School of Civil Engineering
FACULTY OF ENGINEERING AND PHYSICAL SCIENCES

UNIVERSITY OF LEEDS

1st Workshop on Higher Education Partnerships for Sub Saharan Africa, 19 - 20 August 2020

Engineering Education and COVID-19: Reflections and Suggestions

Apollo Tutesigensi
a.tutesigensi@leeds.ac.uk

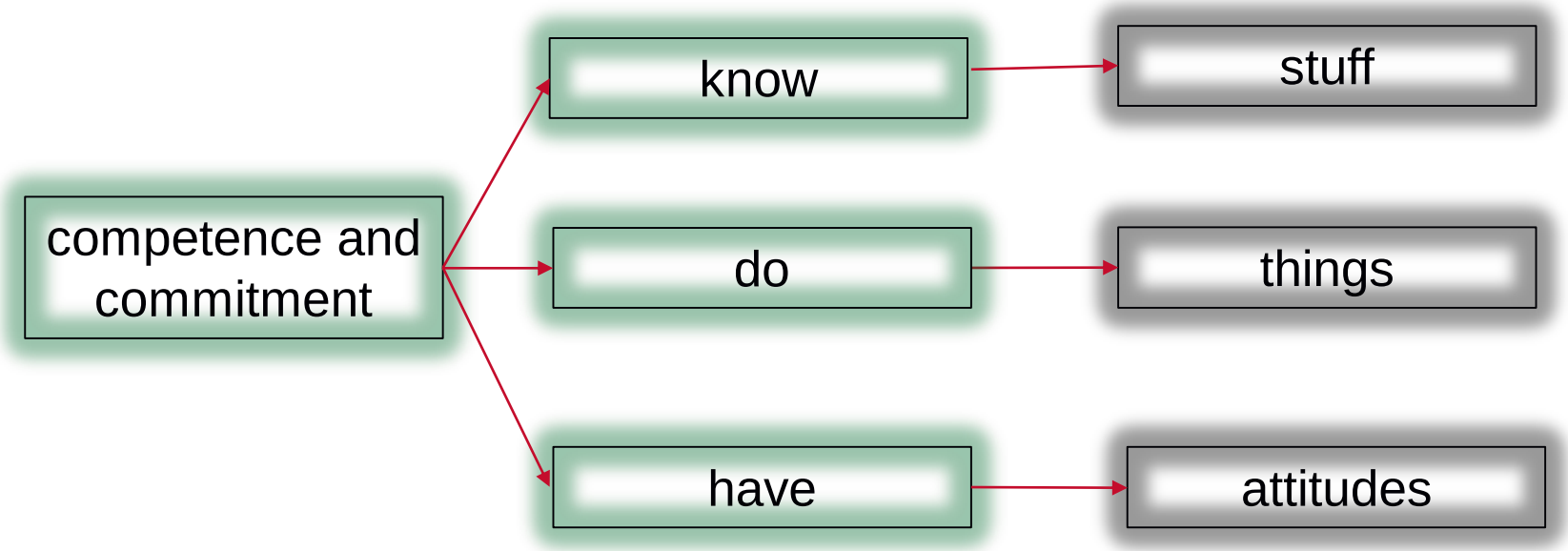
ROYAL ACADEMY OF ENGINEERING

WE BUILD FOR THE FUTURE

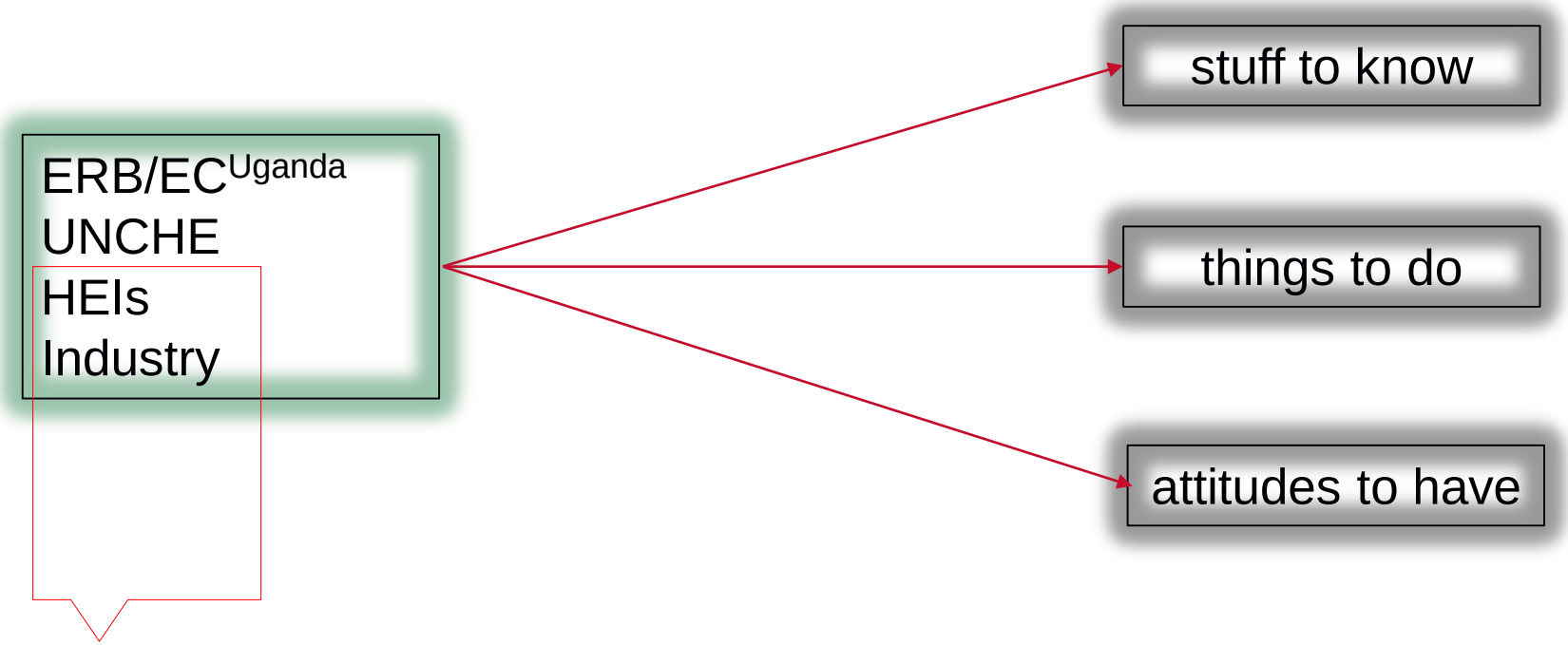
Outline - 4 questions:

1. What is engineering education?
2. What is COVID-19?
3. How has COVID-19 affected engineering education?
4. What can we do about it?

What is engineering education?



What is Engineering Education?



University-industry collaborations in supporting engineering education!!

What is engineering education?

Competences and Commitment

Learning (Outcomes/Activities)

- cognitive (Bloom, et al. (1956) and Anderson, et al. (2001))
- affective (Bloom, et al. (1956) and Krathwohl, et al. (1964))
- psychomotor (Bloom, et al. (1956) and Dave (1970))

What is COVID-19?

- infectious respiratory disease
- caused by a virus formally recognised as **related** to severe acute respiratory syndrome coronaviruses (SARS-CoVs) of the species *Severe acute respiratory syndrome-related coronavirus* and designated as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)

- spread through saliva or discharge through the nose getting in contact with nose, mouth or eyes **directly** or **via a surface**
- started in the City of Wuhan in Hubei Province, Peoples' Republic of China (PRC) circa October 2019
- notified by PRC to World Health Organisation (WHO) on 31 Dec 2019
- named by WHO on 11 Feb 2020
- characterised as a pandemic by WHO on 11 March 2020

How has COVID-19 affected engineering education?

