Teaching and Technology: Web Meetings for Laboratory Education

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This workshop explored the web meeting service Dimdim, its limitations, and its application to laboratory instruction by running an actual meeting with an off-site participant. Also Dimdim was compared to Skype and other web communication applications. Subsequent to the workshop the authors helped create a Forum on the ABLE website where applications that ABLE members can use for education can be described and linked. The Forum is called "Teaching Apps" and is located in the Resources dropdown menu.

Keywords: teaching, electronic, meeting, tools

Introduction

There can be occasions when biology instructional staff and students need to collaborate outside of a laboratory session. One example might be that a student doesn't understand how to use a spreadsheet program to construct a graph or perform statistical analysis of their data. Another example might be that students need to collaborate on writing a laboratory investigation work plan or a group report and it is not convenient or possible to meet in person. In these and similar situations a web (virtual) meeting service could aid instruction and collaboration. A candidate was the relatively new service called Dimdim (**http://www.dimdim.com**). This service has since been discontinued and currently only supports prior subscribers. A new alternative to screen sharing is now offered with the most recent version of Skype (5.1 for PC; 2.8 for Mac). Instead of using a webcam to display meeting participants, there is now a "Share Screen" capability that sends a window or full-screen copy of the host's desktop. This workshop highlighted Dimdim and not Skype.

During and after this workshop it became apparent that there are many computer resources that are suitable for education with respect not only to communicating with students, but also for simulating situations for analysis. For this reason the authors decided to help create a Forum on the ABLE website where applications that ABLE members can use for education can be described and linked. The Forum is called "Teaching Apps" and is located in the Resources dropdown menu (Fig. 1). For convenience, a Master Document (see Appendix) containing all of the resources will also be maintained and a link to it will be included in each Forum post.

The link is:
(https://docs.google.com/document/edit?id=1MF 5n5TrPUhKmEHr6VIPwJN2c6Olm3iEBNrdCI eRet0I&hl=en&authkey=COS405QJ).

ABLE members are invited to explore the Forum and download the document (which will be kept current and in synchrony with the Forum entries). In this way instructional staff can be kept apprised of some of the new resources available online. You are also invited to submit entries to the Forum, and if you would like them to be added to the Master Document you should send an electronic message to Todd or Bob (**tnickle@mtroyal.ca** or **hodson@udel.edu**)

Items that are in included in this Forum are currently organized under the headings listed below. Additional categories may appear as technology advances.

- Collaborative Learning Software and Strategies
- Computer Management and Communication Software
- Internet Meeting Software
- Scheduling Software
- Simulation Software
- Tutorial Authoring Software
- Videos

Figure 1. Navigation to the ABLE Forum for electronic resources applicable to biology laboratory teaching.

Appendix - Electronic Resources

[Suitable for both PC and Mac unless stated otherwise. Quotations are taken from websites.]

Table of Contents

Collaborative Learning Software and Strategies

- **CPR – Calibrated Peer Review** (free)
  http://cpr.molsci.ucla.edu/
  Calibrated Peer Review (CPR)™ is a Web-based program that enables frequent writing assignments even in large classes with limited instructional resources. In fact, CPR can reduce the time an instructor now spends reading and assessing student writing.

  CPR offers instructors the choice of creating their own writing assignments or using the rapidly expanding assignment library. Although CPR stems from a science-based model, CPR has the exciting feature that it is discipline independent and level independent.

- **JiTT** – Just in Time Teaching (free)
  http://webphysics.iupui.edu/jitt/

    Just-in-Time Teaching (JiTT for short) is a teaching and learning strategy based on the interaction between web-based study assignments and an active learner classroom. Students respond electronically to carefully constructed web-based assignments which are due shortly before class, and the instructor reads the student submissions "just-in-time" to adjust the classroom lesson to suit the students' needs. Thus, the heart of JiTT is the "feedback loop" formed by the students' outside-of-class preparation that fundamentally affects what happens during the subsequent in-class time together.

