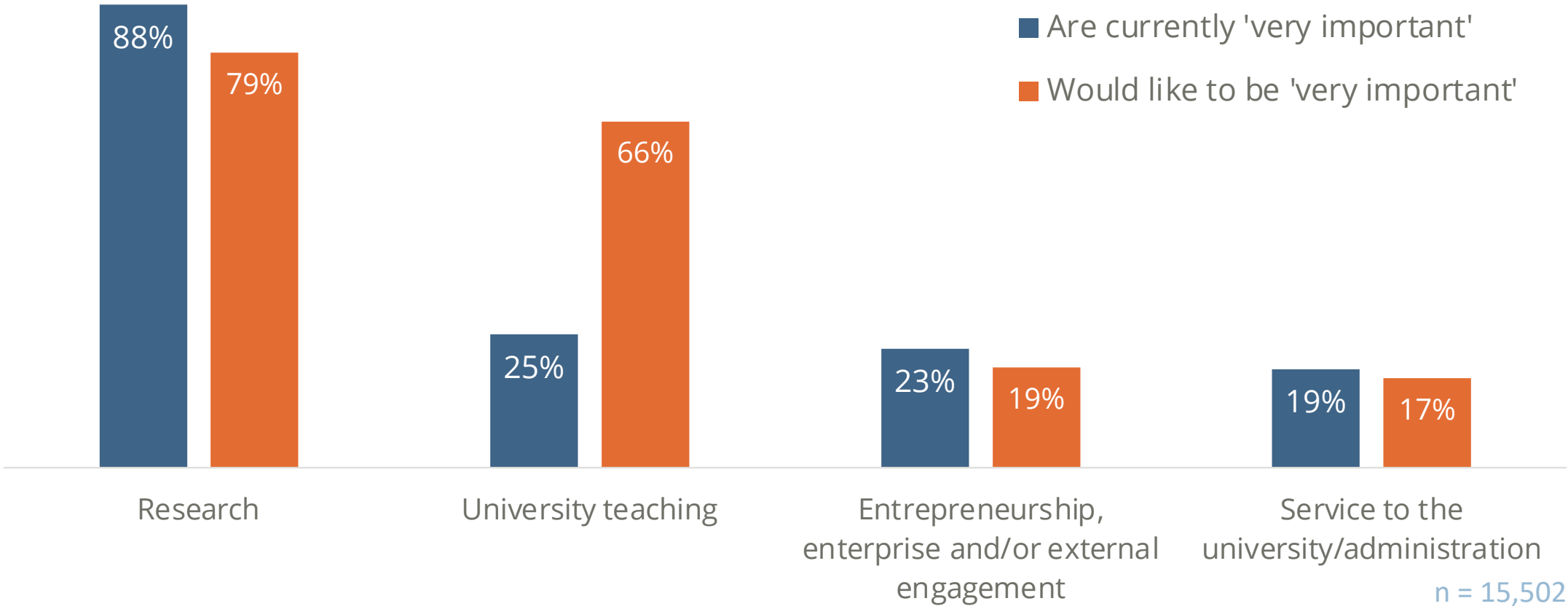


Respondents who would like each activity to be very important ....



