UNIVERSITY OF CAMBRIDGE

Disability Resource Centre

Teaching the Natural Sciences Tripos to Students with Impairments

Disability Resource Centre

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The Natural Sciences Tripos is one of the most demanding courses in the University of Cambridge. Due to the high level of practical work and multi-departmental nature of the course it can create particular issues with regards to adaptations for students with impairments. The most supportive start is communicating with the student as to what his/her requirements are. The student has the most experience in living with their particular impairment and thus this resource should not be ignored.

Lectures:

In many cases making teaching more accessible could simply be a case of following "good practice". These are general guidelines, for more specific guidelines with regards to a particular impairment please refer to the other information sheets provided in this series.

- Confirming that the lecture theatre is accessible and if an induction loop is present, using the microphone provided is essential.
- Facing an audience when conducting a lecture and not speaking if you turn away to write on a blackboard.
- Ensuring that PowerPoint presentations are in an appropriate font size, slides are not cluttered and that there is appropriate contrast between the text colour and background. Use of fonts such as Arial and other sans serif fonts have been found to be clearer than others
- Ensuring handouts are written in an appropriate font size and available in several formats, e.g. paper and electronic. This would allow a student with visual impairments to have access to the handouts via their screen-reading software. In addition, if the student uses Braille, this can be provided if the DRC is contacted sufficiently in advance.

- A specific issue with regards to lectures in NST is that they can be in different departments of the university with only a short period of time between them. It is important to be aware that it will often take a student with impairments longer than others to make this transition. This is especially relevant in NSTIA and NSTIB.
- Giving written instructions with regards to examinations, practicals and rescheduling of lectures in addition to announcing is helpful for students with hearing impairments.
- If using graphs, detailed flowcharts to explain experiments, it is important to be aware of any students that may not have access to these visual cues. Summarizing the effect and its consequences in words may be helpful to all students.

Practicals:

It is important to consider what adjustments can be made in order for the student to maximally gain from practical sessions. It should not be assumed that the student will not be able to perform the experiments or will not benefit from it due to their impairment. Often all the student may require would be a lower work-bench or an interpreter who would explain the demonstrators instructions to them.

- Communicate with the student the nature of the practicals that are set and what assistance the student may need for them. This should ideally be done well before the actual practical as it will allow the student to organise assistance if needed.

- Workstations for individual students with disabilities should be arranged to be suitable for the person using them and the task being performed.
- Ensure there is an emergency evacuation plan for the student and the student is aware of it. Also the student should be able to access emergency eye-wash basins.
- NSTIA practicals can occasionally take more than 3 hours, in such cases make sure that the student has the opportunity to take rest-breaks.
- Impairments increase the time and effort which students must expend in activities of daily living, as well as in activities related to their studies. **Be aware of this** if a student is making a request such as extra time for the completion of practical write-ups.

Case study:

Case study evaluating accessibility and use of a laboratory by a student who uses a wheelchair and a blind member of staff

Abstract:
This case study describes the findings of two disabled people who visited an engineering laboratory. It highlights aspects of building design, room layout and equipment use that are often overlooked and which often can be rectified quite simply and inexpensively. The points raised may be used to audit any building and lab.

Background:
The Department of Electronics and Electrical Engineering is based in a purpose-built 1970's building on 8 levels. In order to evaluate the extent to which the building's design meets accessibility requirements and to determine what modifications would be required to make laboratory areas,

in particular, truly accessible, some visits by disabled people were arranged.

Methodology:
Karen who uses a motorised wheelchair and John who is blind and uses a long cane volunteered for the trail. Their comments on all aspects of the access to and use of the laboratory that could be improved were noted.

Issues for access:
Entrance to the building:
Karen could not use the automatic sliding main door as it is accessed by a flight of stairs. Instead she entered the building on level 4 where access is provided for wheelchair users through a narrow passageway to a single outwards-opening door from the building's integral car park. Getting out of the taxi was slightly problematic as there was no kerb to reduce the total height to descend.

The passageway from the car park to door is a designated smoking area with cigarette bins. This door is also the out-of-hours door, when it is operated by a card and pin pad. Within the building there is flat access and lift access to all floors, with heavy double fire doors throughout, and a total width of 120 cm to all corridors and doorways.

Entrance to the laboratory:
Karen had to wait at reception before going down one level to the lab. However the waiting area's close arrangement of furniture did not allow access to the seating area for Karen's wheel chair. Furthermore the seating and display units created an impenetrable barrier, preventing wheelchair access to the nominally wheelchair accessible lavatory in the corner. She noted that a parent with a child in a buggy and a visually impaired visitor would also have problems. One of the lab's double doors was latched and Karen couldn't open it.

Within the laboratory:
The space between the benches enabled Karen to manoeuvre fairly easily. However, the bench height was designed to be used by someone sitting on a traditional high lab stool and prolonged use from a wheelchair would have been uncomfortable. Typically, students work in pairs at each workstation, with insufficient room if the neighbouring workstation also has 2 students. Some equipment is normally used whilst on a high level shelf built above the workbench.

