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## Who feels unwelcome in your biochemistry programme?

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Has the design of your biochemistry courses and facilities unintentionally excluded certain students and faculty? We live in an era of heightened awareness about nondiscrimination with respect to underrepresented groups defined by gender, race, ethnicity, socioeconomic status and other characteristics. Have you considered issues related to the inclusion of talented students and faculty who have disabilities? If not, today is a good day to start doing so. This article shares an approach for

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this minority group along with others, while reducing the need for additional accommodations for individuals with disabilities.

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Biochemical careers are within the reach of some individuals with disabilities, in part because of the advances in assistive technologies that provide access to computers and software. However, the inaccessible design of labs, web resources, other technology, curriculum and pedagogy continue to erect barriers with respect to physical access, software and hardware, and teaching methods.

It is likely that more than 10% of students at an institution have a disability. Some are obvious (e.g., physical disabilities, sensory impairments), but most are not (e.g., learning disabilities, attention deficits, mental illness). Images of students with a variety of disabilities interacting with each other, faculty and technology are presented in [Figures 1–3](#). Perhaps a faculty member has received letters from a disability services office with the approved accommodations (also called ‘reasonable adjustments’) for a specific student, but it is likely that students with such approved modifications represent less than half of the students with disabilities on a campus. Additionally, if faculty members do not know the specific characteristics of potential future students with disabilities, how can they take steps to make their courses more inclusive? How can staff make their science laboratories more accessible? And how can administrators ensure that their services, web content and other offerings are accessible to a broad audience?

## Figure 1



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**Two students with disabilities interact with a faculty member in a science lab (Reused with permission from University of Washington DO-IT Center under a Creative Commons license)**

**Figure 2**



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**Two students with disabilities work together using a handheld computing device (Reused with permission from University of Washington DO-IT Center under a Creative Commons license)**

**Figure 3**

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**Software to enlarge text makes it possible for a student with a visual impairment use a computer (Reused with permission from University of Washington DO-IT Center under a Creative Commons license)**

An important step is to routinely apply universal design (UD) principles to the design of courses, materials, services and facilities. In so doing, they become more welcoming and accessible to all students and faculty, both with and without identified disabilities. Since they are proactive in nature, UD practices also minimize the need for additional modifications for individuals who have disabilities who wish to engage in departmental offerings in the future.

## **Universal design**

UD is an approach that can make a department or programme accessible to, and inclusive of, all potential students and instructors. It is defined by the Center on Universal Design as ‘the design of products and environments to be usable by all people, to the greatest extent possible, without the need for

adaptation or specialized design'. Put simply, the vision of UD is one of equal access; everyone who qualifies to take courses, to teach them, conduct a lab practical, use resources and/or otherwise participate should be able to do so. Rather than design departmental offerings for the average user, UD suggests they are intentionally designed for people with a wide range of abilities, disabilities, gender identities, ages, reading levels, learning styles, native languages, cultures and other characteristics. An audit is conducted from the perspective of individuals who may have learning disabilities and/or visual, speech, hearing and mobility impairments. For some, English is not their first language. Some may be older than the average student. Some may be technologically proficient and others may have limited experiences with technology. The goal is to make sure, regardless of these differences, everyone

- feels welcome,
- can get to facilities and manoeuvre within them,
- is able to fully benefit from resources and courses and
- can make use of equipment and software.

Although applying UD minimizes the need for accommodations for individual students, faculty and staff with disabilities, it is also important to have a plan in place to respond to requests for additional disability-related adjustments in a timely manner and to ensure that the faculty and staff are prepared to work with colleagues and students who have disabilities.

When communicating with individuals with disabilities, it is important to treat them with respect. For example, ask a person with a disability if they would like or require help before jumping in to provide assistance. Talk directly to the person with a disability, not through their companion or interpreter. When guiding people with visual impairments, offer them your

arm rather than grabbing or pushing them. Describe the content of charts, graphs, pictures and other content presented with visuals. If amplification equipment is provided in a venue, use it routinely without taking a non-response to the question “can you hear me at the back” as a justification not to use the microphone. Repeat any questions from audience members. Face people with hearing impairments and avoid covering your mouth, so that they can see your lips. Avoid talking while chewing gum or eating. Provide information in clear, calm, respectful tones. Offer directions or instructions both orally and in writing. And always avoid derogatory slang or negative descriptions of a person’s disability. For example, ‘a person who uses a wheelchair’ is more appropriate than ‘a person confined to a wheelchair’. After all, a wheelchair is not confining – it is liberating!

## **UD guidelines and examples**

The following subsections provide basic guidelines and a few examples of related questions that can guide faculty and administrators in making an academic department more accessible. For an elaboration and update of this content, consult DO-IT’s *Equal Access: Universal Design of an Academic Department* and *Making Science Labs Accessible to Students with Disabilities* in the ‘Further reading’ section of this article. Sections of this have been reused with permission from University of Washington.

### **Planning, policies and evaluation**

When planning or evaluating your facilities and programmes, make a conscious decision to consider diversity issues. For example, you could ask:

- Are people with disabilities, racial and ethnic minorities,

students with diverse gender identities and sexual orientations, young and old students and other groups represented in departmental planning and review processes and advisory committees?

