Co-creation and implementation of an inclusive doctoral training programme

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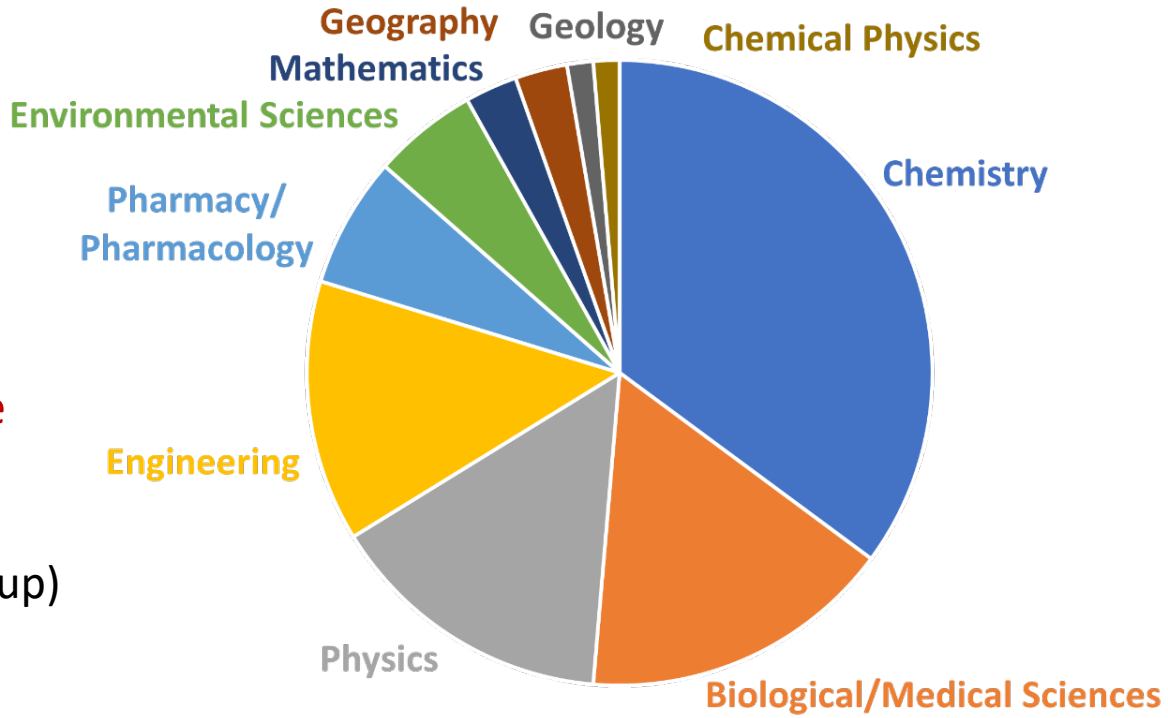
EPSRC Centre for Doctoral Training in Aerosol Science

Our context

- The EPSRC CDT in Aerosol Science is a partnership between seven institutions and 65+ industrial partners.
  - 4-year cohort-based training and research PhD

- Established in 2019 to deliver comprehensive and broad-based training in aerosol science.
  - Train 96 postgraduates over five cohorts

- CDT is highly multidisciplinary and demographically diverse
  - PGRs come from a broad range of UG backgrounds
  - 25% are returners to education
  - PGRs alumni of 37 different UK institutions (49% Russell Group)



UG disciplines of cohort 1-4 PGRs (n=73)

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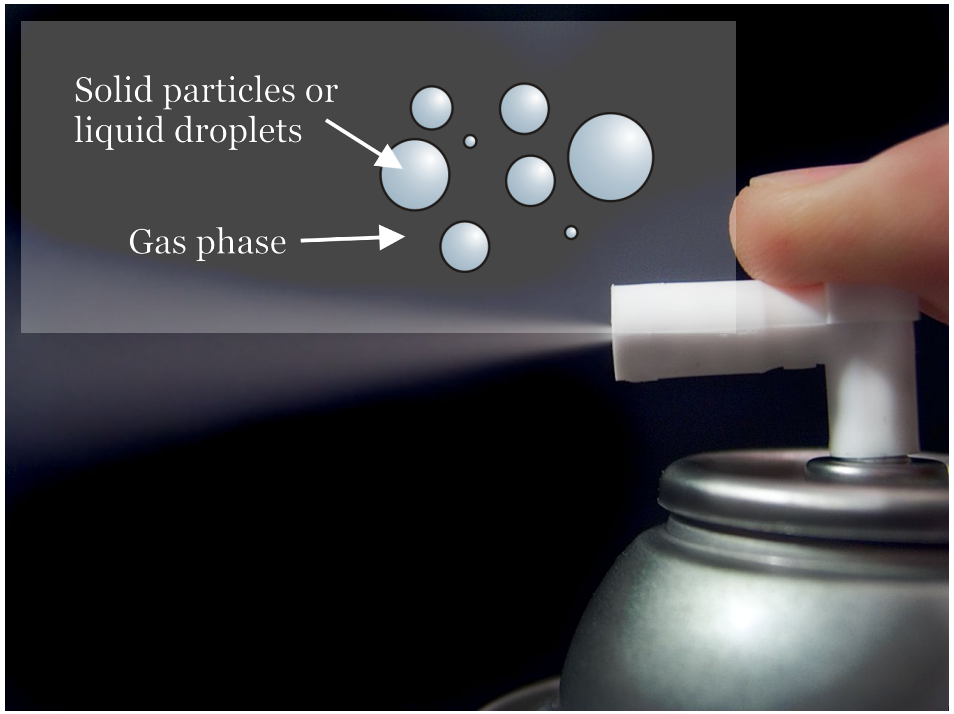
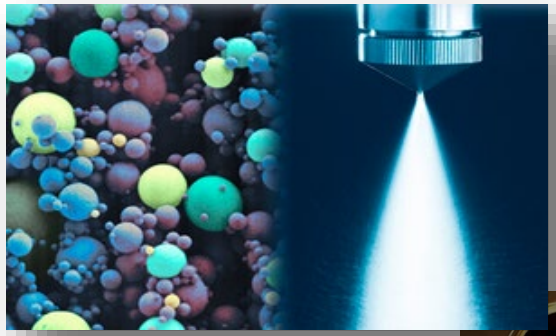
Interdisciplinarity of aerosol science

