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## Introduction

- Teaching Laboratory Spaces are crucial component within many STEM study programs, providing students with essential hands-on experience and bridging the gap between theoretical knowledge and practical application.
- To be effective, laboratory sessions should apply both experiential learning and reflective practices. Programs of study should include a variety of laboratory designs from teacher-led to student-led.<sup>1</sup>
- As traditional teaching methods evolved, practical applications must be re-assessed to ensure they provide authentic learning experiences and meet student/staff needs<sup>2,3</sup>.
- Universities are exploring alternative delivery methods using digitalisation and centralised teach spaces to innovate learning experiences within these spaces.

## Aim of study

Gather evidence to underpin future planning / or re-design of teaching laboratory spaces within the University ensuring they meet both staff and student requirements.

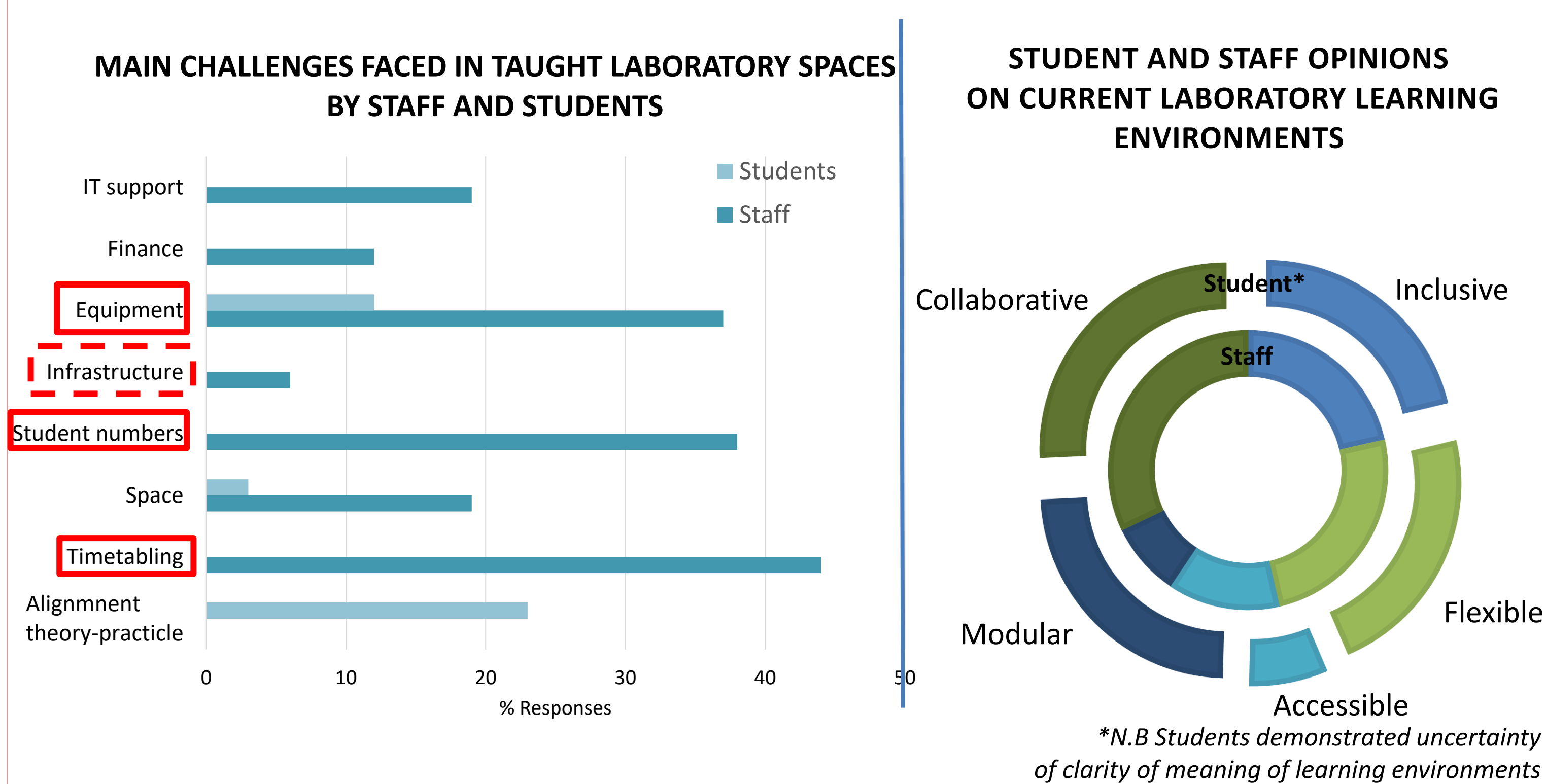
## Research methodology

- Mixed-method approach to explore future trajectories of taught laboratory space that included
  - Staff/student surveys to capture a current snapshot of taught laboratory spaces at the University of Leeds;
  - Literature scoping and field visits were used to investigate approaches used by other institutions

## Results and Discussion:

### 1. Main Challenges

- Overall, the current student (76%) and staff experience (56%) was positive but there was room for improvement.
- Students recognised laboratory sessions provided hands-on experience and allowed for essential skill development.



### Major Impacts: Staff

- Losing out to competitors;
- Increased staff workload;
- Lack of funding;
- Teaching and Learning discrepancies that question Inclusive pedagogical approaches and physical accessibility.

### Student\*

- Limited Student-Led sessions;
  - Discontinuity with module learning objectives;
  - Not Emulating workplace.
- N.B Students demonstrated uncertainty of clarity of meaning of learning environments

### Shared

- Lack of continuity between practical and theoretical content;
- Ineffective use of student time.

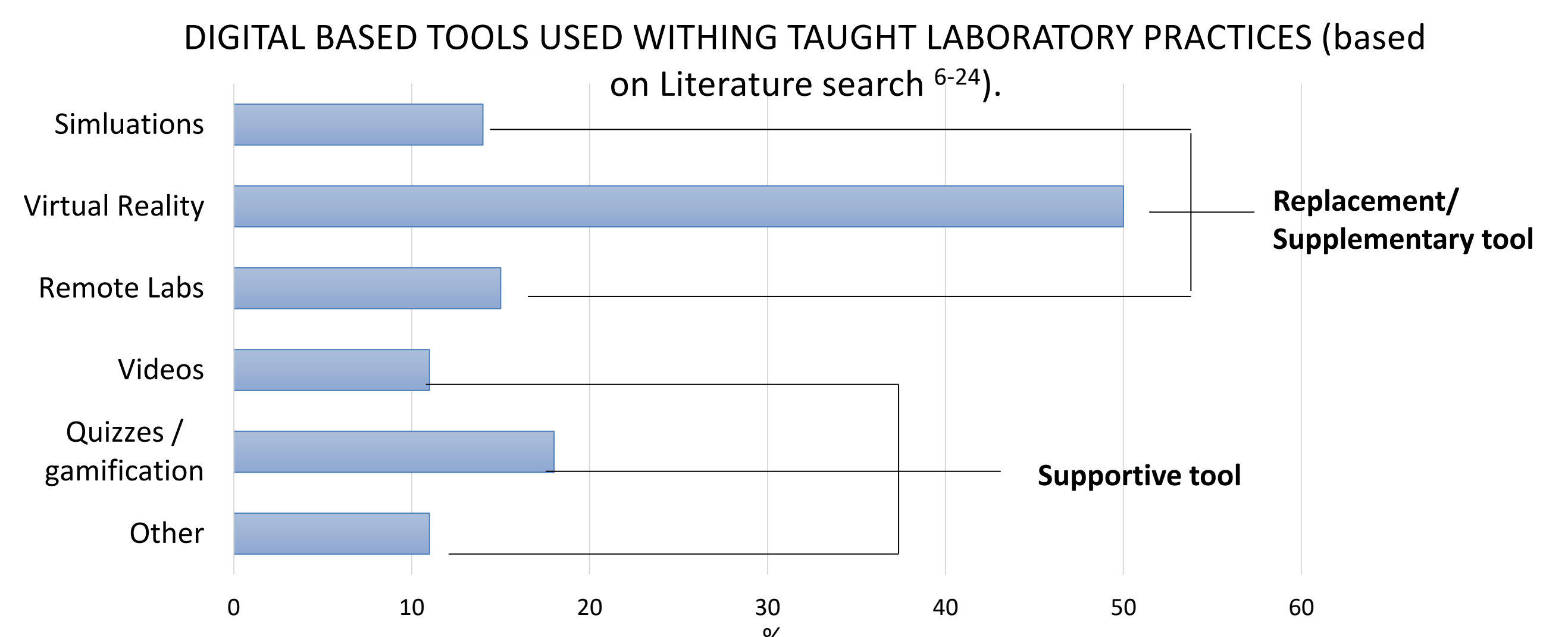
\* Only 9% of student participants 'considered [themselves] to be disabled', this could potentially impact the outcomes of the student survey around learning environments and Inclusive/accessible practices

## Conclusion:

- Students recognise the importance of taught laboratory practices within their program of study and understand the skills developed are relevant to their future careers. It is important to review these spaces and pedagogical practices and drive creativity and innovation.
- Through technological development and innovative practices, there is an opportunity for curriculum development that could enhance student and staff experience.
- Opportunity to foster a more dynamic learning environment that encourages and facilitates collaboration and interaction across laboratory pedagogies which can lead to interdisciplinary lab curriculums and ways of working that are more efficient and support some of the challenges laboratory spaces face.

