Citation
Palmer, W. P. (1987) The world wide web and chemistry textbooks on line ASERA 97- 28th Annual Conference of the Australasian Science Education Research Association, City West Campus, University of South Australia, Adelaide, South Australia, July 4- 7.

Abstract

This paper illustrates the educational uses of the Word Wide Web in a university situation; it gives an account some of the ways in which the World Wide Web and other information technologies have been used to extend the scope of the history of science generally and the history of chemistry in particular. I observed that the World Wide Web contains a huge number of classical and literary works online, whereas the number of scientific works online is comparatively small. I have taken three actions to try to remedy this deficiency.

i) I set up a WWW page called 'Science Textbooks and Historical Science Online', which provides links to science books, which are available online. This WWW page, which was very small has now grown and I receive quite a lot of interested comment.

ii) I found a sponsor who has agreed to put 12 chemistry textbooks online, if I could form a committee of knowledgeable and interested people and get some agreement on what those textbooks might be.

iii) I have started a web page in which a nineteenth century chemistry textbook by Robert Avey Ward is being put online.

I hope that these actions will improve the research tools available to those interested in the history of science.

THE WORLD WIDE WEB AND CHEMISTRY TEXTBOOKS ON LINE

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ABSTRACT

This paper gives an account some of the ways in which the World Wide Web and other information technologies have been used to extend the scope of the history of science generally and the history of chemistry in particular. I observed that the World Wide Web contains a huge number of classical and literary works online, whereas the number of scientific works online is comparatively small. I have taken three actions to try to remedy this deficiency.

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INTRODUCTION

It is a matter of some interest that many academics are setting up their own WWW pages. Where can they obtain technical help to set up WWW pages? What help do they get from the community of scholars? What help do they get from their institutions ? Who controls the content of WWW pages? What reasons do academics have for setting up WWW pages? Martin 1997 has put online the results of a survey from the University of Western Australia which he carried out to answer some of those questions. The answers to some other questions posed may be found within this paper or to have answers dependent on the degree of support of the university involved.

This paper is largely anecdotal, but it occurred to me that currently many WWW pages are being established, but to the best of my knowledge, there is little 'case study' information available about the process of setting up a WWW page and the reasons for doing so. For the purposes of this paper I will try to record this in the field of the history of science and science education. I should also put on record that my own faculty and university have been supportive of the pages I have written.

There is a sense in which establishing a WWW page is like writing a book, but its display, which is analogous to publication is very much easier than publishing a book, as editorial controls are less demanding. However there is a major difference between publishing a book and putting a WWW site online. A book has to be complete, perhaps even perfect at publication, whereas it is acceptable and indeed common practice to put a WWW site online whist incomplete (under construction -as the jargon goes). The site is then improved consistently - perhaps over an extended period. But both authors of books and those who write WWW pages feel a sense of achievement in that they have created something new. This constant change has implications for referring to pages in research since they frequently appear and disappear and are changed without notice. Thus if I refer in a paper to some idea or phrase on the WWW, it may have disappeared or have been altered by the time that the reader tries to refer to it. I think it is largely the transience of WWW pages and other information technology (IT) products that makes them suspect to the research culture.

One could claim that the WWW is an invention that parallels Caxton's invention of printing, since it opens up authorship much more widely than ever before in the history of the human race. It is interesting to note that "The Web was initially developed at CERN to serve its constituency of high energy physicists" (Levy, 1993). For a more detailed history (see Leiner, B. M., Cerf, V. G., Clark, D. D. et al, 1997) and this information is available on the WWW or in print. One can see from the time-line in the online version that the take-off for the WWW was late in 1993. This is confirmed for example, by the fact that Engst 1993, in his excellent handbook of the internet scarcely mentions the WWW.

There is thus a mix of the creative instinct and personal vanity and the technological equivalent of "keeping up with the Jones' "in attempting to put a WWW page online. There is also the desire to promote those academic areas which are of personal interest and to ensure that they are easily accessible to others. In September 1996, I set up the first part of my WWW page: in my own case several factors played a part.