Atmospheric Science





Industrial processes, eg. spray drying

Drug delivery to the lungs

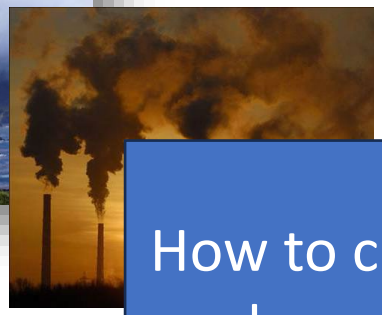
Agrochemicals

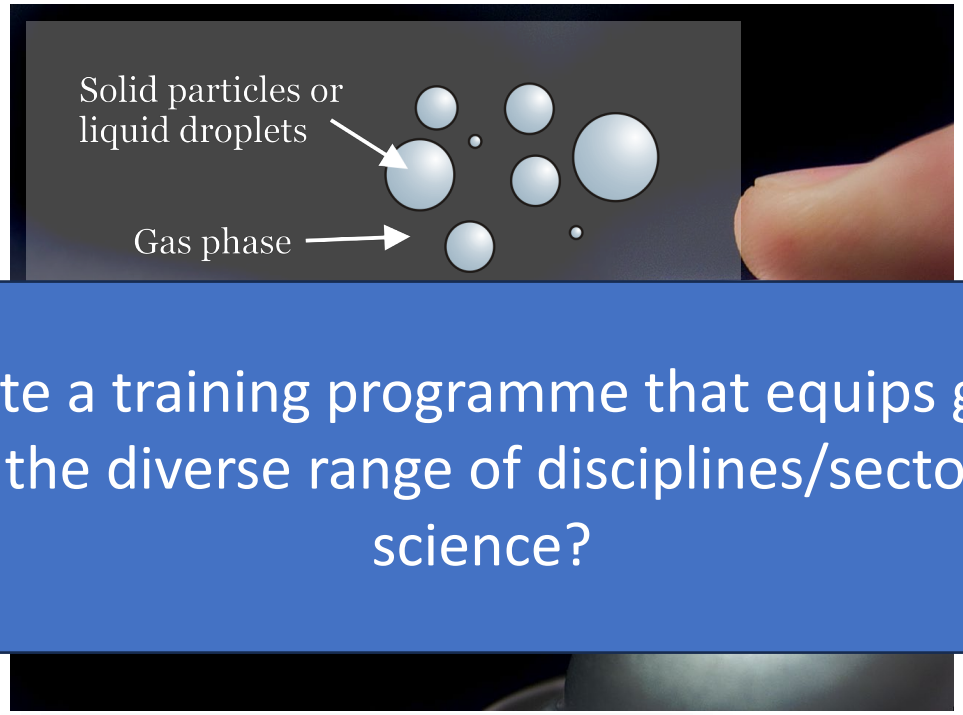
Health effects and disease transmission

Delivery of fuels for combustion

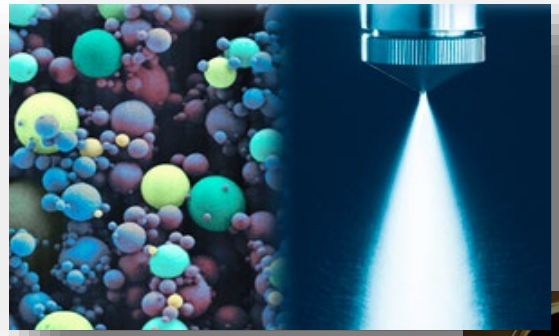
Interdisciplinarity of aerosol science

Atmospheric Science





How to create a training programme that equips graduates to work across the diverse range of disciplines/sectors in aerosol science?



Industrial processes, ay drying

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Stakeholder co-creation

The Aerosol Society

Stakeholder workshop (professional aerosol science practitioners):

- Representatives from 26 UK-based enterprises, industries and public-sector organizations
- Academics involved in training PGRs in aspects of aerosol science

Objectives:

1. Identify the critical research objectives in aerosol science for each specific industry.
2. Explore the training needs of both current and future employees of stakeholders in each sector
3. Determine the frameworks in which the relevant training could be delivered.
4. To share ideas for ongoing stakeholder engagement with researcher training.
5. To agree on key words that describe core concepts required in the training of aerosol science researchers.

→ **Outputs collated and summarised in interim review**

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Stakeholder co-creation

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Post workshop consultation programme:

- Feedback and refinement of interim review through:
  - online survey
  - 1:1 telephone consultations with stakeholders
  - PGR focus groups

