E-learning in human nutrition: a pilot study

Pedro Moreira[*,1], Vitor Teixeira[*,2], Hugo Valente[*,3], Patrícia Padrão[*,4], Margarida Amaral[†]

* Faculdade de Ciências da Nutrição e Alimentação da Universidade do Porto
[1] pedromoreira@fcna.up.pt
[2] vhugoteixeira@fcna.up.pt
[3] hugovalente@fcna.up.pt
[4] patriciapadrao@fcna.up.pt

† Gabinete de Apoio para as Novas Tecnologias na Educação da Universidade do Porto
mamaral@iric.up.pt

Abstract

E-learning presents a host of new opportunities for institutions to cost-effectively expand access to education and improve educational outcomes. This communication aims to detail the results of the first phase of a project in University of Porto, which used e-learning to support students' learning. Our primary goal was to deliver some e-learning solutions to improve educational outcomes in human nutrition classes.

E-learning was used in teaching and learning in a whole range of ways. The number of students enrolled in human nutrition classes was 72. In order to evaluate the project, students completed a self-administered questionnaire, in the web. Educational outcome was also expressed as the final grades in human nutrition course, and regression analysis was used to estimate the association between final grades (maximum is 20 points) and number of hits in the web pages.

Our experience in this pilot study was that WebCT allowed delivering innovative e-learning strategies for engaging students, addressing many of the educational problems associated with traditional teaching, and serving diverse student populations (different ages, employment status and geographic residence). Students emphasised that e-learning increased significantly their communication with professors. Each "hit" in the web pages increased the final score in 0.002 points (in the regression analysis, final score was the dependent variable and the number of hits was the independent variable; beta = 0.002, intercept = 11.8, $r^2 = 0.13$, $p = 0.012$). In conclusion, students demonstrated high satisfaction with e-learning, and performance in final grades was related to the number of hits in the web pages of human nutrition course.

Keywords: e-learning; outcome; human nutrition.

1 Introduction

E-learning presents a host of new opportunities for institutions to cost-effectively expand access to education and improve educational outcomes, which will potentially enhance the learning process [1]. This study aims to detail the results of the first phase of a project in University of Porto, in 2003/4, which used e-learning to support students' learning. Our primary goal was to deliver some e-learning solutions to improve educational outcomes in human nutrition classes, and to assess the relation between number of times that e-learning platform was visited and evaluation attainment.

2 Methods

This project was developed in collaboration with the Department of New Technologies in Education (Gabinete de Apoio para as Novas Tecnologias na Educação, University of Porto – GATIUP). In our pilot study, we adapted our traditional student-centred, problem-based approach to the acquisition of skills in the course of human nutrition, in to a blended-learning experience, using WebCT 4.0 as the e-learning platform. This allowed lecturers to retain their facilitator role, and encouraged students to explore, analyse and make decisions using objects and simulations embedded within web pages. E-learning was used in teaching and learning in a whole range of ways: accessing electronic journals; computer-generated presentations to go together with lectures; electronic publication of lecture notes; research using the Web; setting computer-based bibliographic searches; using email communications for class management; using real databases to retrieve information; using bibliography to attend lectures; and putting students into "real" task situations where, under the guidance of teachers, they discover how to approach the evaluation of the problem and acquire needed information and skills to understand the mechanisms involved in the problem and how to approach the management of the situations. The number of students enrolled in human nutrition classes in 2003/2004 was 72.

In order to evaluate the project, students completed a self-administered questionnaire, on the web. Evaluation outcome was also expressed as the final grades in human nutrition course, and regression analysis was used to estimate the association between final grades (maximum is 20 points) and number of hits in the web pages. We also compared final grades in human nutrition during 2003/4 and the last 4 years.

3 Results

The content pages that were produced included 176 PDF, 38 Word documents, 29 PPT e 34 HTML. The number of hits increased during the year (Table 1), and we observed 17320 hits in approximately 637 hours of access. The average number of hits per page was 76 (maximum number was 626). The more visited pages were the ones that included guidance to practical sessions, putting students into "real" task situations in a problem-based learning approach, and pages that exhibited content materials from learning sessions. The total number of exchanged emails was 116, and the Forum discussions occurred only 23 times.

Month	Number of pages	Number of hits	Time (h:m:s)	Time/hit (m:s)
November			91:12:19	
December	90	5454	188:01:12	2:04
January	126	8950	312:1945	2:05
February	130	9085	332:35:04	2:11
March	152	10725	364:11:14	2:02
April	185	12716	435:42:15	2:03
May	211	15285	535:03:34	2:06
June	220	16432	556:65:32	2:09
July	227	17320	637:10:56	2:12

Table 1: This is an example of a table caption

Student's evaluation on the e-learning project (n = 34; 47% of total students), showed that: 27% accessed the platform on a daily basis; 46% accessed 2/3 times/week; 18% once per week; and 6%, 2 times/month. The majority of the students (79%) considered that "on-line learning" and "learning in class" were very coordinated and that module contents were very regularly updated (67%). Students emphasised that e-learning increased significantly their communication with professors (much/very much: 76%), and their performance in the course (88%). Other positive remarks included: simple access to materials (ready-to-use, and 24-h availability), by 82%; convenience, by 30%; and motivation (6%).

Students emphasised that e-learning facilitates learning at anytime and anywhere, and it reduces the obstacles of time and distance, providing greater equality of opportunity.

Nearly half of the subjects (46%) mentioned that they do not have negative aspects to consider, and 42% stated that the speed of the internet connection was to slow. All of the students considered that e-learning should continue in the following years.

