



Return engagement of the traveling *Joanne & Sheila Show.*

Over the course of several years, our Teaching Laboratories saw a marked increase in the number of students requesting assistance in laboratory classes.

We've been able to assist with many different functional limitations, while making the laboratory experience available to a wide range of students.



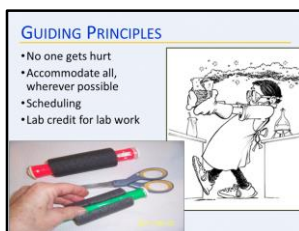
We've been challenged by a number of physical and mobility issues and by more recently by 2 students with very low vision.

→ Both of those have now survived general chem. lab and one of them has completed introductory organic chemistry.

We strive to meet our students' needs with reasonable accommodations **WHEREVER POSSIBLE**.

"Wherever possible" becomes a loaded phrase when department staff and the Office for Students with Disabilities consider what can, should and must be done to facilitate a student's participation in a particular activity, such as a lab class.

→ GUIDING PRINCIPLES



When we look at a situation, our priorities are clear:

- No one gets hurt. A student who *cannot, with reasonable accommodations, manage to work in a way that guards his/her own safety and that of others in the lab ...* shouldn't be working in lab.
- Our goal is to accommodate everyone who wants to learn lab skills, if at all possible.
- "Reasonable accommodation" (required by the Americans with Disabilities Act, the ADA) may include considerations of scheduling.
 - ✓ A student whose broken leg is confined to a cast and crutches for six weeks will be encouraged to reschedule into a quarter where the pain, awkwardness and mobility issues are not factors. We remind the student that he/she will have a better chance to give the class full attention and perform at his/her best.
 - ✓ A student who is permanently disabled is another case and delayed accommodations would serve no purpose.
- Lab credit for lab work. Curriculum & safety professionals across campus agree that
 - ✓ watching work is not the same as working;
 - ✓ lab class credit should be given to students who have completed the lab work.

A student who has trouble manipulating glassware can be given modified glassware, extra time or extra tools to assist, but must experience the work and make the decisions. →

Consult with

- Office for Students with Disabilities (OSD),
- Instructor,
- Lab TA
- Student **Out of the LAB thinking...**
 - Materials
 - Functional equivalents
 - Hardware store & others
 - Never overlook duct tape & super glue

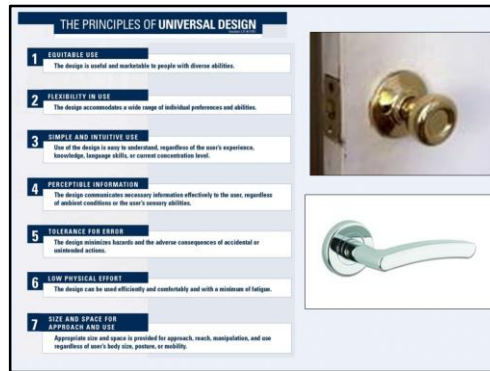
In all our attempts to make accommodations, consultation with

- the Office for Students with Disabilities,
- the Instructor,
- the Lab TA and
- the student has been our routine.

“Out of the LAB” thinking (sometimes resulting from brain-storming) can turn a difficult situation into a puzzle solved by teamwork.

Remember we have not “always done it this way.” Always is a long time.

→ UNIVERSAL DESIGN



If products and facilities are usable by all – to the greatest extent possible, without adaptation.

A low workstation may be installed with a wheelchair user in mind, but it functions well for very short student.

Door handles are easier for everyone, where knobs are impossible for some.

➔ **CHRONIC RESPIRATORY ILLNESS**



NC STATE UNIVERSITY College of Design

THE CENTER FOR UNIVERSAL DESIGN

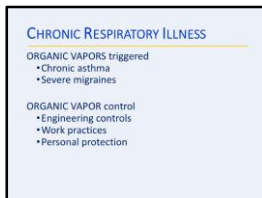
Box 8613 • Raleigh, NC • 27695-8613

1 800 647 6777 Info Request Line

919 515 3082 Voice and TTY

919 515 8951 FAX

<http://www.design.ncsu.edu/cud>



CHRONIC RESPIRATORY ILLNESS

In 2 cases over the years, chem majors have brought us concerns about sensitivities to organic vapors. In 1 case, the student had severe chronic asthma, but hoped to teach high school chemistry. The second student had severe, debilitating migraine headaches. In both cases,

- organic vapors were a known trigger.
- the student's remaining classes included advanced organic chemistry labs.