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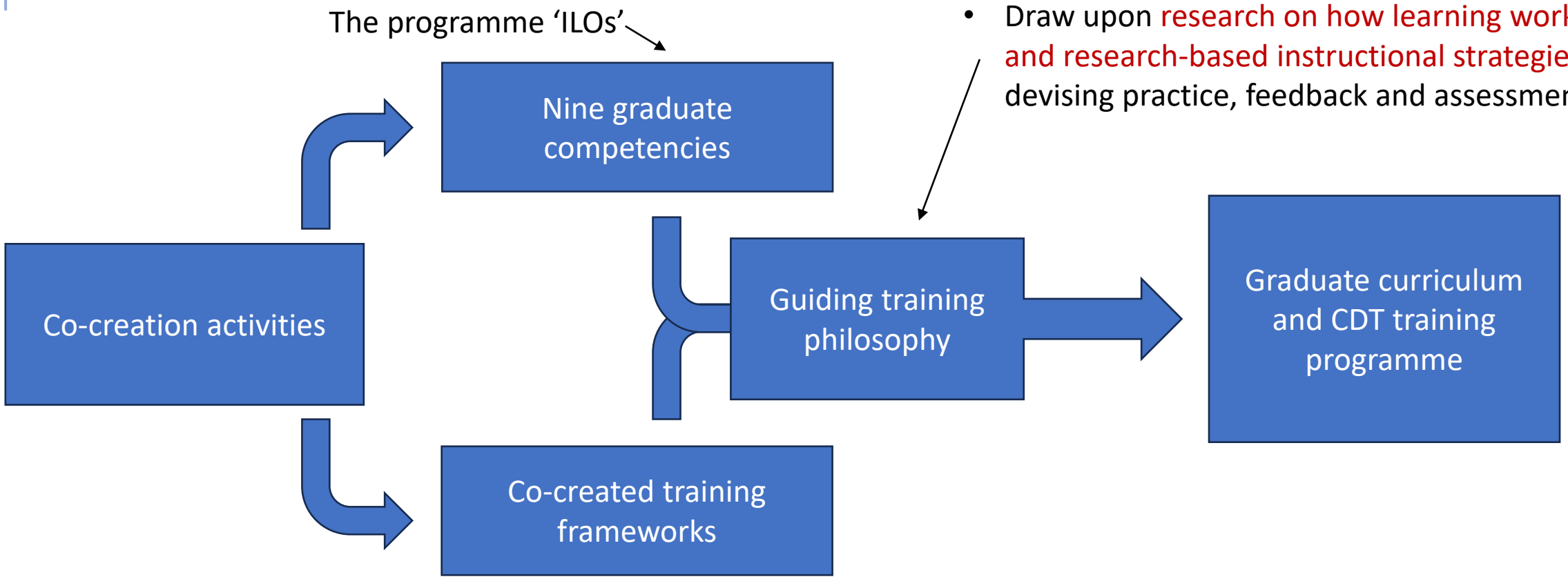
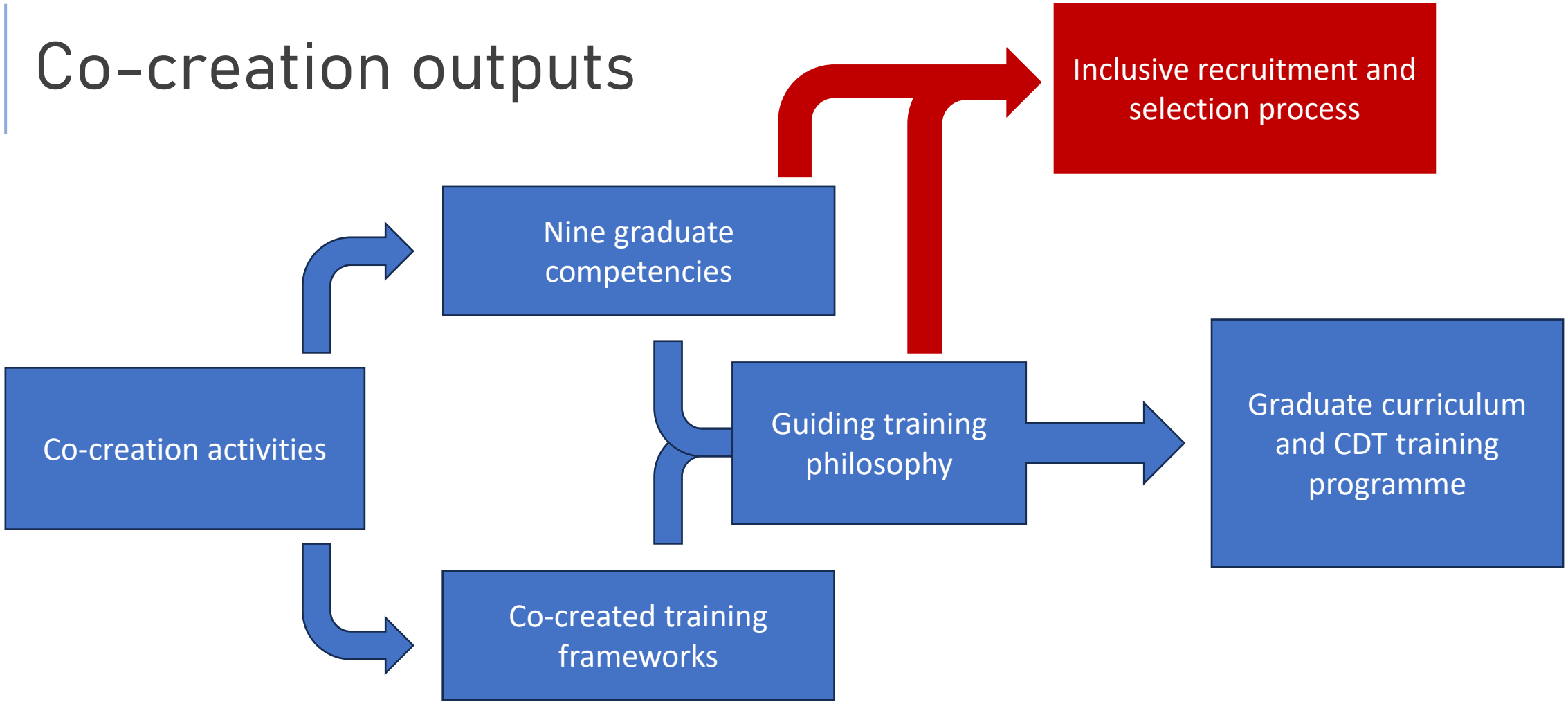
Building a UK pipeline of research, innovation and technology development for aerosol science (The Aerosol Society, 2018) Building-a-UK-Research-and-Innovation-Pipeline-in-Aerosol-Science.pdf (aerosol-soc.com)

Co-creation outputs

- Ensure that PGRs engage in practice and receive feedback in each area of their training, with assessment of their progress.
- Draw upon research on how learning works and research-based instructional strategies in devising practice, feedback and assessment.



Co-creation outputs



Nine graduate competencies & training frameworks

Graduates will be able to demonstrate these competencies:

1. Apply theoretical knowledge of aerosol science across a range of problems of a chemical, physical, biological or technological nature.
2. Undertake independent design and conduct experiments/models with technical mastery, as well as analyse and interpret data.
3. Identify, formulate, critique and solve research problems within their specialised context to advance the understanding of aerosols.
4. Develop or adapt advanced methodological approaches to contemporary problems, recognising the complexity and tolerating the ambiguity that arises in real-world systems.
5. Synthesise new approaches to meet an identified outcome within realistic constraints such as economic, environmental, social, political, ethical, safety, manufacturability, and/or sustainability.
6. Act in congruence with professional & ethical values, & manage ethical dilemmas in formulating scientific solutions.
7. Function effectively and confidently in multidisciplinary teams, acting autonomously and taking responsibility for the scientific activity of others.
8. Communicate and share research knowledge to both expert and non-expert audiences, and guide the learning of those from outside their discipline.
9. Manage personal intellectual development as a self-critical, reflective scientist with the agility to respond to new challenges.

