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ScienceDirect

Procedia - Social and Behavioral Sciences 174 (2015) 172 – 178

Procedia
Social and Behavioral Sciences

IETC 2014

Effects of teaching strategies supported by information and communication technologies on satisfaction and learning of college students

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This work has been supported by CAPES and FAPDF

Abstract

Studies show that Brazil is currently experiencing a double burden of nutritional problems related to malnutrition and other nutritional deficiencies on one side and the onset of the binomial overweight / obesity on a population scale on the other side. Such disorders are linked to complex factors. Therefore it is understood that their resolution will only be possible with the involvement of the whole society. In Brazil, health courses do not address, except for nutritionists and, to some extent, nurses, specific contents on human nutrition, compromising the action of other health professionals in the area. This study aims to contribute to the teaching of basic nutrition content in a course offered to undergraduate healthcare students of a public college in Brazil. The course was restructured in order to meet the educational objectives previously set. New features, educational technologies and materials based on instructional theories and instructional design were developed and included on the course. The main results on satisfaction and learning are presented.

Peer-review under responsibility of the Sakarya University

Keywords: Learning in Health Education; Multimedia features; New information technologies and communication; Human Nutrition

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Peer-review under responsibility of the Sakarya University
doi:10.1016/j.sbspro.2015.01.643

1. Introduction

Even within a context of economic, political and social turmoil, Brazil has changed substantially over the last fifty years due to external factors, derived from a progressively globalized world, and also due to autonomous circumstances associated to its own historical and cultural processes (Batista son & Rissin, 2003). However, the country still faces significant regional disparities in income distribution, contributing to the complex epidemiological situation of nutritional problems, manifested by a double burden of diseases, in which it is observed on one side malnutrition and nutritional deficiencies (especially of iron, iodine and vitamin A), and on the other side problems related to the excessive consumption of processed foods and the appearance of the binomial overweight / obesity on a population scale (Malta et al, 2006; Victora et al, 2011; Mendes, 2012).

One of the causes that explain the increase of the population weight is the change in the eating habits in Brazil. Recent surveys show that 34.2% of the population consumes fatty meat, 56.4% eat whole dairy products, 28.1% make regular use (5 times per week) of sodas and only 20.2% of the population consume daily the adequate amount of fruits and vegetables (IBGE, 2010; Brazil, 2012). There is also evidence of a relationship between poor diet and chronic diseases, among them obesity, cardiovascular diseases and diabetes (Monteiro et al., 2010). These diseases elevate the costs of the health system and, if not prevented and managed properly, demand increasing healthcare investments, which justifies the adoption of integrated sustainable strategies for their prevention and control (Malta et al. 2006). The solution requires interventions at the macro, meso and micro levels, involving government, industry, school, health services, health professionals and families (OECD, 2014).

In Brazil the training of health professionals is done predominantly through classroom courses (Ruiz-Moreno, Milk, & Ajzen, 2013), guided by the traditional pedagogy, but without delivering the desired professionals needed by the population (Buchabqui, Capp, & Petuco, 2006) and without generating relevant changes in current heath practices (Batista, & Gonçalves, 2011). Thus, it is important to test differentiated educational strategies in an attempt to reduce the imbalance between the skills of health professionals and the needs of the population. Information and Communication Technologies (ICTs) are being used by educators as a strategy capable to induce the development of new learning methods, that are more dynamic and individualized and able to facilitate the teaching-learning process, contributing to the development of key skills in the area (Westera 2012).

Thus, the central aim of this research is to restructure a basic nutrition course, assessing the effects of new educational methods with the inclusion of teaching strategies supported by information and communication technologies on satisfaction and learning of the students enrolled in it. The hypothesis is that the development of courses and materials supported by a theoretical and empirical research base produce greater satisfaction and lead to greater gains in student's knowledge.

2. Method

The 30-hour Basic Nutrition presential course held at a Brazilian public university is offered to students of 5 undergraduate courses. It is a mandatory course for nursing students and an elective course to pharmacy, physiotherapy, occupational therapy and public health students. After the analysis of the profile of students, interviews with the professor responsible for the course and analysis of materials provided the course was restructured according to the cognitive theory, as well as instructional theories. As a complement the Food Guide for the Brazilian Population (Brazil, 2005a) was analyzed to ensure that the minimum knowledge of the area were identified and compared to the themes of the syllabus available.

The restructuring of the course consisted of: (1) defining and classifying educational goals; (2) defining the sequence of instruction; (3) defining the educational procedures; (4) preparing the contents and materials for each class; (5) selecting the media for material distribution (6) developing the presentation format of the content in the virtual environment (Moodle); (7) developing learning and satisfaction assessment tools; (8) training tutors.

The contents extracted from the food guide for the Brazilian population, and the interview with the professor in charge of the course, were transformed into educational objectives (Bloom et al., 1956). The original sequence of the course was kept, with the exclusion of the subject hospital malnutrition and the inclusion of a review class. The learning situations (procedures and educational events) were chosen in order to facilitate the acquisition of the skills

described in the educational objectives. There are different strategies, techniques or educational events used for the learner to acquire the competencies defined in the educational objectives (Borges-Andrade, 1982).