We were clear that our best option – for everyone involved – would be to control irritating vapors through chemical use & **engineering controls**, such as keeping bottles closed outside hoods & doing as much work as possible in the hoods. We agreed with our respiratory protection professionals that a respirator should be reserved for situations where other options have been tried and exposures are still not controlled.

We felt we were doing a creditable job in guiding students and TAs in techniques to control fugitive emissions. . . . In a crowded lab full of undergraduates it doesn't take much more than one 'failure to control' incident to turn a reasonably controlled environment into one that's intolerable for a sensitive person.

Our lab sections are normally 24 students supervised by one graduate TA, so the opportunities for vapors being released into the lab – entirely outside the control of the most sensitive student – are legion.

→ **respiratory protection program**



Each of these sensitive students was enrolled in the campus respiratory protection program and supplied with a respirator.

Our more recent student tried a HALF FACE RESPIRATOR →

- heat stress
- huge thirst
- need for frequent breaks to rehydrate & cool down
- Even with frequent fresh air breaks, as needed, exhausted after 3 – 4 hours in lab

→ PAPER



The Darth Vader jokes from the rest of the class were judged mildly amusing.

She then switched to a powered air-purifying respirator (PAPR), which circulates clean air into a Tyvek hood.

The battery powered pack – worn at the waist – was heavy and needed to be recharged on a regular basis.

The air entering the hood made enough noise to interfere with hearing some conversations, but it was possible to work for the entire period without as many breaks and the constant air flow was cooling.

→ HAND GRIPS



HAND GRIPS

In recent years, we've had several students who had trouble grasping and controlling tools. The trouble was often minimized by increasing the size of the grip on tools, notably pipets, pipettors and syringes.

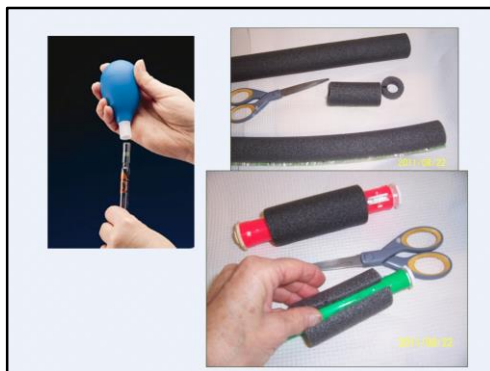
In our organic chemistry lab program, most students make extensive use of small syringes, and Pasteur pipets fitted with small latex bulbs to dispense 1- and 2-mL volumes. Both of these require small motor skills and a steady hand.

→



For one student, we replaced both items with a variety of syringes fitted with caps that allowed a larger-diameter grip. The increased diameter, plus a plan to work with both hands facilitated his work. With an assortment of syringes, caps, pipet tips and a tube of SuperGlue, he was ready to assemble his tools, as the needs arose.

→ Pipe insulation



For a student in General Chemistry, a pipettor was easier to use than a pipet bulb, but his hand tremor still gave him trouble. In this case, we added pipe insulation to his pipettors to increase the diameter of the grip & provide cushioning.

→ **CHRONIC BACK PAIN**



CHRONIC BACK PAIN

When we had a student with a chronic back injury we wanted to provide her a workstation that rested her back & legs. Unfortunately, our lab benches have no knee spaces, so a simple stool or task chair wouldn't work. At that time, we were able to purchase an industrial sit-stand stool designed to allow a worker to avoid standing all day, where sitting isn't an option. We found this worked very well and have recently used it again for a student who was 7 months pregnant. Both students finished the class.

The triangular base design gives the worker a chance to place feet close to the bench. It's stable; the seat swivels 16° in either direction and returns to center automatically. The seat tilts forward up to 15° and the seat height adjustable from 23½" to 33½" high. We paid about \$300, but the price is now close to \$700.

→ EXPOSED TOES



EXPOSED TOES

In our next case is one that has been repeated several times: a student with a broken foot or a bad ankle is sufficiently healed to stand and walk without crutches, but is still confined to an orthopedic boot to protect the vulnerable foot.

In all respects, she's ready to attend lab classes, except that her toes are unprotected where they protruded from the protective boot.

Since there was only room in the boot for the thickness of a sock, her toes are left vulnerable to chemical splash and sharps.

→ **Dance slippers**

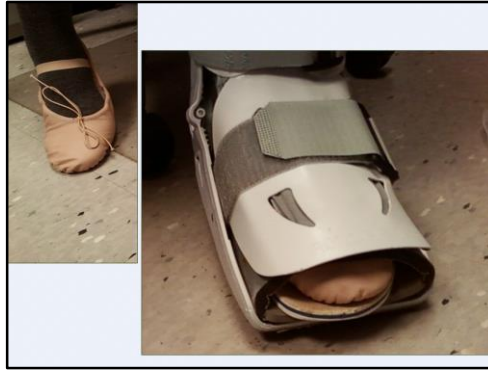


Our remedy in this case was a pair of dance slippers.