John has some familiarity with the building and was able to locate and use the main entrance unaided. However guidance was necessary to find and use the lift and then to find the laboratory room as Braille or other tactile cues for navigation are not available in the building.

Audit for access

- Is a designated smoking area a pleasant entry to the building?
- Do cigarette bins cause an obstacle to wheelchairs?
- Is there reserved parking for disabled people?
- Is the lighting in the passageway sufficient for all disabled people, including blind persons with some light vision?
- Do entrance doors open inwards or automatically?
- Are PIN pads at an accessible height with a paddle system required for wheelchair users outside of normal hours?
- Are fire doors fitted with automated hold-open electro-magnet mechanisms or light enough to open

and wide enough that only one needs to be opened to get a wheel chair through?

- Once open do the doors swing shut with the risk of trapping hands?
- Are there hoists in the lavatories?
- Are all buttons on lifts accessible?
- Can some benches be adjustable to accommodate various heights of chairs and wheelchairs?
- Are workstations far enough apart?
- Can equipment be easily moved down onto the workbench level for ease of access?
- Are there Braille or tactile clues on lift buttons, doors and corridors to assist in direction throughout the building?
- Do you operate a brief run-through before lab sessions for familiarisation with the layout of the lab, including the location of equipment?
- Do your demonstrators have training in supporting disabled students?

Issues for laboratory work:

Karen's lab requires work on the computer, using the SPICE software to compare a simulation with a real circuit followed by work with the real circuit and specialist measuring equipment. Karen has reasonable use of her hands and therefore did not experience any particular problems manipulating the various small knobs and switches on the equipment. However she does not type and uses a dictation package to interact with computers. The use of software raises issues of the compatibility of different versions and operating systems.

John's laboratory required him to make observations from an oscilloscope, adjust controls, take measurements and

record results. Thereafter he was required to connect “black boxes” to an oscilloscope, signal generator and gain phase meter with cables prepared with black or red connectors. Each box has a schematic circuit diagram printed on the top. John felt that coaxial connectors and other leads can be connected without problems once items of equipment are known and understood. However there were at least three different designs of oscilloscope in the laboratory. Although all of them have controls performing similar functions, the locations and graduations of a given control vary and would be time consuming to learn by heart.

Audit for laboratory work:

- Can switches and knobs be used by people who have dexterity problems?
- Are there any technological aids used to support these tasks?
- Are dictation packages connected to the computers?
- Is there compatibility between supporting software and your department’s operating system?
- Is there a virtual laboratory available for the course?
- Are there Braille notetakers and computers with screenreaders and Braille displays in the lab?
- Is an appropriate extension of time given to accommodate students who have reading disabilities or require breaks in a three-hour lab session?
- Are lab sheets made available in advance?
- Do you use dyno Braille tape to mark cables and equipment?

- Are symbols and circuit diagrams printed on equipment discernable to touch?
- Does equipment have audio output or RS232 computer connection to enable output of data to a computer for subsequent use with screen readers?
- Can LabView and other specialised software be read with screen readers?

How Can Other Academics Reproduce This?

This case study illustrates how so much of what is taken for granted by non-disabled people can create problems for disabled people. Most of the access issues are easily rectified at minimal cost. The issues for laboratories can be more complicated, requiring equipment and technology, although some changes, such as Braille dynotaping to label equipment, would be relatively low cost and easy to implement. However, recognition of the need at time of purchase or replacement will ensure a much more accessible environment.

Further Information:

- A general overview of teaching students with disabilities (including mobility impairment) can be found at: http://www.open.ac.uk/inclusiveteaching/ and: http://www.engsc.ac.uk/downloads/resources/disguide2ed.pdf

- Information sheets on teaching students with various impairments: http://www.nottingham.ac.uk/disability/ITS%20leaflets.htm

- Guidelines by the Royal Society of Chemistry for the safety of laboratory workers with disabilities: http://www.rsc.org/pdf/ehsc/disabled.pdf

- A source of adapted technologies for students with disabilities (including mobility impaired, visually impaired and hearing impaired students) is available at: www.abilitynet.org.uk and: www.techdis.ac.uk

- The book *Able scientist/technologist, disabled person*, C. Hopkins and A. V. Jones, and a video *Disabled students in chemistry*, include a comprehensive list of laboratory adaptations for disabled scientists. Both are available, price £15 each, from either: Eslek Publications, 36 West End, Long Whatton, Leics LE12 5DW, e-mail: Ironsideuk@aol.com; or Commercial Centre, DICE Centre, Nottingham Trent University, Nottingham, tel: 0115-941 8418.

- Easy access to computer software and information for science students: http://www.rit.edu/~easi/

- The TechDis provides an on-line resource of information about products which are available to assist those with disabilities: http://www.niad.sussex.ac.uk/

- Detailed information about teaching students with mental health difficulties with focus on adapting assessment methods www.studentmentalhealth.org.uk/chap3.htm

Contact information

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Leaflets in this series

- Asperger Syndrome
- Mental Health
- Hearing Impairment
- Physical Impairment
- Visual Impairment