

Applications of Internet to Teaching–Learning Through the Use of Web Pages

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This work reports the experience and contribution of two web pages to formal, traditional education. The aim of these pages were to: (i) provide complementary information to the courses; (ii) permit interactivity through a virtual “forum”; (iii) try new strategies to evaluate the student’s performance; (iv) incorporate and encourage students to use the Internet efficiently.

One of the web pages is a teaching–learning tool with contents of the *Private Pharmacy* course, its program, an electronic test and a virtual forum. The other site presents reinforcing contents for various courses of the forthcoming professional activity. This page contains highly requested sections, for example: (i) other web sites (links) of interest; (ii) the virtual pharmacist, who solves questions about drugs and answers FAQs; (iii) legal information about the professional rights and duties of the pharmacist.

As a conclusion, both pages were widely accepted as a complementary tool for traditional, teacher-directed class. The electronic test has many advantages, but it still has certain limitations in relation to what should be evaluated. The virtual forum turned out to be the most successful section, since it not only reinforced communication among students but also incorporated pharmacists at work, teachers and professionals working in related fields.

Keywords: Internet teaching; Pharmacy teaching; Virtual forum; Web sites

INTRODUCTION

The ever-growing available information on the Internet and the increasing number of computers connected to the net has caused significant changes in our students’ interests and abilities (Marzak *et al.*, 2001). Thus, the teaching of Pharmacy in our

university is incorporating info-communicational techniques that should motivate our students by taking advantage of their computing knowledge. This paper presents the results obtained after incorporating two web pages as teaching–learning tools.

The Internet is, at present, an interconnected net that links computers to more than a million servers world-wide. This huge net uses various means for their interconnection, e.g. coaxial cable, microwaves, optical fiber, satellites, telephone lines (Universidad de Chile, 1996). Thus, students’ access to the Internet is varied. This situation is similar in our country. A national net was created for academic use in 1986; two private institutions were the main supports. The first international connection was performed in 1987. In 1990, the net was no longer only academic and opened up to new possibilities, thus interested entities gave origin to the National University Net (REUNA) (Boizard and Pérez, 1996). The Council of Principals of Chilean universities encouraged net development, administration and connection to the Internet. All the institutions under REUNA were interconnected between 1992 and 1993.

In 1993, the Internet suffered a revolutionary improvement: web pages having hypertext format appeared. Under this format, users could easily receive and send images, sounds, graphs, movies, thus making the Internet more appealing and motivating. In this context, the number of users and web pages increased and the kind of information appearing in them grew in variety. Thus, in this wider and larger market, the net permitted access to varied

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information on drugs and health. Popular search engines permitted to find related sites (links), which are so numerous and can be difficult to handle (Garin, 1996). We think that web pages give us an opportunity to open a window to the world about the sensible, responsible and informed use of drugs in Pharmacy. They should also permit availability to a wide range of resources and sources of information for staying updated in this highly demanding, delicate and strict profession. Thus, we developed a web page with a two-fold function: educational and social. It is convenient to emphasize that the use of hypertext language allows easy exploration of texts. The inclusion of images to web pages is simple and depending on the graphic card, their quality is usually higher than prints on paper (hard copies).

The aims proposed for these web pages were to

- i) provide complementary information to the courses,
- ii) permit interactive activity through a virtual "forum",
- iii) try new strategies to evaluate the student's performance and
- iv) incorporate and encourage students to the efficient use of Internet.

METHOD

Two web sites, one with a teaching approach and the other with contents for a course of "Community Pharmacy" and with a social concern, were designed. The first was named "Private (or Community) Pharmacy (<http://abello.dic.uchile.cl/~hechavez>)" and the other was called "Virtual Pharmacy (<http://abello.dic.uchile.cl/~farmaciavirtua>)". Both web sites were used as teaching tools to support traditional education.

The probable advantages of the net in education were explored through specially designed and obligatory activities for the student:

- i) From a set of actual questions directed to the virtual pharmacist (web page *Virtual Pharmacy*), one question was chosen and uploaded every week to the web page Private (or Community) Pharmacy to be answered by the students within a week by email. Each student had to answer at least three questions. The best weekly answer was evaluated. Both students and answers were followed up.
- ii) Students were encouraged to participate in a virtual forum on an issue of current actual pharmaceutical interest, e.g. bioequivalence. Although this activity was not evaluated with a mark, it had to be done at least once during the course.

- iii) Students had to make use of complementary teaching materials provided by the teachers.

Most web pages of pharmaceutical interest were investigated. Then, two web pages were designed and created to be used as part of the course named *Private Pharmacy*, which intends to reinforce the occupational field of about 77% of pharmacists working as technical directors in drug shops. One of the pages, *Private Pharmacy*, gave general information of the course and its use was restricted to students. However, as it has been included in national search engines, other users also visit it. The other page, *Virtual Pharmacy*, has not only contents of the course but also general information about drugs, such as links of interest. All students evaluated this page with printed questionnaires at the end of the course. Since this page has been included in international search engines, it is also visited from abroad.

RESULTS AND DISCUSSION

Although the planning, design, creation, testing and maintenance of web pages are time-consuming and demanding, the benefits are clear. The pages were developed by both teachers and students, which meant user-friendly pages and greater compromise with the subjects. In addition, the student devotes more time to learning, keeps updated, becomes more conscious of their professional role and is open-minded to face new situations. The teacher is also motivated to design new complementary teaching tools, thus improving teaching-learning process.