These are very thin slippers made of soft leather and available in the classic ballet colors of black, white and pink.

Other colors are available if you have a bit of leather dye.

→ Slipper in boot



Ballet slippers conform to the foot, are soft & flexible, and provide enough ease to be wearable. Because the slipper is a single layer of thin leather and the sole is only one or two thin layers, the whole slipper fits into the orthopedic boot without adding much thickness, protecting the toe from glass cuts and spilled chemicals.

→ other toe covers.



Since then, We've experimented with a number of other toe covers.

One of the more successful was a plastic beaker

→ **Beakers & beer cups**



A plastic beer cup works well, too.
Duct tape is essential.

→ WHEEL CHAIR CHEMISTRY

WHEEL CHAIR IN LAB



WHEEL CHAIR CHEMISTRY

Over the course of several years, we've had three students who use wheelchairs complete General Chemistry Lab.

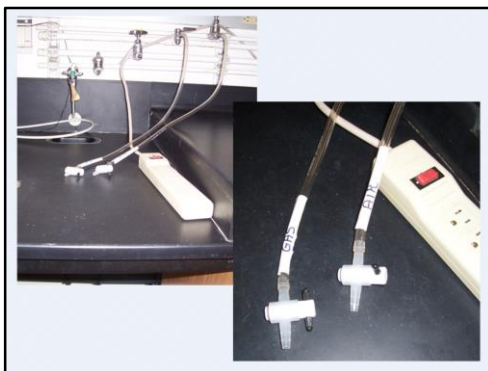
Two of them also completed Introductory Organic Chemistry Lab.

→ **accessible workstation**



We're fortunate to have an accessible workstation and hood in several of our labs.

→ OTHER TOOLS



In one General Chem Lab, Some additional modifications were made to bring services within reach of a seated student.

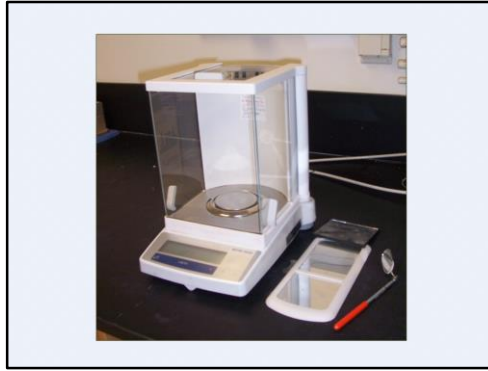
→ deep sink



A deep sink was modified with a drop-in shallow sink and long handles on the water faucet.

DI water was provided closer to front

→ mirrors



Some modifications were as simple as supplying mirrors to a student who had trouble seeing instruments from her chair.

→ **Biology...adjustable tables**





In our Biology department, adjustable tables have been purchased to allow a seated student to use a microscope.

LOW VISION

GENERAL CHEMISTRY

- Hot plate
- Digital tools
- Larger volume + larger glassware → more precipitate
- Raised work surface



Enlarged glassware

Larger samples

Large clear labels

- Hot plate
- Digital thermometer, pH meter, spectrophotometer (Spec20)
- Larger volume of reactants
+ larger glassware → more precipitate
- A shelf brought work nearer eye level

→ More tools

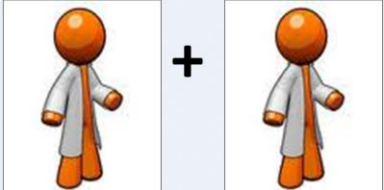


- Extra time in lab = space in two successive sections (2 TAs) is one of the things that requires advance planning
- Organization saved time.... drawer dividers, boxes, egg carton
- “Directed assistance”

→ DIRECTED ASSISTANCE in lab

DIRECTED ASSISTANCE IN CHEM LAB

- **Helper** = student lab assistant paid by CHEM Labs
- Not to teach, coach, direct, or make decisions
- **Enrolled student** must ask or direct **helper**
- Helper can confirm a reading but not read for student
- Previous experience ???



ASSISTANCE in lab

- must be safety trained
- all PPE rules apply
- Inexperienced is better – who knew?
Experienced student too close & too helpful.