Map to all domains of the Vitae Researcher Development Framework

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Co-created training frameworks included:

- Participation in a short, extra-disciplinary research placement
- Public sector or industrial placement

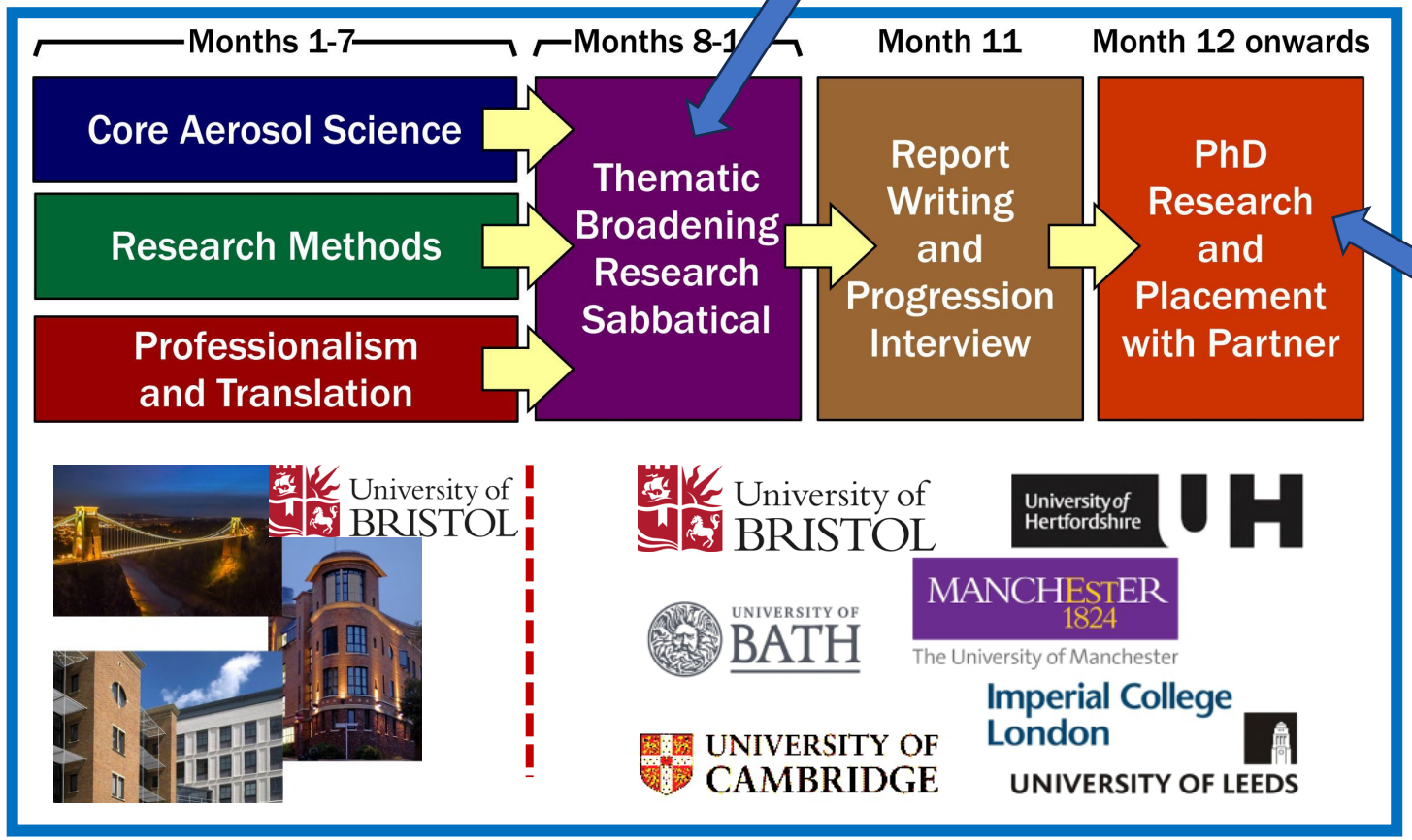
CDT training programme

Nine graduate competencies as programme ILOs

Constructively aligned pedagogies

Use of research based instructional strategies

Short, extra disciplinary research placement



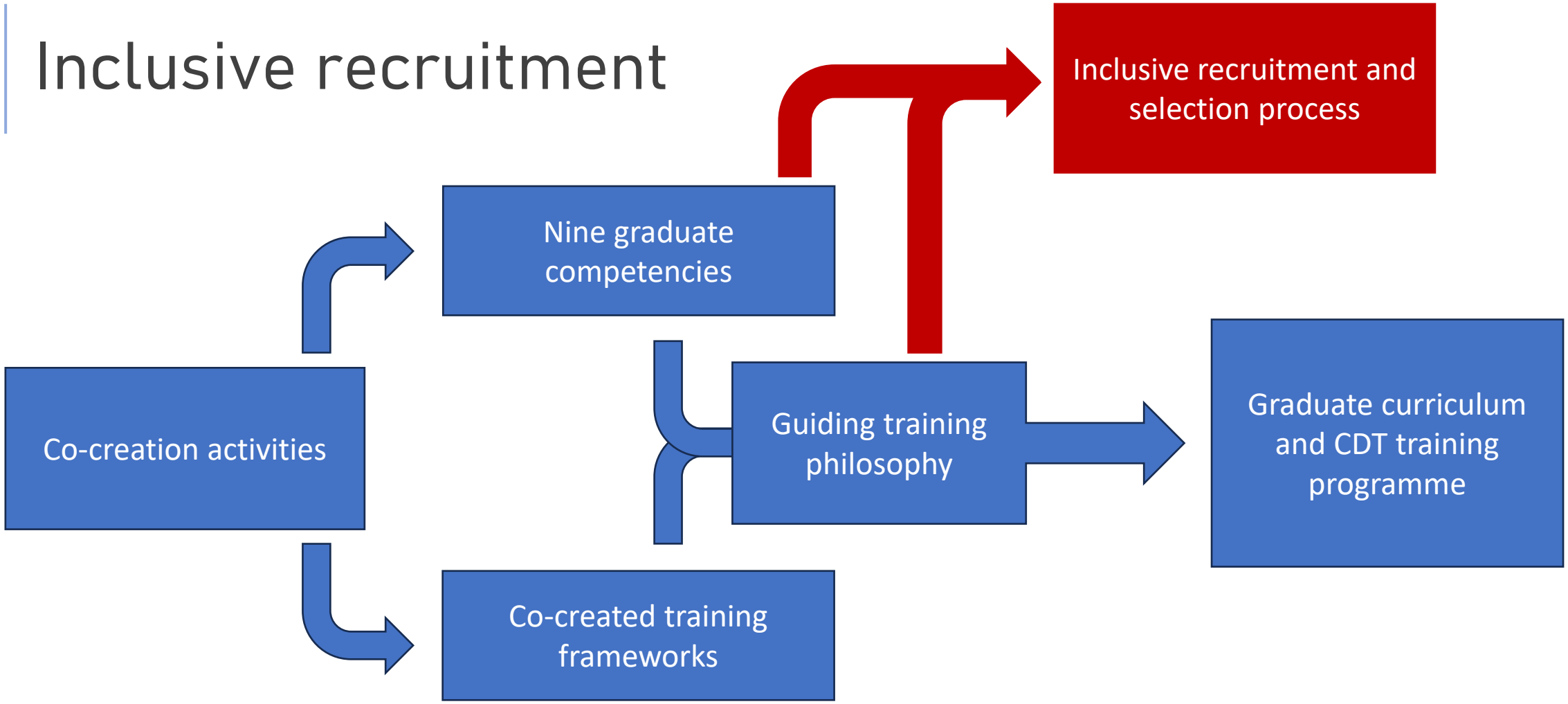
Public sector or industrial placement

Example: Constructive alignment of pedagogy

- Team-Based Learning (TBL) used in course delivery
  - Research based instructional strategy
