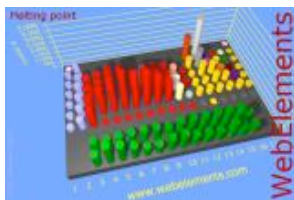


WebElements

<http://www.webelements.com>

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Motivation

The initial aim of WebElements was simply to see if the world-wide web had anything in it for chemistry. It clearly did given that it was possible to display a periodic table, and I've dabbled with using the web ever since.

Initially, I simply wanted WebElements to be a resource, a place where one could find respectable referenced information. A little later, I developed different visual displays for the numerical data, including interactive Flash plots in a number of different styles. I wanted students to realize that different data sets are best viewed in different ways.

I was keen to discover whether one could use the web to make students more active than passive in terms of their learning strategies. For example, textbooks tend to address the same few key properties in terms of periodicity (e.g., ionization energy, electronegativity, melting point, etc.) I wanted students to discover for themselves other examples of periodicity not covered in their textbooks. The idea was to make the information available and to invite them to research the

Learning Activities

WebElements is a place online for students to explore periodicity by enabling them to acquire data, and to analyze it. It is also a source of information for the chemical elements and simple binary compounds. In practice, WebElements now contains many graphs and other visual displays of many properties so while the drudgery of acquisition of data is not necessarily present now, the exciting analysis is.

It is interesting that students often expect all properties to show periodicity, when of course they do not. So, I am looking for students to assess the data critically and to develop for themselves an understanding of the relationships between the elements.

I suggest students study non-numerical properties as well. For example, WebElements contains structural information on the elements and many compounds, allowing structural periodic relationships to be explored as well.

The amount of peripheral information is expanding. One reason for this is simply to build up the amount of general interest information and to enhance the "wow" factor for chemistry. One of the next features in WebElements will be a showcase of some stunning photography of minerals linked to more academic information related to those minerals.

WebElements contains a news section highlighting recent news related to the elements and also a forum area where users are invited to ask and answer questions related to the period table and more diverse areas of chemistry as well. Students should be encouraged to participate in the forum area.



Teaching and Learning Impact

I find many of my students use the resource quite regularly throughout their course. In fact, many others from around the world do so as well given that the site traffic averages 35000 distinct users per days every day over the last year (2004).

I find that students do not critically assess the data from the different online periodic table resources (e.g., are the numbers plausible, from where does the data come originally?). Too often, the first figure or comments latched upon is the one that will do (see teaching tips). Students in Sheffield often use the resource well beyond introductions to the periodic table, and information from WebElements is often quoted back at me in subsequent courses involving students writing their own web site and in other exercises.



Teaching Tips

Encourage students to explore the information within WebElements. In particular, WebElements is a place online for students to explore periodicity by enabling them to acquire data, and to analyze it. Use the many graphs and other visual displays to understand the periodicity of the data and to appreciate the immense scope and usefulness of chemistry.

I find students (in general) do not critically evaluate the data and do not compare data from different sources. They do not ask where data comes from originally. Try getting students to access information from WebElements, textbooks, and other periodic table sites and to make comparisons. Ask the students to consider why, say, the melting point of platinum is one value in WebElements and perhaps a different value elsewhere. Which is right, or could both be right, and if so, how can this be? These comparisons would make a good exercise in critical evaluation. This is actually part of a much wider problem. Too many students these days believe far too much of what is

them to research the possibilities.

Background

In the earlier phases, WebElements was a general resource for undergraduate students, and perhaps for 18-year olds prior to university entry. Over the years, many teachers have written explaining how WebElements has acted as a data repository around which teachers/lecturers have designed activities for their students. The nature of the web, however, meant that very soon younger and older users were all using it, in the former case for projects at school, and in the latter case as a source of data. I was getting a lot of e-mail asking for more features and more information. I therefore developed a "scholar" edition containing a subset of the main data more appropriate at the 14-16 age group. One of the aims was to cut down on information overload.

I assess the resource myself interminably using online questionnaires. I have a set of feedback data from 25000 correspondents and some 30000 responses from the web site.

WebElements now contains several thousand graphs displaying periodicity in many different ways. Some of these are interactive. For example, see: <http://www.webelements.com/webelements/properties/text/image-flash/melting-point.html> where 5 different devices are used to display melting points for the elements in the periodic table.

The usefulness of WebElements to the educational community is recognized through a series of awards over the years. For example, WebElements is winner of 2002 Sci/Tech Web Award from Scientific American. WebElements is listed in the BBC online Education Web Guide as "a brilliant site with all the information required at A level chemistry and beyond..." WebElements is rated as one of the MARS Best of Free Reference Web Sites of 2001. In the UK, I was awarded the Royal Society of Chemistry HE Teaching Award for the development of WebElements. More recently many new textbook refer students to Web Elements for data.

Reflections

It took a while for me to realize that many students require something more than immersion in the data related to the chemistry of the elements. It is clear that many students require something that also is "interesting" in terms of relevance to the real world and that WebElements is in need of more narrative material.

WebElements has bulletin boards, news areas and a number of other features. I'm looking to bring all these features into a single area in the near future, which should improve drastically the usability of the "community areas" of WebElements. The software for this is now in place on an experimental server and this system also allows the seamless incorporation of online courses using Moodle (moodle.org) as the delivery system.

At peak times, WebElements accounts for up to 50% of Sheffield's web traffic (65 million page impressions minimum in the last 12 months, ca. 35000 users sessions every day over the last 12 months), which is great, but there are resource implications. For instance, there is a heavy cost (server traffic) which the University will bear for only so much longer. We are seeking ways to attract funds and income to cover such costs in the future.

WebElements has led to my development of related, but not incorporated, sites such as the Orbitron (www.shef.ac.uk/chemistry/orbitron/ - a gallery of atomic orbitals) and The Symmetron. The latter site will explore the symmetry of elements within molecules through animations.

too much of what is written on the web.

WebElements now has a wiki built into it and it is surprisingly underused. Wikis (WikiPedia is the best known) are fantastic communal document development systems ideal for students to pool resources. Teachers could get students to contribute to this. Writing about chemistry is a great way to understand it.

WebElements will contain a project area where students can publish their own projects/essays and hopefully some prizes will be given to recognize better projects. The idea is to provide a vehicle where students or groups of students can publish projects and know a wide readership is guaranteed.

WebElements will publish some online courses using Moodle (mooodle.org) as the delivery system. Moodle is a powerful open source system that allows students to enroll from anywhere at a minimum cost. I shall also be looking to find ways for external course developers to contribute so we can provide a place for anyone to publish relevant courses. I should also like to explore the possibilities of getting students to write their own courses using Moodle - a recognition of the fact that one of the best ways to understand a concept is to teach it.