

Accessible Science Labs: Specialized Equipment for the Visually Impaired

a presentation for



CVTC 2009

Tuesday, October 20th, 2009

**Presented by
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**Vision Resource
Centre - North**

Presentation Outline

- Background information
 - including the *Access Chemistry Project*, California
- Contents of Accessible Science kits at the various Vision Resource Centres
- Equipment demonstration
- Q & A

BACKGROUND INFORMATION



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Background Information

- common practices: anecdotes from AB schools
- literature review
- 'Access Chemistry' summer camp...

Access Chemistry Project, June 2008

- Where in the world is San Luis Obispo?
- About the camp...
- About the students...
- About accessible chemistry!



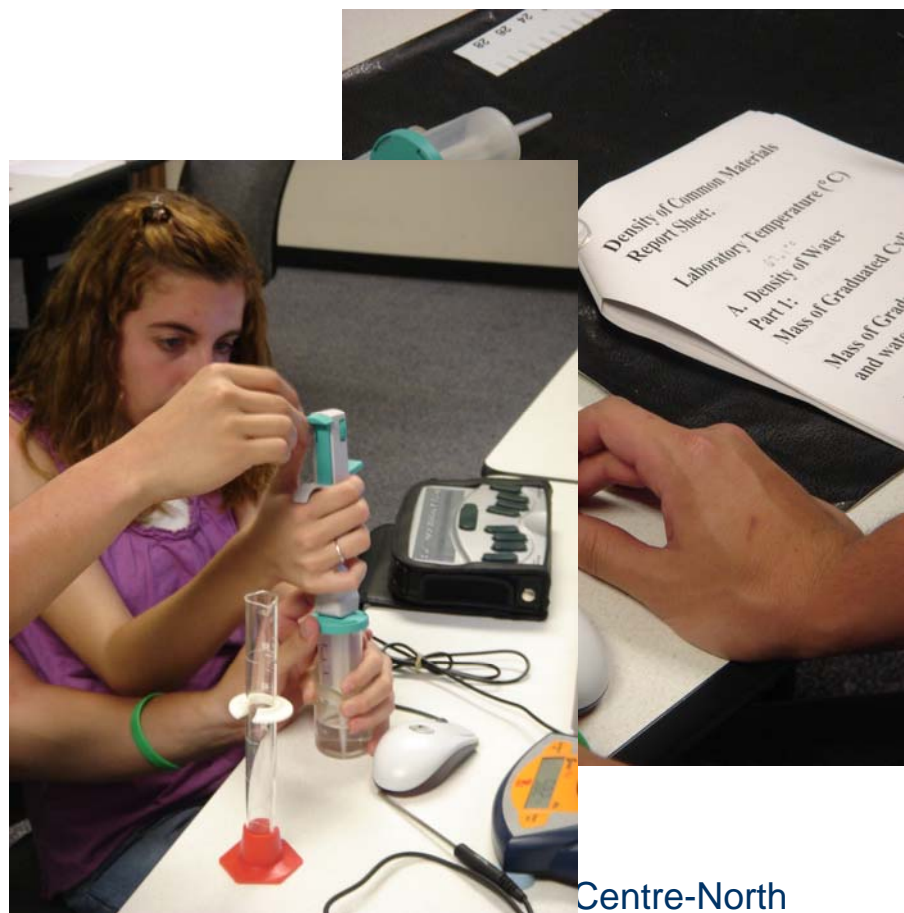
Kayaking in Morro Bay Estuary



Access Chemistry Project, June 2008

Example 1:

- Instead of a graduated cylinder...
- ...use an auto pipette instead!