  - Makes the diversity of the cohort an asset
- PGRs placed in fixed, multidisciplinary teams of 4/5 members
  - Time invested in team cohesion; agreed working practices
  - PGRs spend >200 hours working in their teams
- Provides a framework for:
  - peer-to-peer learning
  - communication and teamworking skills
  - cohort building
  - establishment of peer support networks

Michaelsen, L. K., Knight, A. B., & Fink, L. D. (2004). *Team-Based Learning: A transformative use of Small Groups in College Teaching*. Sterling, VA, USA: Stylus Publishing.

Inclusive recruitment



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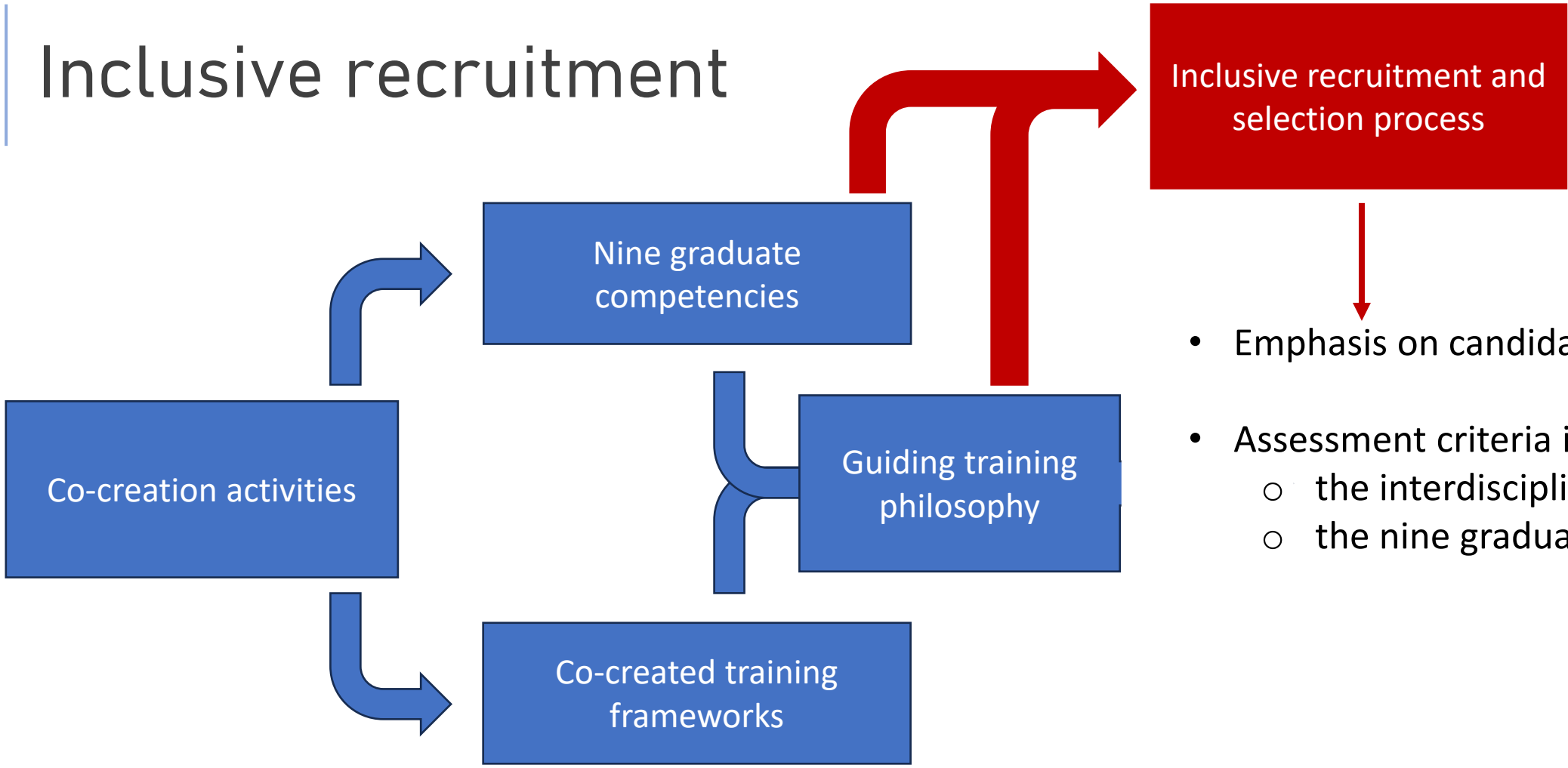
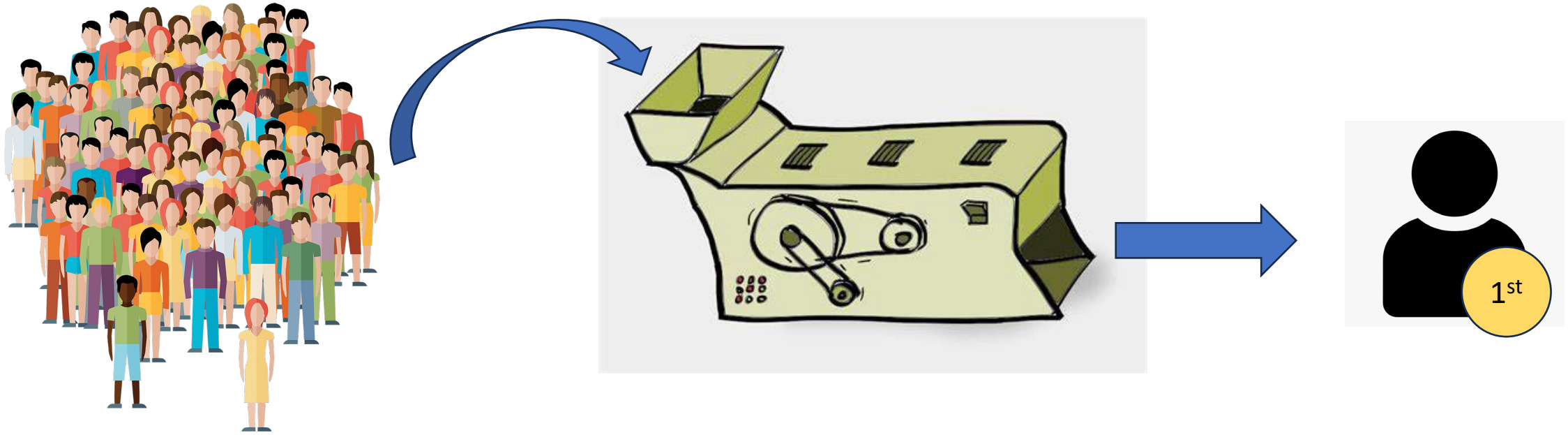
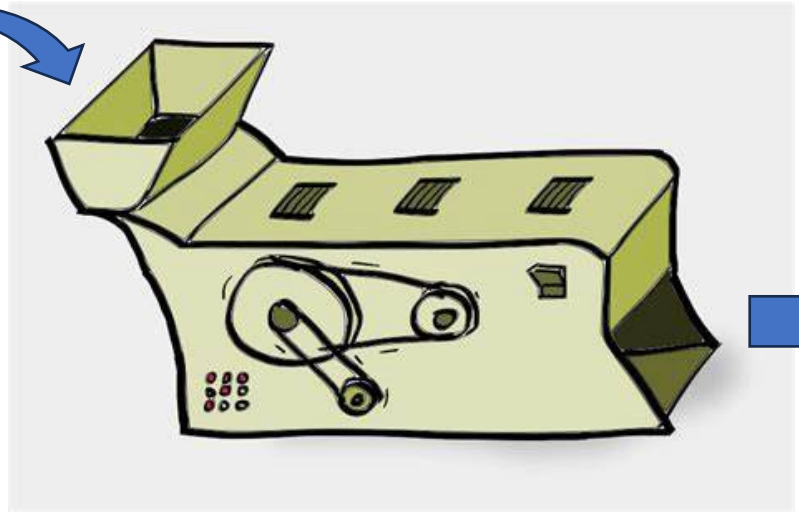


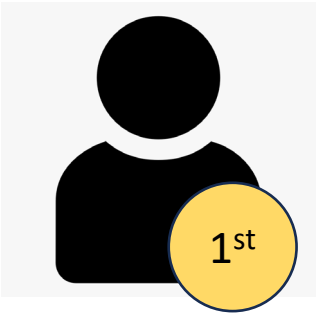
- Emphasis on candidate **<u>potential</u>**
- Assessment criteria informed by:
  - the interdisciplinarity of the CDT
  - the nine graduate competencies

The idealised recruitment process



The ~~idealised~~ inclusive recruitment process





What does ‘best’ actually mean?

Are our applicants <u>really</u> diverse?

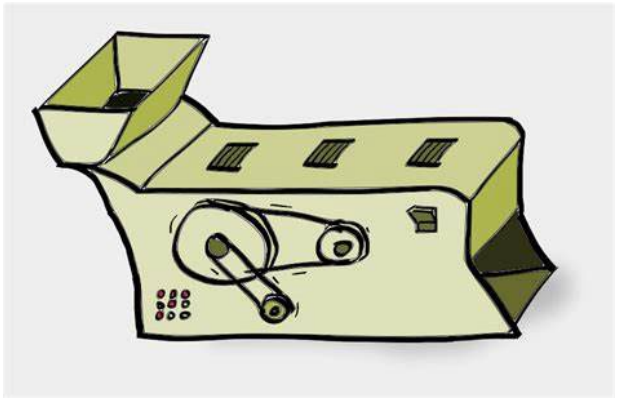
What evidence are we using to measure ‘best’?

How can we ensure the process is equitable?

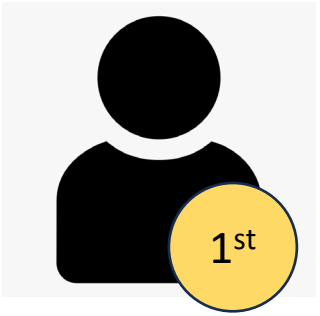
Developing an inclusive recruitment process