→ reading magnifier



Student arrived with reading magnifier she had used in other settings:

- Best for type, as designed
- Freeze frame function good for instrument readings
- Available contrast changes

Racks & boxes helped with organization – saved hunting time

→ **Large print documents**



Large-print documents and tools
Were generated with a enlarging color
copier

→ safety exam

10. In the event of a fire in the Teaching Labs (not involving any person or clothing), a student should:

- A. evacuate the room, close doors & call Campus Police from a safe location.
- B. fight the fire until the emergency crew arrives.
- C. assist others where possible.
- D. A & C
- E. B & C

One version of the safety exam ran to 26 pages, as some questions needed 2 pages.

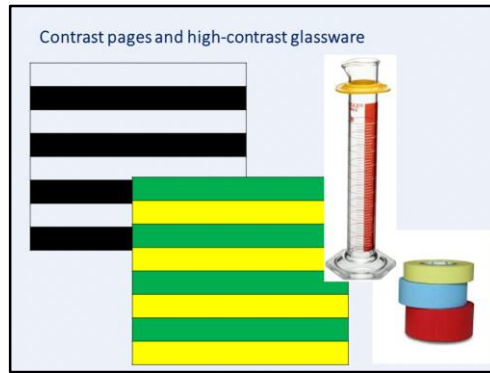
→ periodic table

Periodic Table for exams	
1 H Hydrogen 1.01	2 He Helium 4.00

Her version of the periodic table was many pages, plus an enlarged table for relationships

➤ Unfold large periodic table

➔ **High contrast lab tools**



Contrast backgrounds and high-contrast glassware

→ **Unsolved problems for GENERAL**

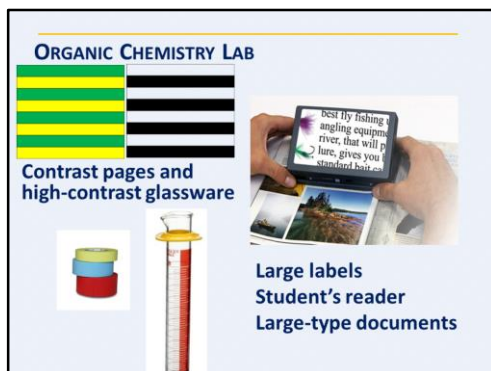
CHEMISTRY LAB

Unsolved problems for
GENERAL CHEMISTRY LAB

Viewing spectra *via* individual
spectroscope.



➔ **ORGANIC CHEMISTRY LAB**



As our students with Low Vision moved into **ORGANIC CHEM LAB**,

We used all the tricks we learned in general chem lab, plus a few new ones.

→ **Acrobat HD READER**



One of the great new tools suggested by a counselors was a new version of the **Acrobat HD** projection system which works with a free standing monitor. This helped with chalkboards and demonstrations.

Is anyone a CALIFORNIA TAX PAYER ???

You see your dollars at work....

CA Department of Rehabilitation

footed the bill for this \$2000 instrument, which become the property of the student.

We made a splash-resistant cover for the camera and covered the monitor with a loose plastic cover = Lab Coat for instrument.

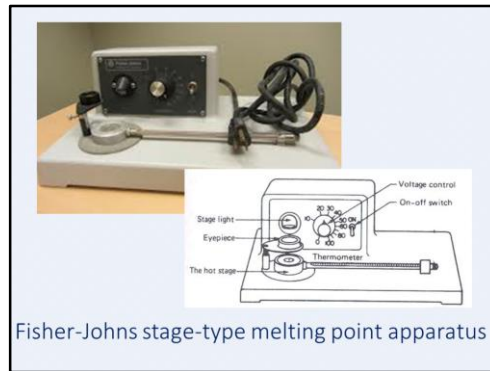
→ MELTING POINT INSTRUMENTS



Failed attempts to visualize crystals melting in the capillary :
Plenty for another talk...

- Web cam
- Cell phone cameras
- Borescope

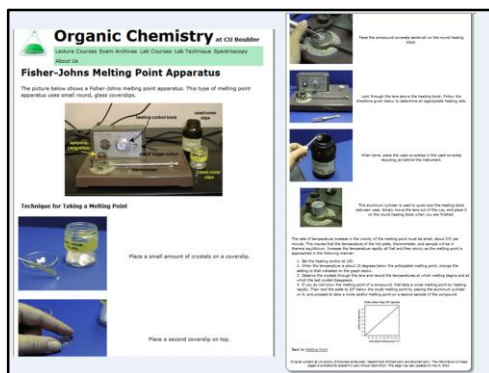
→ **stage-type MP apparatus**



Instructor found stage-type MP apparatus

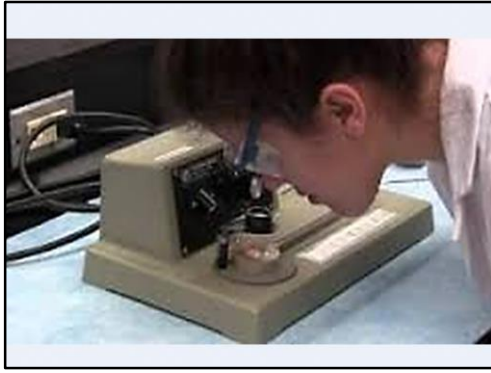
We replaced the thermometer with a digital thermometer with hold function (!)

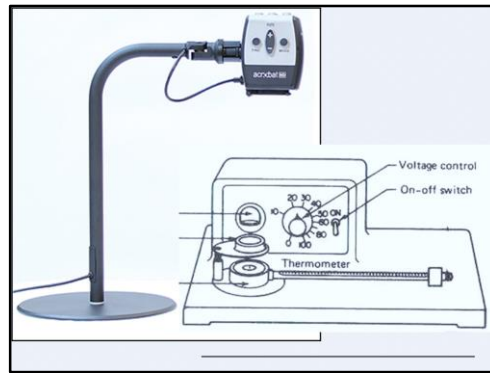
→ **Colorado University instructions**



A little hunting turned up the Colorado University page of instructions.

➔ Lily with Fisher-Johns apparatus





The combination worked well enough that we can say she saw the melt & recording the temperature.

→ **Recent changes on campus**



Recent changes on campus may have contributed to our having a large number of students requesting accommodations in recent years.

OFFICE FOR STUDENTS WITH DISABILITIES (OSD) & ADA TRANSPORTATION

- Our campus OSD reorganized and increased its staffing from one to several professional disability specialists
- Currently expanding again
- Our ADA Transportation Group has also become increasingly active and present throughout campus over the same time.

With increased services, it may be that the campus as a whole is more attractive to a student who anticipates needing services.

It has been speculated that increased numbers of students with disabilities leads to an atmosphere where the stigma of asking for accommodations is less. As it becomes easier to access services, the numbers of students with disabilities coming to our attention increases.

→ TEXT FOR LAB STUDENTS

TEXT for first day of lab

ADDITIONAL ASSISTANCE IN LAB: *If you have any special needs or conditions with which you would like to receive assistance in lab, please contact Stella Kennedy (skennedy@ucsd.edu) with information about your needs and your contact information. Examples might include pregnancy, limited mobility, vision or hearing, or any other condition that might need accommodations to work in lab. If you're not sure whether we can help with your situation, just ask & we'll get back to you as soon as possible.*

TEXT FOR LAB STUDENTS

For some years now, we've used a note on one of the forms each student receives on the first day of a lab class.

The TAs are asked to read it out to the students (see below).

We also requested that each TA post the name & email address of the Safety Coordinator on the board during the first lab.

With this information in hand, we may be getting more students who recognize that we're willing to help them, rather than assuming they need to drop the class when something comes up.

→ EMAIL MESSAGE

EMAIL TO STUDENTS

After registration, before class

- Let us help.
- Contact us as soon as possible.
- Some accommodations take real time to arrange.

EMAIL MESSAGE

We also started sending an email to all students registered for lab classes, asking them to contact us with any concerns or requests for help as soon as possible. We express our willingness to work with the student & the Instructor. We also mention that some accommodations take time to implement; we need them to take the initiative and contact us.

→ **Guiding principles**

GUIDING PRINCIPLES

- No one gets hurt
- Accommodate all, where ever possible
- Scheduling
- Lab credit for lab work



SUMMARY

However it came to us, we saw an increase in the number of students contacting us and requesting assistance in lab classes.

In each case, we had our best success when we went by our guiding principles, make no assumptions ahead of time, and work openly & honestly with everyone concerned.

→ **Most useful tools**

OUR MOST USEFUL TOOLS

- Procedures with documentation
- Creativity and willingness to think outside the lab
- Partnership

→ RESOURCES

RESOURCES

TEACHING CHEMISTRY TO STUDENTS WITH DISABILITIES: A MANUAL FOR HIGH SCHOOLS, COLLEGES, AND GRADUATE PROGRAMS. 4th Edition
American Chemical Society Committee on Chemists with Disabilities. Copyright 2001, The American Chemical Society.

YOUR OFFICE FOR STUDENTS WITH DISABILITIES

Sometimes called:

“Disabled student services”

“Disabled student service program (DSPS)”

Make friends with your on-campus experts. They know:

What’s required

What’s available

Whether there’s any money available

Questions??