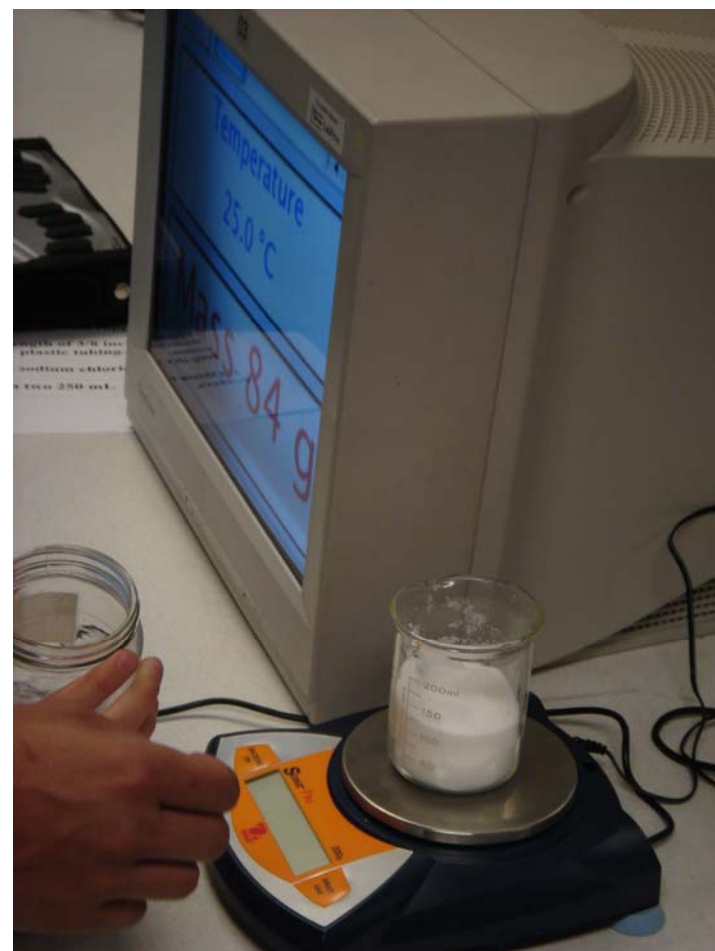


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Access Chemistry Project, June 2008

Example 2:

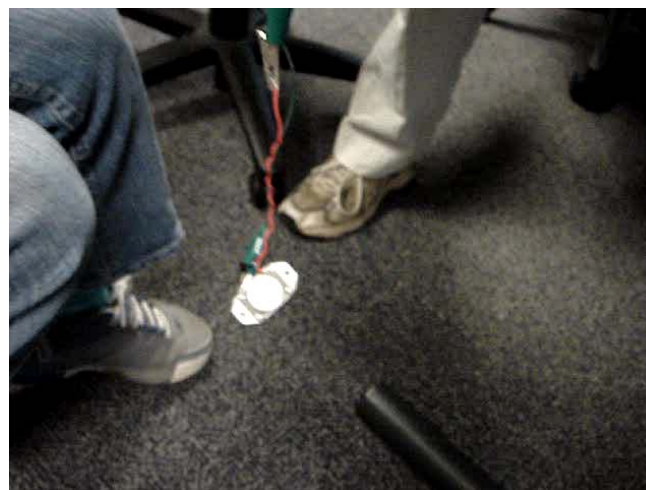
- Instead of visually reading a scale...
- ...use a digital scale and software instead!



Access Chemistry Project, June 2008

Example 3:

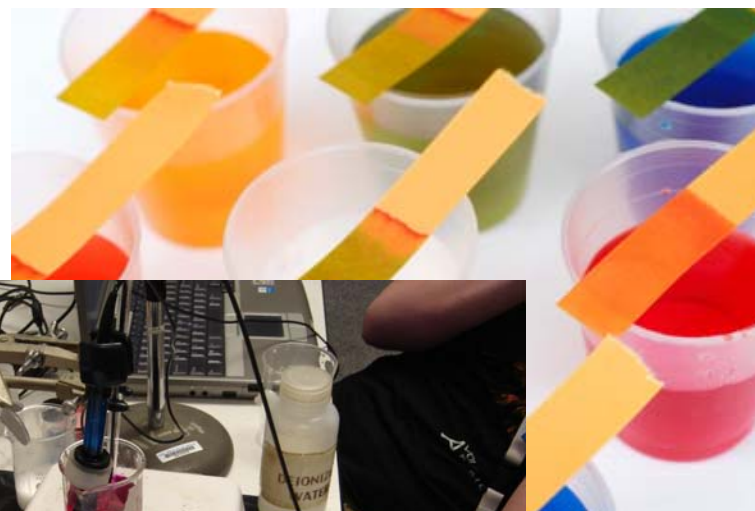
- Instead of creating a wet-cell battery to power a light...
- ...power a Radio Shack buzzer!



Access Chemistry Project, June 2008

Example 4:

- Instead of litmus paper to test pH...
- ...use a digital pH probe instead!



Access Chemistry Project, June 2008

A typical set-up using...

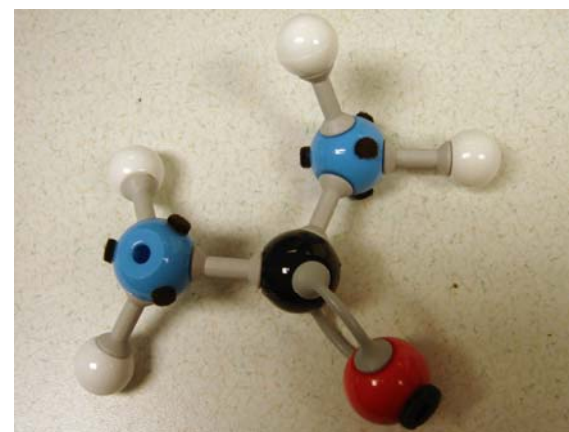
- a pH probe...
- a stirring hotplate...
- and an audible light sensor (SALS)



Access Chemistry Project, June 2008

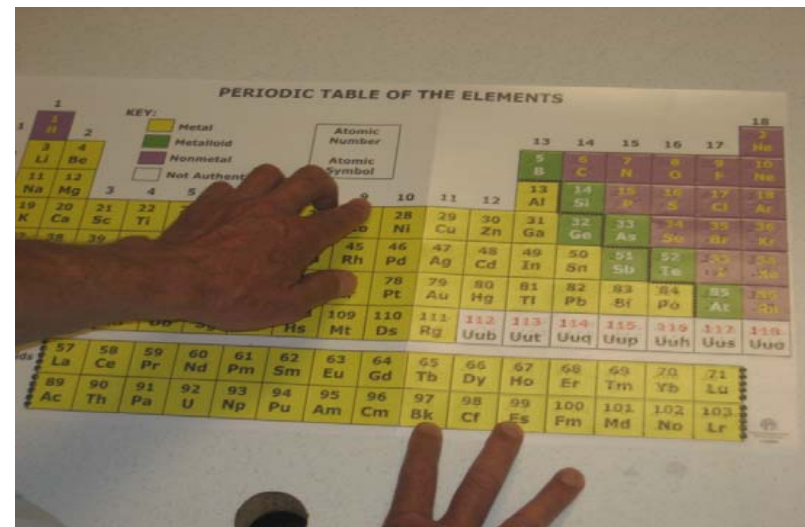
Other examples:

- braille labels
- tactile models
- good lighting



Large Print and Braille Versions of the Periodic Table of the Elements

The Braille Periodic Table is distributed by the *American Printing House for the Blind*



Electronic Periodic Table of the Elements Developed by Dennis Fantin and Art MacCarley




ACCESSIBLE SCIENCE KIT CONTENTS



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Vernier Equipment

- LabPro Interface!
 - made accessible when the LabPro software is used along with...
 - screen magnification or
 - text-to-speech software, with  additional scripts by PennState's ILAB



Vernier Equipment - CHEMISTRY

- Temperature probe
 - stainless steel
 - far more accurate and eliminates the use of a 'candy thermometer'
 - no need to visually read the temperature gauge!



Vernier Equipment - CHEMISTRY

- pH Sensor
 - measures the pH (acid or base level) of a liquid
 - Far more accurate than litmus paper
 - Requires special storage and possibly calibration!



Vernier Equipment - CHEMISTRY

- Light Sensor or TI Light Probe
 - measures the illumination in a general area
 - can be used as a comparison at the start of a chemical reaction before & after as a colour change indicator
 - each 'sealed' in a test tube for use with chemical solutions



Vernier Equipment - CHEMISTRY

- Conductivity probe
 - measures the capability of a solution to conduct electricity



Vernier Equipment - CHEMISTRY

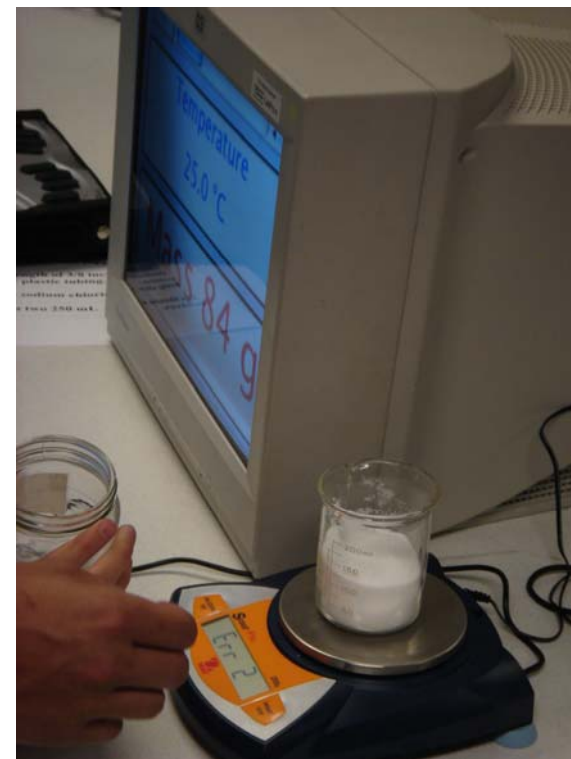
- Salinity probe
 - measures the amount of salinity within a solution



Other Items - CHEMISTRY



- OHAUS Digital Scale
(with USB-Serial adapter)
 - eliminates need to use balance scales or visually-read display
 - does require an extra step to configure with LoggerPro software



Other Items - CHEMISTRY

- Corning Stirrer Hotplate
 - with Teflon-coated stir bar
 - can be marked with braille to indicate temperature and stir-speed levels



Other Items - CHEMISTRY

- RAININ Auto Pipette
(manual model, non-electronic)
 - eliminates need to visually read meniscus with graduated cylinders
 - Various tip sizes can accommodate a wide range of solution volumes
 - Very accurate, even with small amounts



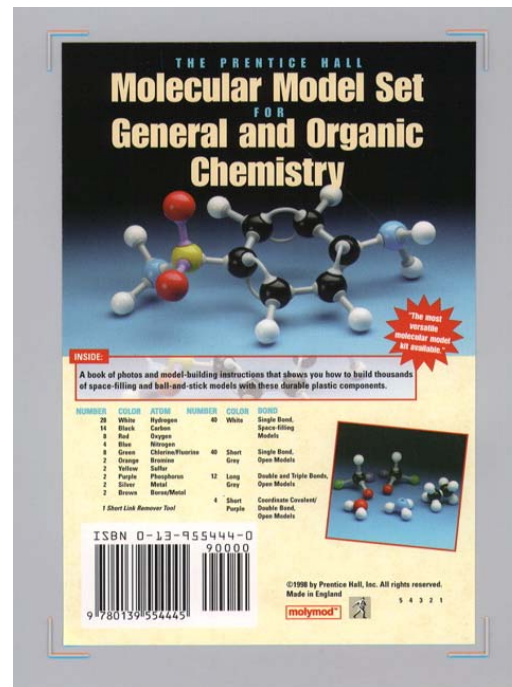
Other Items - CHEMISTRY

- BRIGHT Atom Kit
 - Swedish design
 - ‘mainstream’ product was designed originally by a mom for her son who is visually impaired!



Other Items - CHEMISTRY

- Molecular model set (not exactly as show)
 - can be marked tactually to indicate carbon from nitrogen, etc.



Vernier Equipment - BIOLOGY

- Blood Pressure sensor
 - Measures diastolic, systolic and beats-per-minute
 - Automatically releases pressure
 - Data recorded & graphed with spacebar



Vernier Equipment - BIOLOGY

- Respiration Monitor
 - measures volume of lung capacity during breathing
 - requires Gas Pressure Monitor!



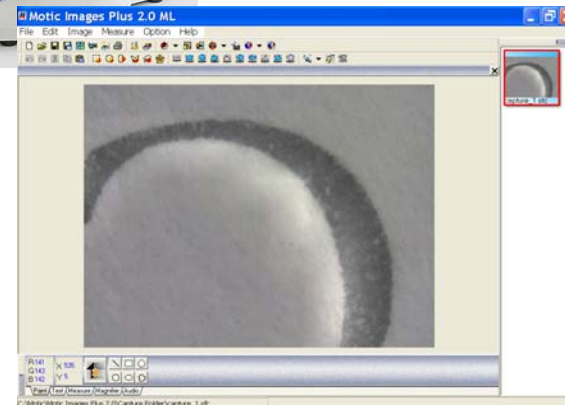
Vernier Equipment - BIOLOGY

- Heart Rate Receiver with Chest Belt
 - measures heart rate wirelessly
 - participant can be fully active while monitored!



Other Items - BIOLOGY

- Boreal USB Digital microscope
 - low-vision solution to viewing microscopic images on a PC with the Motic software
 - with protective carry case



Vernier Equipment - PHYSICS

- Voltage Probe
 - tests the voltage passes through various metals
 - can be used with Vernier Circuit Board



Vernier Equipment - PHYSICS

- Circuit Board

- provides hands-on for students to understand circuitry
- can be used with Voltage probe
- use of audible buzzer instead of light bulb
- requires batteries (D x 2)



Vernier Equipment - PHYSICS

- Photogates (x 2)
 - can be set up in sequence...
 - ... or used with bar tape to record velocity



Vernier Equipment - PHYSICS

- Laser Pointer(s)
(optional use with Photogates)

- would be used for larger objects passing through / beside Photogate(s)

- can be mounted with a laser stand



Vernier Equipment - PHYSICS

- Motion Detector
 - monitors movement as close as 15 cm...
 - ... or as far as 6 metres
 - comes with mounting clamp



Vernier Equipment - PHYSICS

- 3-Axis Accelerometer
 - can monitor acceleration along one, two and/or three directions of movement
 - Data can be recorded independently from LoggerPro connection
 - LabPro interface would require batteries (AA x 4)



Reference to handout
“Using LabPro
Remotely.pdf”

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Vernier Equipment - PHYSICS

- Sound Level Meter
 - records the decibels of sound objects
 - synchronized with the LabPro interface, or independently and data uploaded later



Other Equipment

- Totes-n-Toolboxes!
 - larger one – a mobile storage unit – works well for Chemistry equipment
 - smaller tool boxes suffice for Biology and Physics, one each



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Other Equipment

- Support Rod and Stand!
 - needed to attach sensors and/or probes
 - additional support rod can be attached directly to the Corning Stirrer Hotplate



Other Equipment

- Spill Trays!
 - in contrasting black and/or white colours
 - very large size
 - protects laptop and other digital equipment by containing spills



Other Equipment

- Measuring Tapes!
 - digital display for low vision users (in both caliper and tape measure models)
 - tactile-marked ruler for the braille-reader

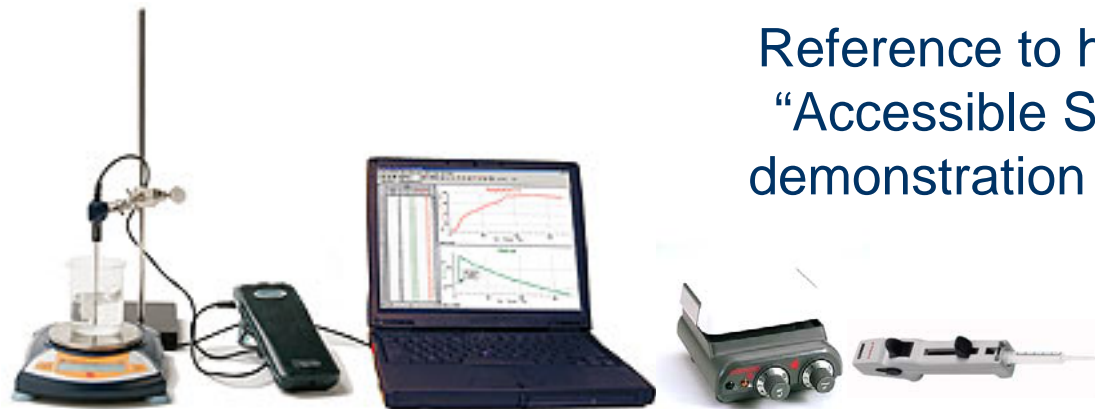


Additional Recommendations

- Cut Resistant Gloves
 - various fabrics such as Kevlar®
 - can be used with latex glove overtop



EXPERIMENT DEMONSTRATION

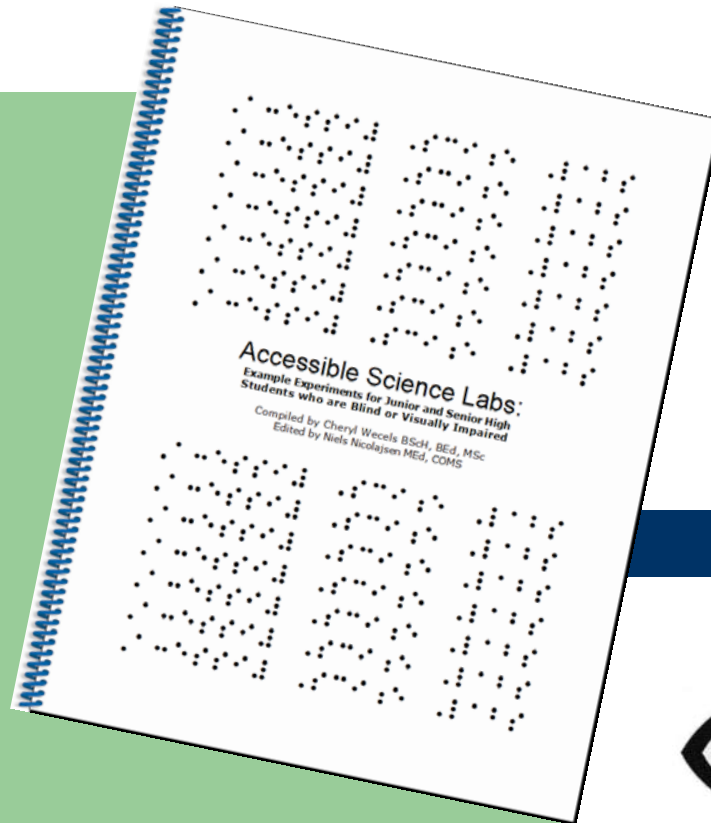


Reference to handout
“Accessible Science
demonstration lab.pdf”



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COMING SOON...



Resource Book:
*Accessible Science Labs:
Example Experiments for Junior
and Senior High Students who
are Blind or Visually Impaired*



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COMING SOON...

Objective #3 (of the VRC-North's
Accessible Science Project):

... build an electronic Periodic table
for use with an IVEO...

...or could possibly be built with:

- SALsystem (Mangold)
- Talking Tactile Tablet



QUESTIONS and ANSWERS

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