The students' degree of acceptance of the page *Virtual Pharmacy* (Chávez *et al.*, 2000) was evaluated by means of anonymous questionnaires ($n = 61$). Through the first question the students qualified the page as "Poor", "Midpoint" or "Excellent". Most of them qualified it as "Excellent" (96%); 4% did not answer the question.

The students were asked to write comments about the web page. Table I shows the answers in descending order of percentage. The page was considered a helpful resource to keep both the student and the pharmacist updated (24%) and also a good means to widespread the role of the pharmacist to the community (14%). With respect to the clarity of the objectives, Table II shows that most students (94%) thought that the starting objectives were very clear and precise.

Another question inquired about the practical usefulness of the issues presented in the web page. Table III shows that most answers stated the usefulness of the issues to patients' questions and to keeping pharmacists' updated. Table IV shows that although a large proportion of students think

TABLE I Students' opinions about the web pages (*n* = 61 students)

Opinions	%
Useful to keep up-to-date both students and pharmacists	24
Spread the role of the pharmacist to the community	14
Permit to obtain pharmaceutical information from home	12
Give information about drugs and health issues	12
Permit fast and direct access to pharmaceutical issues present in the page	12
An excellent idea to complement traditional education in pharmacy	10
Permit to have professional contacts (and links)	6
Represent an innovation as a teaching-learning tool	4
A good manner to widespread the sensible use of drugs	4
An attractive manner to learn contents of <i>Community Pharmacy</i>	2

that the issues included in the page are enough (39%), a significant percentage of them think that other issues should be included in the page, such as information about active principles (22%) and recommendations to avoid auto-medication (12%). A few of them would include subjects like Bioethics (7%).

In relation to how this page should be evaluated, most of them thought that e-mailing was convenient (47%), many of them believed that an electronic test should be designed (39%), some of them wanted a written test (13%), and only few of them wanted both a written and an electronic test (2%). Approximately 8% did not answer the question. There was another question about the usefulness of this page to other users. Thirty six percent think that the page may also be useful to lay people; 33% believe it to be useful to other health professionals; and 31% think it is also useful to recently graduated pharmacists. Other aspects under consideration included overall presentation of the page, colour used, number and type of images, downloading time, diagramming and design.

The other web page (Chávez *et al.*, 2002) gives complementary information about the course and includes a test that has to be answered by e-mail. In addition, it gives access to a virtual discussion forum.

TABLE II Opinions about the clarity of the objectives of the web pages (*n* = 61 students)

Opinion	%
They are very clear and precise	94
They are little clear and precise	4
No answers	2

TABLE III Opinions about the usefulness of the issues presented in the web pages (*n* = 61 students)

Opinion	%
Large amount of issues of frequent occurrence in pharmacy offices	33
Search of information about drugs and other pharmaceutical issues to keep pharmacists updated	33
Issues for the educational growth of the pharmacist	19
No information about active principles	7
Lack of other pharmaceutical issues	5
The issues presented are not the most important ones	3

The results obtained thus far identify some implications of e-mail answers:

- The answers need to be indicative of personal work or personal criteria in relation to the posed problems so that they actually reflect personal position.
- The use of attachments permits to ask for works including images and also specific works done using word processors, electronic sheets, presentation programs.
- Every student must have a personal e-mail.
- Every student must have prompt access to Internet.
- Students can work at home.
- The teacher(s) should have a special dedicated e-mail box to receive e-mails from students.
- The students should have the possibility to deliver their work in diskettes.

In relation to the virtual forum, results were evaluated by number of participation, their content quality and innovation (presentation of a new issue for discussion). Ten percent of overall number of students participated in the forum at least five times; 40% from two to four times; 50% only once and only

TABLE IV Opinions about the issues present in the teaching-learning web page and others that should be included (*n* = 61 students)

Issues	%
Agreement with the issues present in the web page	39
No information about active principles	22
Inclusion of recommendations to avoid automedication and to use drugs in a rational (sensible) manner	12
More health issues	10
Convenience of having issues related to bioethics	7
Convenience of having access to scientific publications	5
Inclusion of issues related to prevention of important chronic diseases	2.5
Inclusion of first-aid information	2.5

5 out of 90 students did not participate at all in the forum. Most students (40%) were interested in professional issues; 10% in curricular and academic matters; 30% in particular situations of the course such as students' friendliness, agreements and disagreements; 20% in pharmacological news and pharmacist's advice; 10% proposed new issues for discussion.

Since 40% of the students own a computer connected to the Internet, most connections had to be done with computers either from the Faculty of Chemistry and Pharmacy or from friends. A particularly interesting aspect of the virtual forum was the spontaneous participation of external professionals, who enriched students' academic growth.

CONCLUSION

This assessment demonstrates the good acceptance of the two web pages as a means to complement the traditional course of *Community or Private Pharmacy*. The electronic test has advantages and disadvantages and has to be evaluated continuously since its concept is quite different from a traditional written

test. The virtual forum was highly important to encourage students' participation and their communication with each other. We believe that the use of web pages contributes positively to improve students' self-confidence. They have different means to communicate with their classmates, with professionals at work and with the professor co-ordinating the course.

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