- **LON-CAPA** – LearningOnline Network with Computer-Assisted Personalized Approach (free)
  http://www.lon-capa.org/

    LON-CAPA is a free open source distributed learning content management and assessment system.

- **POGIL** – Process Oriented Guided Inquiry Learning (free) **http://www.pogil.org/**

    POGIL is an acronym for Process Oriented Guided Inquiry Learning. It originated in college chemistry departments in 1994; it is now being used in many high schools and colleges in a variety of subject areas around the country. POGIL uses guided inquiry – a version of the Socratic method in which students use carefully designed materials that guide them to construct new knowledge. It is a student-centered strategy; students work in small groups with individual roles to ensure that all students are fully engaged in the learning process. Its activities focus on core concepts and encourage a deep understanding of the course material while developing higher-order thinking skills. POGIL develops process skills such as critical thinking, problem solving, and communication through collaboration and reflection, making students more competitive in a global market.

- **Tidebreak** (license)
  http://www.tidebreak.com

    This commercial product consists of (1) TeamSpot: Meeting rooms and Informal Learning Spaces, (2) ClassSpot: Interactive Classrooms, and (3) ClassSpot PBL: Project-Based Learning and Studios/Classrooms. A free demonstration is available.

Computer Management and Communication Software

- **iTALC - Intelligent Teaching and Learning with Computers** (free)
  http://italc.sourceforge.net/ iTALC is an alternative to NetSupport School Tutor.

    iTALC is a use- and powerful didactical tool for teachers. It lets you view and control other computers in your network in several ways. It supports Linux and Windows 2000/XP (Vista support will come) and it even can be used transparently in mixed environments! In contrast to widely used commercial equivalent software, iTALC is free! This means you do not have to pay for expensive licenses or things like that. Furthermore the source-code is freely available and you're free in changing the software to fit your needs as long as you respect the terms of iTALC's license (GPL). Freedom in two ways!

    iTALC has been designed for usage in school. Therefore it offers a lot of possibilities to teachers, such as
    - see what's going on in computer-labs by using overview mode and make snapshots
    - remote-control computers to support and help other people
    - show a demo (either in full screen or in a window) - the teacher's screen is shown on all student's computers in real time
    - lock workstations for moving undivided attention to teacher
    - send text-messages to students
    - powering on/off and rebooting computers per remote
    - remote logon and logoff and remote execution of arbitrary commands/scripts
    - home-schooling - iTALC's network-technology is not restricted to a subnet and therefore students at home can join lessons via VPN-connections just by installing iTALC client. Furthermore iTALC is optimized for usage on multi-core systems (by making heavy use of threads). No matter how many cores you have, iTALC can make use of all of them.

- **Dropbox** (free; extra storage can be purchased)
  http://www.dropbox.com

    Dropbox is a utility that lets you create a directory that automatically synchronizes files saved in it to a "cloud computer". This means that if you're editing a Word document at home and save it in the dropbox folder on your Mac or PC (or even another operating system) then it will automatically be updated online. Go to work, open the dropbox folder on that computer, and you'll be working on the same document – no memory stick or diskette is involved. There are mobile versions of Dropbox for the iPhone/iPod Touch and other handheld comput-

ers. You could use this for itineraries and attachments for meetings so that you don't have to print out agendas etc. Dropbox is particularly useful with Documents To Go, an application that lets you edit Word, Excel, and PowerPoint files on a handheld computer (file transfer can otherwise be an issue). Storage starts out with 2 Gb free, but you earn 250 Mb (to a maximum of 8Gb) for each person you encourage to sign up by email invitation or by adding a link (such as **http://www.dropbox.com/referrals/NTQ4NDE0MDM5**).

- **NetSupport School** (license)
  http://www.netsupportschool.com/ PC only
     "NetSupport School is a class leading training software solution, providing Teachers with the ability to instruct, monitor and interact with their Students either individually, as a pre-defined group or to the overall class. Combining advanced classroom PC monitoring, real-time Presentation and Annotation tools, with an innovative customized Testing suite, Internet and Application control, real-time audio monitoring, automated Lesson Plans, Printer Management, Instant Messenger control, Content Monitoring and Desktop Security, this latest version of NetSupport School (10.5) rises to the challenge and requirements of today's modern classroom." A free 30-day trial is available. Windows 7 compatible. An example of cost: 25 to 49-user $49.35/install; there are discounts for a larger number of installs.