- Do you have policies and procedures that ensure access to facilities, printed materials and electronic resources for people with disabilities?
- Do policies and procedures require that accessibility be considered when departmental websites are created and updated?
- Do you have a procedure to ensure a timely response to requests for disability-related accommodations? Is this content included via the departmental and/or teaching websites?

## **Facility and environment**

Ensure physical access, comfort and safety within an environment that is welcoming to individuals with a variety of abilities, racial and ethnic backgrounds, genders and ages.

- Are the parking areas, pathways and entrances to departmental buildings wheelchair accessible? What about the labs?
- Are all levels of departmental facilities connected via wheelchair-accessible routes of travel? Are accessible routes of travel easy to find?
- Are aisles kept wide and clear of obstructions for the safety of users who have mobility or visual impairments?
- Are parts of service counters and desks at a height accessible from a seated position?
- Are there ample high-contrast, large-print directional signs to and throughout departmental labs, administrative offices, classrooms and other facilities?



## **Support services**

Make sure support staff are prepared to work with all students, faculty and staff.

- Do staff members know how to respond to disability-related requests, e.g., provision of sign language interpreters?
- Are staff members aware of issues related to communicating with students of different races, ethnicities, ages and abilities?
- Are web pages, documents and other online resources designed to be accessible to people with disabilities and up to date with relevant legislation [e.g., in the UK, the Public Sector Bodies (Websites and Mobile Applications) (No. 2) Accessibility Regulations 2018]?

## **Information resources**

Ensure that departmental publications and websites welcome a diverse group and that information is accessible to everyone.

- Do pictures in departmental publications and on websites include people with diverse characteristics with respect to race, gender, age and disability?
- Are all publications, including those using Portable Document Format (PDF), available in an accessible format on department websites?
- Do departmental web pages adhere to accessibility guidelines or standards adopted by your institution or your department (e.g., the widely adopted Web Content Accessibility Guidelines)?

## **Courses**

Ensure that faculty members deliver courses that are accessible to all students and that academic adjustments are

provided in a timely manner.

- Do video presentations have captions?
- Do faculty members employ accessible web design practices for their content, including that presented using a Learning Management System?
- Do faculty members use accessible documents (e.g., PDFs)?
- Do faculty members employ instructional strategies that maximize the learning of all students by providing multiple accessible ways for students to learn?
- Do instructors provide multiple ways for students to interact with them and with fellow students to ensure that each student has an accessible way to engage?
- Do instructors use a variety of assessment methods to evaluate students?

## **Labs**

Are equipment and software in departmental lab facilities accessible to everyone?

- Is an adjustable height table available for each type of workstation?
- Can controls on equipment be reached from a seated position?
- Is accessibility-designed lab equipment used?
- Are issues related to disabilities considered in safety issues and emergency procedures?

## **Getting started**

A department might begin to address accessibility issues by creating a task force to explore ways of making the department more welcoming and accessible to everyone.

Members of the group could begin by consulting the resources listed in this publication, developing a list of action items and labelling each with a recommended deadline date for implementation and analysis of who will do what.

## Conclusion

There are growing numbers of individuals with disabilities pursuing post-secondary education. Applying UD principles has the potential to make academic programmes, including those in biochemistry, more welcoming and accessible to students and faculty with disabilities. The process may also lead to reduced needs for individual accommodations. Applying UD can contribute to the creation of a level playing field for students with and without disabilities and contribute to biochemistry fields of study and employment with their unique expertise and experiences.

## Further Reading

- *Universal Design: Principles, Process, and Applications*[uw.edu/doit/resources/popular-resource-collections/applications-universal-design](https://www.uw.edu/doit/resources/popular-resource-collections/applications-universal-design)
- *Equal Access: Universal Design of an Academic Department*[uw.edu/doit/equal-access-universal-design-academic-department](https://www.uw.edu/doit/equal-access-universal-design-academic-department)
- *Equal Access: Universal Design of Student Services*<https://www.washington.edu/doit/making-science-labs-accessible-students-disabilities>
- *Equal Access: Universal Design of Instruction*[uw.edu/doit/equal-access-universal-design-instruction](https://www.uw.edu/doit/equal-access-universal-design-instruction)
- *Making Science Labs Accessible to Students with Disabilities*[uw.edu/doit/making-science-labs-accessible-](https://www.uw.edu/doit/making-science-labs-accessible-)

[students-disabilities](#)

- *Accessible Science Equipment*[uw.edu/doit/accessible-science-equipment](http://uw.edu/doit/accessible-science-equipment)
- *The Center for Universal Design in Education*[uw.edu/doit/equal-access-universal-design-academic-department](http://uw.edu/doit/equal-access-universal-design-academic-department)
- *ADA Checklist for Readily Achievable Barrier Removal*<https://www.ada.gov/checkweb.htm>
- *Web Content Accessibility Guidelines*[w3.org/TR/WCAG21/](http://w3.org/TR/WCAG21/)
- *Accessible Technology*[uw.edu/accessibility](http://uw.edu/accessibility)

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