Analytical Sciences Digital Library – a Unifying Force for Analytical Science Education

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The ASDL, as seen with some of the links on its main web page in Figure 1 (http://www.asdlib.org), is more than just a repository of information for the use of analytical chemistry teachers, students and practitioners; it is a site that creates opportunities for input and interactions among the analytical science education community. Interactions within the ASDL on-line community gives chances for continual growth in the adaptation of curricular materials already posted on ASDL and development of new resources that can be shared with others. The ASDL on-line community goes beyond traditional social networking through a variety of tools provided to allow users to collaborate on projects, maintain their own blog spot, develop research and curriculum ideas, syllabi, and online texts, connect with colleagues, and work collaboratively in teams of students and/or faculty. The library Editor-in-Chief is Cynthia Larive, from University of California-Riverside, and the Managing Director is Theodore Kuwana, Emeritus Faculty Member from the University of Kansas. There are several editors and an Advisory Board, and the names of the individuals are here: (http://www.asdlib.org/asdlPeople.php). Note that all of the material in ASDL is peer-reviewed, which gives the user an advantage over the traditional online search engine, such as Google, in that suitable sites have already been identified by the reviewers as being an acceptable resource for the topic of interest. There are resources that will be mentioned here that can be, or have been used in classes such as, but not limited to quantitative analysis and instrumental analysis, which complement or can possibly replace traditional textbooks used for these courses.

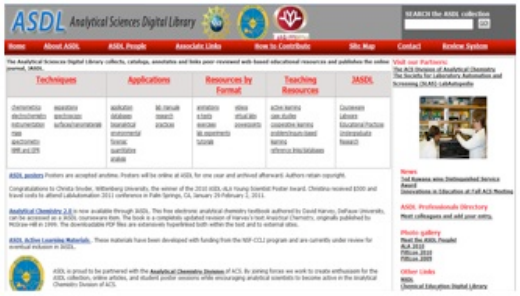

Figure 1: The main ASDL web page highlighting several options for the online community.

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Analytical Chemistry 2.0: David T. Harvey, from DePauw University, has submitted an electronic textbook for use to teach a traditional analytical chemistry/quantitative analysis course (http://www.asdlib.org/onlineArticles/ecourseware/Analytical%20Chemistry%202.0/Text_Files.html). The book has been updated from his text, *Analytical Chemistry*, originally published by McGraw-Hill in 1999. He has done an excellent job of continuing to update the material to allow for the book to be used BY ALL for free. The files are in a textbook format for those that would like to create a paper copy of the material to use. If the student would prefer to use the electronic version, the Adobe Acrobat (pdf) files are set up to allow the student to highlight text, insert their own notes. As per discussions with students, they greatly appreciate when they do not have to spend upwards of $200 for a textbook for one course, and this resource provides that option.

LabView for Analytical Chemistry: Mark Jensen, from Concordia College in Minnesota, has submitted a teaching module highlighting digital signal acquisition and processing (http://www.cord.edu/faculty/jensen/LabVIEW/index.html). The author has focused on several different applications, including calculating a signal-to-noise ratio, a boxcar averaging application, generating a noise/power spectrum, an actual analog-to-digital conversion, calculating the Nyquist frequency, an application on ensemble averaging, and digital signal filtering. An example of the analog to digital conversion can be seen in Figure 2. Jensen provides two options, one via the Labview™ virtual instrument format (.vi file), or standalone executable file where the LabView™ runtime engine, that is a free download on the National Instruments webpage. On the ADC web page, Jensen provides a general description of the mathematical equations needed for ADC, gives a copy of the front panel, as well as guiding questions to help realize the issues with selecting the proper range number of bits for an application.

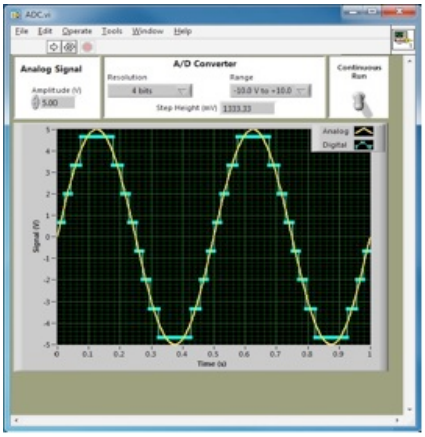

Figure 2: An image of the output of an executable file accessed through ASDL highlighting analog to digital conversion.

URL for simulation: http://www.cord.edu/faculty/jensen/LabVIEW/Simulations/Simulation%20Pages/ADC.html

Contextual Problem Approach: Lake Nakuru, Kenya: A team of faculty (http://www.asdlib.org/LakeNakuruPDFs/Guide%20to%20Instructors_1_17_2011.pdf) from across the United States has been able to construct a module highlighting an environmental problem in Lake Nakuru in Kenya (http://www.asdlib.org/lakeNakuru.php), where flamingos had been dying by tens of thousands since 1993. The goals of the module include being able to identify the problem with respect to what was killing the flamingos, generating a sampling plan, understanding the instrumental techniques used to identify and quantify the analyte (currently gas chromatography-mass spectrometry), as well as method validation of the EPA method 525.2. Also included is an instructor's guide which provides focused information to help instructor guide the students in each section. Note that this module has been constructed during ASDL curriculum workshops funded by NSF, typically during the summertime.

Some of the other resources in the library which not described in depth include (1) a forensic science lab-book contributed by Rob Thompson from Oberlin College that includes instructor and student procedures for the analysis of alcohol, arson, drugs, explosives, glass, gun-shot residue, fabric, paint, and pen ink (http://www.asdlib.org/onlineArticles/elabware/thompson/Home1.html); (2) a resource where Way Fountain, Dawn Riegner, from the United States Military Academy, and I provided links (most through ASDL, http://www.asdlib.org/onlineArticles/ecourseware/Spudich/Spudich_ASDL_Chem520.pdf) for several topics and learning objectives seen in instrumental analysis; (3) an interactive learning (http://www.asdlib.org/onlineArticles/ecourseware/Bullen_XRD/XRDModule_index.htm) module on X-ray Diffraction by Heather Bullen from Northern Kentucky University; (4) an online community (http://community.asdlib.org/) for analytical chemists to post blogs for classes, video exchanges, and the list goes on with possibilities. Note there several hundred different resources available through ASDL.

Over the years, there are several items of interest that have been generated about the use of the library for teaching. In using the active-learning modules, it was noted that the students were motivated when having to participate in this environment, more so than in a traditional lecture. The material focuses on student centered learning, is adaptable in a variety of teaching environments, problems are inter-dispersed within the material. Some of the issues are time and tailoring for individual classroom environments. All of the information is electronic (even using an iPhone) and available free of charge.

Future goals include completing textual material for the remainder of the analytical curriculum, develop more inquiry-based collaborative learning projects, more instructor guides and focus new contextual modules to include (1) an extension of the Lake Nakuru project focusing on toxic metals, (2) effects of acid rain on several environments, and (3) performance enhancing drug testing to include steroids analyses.

Attachment	Size
fig1p6fall2011cccenl.jpg	37.88 KB
fig2p6fall2011cccenl.jpg	31.48 KB