

WEB PAGES AND MULTIMEDIA AS A TOOL FOR BIOCHEMISTRY INSTRUCTION

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● Abstract

Nowadays the usefulness of taking advantage of multimedia materials as a support tool in eaching is well established. Fortunately, the means to access these resources are increasingly available. This approach becomes particularly useful in the life sciences area, where perception of three-dimensional features of biomolecule structure and interactions is crucial, as well as of the dynamic nature of all processes that take place in living beings.

In this communication, we will present experiences on the use of diverse materials as a support for teaching in the classroom and, likewise, as a tool to assist the student in his/her personal study and learning process.

The development and use of these materials are structured through the web page format, since this offers a series of features ideally suited as “universal content container”: a single environment is provided for different types of materials: text, images, animated diagrams, movies, sound, molecular models, exercises, self-assessment, interactive content.; everything is handled with a software familiar to the user, available easily and at no cost; the same material serves as support tool for the teacher during lectures and as a study resource for the students; it can be made available under multiple settings: in the classroom, in the laboratory, in the student’s personal computer, on the hard disk, on CD-ROM, through a local network, through internet, etc.; it allows easy update of contents, as often as needed.

● Introduction

In the modern view of the teaching practice, the role of a teacher is often described as a “facilitator” in the student’s personal process of learning. As such, one of his/her responsibilities is to take advantage of whatever tools become available to assist that process. Everybody knows examples of such an adoption of new ways to support teaching, e.g. from the use of blackboard and chalk, to overhead transparencies or slides, to videoplayers and computer display projectors. Equally acknowledged are the software facilities, mainly the widely used screen-projected presentations using Microsoft PowerPoint or similar slide-show programs. In this same context, we want to bring into attention the web pages, which may be less commonly recognized and used. This format offers several notable advantages that will be discussed here, prominently the ability for interactive content. This is useful for the commonly advocated switch from

unidirectional, teacher-driven presentation to a student-centered, personal learning experience, although designed and oriented by the instructor. Contrary to what may be a common perception, using the web page format does not require the use of internet and does not mean to build a distance-learning environment, but can effectively be used as a complement to lectures and presential teaching.

● Materials and methods

For the author (the instructor himself or assistants, if available): The main need is a web page editor software. This may range from the simple, such as Netscape Composer [1] and more modern equivalents Mozilla Composer [2] and Nvu [3], to the professional, sophisticated tools such as Dreamweaver [4]. Creation and modification of images and animations is a second issue, that may be necessary to different extents; requiring some degree of graphic design abilities.

Third, true interaction with the user requires more advanced knowledge, e.g. editing of Flash documents or coding in JavaScript as part of the web page.

Finally, depending on the intended range of use, space on a web server and access for file upload may be needed.

For the user: Using the web pages requires just a web browser; in fact, any one, if the pages are written consciously. This is included with the computer operating system or anyhow is available easily and at no cost.

● Discussion

Following 7 years' experience in web page development as support for teaching in a University environment, some examples, advice and conclusions can be presented here.

Advantages of web page format

All sorts of content are allowed in a single environment: text, images, animations, movies, sound, molecular models, diverse interactive elements. Guidance can be included along with the material itself.

The user is confronted with a single piece of software (the web browser), usually already known and available anywhere. No need to install new and different programs, to learn how to use them, or to be tied to specific computers.

The same material can be used as a teachers' tool during lectures and for the students' personal study. Also, it can be handled locally on hard disk, on portable media (CDROM, USB disk), or distributed via intranet or internet, projected in the lecture hall, viewed on one's computer screen, or even printed on paper. Author's effort is hence reduced and resources optimized: write once, use in different environments.

Easy implementation of modularity of contents, allowing adaptation to different audiences, levels, or subjects.

Interactivity with the user/student can be provided, what leads to a more active learning.

Application for teaching

Although they are continually intertwined, we can describe work in two fronts, somewhat independent with respect to concept, update, organization and teaching practice:

Standalone resources: Examples are elaboration of instructive materials, most prominently interactive, three-dimensional molecular models. In addition, a compilation of guided, animated schemes, built from a selection of excellent materials already available on internet and, in many occasions, translation of them into Spanish. Third, a collection of questions and exercises, with answers included, allowing for self-evaluation and specially for directing the learning process. For an example, visit [5].

Course-related pages: Edition of a companion web site to support teaching of specific courses. Among its possible contents, we can cite course information, syllabus, scheduling progress of the classes on a calendar, access to supporting material—specially figures, chapter summaries, presentations used in the lecture—, bibliography for each chapter—both on textbooks and with links to the web—, questions, problems, exercises, means to contact the instructor, result of exams. For an example, visit [6].

Suitability for Biochemistry and Molecular Biology

This subject area has several features that make particularly profitable the use of multimedia and web pages. First, the dynamic nature of biological processes, which is more easily demonstrated by using animated images or schemes; for example, the synthesis of nucleic acids and proteins can be illustrated in motion. Second, and very prominent, the three-dimensional characteristics of biomolecules, essential for understanding their structure and the basis for their function, as well as the interactions among different molecules; perception of this spatial relations is often confronted by a difficulty by many persons to visualize a 3D world using 2D representations. The use of physical or tactile molecular models, although advisable, is rarely available, and computerized models offer a successful alternative.

Other general considerations

Further to what has been discussed, web page format is naturally amenable to be used on a web server. Open availability through internet results in dissemination of resources, sharing of materials with colleagues from other universities and countries, and exchange of experience. It is wasteful of time and resources that each instructor has to build materials that others have already written; there is no need to “reinvent the wheel”, but instead the world-wide web offers ample space and capabilities for open collaboration. On the other hand, the inherent modular

nature of the web pages allows for adaptation to personal preferences, to suit different subjects, levels and environments.



References

- [1] Netscape Communications website: <http://www.netscape.com>
- [2] Mozilla Project website: <http://www.mozilla.org>
- [3] Nvu Project website: <http://www.nvu.com>
- [4] Adobe website: <http://www.adobe.com>
- [5] “Biomodel” website at University of Alcalá de Henares (Spain): <http://biomodel.uah.es>
- [6] Companion website for Molecular Biology and Genetic Engineering course at University of Alcalá de Henares (Spain): <http://www2.uah.es/bioquimica/f-bmig>