Website Evaluation Project

Drawing Lewis Structures

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Background:

In my physical science course we utilize the internet extensively. There is an interactive course website that contains message boards, a course syllabus and calendar, PowerPoint presentations, video clips and animations, tutorials and study guides, online assessments, and webquests. The utilization of the internet can take many forms and have many purposes. There are three main uses for website content integration in my physical science course.

The first use is introduction. An example of introduction is the webquest. A webquest proposes and question or a problem and then students access several websites to synthesize a product, often in the form of a report of presentation but can be anything such as experimental procedures, graphic organizers, and even homemade videos. The material is new and the students are required to make connections from the previous knowledge to the new concept. Websites that are used for this purpose need to be well written and organized and are most effective when they incorporate meaningful graphics, animations, and video clips.

The second use is for reinforcement. These sites can give an overview of the topic without such need for detail and integrated multimedia as needed in a site used for introduction. These sites can also not be as organized or visually stimulating, but they must demonstrate how to approach a problem or topic and give clear steps to follow in the problem solving method followed by sample problems and answers. These are the most difficult sites to locate since they almost by necessity require high levels of interactivity. These sites can be used as an informal assessment of student understanding.

The third use is as a tutorial or supplemental help. These sited are used by the student independently to clarify their own understanding or to activate prior knowledge. An example of a general tutorial would be a site on the metric system or scientific notation. These concepts have been learned by the students in prior course work but may students need polishing in these areas. Another type of tutorial I utilize is a site on a topic that is covered in my course but has multiple approaches to the subject matter. I will offer these sites as an alternative to students who struggle to understand the concept from class work. The baseline for these sites is that they have something to offer over the textbook presentation.

My partner, Jennifer Schwartz, and I have compiled and rated a list of 27 websites on the topic of Lewis Structures. The sites were rated on a scale of 1 to 5; 5 being the best. The ratings are not only based on content but more so on the utilization of the web medium, i.e. does the website make use of graphics and elements of design to enhance the delivery of content. A website with a simple text explanation or description with no added quality from the capabilities of the web received low ratings. In our view, the web delivery of such content offers no benefit over the traditional text book and as such is of little use. In the rest of this paper I will present the sites that represent the best in each

category of uses in the classroom. The full list of 27 with ratings is available on my website.

Websites for Introduction:

The first site review that fits this category is HyperPhysics: Lewis Dot Diagrams of selected elements (http://hyperphysics.phy-astr.gsu.edu/hbase/pertab/perlewis.html). This website stands out for introduction because it presents the Lewis structures the main group elements in the format of the periodic table. It also presents the electron distribution into shells in the same periodic table format. These pictorial representations allow student to identify patterns in the periodic table, electron configuration, valance electrons, and Lewis structures. While most sites focus on the rules for drawing the structures this site focuses on the underlying meaning of the structures and connecting them to other related topics. For 9th grade students identifying these connections and unifying themes is often not intuitive and more times then not a source of confusion. The visual representation provides a clear connection which should alleviate much if this difficulty.

The second site is also from HyperPhysics. It is their page titled Lewis Diagram for Compound Formation (http://hyperphysics.phy-astr.gsu.edu/hbase/chemical/lewis.html#c1). This page is a straight forward, clean, and very visual. It explains and diagrams ionic and covalent bonding through Lewis structures with plenty of pictures and simple yet accurate explanations. It also links to a second page that addresses double and triple bonds. This site could easily be a basis for a webquest or even a PIM activity.

The third site is from LSU Undergraduate Chemistry Information Depot on Lewis Structures Tutorial (http://www.chem.lsu.edu/lucid/tutorials/lewistutorial.html). This page is an animated gif file of how to draw the Lewis structure of water. It proceeds at a constant timed pace and presents a step by step illustration of drawing the Lewis structure for water. It prompts the student to work through the problem as the animation proceeds. The weakness in this site is that the animation is arbitrarily timed and the user has no control over the pacing.

The forth site is from Waterloo University titled Lewis Dot Structures (http://www.science.uwaterloo.ca/~cchieh/cact/c120/dotstruc.html). The site is excellent with plenty of enrichment information. It offers concise background information and then an in-depth look at structures and resonance which leads to formal charge. It provides plenty of examples with text and pictorial solutions. At the end of the site it devotes a section to exceptions to the octet rule and finishes with confidence building questions with pull down menus for hints. This site would be used in my more advanced 9th grade Physical Science sections.

The last site in the introduction category is from Fordham Preparatory School. It is titled Science Help Online-Chemistry: Lesson 3-8 Lewis Dot Structures (http://www.fordhamprep.com/gcurran/sho/sho/lessons/lesson38.htm). This site is basic but well written and clear. It would be ideal for a lower performing section of 9th graders. It has simple and direct steps to construct structures supported by large clearly constructed images. It ties electron configuration to Lewis structures and offers

additional practice in the form of worksheets. The downside is that the practice worksheets do not provide answer or guided samples.

Websites for Reinforcement

The only site under reinforcement is a site that I have used for a couple of years in my course. It is from St. Olaf University's General Chemistry Tool Kit (http://www.stolaf.edu/depts/chemistry/courses/toolkits/121/js/lewis/). The site gives the user 41 compounds to select from. Starting with a skeletal structure indicating only the atoms and single bonds connecting them, the user can practice constructing Lewis structures by clicking on the atoms to add lone pairs and the bonds to add bonding pairs. The site provides a table showing total valence electrons, the total lone pairs, and total electrons in each type of bond. It also displays the charge. When the user is complete they can check there structure and see resonance structures. Students have responded well to this site since it is so interactive and provides instant feedback. This site works well for students working in pairs or small groups which will take advantage of peer tutoring.

Websites for Tutorial

The first site for use as a tutorial is a site from Pasadena High School called Drawing Lewis Dot Structures of Simple Molecules (http://michele.usc.edu/cttc/GNiles/lewisdot.html). This site is a quick and visual explanation starting with the most basic structures of atoms and molecules then progressing to atomic structure. This site is geared towards the more advanced physical science student. It's advantage over the use of print resources is the vast amount of examples and visual representations.

The second site in this section is from the UCLA Department of Chemistry, titled Drawing Lewis Structures (http://www.chem.ucla.edu/~lbs/lewis.html). The site is more basic then the Pasadena site and contains a detailed step by step procedure with examples. This site is an exemplary sample of many tutorial type sites available from our research it is clean, lacking distractions, and straight forward. It is a perfect site for the student who missed the instruction or who needs to resolve misconceptions about the method of constructing structures. For reoccurring themes like Lewis structures this site and the many similar to it offer a quick reference for students.

Conclusion

When selecting websites for use in the classroom it is important to consider several factors. First, like all classroom resources, you need to consider your audience. Second, consider your expectations of what you want students to get from the site. For many purposes other media or methods are more meaningful. Third, consider the quality of content and design of the web sites. Poorly designed sites can be more of a distraction to students and can plant misconceptions that are difficult to root out.

Lastly, to effectively integrate web resources into the classroom organization is key. Having your own site, even a very simple page, with instructions and links posted can streamline the entire process. Student's can effectively work at their own pace and the class as a whole is saved the chaos of misspelled and mistyped URLs. Well researched and well presented web resources can be a highly effective teaching tool.