Internet Meeting Software

- **Google Apps Education Edition** (free)
  http://www.google.com/apps/
     "[It] offers a free (and ad-free) set of customizable tools that enable faculty, staff and students to work together and learn more effectively.
  ◦ Communication – Enhance your community's dialogue with hosted email, shared calendars and integrated video chat.

  ◦ Collaboration – Google Docs and Google Sites enable students and teachers to share documents online, at any time and from any location.
  ◦ Infrastructure and security – Easily integrate your existing IT systems with Google Apps while keeping your school's domain safe and secure."

- **GoToMeeting** (license)
  http://www.gotomeeting.com/fec/
     "GoToMeeting allows you to host an online meeting with up to 15 people – so you can do more and travel less. Using our Web conferencing tool you can share any application on your computer in real time. Attendees join meetings in seconds." A

free 30-day trial version is available. We have no experience with this application.

- **Skype** (free)
  http://www.skype.com/intl/en-us/home/
     Provides audio and video communication, screen sharing, and conference calls. In general works with both PCs and Macs.
  ◦ **Audio (Skype-to-Skype) calls**
        This type of audio call is between two computers. "You and your (contact) will need to have a headset (or use your computer's built-in microphone and speakers) to talk to each other. You can really improve the sound quality of your calls with a headset. You can also use Skype to make terrific value calls to phones and mobiles."
  ◦ **Video calls**
        Video calls are between two computers. Only a webcam is needed along with microphone and speakers or headset.
  ◦ **Screen sharing**
        This tool is implemented for a conversation between only two persons. "To share your screen simply call a contact and in the conversations window click **Share** > **Share Your Screen** in the IM toolbar (in Windows) or **Share** > **Share Screen** (on a Mac). You can even select if you want to share your full screen or just a part of it."
  ◦ **Conference calls**
        "Host or participate in free conference calls with up to 25 people. You can include people who are using Skype, and others on phones and mobiles."

- **WebEx** (license)
  http://www.webex.com/
     "WebEx is an easy way to exchange ideas and information with anyone, anywhere. It combines real-time desktop sharing with phone conferencing, so everyone sees the same thing as you talk. Some people call this web conferencing because of the web + phone sharing. Others call it online meeting because they take care of business online like they do in in-person meetings. No matter what you call it, WebEx is a great way to work with people in other locations."

Scheduling Software

The following is quoted with permission from an IT Activity Report at the University of Delaware:
   "A variety of calendars are used on campus: Paper and pencil, Outlook on an Exchange server, Google Calendar, iCal, etc. What can you use to schedule a meeting when the attendees use different calendar systems? What if the meeting includes people from other organizations? Several free tools are available on the Web for this dilemma. IT staff use three such

tools to schedule meetings. All these tools allow you to propose multiple meeting times and email a link to participants, so they can select the time(s) they are available."

- **Doodle**
  http://www.doodle.com

    A free polling site that allows you to set up a scheduling poll. Includes support across multiple time zones and support for three meeting options: "Have time," "Do not have time," and "Could make time if absolutely necessary."

- **Tungle**
  http://www.tungle.me

    A more sophisticated tool that allows you to create a profile that can upload availability from another calendar. If your contacts have Tungle accounts, you can preview meeting availability before sending out a meeting request. If you give Tungle access to your calendar, Tungle can also schedule the meeting and add it to your calendar once all the invitees have checked in.

- **When Is Good**
  http://whenisgood.net

    An easy tool that lets you drag your mouse over a grid to select times. The least sophisticated of these three tools, When is Good requires you to write down a "results code" so that you can view the results.