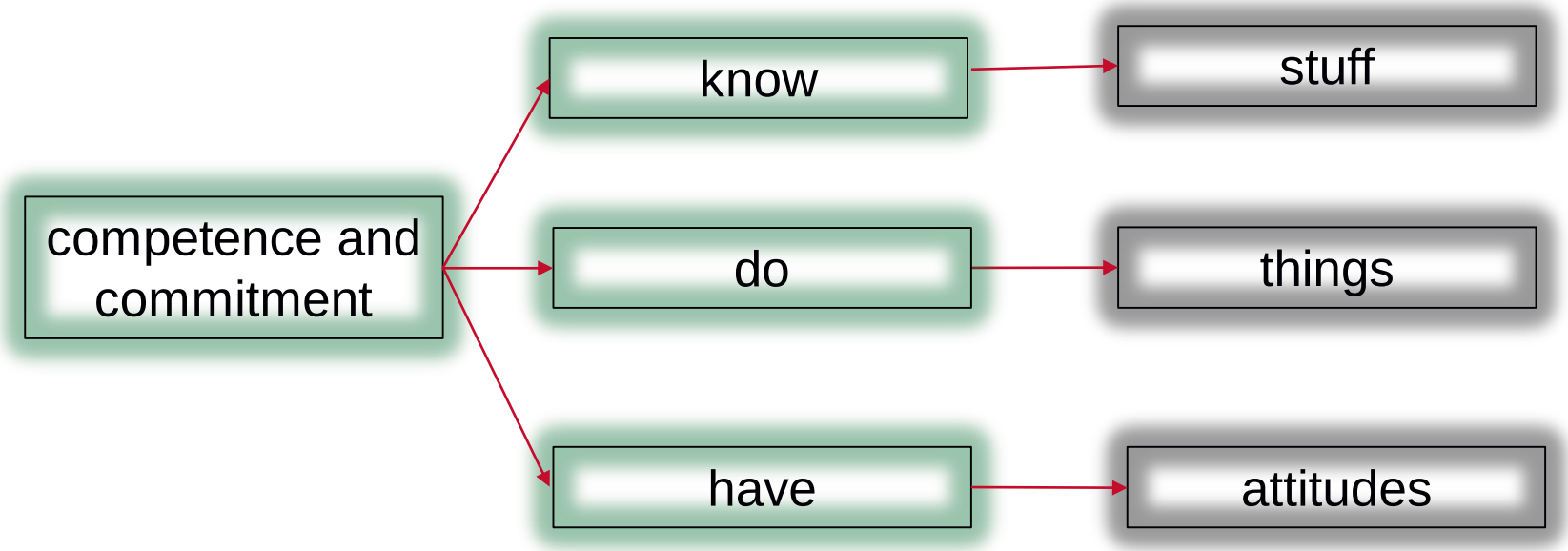
Short/medium term

1. suspension (issues: *health and wellbeing*)
2. remote experiences (issues: hardware, software, access, *socialisation*, **work load**)
3. rescheduling (issues: *programme completion time*, *equality*, **work load**)

Medium/long term

1. no effect
2. redesign: IT-driven (issues: hardware, software, access, *socialisation*, **work load**)
3. redesign: social distance-driven (issues: hardware, software, access, *programme completion time, equality,* **work load**)
4. redesign: PPE-driven? (issues: **r&d**, **technology readiness**)

What can we do about it?



1. Do not change the fundamentals of engineering education
2. Change the process of delivering/acquiring engineering education

What can we do about it?

Cognitive domain

1. Deploy technology
- hardware
- software: virtual learning environment
- internet access: high speed

Requirements
- learning technologists
- training (technical and pedagogical) for academic staff
- funding
    - HEIs
    - students

What can we do about it?

Affective domain

1. Deploy technology
- hardware
- software: virtual learning environment
- internet access: high speed

Requirements
- learning technologists
- training (technical and pedagogical) for academic staff
- funding
    - HEIs
    - students

What can we do about it?

Psychomotor domain

1. Deploy technology
- hardware
- software: virtual learning environment
- internet access: high speed

Requirements
- learning technologists
- training (technical and pedagogical) for academic staff
- funding
    - HEIs
    - students

What can we do about it?

Psychomotor domain

2. Design socially-distanced face-to-face activities
- reorganisation of:
    - learning spaces/facilities
    - technical support
    - programmes/courses

Requirements
- development of appropriate SOPs
- funding
    - HEIs
    - students

What can we do about it?

Psychomotor domain

3. Design and implement a 'bubble'
- identification of:
  - composition
  - accommodation
  - learning activities
  - assessment

Requirements
- development of appropriate SOPs
- funding
  - students
  - HEIs
  - industry

University-industry collaborations in supporting engineering education!!

Conclusion

1. What is engineering education?
2. What is COVID-19?
3. How has COVID-19 affected engineering education?
4. What can we do about it?

Bibliography

Anderson, L.W. and Krathwohl, D.R., Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J. and Wittrock, M.C. 2001. A taxonomy for learning, teaching, and assessing: a revision of bloom's taxonomy of educational objectives. London: Longman.

Bloom, B.S., Engelhart, M.D., Furst, E.J., Hill, W.H. and Krathwohl, D.R. 1956. Taxonomy of educational objectives - the classification of educational goals, handbook I: cognitive domain. New York: David McKay.

Clark, R. S. and Lyons, C. 2004. Graphics for learning. San Francisco, CA: Pfeiffer.

Clark, R.C. 2007. Developing technical training. 3rd ed. San Francisco, CA: Pfeiffer.

Dave, R. H. 1970. Psychomotor levels. In: Armstrong, R. J. ed. Developing and writing behavioral objectives. Tucson, Arizona: Educational Innovators Press, pp. 20-21.

Engineering Council. 2014. UK-SPEC UK Standard for Professional Engineering Competence. 3rd Edition. [Online]. [Accessed 18 August 2020]. Available from: http://www.engc.org.uk/engcdocuments/internet/Website/UK-SPEC%20third%20edition%20(1).pdf

Engineering Council. 2019. Pocket guide to professional registration for engineers and technicians 219/2020. [Online]. [Accessed 18 August 2020]. Available from: https://www.engc.org.uk/media/3108/pocket-guide-to-registration-2019-20.pdf

Kolb, D. A. 1984. Experiential learning: Experience as the source of learning and development (Vol. 1). Englewood Cliffs, NJ: Prentice-Hall.

Krathwohl, D. R., Bloom, B. S., and Masia, B. B. 1964. Taxonomy of educational objectives - the classification of educational goals, handbook II: affective domain. New York: David McKay.

Word Health Organisation. 2020. Rolling updates on coronavirus disease (COVID-19). [Online]. [Accessed 18 August 2020]. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen