Inclusive Education Briefing: Labs and Practicals

Overview

Running labs and practicals presents unique challenges and opportunities when thinking about inclusivity, particularly due to the physical setting, tools and equipment, and potentially intense nature of the laboratory environment. Being flexible in the design of the lab session and the learning space can help ensure that the sessions as inclusive as possible. Additionally, using a range of technical and pedagogic techniques as well as different methods for communicating ideas and expectations can benefit all students. Finally, making labs welcoming environments for everyone, regardless of gender, ethnicity and mobility, is important.

Much of the work in this area has focused on making laboratory teaching as accessible as possible for students with disabilities (such as limited mobility and hearing and visual impairments), and many of the modifications, such as improving the acoustics, using large print for instructions and offering opportunities to review procedures and techniques before and after sessions can benefit all students. Because disability may be a particular area of interest in inclusive education and lab-based teaching, we have addressed the topic explicitly within the briefing.

Designing inclusive labs

A broad principle for planning lab sessions is to incorporate approaches and opportunities that could suit a wide range of students:

- Building in flexibility
  Are there different ways of reaching the same outcome? Could some aspects of the lab, that might not be accessible for all, be modified if necessary? Building in flexibility from the start will make it easier to address particular circumstances, if necessary (Gravestock, n.d.).
- Teamworking
  Students who are working in teams can help share tasks and activities. This division of labour can help with flexibility, as suggested above. It also models the use of teams in professional labs.

Verbal and written instructions

Offering instructions in different modes (such as spoken, written, video recorded) will benefit everyone and particular those who may wish to review techniques or methods. Making instructions available in advance of the lab, such as via Moodle, would allow students to have extra time to prepare and review.

Consider using large print in a clear text to label all equipment and for printed instruction material. *Camtasia,* or similar software can be used to prepare podcast instructions on how to use online materials for labwork; captions can be created for audio aspects of the recordings.

Welcoming and inclusive culture

Making laboratories welcoming to all students helps everyone feel confident to learn, collaborate and question. Establishing an inclusive culture within labs should be done explicitly and with all those who participate and work in them. For example, a 2006 Institute of Physics survey found that 'patronising' attitudes towards female undergraduates in labs was still perceived to be a problem in some institutions (IoP, 2006). Preparatory activities might include:

- Offering diversity and equality training for all those who work with students (including technicians and demonstrators);
- Agreeing ground rules amongst students in a lab that will help establish a supportive and positive atmosphere for all.

Simulations

The sophistication and range of lab simulations have grown with the increased use of learning technologies generally. Lab simulations can benefit **all** students by offering them increased opportunities to practice and refine techniques. In particular, from an inclusive perspective, they can

- Offer opportunities for those who are unable to attend the laboratory;
- Act as an alternative or addition for students with physical or sensory impairments;
- Serve as an alternative for those who prefer not to undertake certain types of experiments due to religious, medical, cultural or ethical reasons.

Example/brief case study

Carrying out an audit with students and staff who have disabilities would help reveal what works well and what aspects of the lab environment need to be enhanced. See Hersh et al. (2005) for a detailed audit schedule and case study which could be modified for laboratories in any discipline. In this case study, a student who uses a motorized wheelchair and a member of staff who is visually impaired trialled the accessibility, usability, and comfort of a university engineering lab and workstation.

Adopting a wide range of techniques and pedagogical approaches will benefit all students, as will having instructions, theories, practical demonstrations and other learning materials available online before and/or after a session. Providing equipment instructions, safety messages and evacuation plans in large print within the lab is also recommended. Finally, making the lab environment and general ethos welcoming for all will aid student learning.