Simulation Software

- **Classical Genetics Simulator** (licence)
  http://www.cgslab.com/

    "CGS gives students the opportunity to perform test crosses with model organisms, much like a geneticist would do in a modern laboratory. Instructors can set the parameters for the populations that the students investigate, such as the number and type of traits in a population, the modes of inheritance, trait linkage, etc. It is then up to the students to determine which crosses to perform, and to interpret the data that they collect. CGS can be used as a primary laboratory module for introductory biology or genetics courses, or as a supplement to a hands-on genetics module with real organisms." Model organisms are *Arabidopsis*, fruit fly, and mouse.

- **DNAi** (free)
  http://www.dnai.org/

    Cold Spring Harbor has amassed a huge collection of film clip and other DNA resources. At this site you can create a lesson using Lesson Builder to let students go through a slide-show of DNA resources. There are also Flash interactivities (e.g. **http://www.dnai.org/a/index.html** that give students an opportunity to rediscover how the form of DNA contributes to its function.

- **Foldit** (free game)
  http://www.fold.it

    The following is a quotation from Wikipedia (http://en.wikipedia.org/wiki/Foldit) accessed 16 June 2010. **"**Foldit is an experimental video game about protein folding, developed as a collaboration between the University of Washington's departments of Computer Science and Engineering and Biochemistry (many of the same people who created Rosetta@home). The first public beta was released in May 2008. Foldit follows the Games With a Purpose paradigm in which players, as a side-effect of playing, help solve problems that computers cannot solve very well. An earlier example of this paradigm is the ESP Game (aka the Google Image Labeler).

    Foldit provides a series of tutorials in which the user manipulates simple protein-like structures, and a periodically updated set of puzzles based on real proteins. The application displays a graphical representation of the protein's structure which the user is able to manipulate with the aid of a set of tools.

    As the structure is modified, a "score" is calculated based on how well-folded the protein is, and a list of high scores for each puzzle is maintained. Foldit users may create and join groups, and share puzzle solutions with each other; a separate list of group high scores is maintained.

    The process by which living beings create the primary structure of proteins, protein biosynthesis, is reasonably well understood, as is the means by which proteins are encoded as DNA. Determining how the primary structure of a protein turns into a functioning three-dimensional structure – how the molecule "folds" – is more difficult; the general process is known, but predicting protein structures is computationally demanding.

    Foldit is an attempt to apply the human brain's natural three-dimensional pattern matching abilities to this problem. Current puzzles are based on well-understood proteins; by analysing the ways in which humans intuitively approach these puzzles, researchers hope to improve the algorithms employed by existing protein-folding software. In 2008, the Foldit project submitted solutions to the CASP protein structure prediction contest; results were announced in early 2009.

    Foldit is a mix of crowd sourcing and distributed computing."

- **JMol DNA modeling software** (free)
  http://www.umass.edu/molvis/tutorials/dna/
      This uses Java to create a 3D molecule of DNA that students can manipulate. Molecules can be toggled between space-filling and line drawing. Replication and transcription can be demonstrated. Major browsers (IE, FireFox, Safari) are all supported.

- **Rabbits and Wolves** (free)
  http://www.shodor.org/interactivate/activities/RabbitsAndWolves/
   "This applet allows the user to simulate how nature keeps its balance. [It] shows how wolves and rabbits would behave in their natural setting." A useful teaching approach is to challenge students to find conditions that allow a dynamic existence of all three species (rabbits, wolves, grass) for a certain number of iterations e.g. 1000.

- **Spongelab** (free trial; student subscription ~$20)
  http://www.genomicsdigitallab.com
      This game is geared to grades 10-12 and includes a variety of graphics-intensive challenges to help get students interested in the science behind several biological situations. Students can play "transcription hero" which involves manipulations that can modulate the numbers of mutations that occur. In addition there is a "History of Biology" game and some simulators for membrane transport and photosynthesis. It's somewhat slow loading, but is visually exciting with catchy audio and seems well thought out. Lesson plans for instructors are included and there are access levels that include a whiteboard for the instructor to help organize student learning. The developers encourage the sharing of accounts.