Appropriate references were found in the form of scientific articles and textbooks. They were chosen along with the professor and made available at Moodle. However there were not found adequate multimedia materials in Portuguese that would meet the instructional objects. Therefore, 8 podcasts and 6 video classes were recorded specially for the course.

For the development of instruments to assess satisfaction of participants regarding the course, the professor, the, materials, the virtual learning environment and the activities proposed the scales of Abbad et al (2012) were adapted. The satisfaction scale was made available at Moodle by the end of the term. The development of the instruments to assess student's learning was supported by Anderson's taxonomy.

The new instructional design was tested during the period ranging from April to July 2013. The presential classes were held once a week with the duration of 1 hour and 40 minutes. In the first lesson, the syllabus was read and the students gained access to Moodle. The new features available, the strategies that would be adopted every lesson as well as the evaluation methods were explained. No ambiance to the Moodle environment was required because the students had already taken other courses that used the same virtual learning platform. Even so, 2 tutors and means of contact were made available. The learning platform contained hyperlinks, audio files (podcasts), video classes, films, a free nutrition software (NutWin – UNIFESP), suggested readings and classes slides. The learning platform was organized by class including a study guide with all materials and its links.

For the efficacy evaluation the final grades, students' performance during the proposed activities and their reactions (degree of satisfaction) were correlated. The statistical analyzes were conducted using the Statistical Package for Social Sciences (SPSS, version 20).

4. Results

The course was offered during the first semester of 2013. There were 47 enrolled students, being 40 females (85.1%) and 7 males (14.9%). Of these, 43 were 25 years or younger (91.4%) and 4 were above 26 years of age (8.6%).

The reactions of students were assessed in two ways, by the answers of students in May 2013 through a forum at Moodle and by the end of the course, through the application of the instrument of satisfaction. The first assessment occurred after the first test and aimed to assess if students considered the podcasts and video classes useful. Only 28 students (59,57%) answered the forum questions that showed that 50% of the respondents considered podcasts very important for learning, 29% considered them important and 7% of medium importance. No student considered podcasts unimportant and 71% of the respondents reported that they should be kept in subsequent modules. Only 7% of students would like them to be eliminated and the rest were indifferent. As for the video classes 43% of the respondents considered them as very important, 36% important and 7% of medium importance. Most students (86%) agreed that video classes helped learning and should be maintained during the whole course, but 14% of them were indifferent and no students asked them to be suppressed. Thus, we opted for the maintenance of these media in the other modules of the course.

At the end of the course (july/2013) the adapted instrument of satisfaction evaluation was applied. The scale provided to students varied from 0 to 10. Overall, the course and the professors were well evaluated by students. However, some items can be highlighted as deficient (items below average 7.0), according to the opinion of students: practice workload was considered insufficient. On the other hand students thought the amount of paper reviews, forums and portfolios excessive for the course. In addition, the group did not consider forums and portfolios as relevant for learning as other strategies. The second part of the instrument was meant to evaluate study conditions. The lowest score (4.61) showed that students find it difficult to reconcile their various academic activities with the nutrition course. They also reported not having studied with the regularity needed for optimal performance during the course (Table 1).

Table 1. Reactions (degree of satisfaction) of the students by the end of the semester.

Item	Mean	Median	Mode	Standard Deviation
Clear definition of objectives	8,38	9	10	2,13
Compatibility of goals with your needs in the area	8,56	9	10	1,66
Theoretical hours (face-to-face course)	7,94	8	10	2,27
Practice workload	6,56	7	9	2,82
Sequence of modules	8,56	9	10	1,77
Quality of face-to-face lessons	8,94	9	10	1,20
Quality of class slides provided	9,05	10	10	1,25
Quality of video classes	8,97	9	10	1,20
Quality of podcasts	9,07	10	10	1,22
Usefulness of knowledge for personal life	9,28	10	10	1,05
Opportunities to applying the knowledge	7,46	8	10	2,29
Assimilation of knowledge	8,15	8	8	1,20
Ability to impart knowledge to others	8,23	8	8	1,01
Intend to implement knowledge in faculty	8,6	9	7	1,42
Probability of finding personal life opportunities for the application of the knowledge learned	8,25	8	10	1,81
Number of paper reviews	5,53	5	5	3,10
Importance of paper reviews for learning	7,61	8	10	2,14
Number of Moodle forums	5,5	5	5	3,08
Importance of Moodle forums for learning	6,76	7	10	2,67
Number of case studies	7,69	8	5	2,98
Importance of case studies for learning	8,1	8	8	1,30
Number of tests	8,79	10	10	2,04
Importance of tests for learning	8,6	8	8	1,3
Amount of tasks in the portfolio	4,94	4	0	3,99
Importance of portfolio for learning	6,30	7	10	3,22
Moodle: Visual presentation	8,89	10	10	1,65
Moodle: Resources (links, podcasts, video classes)	8,66	9	10	1,56
Moodle: clarity of messages	8,23	9	10	1,67
Moodle: Amount of resources	8,43	9	10	1,91
Moodle: color, type and size of the texts	8,80	9,5	10	1,68
Moodle: ease of use	7,92	9	10	2,67
Prior experience in computer use and Moodle facilitated the course?	8,17	9	10	2,67
Ease of combining the course with other university obligations	4,61	4	2	2,87
Ease of combining the course with personal life	6,02	7	8	2,96
Access to virtual environment with sufficient frequency	7,15	8	8	2,75
Frequency of study	6,58	7	7	2,29
Quality of internet connection	8,80	9,50	10	1,7
Your health	6,84	7	10	2,52
Your family's health	8,12	9	10	2,45