Finding talent: Attracting a diverse range of applicants

Equitable recruitment: Shortlisting and interviews



Monitoring and Reporting: Ensuring processes are fit for purpose



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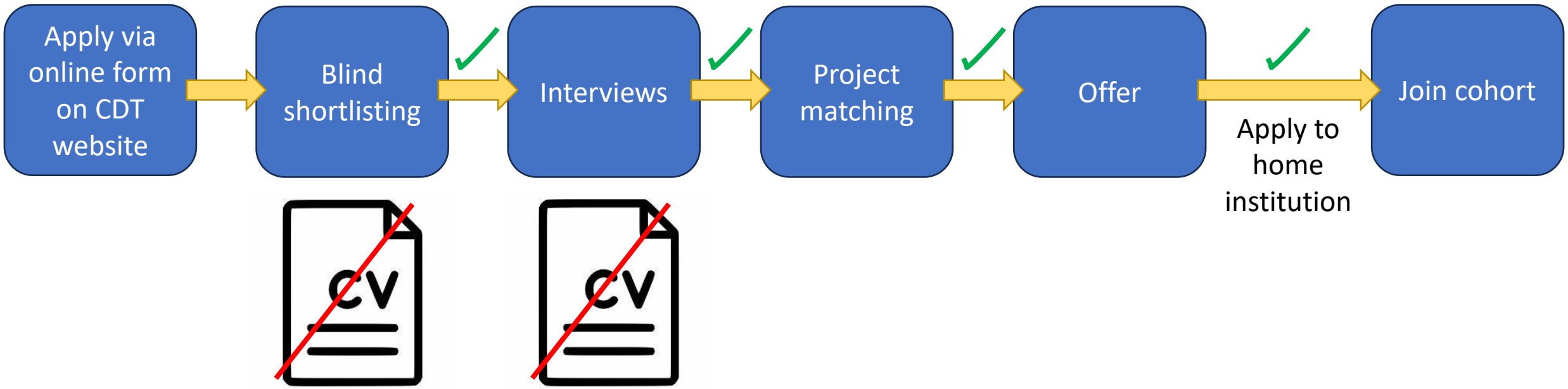
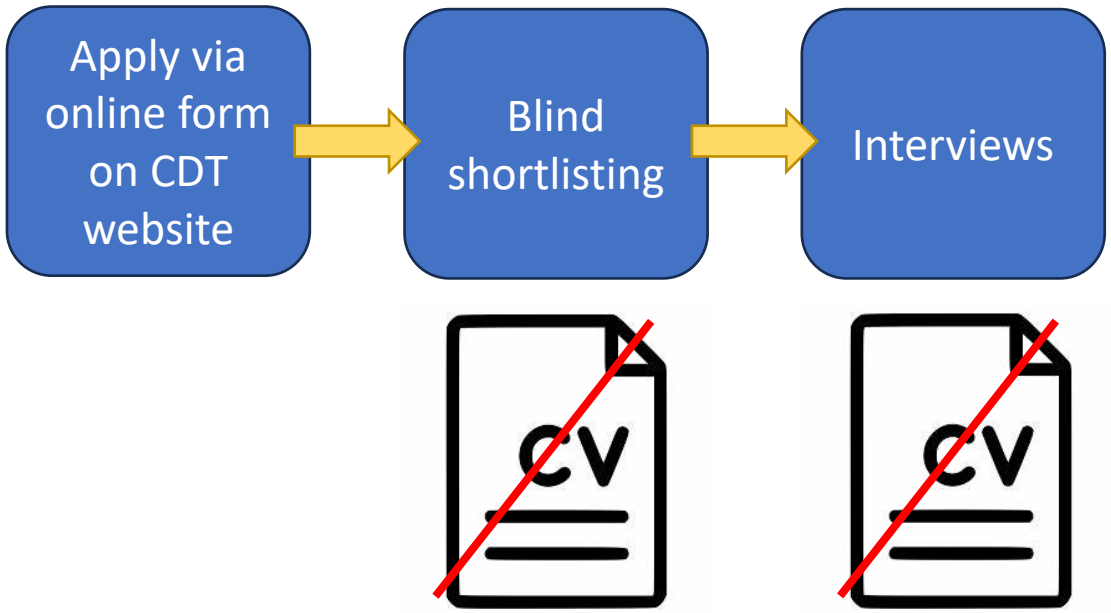
Aerosol Science CDT recruitment process



Shortlisting and interviews

What competencies do we want to assess? + How should we assess those competencies?



Assessed competencies

- Shortlisted applicants complete two competency-based assessments.

Technical/research orientation

- Demonstrate mastery home discipline
- Generate hypotheses
- Place results in context
- Critical engagement with results/errors

Skills and competencies

- Ability/willingness to reflect
- Show intellectual curiosity
- Honesty
- Collaborate respectfully
- Value difference
- Show initiative
- Display professionalism

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Gebbie KM, et.al., Training for interdisciplinary health research: defining the required competencies. J Allied Health. 2008 Summer;37(2):65-70. PMID: 18630780

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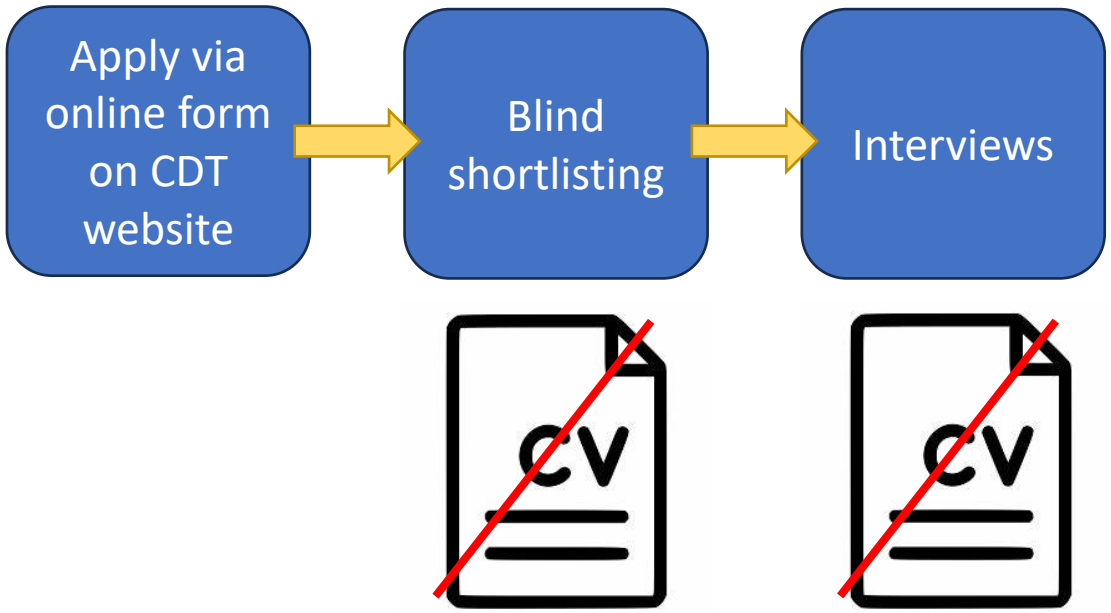