n = 15,502

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



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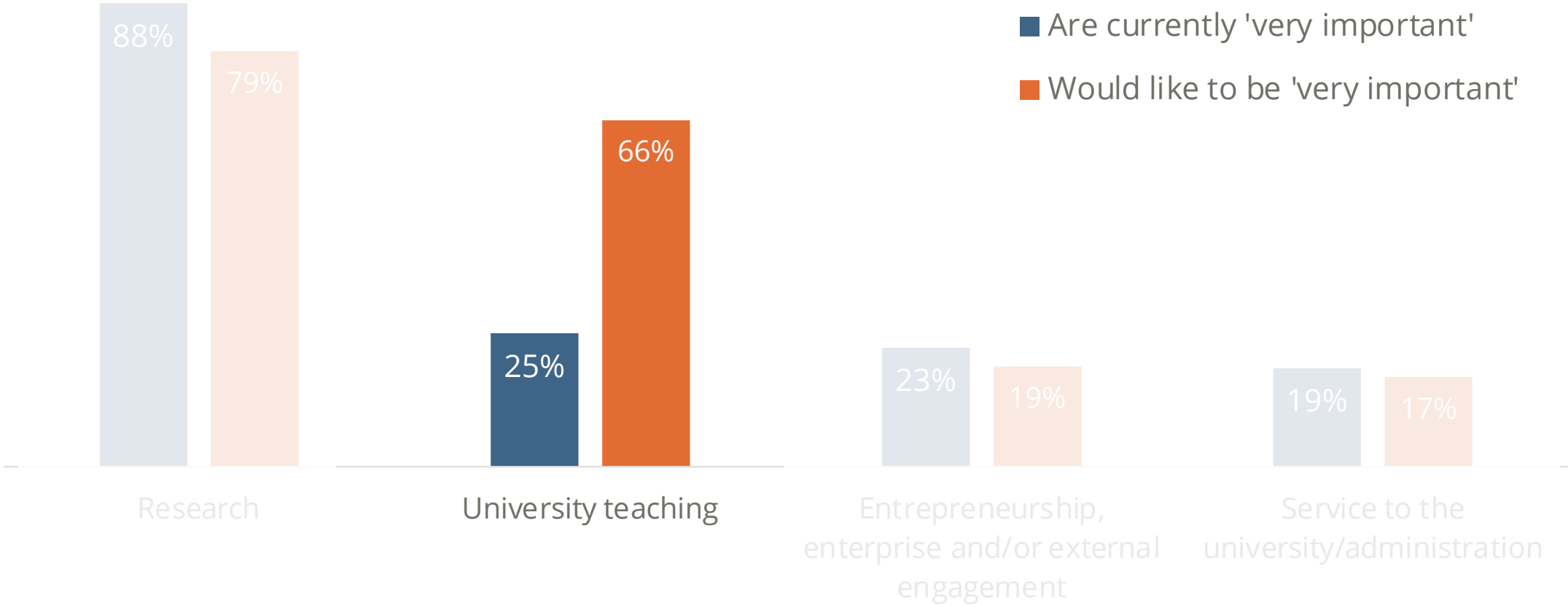
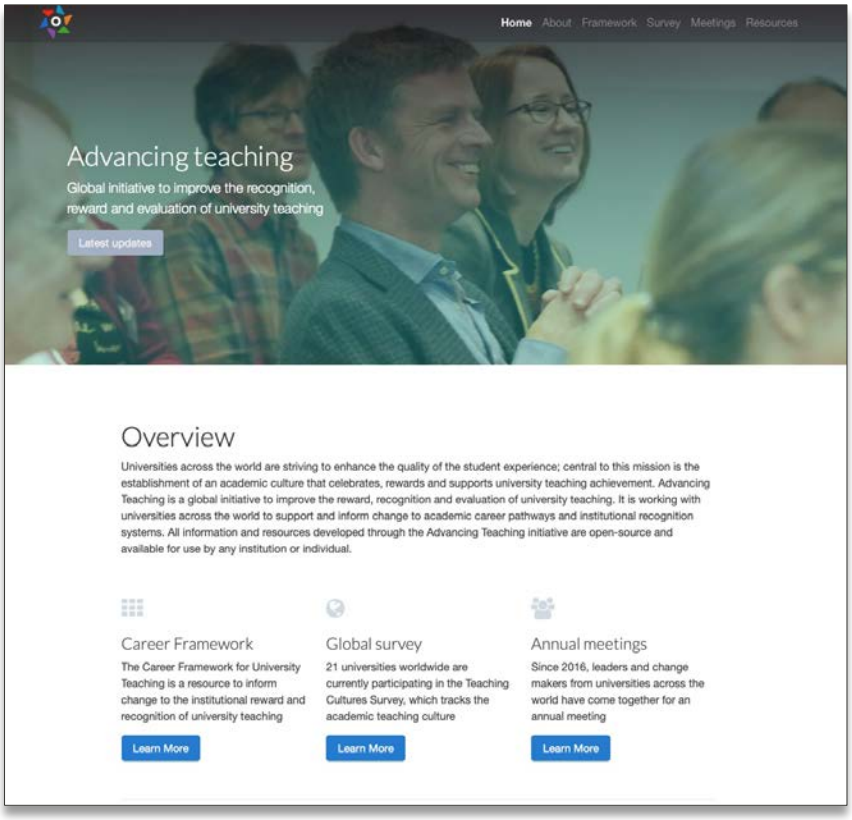
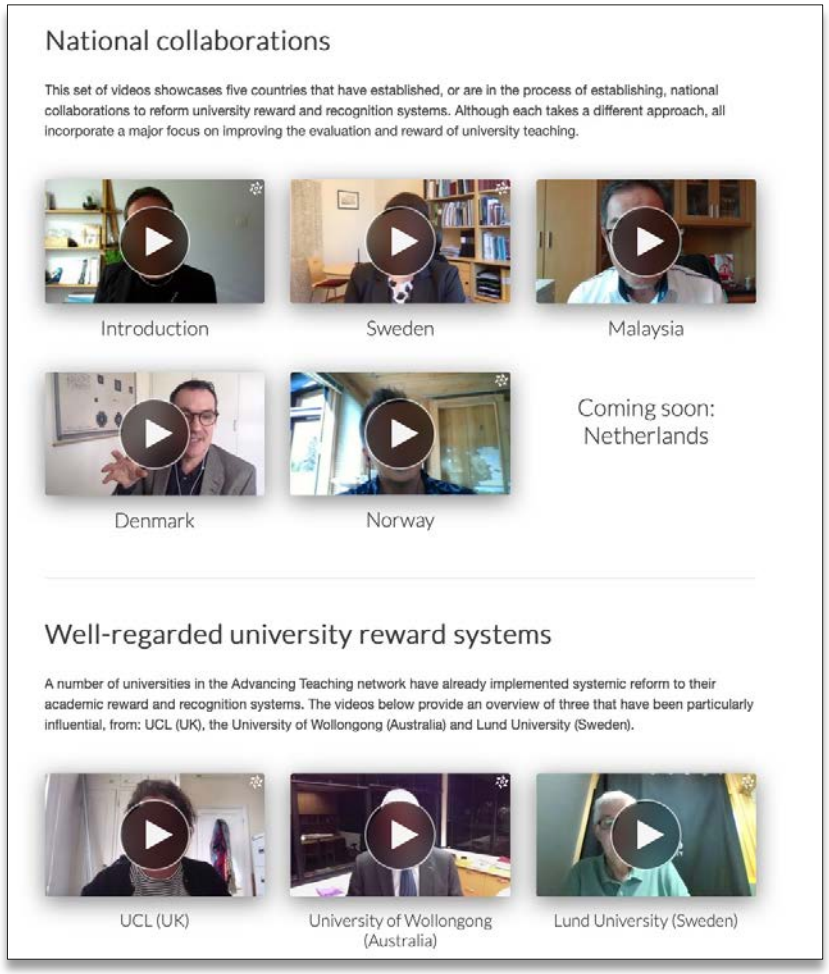

Are currently 'very important'
Would like to be 'very important'
88%
79%
25%
66%
23%
19%
19%
17%
Research
University teaching
Entrepreneurship, enterprise and/or external engagement
Service to the university/administration

Teaching Cultures Survey 2022:

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



www.advancingteaching.com



Thank you