(i) In my teaching I was introducing my students to the WWW, so both they and I were discovering new materials at the same time.

(ii) I, with six colleagues from the Faculty of Education, was undertaking a University of London Certificate in Online Education and training using Computer Mediated Communication.

(iii) In my doctoral studies from Curtin University I have become very much involved in the history of chemistry/ science and from those studies I have developed a specialised interest in the history of the chemistry textbook.

(iv) I undertook a short course (2 afternoons) in writing Hyper Text Mark-up Language (HTML). From this I learned some of the basic principles, without achieving speed or great competence.

(v) I have built up my own personal library of old chemistry/ science textbooks. This has been very useful as it enables me to have a choice of books when thinking of which books to put online.

Relating to (i) and (ii) above, I had developed an interest in search engines which has provided me with an opportunity to practice search techniques on the WWW. This has led to spending much time surfing of the web and has allower me to appreciate exactly what is available on the WWW. To encourage my students to use of the WWW for research, I included a section on using search engines in one of the units that I teach. The WWW/Search engines figure prominently as one of the skills that students need- that is to be able to search the WWW to find a variety of information. It is interesting to note that others also value the WWW as a research tool for example, Barry (1996). Liu (1993) has written a useful general introduction to Search engines on the WWW. Moody's (1996) article explains why people are public-spirited enough to set up search engines: the answer lies in the advertising revenue that can be generated.

Relating to point (iii) and to my experience with the WWW, I made the observation that there are very large numbers of complete books online, but only a tiny fraction of them relate even vaguely to science. There are many sites that list huge numbers of online books eg CARRIE: A full-text Electronic Library : Gutenberg Project-A List of Literature by Author: University of Virginia: English Electronic Texts Resources, etc.

I thus saw a need to provide a WWW site that linked all the full text science books that exist on line. I had noticed that there were few/no sites performing this function, so I thought my site concentrating on this might fill a need. It is the spotting of gaps in existing provision that is an important feature of deciding on writing a useful WWW page.

I was however aware at the outset that the project, though interesting, in essence provided nothing new, as it provided connections to existing sites. I thus felt that it was also essential to provide something that was not available elsewhere. I am thus setting up a 19C school chemistry textbook online. When complete it should be the first such book available online.

MY FIRST WWW PAGE

By October 1996 I had decided, the materials that I wanted put online. I had found about 30 sites that had complete books online. There were/are no complete chemistry nineteenth century textbooks online. I thus widened the scope of the site to include all areas of science in all periods of time, even including the present day.

I was very impatient to put this online, so as there was an offer to write WWW pages and put them online at reasonable cost, I arranged for this to be done from my research funds through the information technology centre. The page was online fairly quickly, though there were some minor errors that took a little time to change. I have added to the initial listing quite considerably since I first wrote it and it continues to expand.

Early in 1997, the Faculty of Education became more interested in improving its WWW pages and now employs Sally Jones part-time to write the Faculty web pages and to help education faculty staff put their pages online. I would express my thanks to Sally at this point for all her help. Sally reworked the page, improved the page design and moved the pages to the Faculty of Education site. At the same time the university made some changes- the net result being that some of the search engines picked up a university error notice, that has dogged my site ever since, so I still get occasional complaints of people who miss the page.

On the other hand I have had a number of complimentary letters that indicate that the site is serving a purpose for some people. The site links online works of historical science. In many cases the sites linked contain a number of works and these tend to expand and put more works online, so I would certainly advise those finding complete works on a site to investigate to see if there are new online offerings. There is a wealth of sites containing classical authors such as Aristotle- the difficulty is to decide whether the book contains enough science to be classified as scientific. With regards to classification, I have generally included those works that might be referred to in a philosophy of science course. One valuable feature of having the whole of a book online is that it can be searched for particular words or phrases in a few seconds using the "Find" function. Thus in my research if I wish to see in what context the word "affinity" might appear in various books, the task is simplified.