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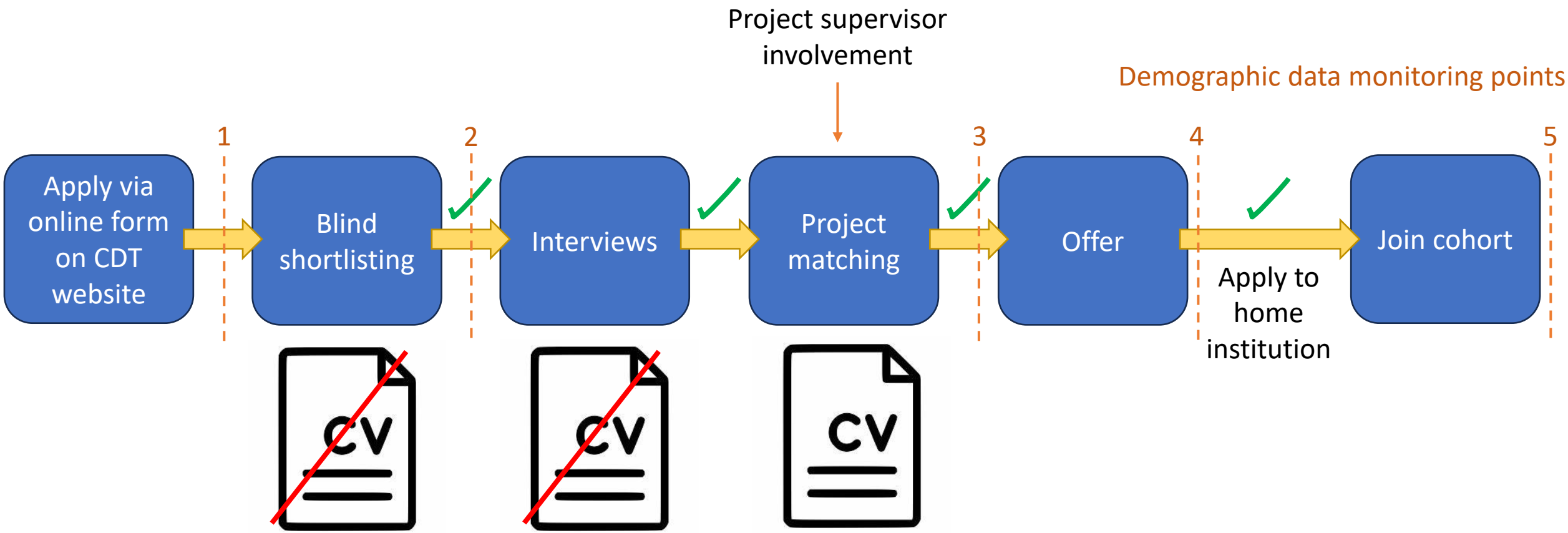
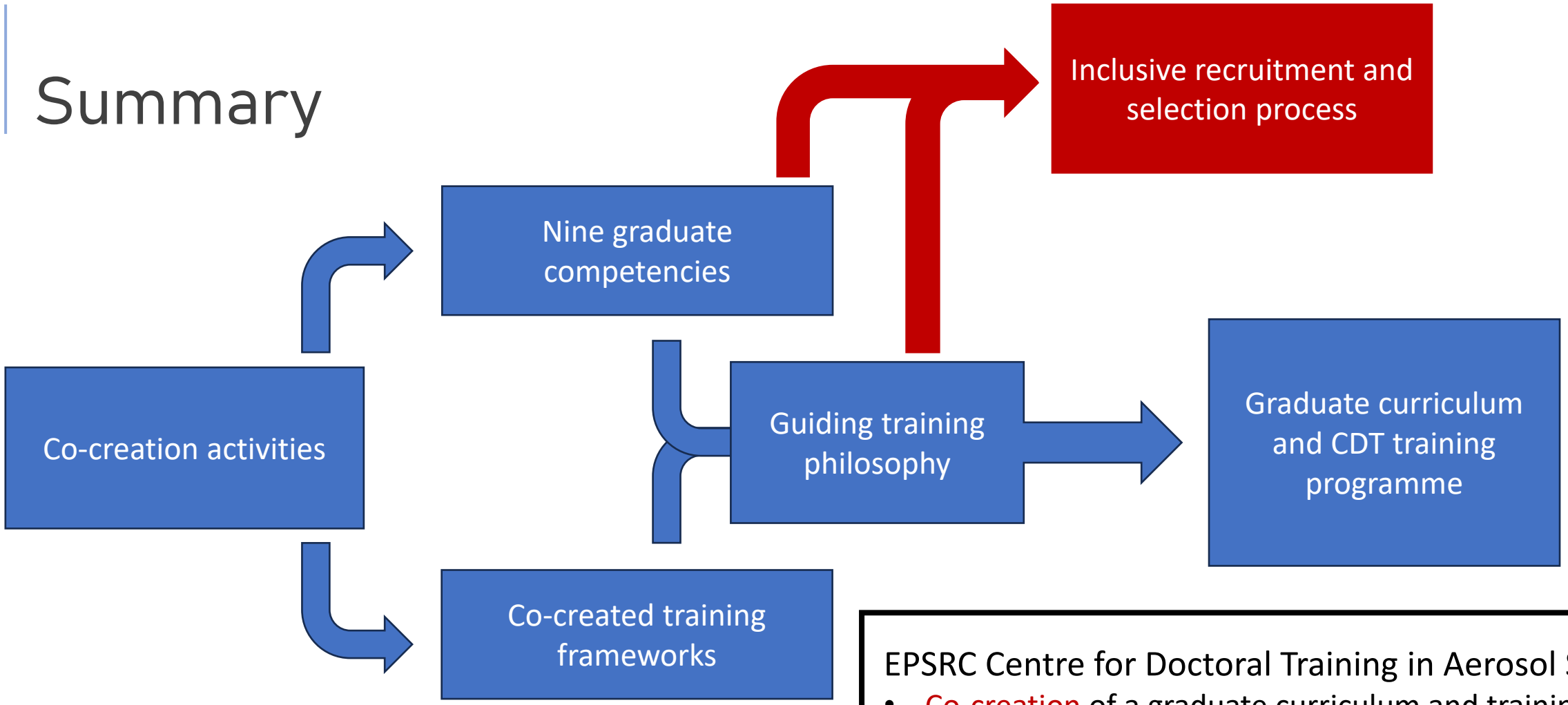
- All applicants assessed against the same rubric - Y, N, U - and examples of positive and negative indicators provided.

Aerosol Science CDT recruitment process



Summary



EPSRC Centre for Doctoral Training in Aerosol Science:

- Co-creation of a graduate curriculum and training programme *via* stakeholder engagement
- Constructive alignment of research based instructional strategies
- Inclusive recruitment and selection process

Thank you

for your attention

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