Tutorial Authoring Software

- **Adobe Captivate** (license)
  http://www.adobe.com/products/captivate/
      This authoring software functions like Wink but is more user-friendly. You can also include quiz questions to help guide your students through the exercise.

- **Adobe Presenter** (license)
  http://www.adobe.com/products/presenter/
      A single license for educators is $250, and a recent renewal was quoted at about $83 for one year (licensed by Clarix Technologies, Inc.). "With just a few clicks in PowerPoint, you can transform drab presentations into engaging Adobe® Flash® multimedia experiences. Easily add narration, animations, interactivity, quizzes, and software simu-

lations to eLearning courses.
   Key capabilities are:
◦ Easily create professional Flash presentations and self-paced courses complete with narration and interactivity.
◦ Import and edit video in any format and export as SWF.
◦ Record and edit high-quality audio.
◦ Help ensure consistency with branding and customization.
◦ Deliver advanced quizzes and surveys with question pooling and randomization.
◦ Publish content as a PDF file, preserving all of your animations.
◦ Create AICC- and SCORM-compliant content.
◦ Integrate with Adobe Acrobat® Connect™ Pro software to deploy, manage, deliver, and track content."

- **Wink** (free)
  http://www.debugmode.com/wink/
      "Wink is a Tutorial and Presentation creation software, primarily aimed at creating tutorials on how to use software (like a tutor for MS-Word/Excel etc). Using Wink you can capture screenshots, add explanations boxes, buttons, titles etc and generate a highly effective tutorial for your users."

Videos

- **Harvard University** (free)
  http://multimedia.mcb.harvard.edu/media.html
      Offers animations such as "Inner Life of the Cell" and various video clips.

- **Howard Hughes Medical Institute** (HHMI) (free)
  http://www.hhmi.org/ and
  http://www.hhmi.org/coolscience/
      A variety of resources include research, the Holiday Lectures on Science, and an interactive education site called "Cool Science". Note that there are DVDs and videos that are free (free as in "you don't pay for shipping, either") that have full public performance rights. These are available at **http://www.hhmi.org/biointeractive/ordermaterials.html.**

- **Nobel Lectures** (free) "The Nobel Prizes". Nobelprize.org. 17 Jun 2010
  http://nobelprize.org/nobel_prizes/
      "Every year since 1901 the Nobel Prize has been awarded for achievements in physics, chemistry, physiology or medicine, literature and for peace. The Nobel Prize is an international award administered by the Nobel Foundation in Stockholm, Sweden. In 1968, Sveriges Riksbank established The Sveriges Riksbank Prize in Economic

Sciences in Memory of Alfred Nobel, founder of the Nobel Prize. Each prize consists of a medal, personal diploma, and a cash award." Recipients give a lecture which is video recorded.

- **Technology, Entertainment, Design (TED)** (free)
  http://www.ted.com/
      "Riveting talks by remarkable people, free to the world." One great example is
  http://www.ted.com/talks/lang/eng/david_gallo_ shows_underwater_astonishments.html,
   and another is
  http://www.ted.com/talks/lang/eng/beau_lotto_op- tical_illusions_show_how_we_see.html

- **SimBiotic Software** (license)
  http://simbio.com/
      SimBiotic Software produces inquiry-driven virtual laboratories and interactive chapters for biology education. Students purchase license and self-printed workbook for $3.00 per simulation.

Mission, Review Process & Disclaimer

The Association for Biology Laboratory Education (ABLE) was founded in 1979 to promote information exchange among university and college educators actively concerned with teaching biology in a laboratory setting. The focus of ABLE is to improve the undergraduate biology laboratory experience by promoting the development and dissemination of interesting, innovative, and reliable laboratory exercises. For more information about ABLE, please visit **http://www.ableweb.org/**

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Although the laboratory exercises in this proceedings volume have been tested and due consideration has been given to safety, individuals performing these exercises must assume all responsibilities for risk. ABLE disclaims any liability with regards to safety in connection with the use of the exercises in this volume.

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