There is then a lengthy gap of nearly ten centuries until one comes to the period of the alchemists. There is a particularly rich site for alchemy with perhaps a hundred or so entries, some of which are full length alchemical writings and some of which are brief extracts. Again I have looked for complete works of better known authors, but have used quite a number of examples from this site. The seventeenth and eighteenth centuries have comparatively few examples of complete books, though there is a good but new site on medical works. The nineteenth century entries are mainly biological -Darwin and Mendel. What chemistry there is tends to be extracts from longer works, examining particular issues, so there are examples of the writing of Dalton and Avogadro (on a very useful site edited by Carmen Giunta) There is one incomplete physics (Natural philosophy) text and a general science book. There are a variety of works of the early twentieth century. There are also some text books of the 1990s in each of the sciences. Some of these have been made specifically for the WWW and thus have a range of useful features that makes them exciting and interesting. I have found other materials over the past few months, which has made me decide to make major changes.

CHEMISTRY TEXTBOOKS ONLINE

A second feature of the web is that sites such as my first site, that connect other sites are actually very common, but basically they only duplicate the function of a search engine, but in a specialist sense. In order to have a worthwhile WWW site one needs to do more than that. The first feature that I had noted was a lack of online chemistry textbooks. I wrote a letter about this concern in a newly established chemical journal, published by Springer-Verlag called *The Chemical Educator*. This journal only has an online existence: it does not exist in print and is the first online science education journal to exploit the strengths of the new medium. My letter got an immediate response from the editor, Clifford LeMaster and an offer. If I was prepared to set up a representative committee that would decide on twelve historical textbooks that would be typical of chemical textbooks as a whole, then Springer Verlag would put them online, so that they would be freely available to the science education and the history of science communities. They might also print the books and sell them as facsimile copies.

I felt that the offer was generous and helpful and I set up a committee of about twenty academics with an interest in this area simply by writing for support to three listservers of which I am a member (Chemed-L, History and Philosophy of Science, and Chemical Information). Responses came back and I divided the overall task into a number of smaller parts. I sent all the correspondence I received to each of those who expressed interest and before long we had agreed on the task listed the criteria for choosing the twelve books, selected about thirty books that typified the period from 1700 to 1900. We cut the list down to about twenty books and put them in order of priority. There were chemistry texts at different level (primary secondary and tertiary) representing UK, USA and Europe, male and female authors, famous and minor authors, etc. Although not everyone may have agreed with the precise order, there was good overall agreement that it would be wonderful to see any good selection of old chemistry textbooks on the internet as a basic research tool. The task of preparing a list of twelve chemistry textbooks was completed in November 1996. As yet, none of these recommended texts have been put online.

MY CHEMISTRY TEXTBOOK ONLINE SITE

By February 1997, I decided that irrespective of the success of the Springer-Verlag project, I would put at least one book online during 1997. I looked for a typical secondary text of late 19C/ early 20C and decided on a nineteenth century chemistry textbook by Robert Avey Ward. The criteria, that I chose were that it should be short with few or no diagrams. Our faculty has a scanner, but it is not too good on scanning diagrams. As a first book, I wanted to ensure that the task was possible. Currently rather more than half the book is online and I hope to complete the first textbook before the end of the year. However the process is slow and clumsy and the old fashioned typeface is not fully recognised by our scanner, so large amounts of hand correction are needed.

CONCLUSION

I suppose that the major question is why should anyone wish to put whole textbooks online. There are some valid reasons:-

(i) The ways that chemical concepts were taught in the past will be clarified and research into this area will be facilitated.

(ii) The origins of chemical concepts can be sought more quickly and efficiently than at present.

(iii) The order in which chemical concepts were taught may be compared. It is to be hoped that this additional knowledge of the past may throw light on our present practice.

(iv) If the number of chemistry texts online increases enough, then this area of research will become more accessible and thus better researched. It should stimulate more research interest in this area.

(v) It is of general interest to chemistry teachers and students to see how students learnt chemistry in the past and what they had to learn.

(vi) Old textbooks are a precious resource. Once a book is online anywhere in the world, this reduces the damage through everyday use to other copies of the same book.

My conclusion is that this is a useful activity, in which any one of us may become involved and I would appreciate any expressions of help or interest.

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