## 2. Digitalisation of Taught Laboratories:

- Digital tools have been embedded into laboratory pedagogy (pre, post and during) and allow for continued learning beyond core laboratory hours.



- Students (100%) and staff (56%) agreed they would like more digital tools embedded as it would enhance student engagement and learning.

Table 1: Benefits, challenges and consideration around embedding digital tools into laboratory practices based on Literature search<sup>6-24</sup> findings and student/staff survey.

| Benefits                                            | Challenges                                       | What is important?                   |
|-----------------------------------------------------|--------------------------------------------------|--------------------------------------|
| ↑ Engagement                                        | Time to develop                                  | Linked to module learning objectives |
| ↑ Understanding                                     | Tool knowledge and resources                     | Well integrated                      |
| ↑ Confidence                                        | Initial cost, IT support                         | Training                             |
| ↑ Accessibility                                     | Limited evidence of impact of student experience | Provides Educational Gain            |
| ↑ Flexibility                                       | Small Scale studies                              | Accessible to all                    |
| ↑ Inclusivity                                       | Limited subject areas                            | Student engagement                   |
| Skill Development                                   | Remove in person support                         |                                      |
| ↑ Application of knowledge / Problem-based learning | Difficult to track engagement of all students    |                                      |

Students (70%) and staff (78%) agreed or strongly agreed that digitalisation can enhance laboratory teaching practices and should be used **to supplement laboratory learning** but should not fully replace it.

## 3. Centralised Teaching Spaces

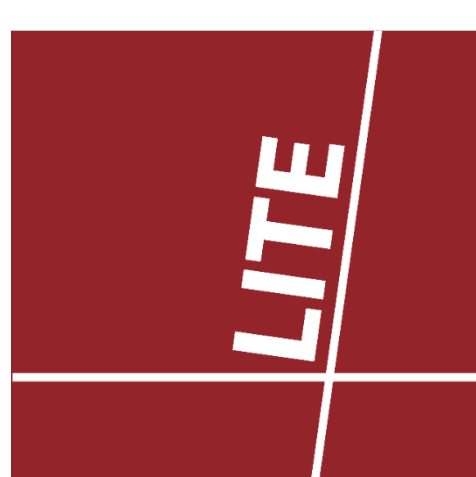
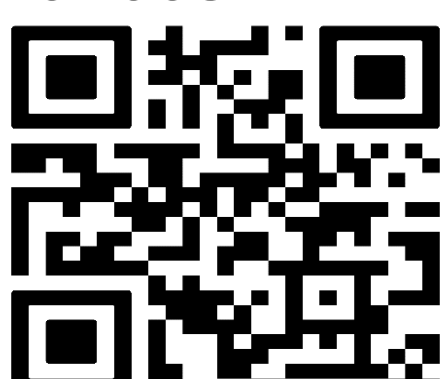
- 3 types of spaces adopted by other Institutions: BioMaker Spaces, Superlabs and Centralised Teaching Laboratories (CTL)

Table 4: Benefits and design consideration for centralised teaching spaces based on Literature search<sup>6-24</sup> findings and field visits.

| Advantages                                                         | Design consideration                                                                                          |
|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Interdisciplinary curriculum development                           | Financial Investment                                                                                          |
| Increased accessibility and student independence                   | Stakeholder engagement curriculum cross over, open communication..                                            |
| Enhanced Industry collaboration and improved research-led teaching | Purpose of build / space                                                                                      |
| Wider accessibility to equipment                                   | Strategical premises and location                                                                             |
| Improved collaboration across taught laboratory spaces             | Design and infrastructure storage, optimising usage, technical support, collaboration, digital integration... |
| Stronger financial Capital Centralised Budgets (CTL only)          | Operational process Budgets, opening hours, access, Safety...                                                 |
| Streamlined processes (CTL only)                                   | Staffing Structure, professional development                                                                  |
| Larger flexible spaces (CTL and Superlabs)                         | Student experience Sense of belonging                                                                         |

- Challenges faced at UoL: Initial financial implications, Services and policies alignment, Scaffolding and facilitating effective collaborative practices across the Faculties and Schools, Staff structure alignment, Securing stakeholder buy-in.
- UoL students raised concerns around 'Sense of belonging'.

## References:



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