When we compared mean final grades in human nutrition during the last 5 years, we did not found statistically significant differences, although in 2003/2004 we achieved the higher percentage of students with very high grades (≥ 16.0), as we can see in Table 2.

	Final scores (0-20 scale)				
Years	1999/0	2000/1	2001/2	2002/3	2003/4
Mean	11.22	12.97	11.38	12.40	13.19
S.d.	3.286	2.236	2.847	2.613	2.192
Minimum	2.34	8.00	5.00	3.00	6.00
Maximum	16.23	16.58	15.97	17.00	17.00
Percentiles					
25	10.53	11.35	9.00	11.40	12.12
50	11.33	13.42	12.31	12.49	13.20
75	12.81	14.58	13.52	14.36	14.93
Final scores					
< 9.5	15.6%	7.3%	27.1%	7.8%	2.1%
9.5-11.9	42.2%	19.5%	18.8%	25.0%	19.1%
12.0-15.9	35.6%	65.9%	54.2%	65.6%	66.0%
≥ 16.0	6.7%	7.3%	0%	1.6%	12.8%

Table 2: Final scores between 1999/2000 and 2003/2004

The number of hits in the web pages varied from 0 to 1849 and each "*hit*" increased the final score in 0.002 points (in the regression analysis, final score was the dependent variable and the number of hits was the independent variable; beta = 0.002, *intercept* = 11.8, $r^2 = 0.13$, p = 0.012).

4 Discussion

In the present study, e-learning had a substantial impact on the learning attainment and we found a clear positive and significant relationship between the number of hits in the e-learning platform and the final grade in the course, suggesting the need to consider further moderating variables in e-learning processes that may explain these findings. Furthermore, the majority of students declared that e-learning increased their performance in the course.

A potential limitation of our study is that we used the number of hits as a measure of e-learning, although this procedure might not be reliable to evaluate the e-learning process. It is also important to recognise that the present findings are based on cross-sectional data, and a causal relationship cannot be inferred. In relation to final grade attainment, at least three possibilities may be responsible for the mentioned association:

the number of accesses influences final grade attainment (for example, the implementation of e-learning may support the contacts with materials and learning sessions that increase the opportunities for advancement in education), final grade attainment influences the decreased workload with the e-learning platform, or a common factor or factors influence both final grade attainment and e-learning use. There is evidence to support the possibility that e-learning may increase the opportunities for advancement in education, [2-4] but research into the effects of e-learning on learning-outcomes are inconclusive [5].

Other benefits were also documented by students, namely that e-learning increased significantly the communication between students and professors, and it is recognised that relationships can be encouraged within the context of an online environment. Other positive remarks included: simple access to materials (ready-to-use, and 24-h availability), by 82%; convenience, by 30%; and motivation (6%). Students emphasised that e-learning facilitates learning at anytime and anywhere, and it reduces the obstacles of time and distance, providing greater equality of opportunity.

Our experience in this pilot study was that WebCT allowed delivering innovative e-learning strategies for engaging students, addressing many of the educational problems associated with traditional teaching, and serving diverse needs of students (in our course, approximately 15% of students were older than 25 years or were working and studying simultaneously). It also possible that the diversity of the new student population and the shift in learning styles will satisfy a broad range of learning requirements if an online environment is present [1].

In the present year, after the experience described above in 2003/2004, it was clear that learning styles should be different in the near future, in order to accommodate e-learning facilities and strategies, and we are using in 2004/2005 a higher version of WebCT (WebCT 4.1.4). In this year (2004/2005), we are trying to improve communication tools (email and discussions), and evaluation and activity tools (namely assignments and student presentations). In the next year (2005/2006), we recognise the need to create content modules customized to the students, and to provide information of interest in an effective format to the student. Therefore, new, innovative, interactive module contents should be produced and developed in the following years, and tested to ensure that they are effective. WebCT Vista will be used in the following year, keeping in mind that eLearning will continue to evolve as new innovations and more interactive modes are incorporated into learning.

5 Conclusions

Evaluations were positive, with students demonstrating high satisfaction with e-learning. Performance in final grades was related to the number of hits in the web pages of human nutrition course. These results indicate that an e-learning approach in human nutrition may improve a student centred learning experience, with high satisfaction rates in students, and opportunities for the utilization of e-learning in the nutritional sciences are remarkable.

References

[1] O'Neill K, Singh G, and O'Donoghue J, "Implementing eLearning programmes for higher education: A review of the literature," *J Information Technology Education*, Vol. 3, pp. 313-323, (2004).

[2] Maki WS and Maki RH, "Multimedia comprehension skill predicts differential outcomes of web-based and lecture courses," *Journal of Experimental Psychology: Applied*, Vol. 8, pp. 85-98, (2002).

[3] Maki RH, Maki WS, Patterson M, and Whittaker PD, "Evaluation of a Web-based introductory psychology course: I. Learning and satisfaction in on-line versus lecture courses," *Behavior Research Methods, Instruments, & Computers*, Vol. 32, pp. 230-239, (2000).

[4] Bell DS and Mangione CM, "Design and analysis of a web-based guideline tutorial system that emphasizes clinical trial evidence," *Proc Amia Symp*, pp. 56-60, (2000).

[5] Wutoh R, Boren SA, and Balas EA, "eLearning: a review of Internet-based continuing medical education," *J Contin Educ Health Prof*, Vol. 24(1), pp. 20-30, (2004).