Table 2 shows the result of students' satisfaction regarding the professors' performance. The scores of both of them were higher than 9.0 (in a scale from 0 to 10).

Table 2. Reactions of the students regarding professor's performance.

Item	Professor 1	Professor 2
Ability to transmit the content	9,2	9,6
Summaries and reviews	9,2	9,6
Class organization	8,7	9,6
Classes depth	9,0	9,5
Use of motivational strategies	8,4	9,5
Teaching resources	8,5	9,0
Mastery of content	9,2	9,6
Certainty about the content being taught	9,3	9,5
Respect regarding student's ideas	9,6	9,8
Mean	9,1	9,5

Two students quit the course, four students failed and the others were approved (n = 41, 87.23%). Pearson test showed no correlation between student's degree of satisfaction and the final course grade (Table 3).

Table 3. Pearson correlation: Degree of satisfaction (student's reactions and final grade).

		Degree of satisfaction mean	Final grade
Degree of satisfaction mean	Pearson correlation	1	,185
	Sig. (1 tale)		,133
	N	38	38
Final grade	Pearson correlation	,185	1
	Sig. (1 tale)	,133	
	N	38	47

A significant positive correlation between the quality of the work and activities done by students' and the final outcome (Table 4) was detected. The higher the students performed their activities, the higher were their final grades. Or students who did their activities with greater care could show their knowledge more appropriately in tests.

Table 4. Pearson correlation: Activities' grades and Test grades

		Activities' grades	Final grade
Activities' grades	Pearson correlation	1	,911**
	Sig. (1 tale)		,000
	N	47	47
Final grade	Pearson correlation	,911**	1
	Sig. (1 tale)	,000	
	N	47	47

**. Significant correlation at level 0,01 (1 tale)

It is inferred that the way the course and its activities were settled contributed for learning. Moodle platform offers the possibility to examine the percentage of students who accessed the podcasts and video classes. It was

observed that 7% (n = 3) of the students did not access the multimedia material any time and 26% (n = 13) of them have accessed more than 76% of the media available (Fig. 1).

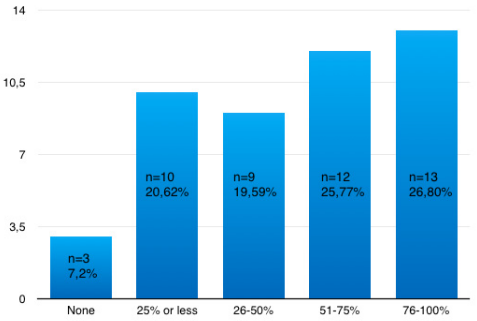

Fig. 1. Podcasts and video classes assessed

Spearman test also showed that the higher was the percentage of podcasts listened to and video classes watched the higher were the test scores and final grade (Table 5).

Table 5. Spearman correlation: Activities' grades and Test grades

		% of podcasts listened to and video classes watched	Test 1 grade	Test 2 grade	Final grade
% of podcasts listened to and video classes watched	Spearman correlation	1	,489**	,302*	,622**
	Sig. (1 tale)		,000	,025	,000
	N	47	47	43	47

*Significant correlation at level, 0,05 (1 tale); **. Significant correlation at level 0,01 (1 tale)

Strategies supported by ICTs were well received by students. Podcasts and video classes, for example, can be used as aids to learning strategies. This study showed that the restructuring of a discipline based on cognitive and instructional theories could lead to greater satisfaction and learning among students. However, these data need to be more investigated, since variations of grades depend on multiple factors, including the profile of the students, changes in teaching strategies and types of assessment.

Conclusion

The use of teaching strategies based on New Information and Communication Technologies has the possibility to democratize education, expanding study access and motivating students to learn. However, evidence suggests that not all positive effects in education can be attributed to the use of the technology itself, but the way they are used (Hew, & Cheung, 2013). This study showed that the restructuring of a discipline using cognitive, instructional and instructional design theories led to great satisfaction and learning. This study has limitations as the fact that it was not possible to compare our students to a control group, in which similar issues have been addressed but without the use of technologies. Moreover, it was not possible to apply a pre knowledge test, something that will be achieved in subsequent courses.

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