Summary checklist and key questions

- What are the central aims and outcomes of the lab session? Can these be achieved in multiple ways to accommodate as diverse a group of participants as possible?
- Is there a good range of techniques, in terms of preparation, experimentation and reporting being used? This will increase students' exposure to different approaches and appeal to a variety of learning preferences.
- Is the lab environment, including space and facilitation, welcoming to and supportive of all students?
- Are there health-related issues to consider, such as the welfare of pregnant students and/or babies in utero? Are there potential hazards present in the labs or used in experiments for students who do not yet know they are pregnant?
- Are there suitable alternatives for students who might not wish to undertake certain activities for cultural, ethical or religious reasons?
- Some key questions for making labs and practicals accessible for students with disabilities:

a) What are the central requirements of the work? Identifying these can help identify where and whether modifications could be made.
b) Could assistive or adaptive technologies be used? These could include simulations, syringe adaptations, talking thermometers, and hand steady syringe adaptations.
c) Is everyone aware of evacuation plans and can all students use the proposed routes to safety?
d) Are there adjustable workbenches which could be modified for wheelchair users?
e) Labs can be noisy spaces. Can the acoustics be improved? This could enhance the experience for all students and especially those with hearing impairments. Alternatively, can microphones and headsets be used to improve communication amongst lab users?
f) Can practical assistants be trained to support those with additional needs?

- How do the requirements of professional accrediting bodies align with inclusive practices? Do they have lab-based work policies? Can students meet the requirements of accrediting bodies if they are working with assistive technologies, simulations or an assistant?
- Can inclusivity be addressed explicitly when students are working in pairs or teams? For example, could someone with mobility restrictions take on suitable roles within a team?

References & Resources

Camtasia: Camtasia software enables the creation of screencasts and recordings, and can be used to create instructions, for example.
http://camtasia-studio.en.softonic.com

Davies, C. (2008) Learning and Teaching in Laboratories. An Engineering Subject Centre Guide. HEA.
https://www.heacademy.ac.uk/sites/default/files/learning-teaching-labs.pdf

Gravestock (2006) Developing an Inclusive Curriculum: A Guide for Lecturers. This resource has guidance on fieldwork, laboratories and practicals aimed at geography, earth and environmental sciences, but is relevant for other, related disciplines.
http://www2.glos.ac.uk/gdn/icp/ilecturer.pdf

Hersh, M., Baker, N., & MacLeod, M. (2005) Case Study: evaluating use of a laboratory by a student who uses a wheelchair and a blind member of staff. HEA.
https://www.heacademy.ac.uk/sites/default/files/case-study-evaluating-accessibility.pdf

Institute of Physics (2006) Women in University Physics Departments.
https://www.iop.org/publications/iop/archive/file_42616.pdf

ReLoad (Real Labs Operated at a Distance). This site offers science researchers the opportunity to work with real data from a distance.
http://reload.leeds.ac.uk

Checklist

Programme designers

- Is the expectation established, at programme level, that labs should be collegial environments in which all students are valued and welcomed?
- Are lab spaces accessible and adaptable? Is the need for alternative formats and adaptable equipment considered when acquiring or developing new resources and/or units?
- Is there programme level guidance flexibility in relation to lab-based curricula? Are alternative and/or additional learning activities (such as simulations), that can be accessed by all students, built in at the design stage?
- Do programme designers view teamworking as part of an inclusive strategy and is the value of working in teams communicated to students in the programme documentation?
- Is there programme-level training in inclusivity for all staff involved in teaching in labs?
- Are there regular opportunities for programme-level feedback from students on their experience of lab sessions, particularly in relation to inclusivity?

Academics

- Are the central aims and outcomes of the lab session clearly stated? Are there multiple ways to achieve these aims and outcomes that can help accommodate a diverse group of learners? Are students given choices in how they go about achieving these outcomes? (For example, can some of the practical work be done using simulation? Are suitable alternatives offered for students who wish not to undertake certain activities?)
- Are inclusive practices modeled for students? These might include negotiating ground rules with students for working in labs and drawing attention to the ways in which a collegial, cooperative and welcoming atmosphere can be established and sustained.
- Is working in teams and sharing roles to include a diverse range of students explicitly addressed with students?
- Is there a diverse range of techniques, experimentation and reporting used?
- Are there regular opportunities for students to feedback on their experiences in lab-based sessions?

Students

- Do students contribute to and apply negotiated ground rules for the lab sessions?
- Does everyone in the lab contribute to an atmosphere which is collegial and welcoming?
- Do students understand how they can support each other in lab sessions? Is the value of peers supporting each other – particularly when they are a diverse group – made explicit?
- Do students respect the contributions of others and do they understand the dynamics of working in teams?