THE FLIPPED CLASSROOM IMPROVES PHYSIOTHERAPY STUDENTS PERFORMANCE AND SATISFACTION IN THE DISCIPLINE OF PHYSIOLOGY: A QUASI-EXPERIMENTAL STUDY

H. Santos

Escola Superior de Saúde do Alcoitão (PORTUGAL)

Abstract

Introduction: In a flipped classroom (FC) approach, students study instructional material before class (e.g., by watching online lectures) while traditional class time is reserved for discussion and/or problem solving of the relevant topics. The popularity of this pedagogical approach, also known as flipped learning or the inverted classroom, has been growing rapidly during the last decade. Objective: The objective of this work is to compare FC class with an expositive approach (EA) in academic performance and satisfaction with the discipline of physiology in physiotherapy students of the School of Health of Alcoitão (ESSA).

Methodology: In the year 2013/2014 the discipline of Physiology was taught according to the EA, the students were subjected to two evaluation moments, a first test, which evaluated the first part of the subject taught in the classes, and the second test, which evaluated the knowledge about the second part of the subject. At the end of the discipline, a questionnaire was applied that evaluated students' satisfaction with the discipline and the teacher's performance. In the following academic year (2014/2015) in the same discipline the FC approach was used and the same evaluation instruments were used.

Results: Student's t-test revealed the existence of a significant difference between the EA group (n = 53) and the FC group (n = 57) at the means of the tests. The FC group (mean = 17.096) had a significantly higher mean compared to the EA group (mean = 14.953). Student's t-test revealed the existence of a significant difference between the EA group (n = 53) and the FC group (n = 57) in the satisfaction with the discipline. The group submitted to the FC approach has a significantly higher satisfaction, compared to the group submitted to the expository method, with the disicpline (FC average = 6.466, EA average = 5,714) and with the teacher (FC average = 6.462, EA average = 5.849).

Conclusion: This demonstrates that FC, if properly implemented with cooperative learning, can lead to increased academic performance and student satisfaction and is an effective means to disseminate key physiological concepts to graduate students.

Keywords: Flipped classroom, cooperative learning, students´ satisfaction.

1 INTRODUCTION

Over the past decade, alerts for reform in education in general and in the health sciences in particular have intensified [1]. The increase not only in the total volume of information, but also in the ease of access requires the role of universities and other educational institutions to be rethought. The next generation of students needs to develop the ability to discriminate a large amount of information and extract and synthesize the knowledge needed for clinical decision making. Vocational education has not kept pace with some of the challenges of the 21st century, largely due to fragmentation, outdated and static curricula that form professionals ill-prepared for the needs of the population[1].

We are facing an era in which education systems place great emphasis on making the most of time during various curriculum activities. In health science education there is evidence that traditional preclinical education has become too dependent on lectures and other passive didactic models and that these methods are less effective in equipping students with reflective knowledge and skills to solve problems in clinical contexts. Some authors have proposed the application of new teaching approaches, such as the flipped classroom (FC), to improve preclinical education [2], [3].

This innovative training approach aims to place the student at the center of the educational process. The concept has had several designations over the past few years, such as flip teaching, flip the classroom, flipped classroom, flipped learning. All designations have in common the same verb form

as the verb to flip. In a simplified way, the use of the expression flip means, in this context, to mean a turning point, which consists in doing at home the work that normally occurs in the classroom and doing in it the work that is supposed to be done at home. Since 2006, two US teachers, Aaron Sams and Jonathann Bergmann, have played a major role in promoting the flipped classroom and have progressively introduced this approach into the world of education.

Generally speaking, the flipped classroom consists of the following elements: (1) students are seen as an active part of their learning process; (2) technologies act as a facilitating element in the self-directed learning process; (3) video viewing should take place a priori to class time; (4) are assigned to the group of students problems based on real situations; (5) class time is allocated to work, and the teacher should act as a guide, providing instruction and guiding the "path" in solving the problem, rather than the traditional expository method in which the teacher uses this same time to expose the subject, with a student playing a passive role [4].

As we have seen, this approach presupposes an autonomous student preparation out of class, so that time spent in the classroom is monetized with specific types of collaborative active learning activities, such as problem-based learning (PBL), team-based learning (TBL), case-based learning (CBL), POGIL (Process Oriented Guided Inquiry Learning) activities, among others [3], [6].

This teaching method has been showing promising levels of student success and satisfaction in different areas of education compared to traditional methods [6].

The aim of this study is to compare the effectiveness between two approaches of teaching the flipped classroom approach and the expository approach in academic performance and satisfaction with the physiology course 1 in physiotherapy students at the Alcoitão School of Health (ASH).

2 METHODOLOGY

In 2013/2014 the course of physiology 1 of the ESSA physiotherapy course was taught according to the expository approach (EA), the students were subjected at two assessment moments, a first test that assessed the knowledge about the first part of the subject taught in class and a second test that assessed knowledge of the second part of the subject At the end of the course, a questionnaire was applied to evaluate students' satisfaction with the course and the teacher's performance. In the following school year (2014/2015) in the same course, the FC approach was used and the same assessment instruments were used.

2.1 Description of Flipped Classroom Implementation

Physiology I is a course of the 1st year 1st semester of the Physiotherapy Degree Course of ESSA. Has a face-to-face workload of 35 hours, runs over 13 weeks and addresses the following syllabus: levels of organization and homeostasis, cell biology, histology, integumentary system, skeletal system, nervous system, muscular system and endocrine system. The lectures were replaced by short introductory videos found online by the researcher on the different themes of the syllabus and preparatory tests. The time of the videos ranged from 3 minutes to 15 minutes, on average lasted 7 minutes. The preparatory tests consisted of multiple choice questions and / or true or false, students had time to perform them (15 minutes). These materials, videos, and quizzes were available on the Moodle e-learning platform (Figure 1), and it was recommended that students view the videos and take the quiz, respectively, before class.

In the beginning of the course groups of 3/4 students were formed, which remained during the semester. In face-to-face classes, after watching the videos and taking the preparatory tests, students would come together in their respective groups, each of which had a particular role (manager, researcher, secretary or speaker) and provided activities that varied between POGIL activities, clinical cases, concept-map building and collaborative testing. Table 1 presents the different activities used in each thematic module, as well as the number of hours used in each module.

During the class the teacher would go through the various groups to clarify doubts and to verify that all groups were following the activity.

At the end of each module were provided supporting texts from the Course Support Book, a document containing the most important terms and definitions about each module, a module summary document, the ability to answer questions that did not count for the assessment, through the QUIZLET website and finally, before the start of a new module, the students had to take a Moodle consolidation test on the subject covered throughout the module.

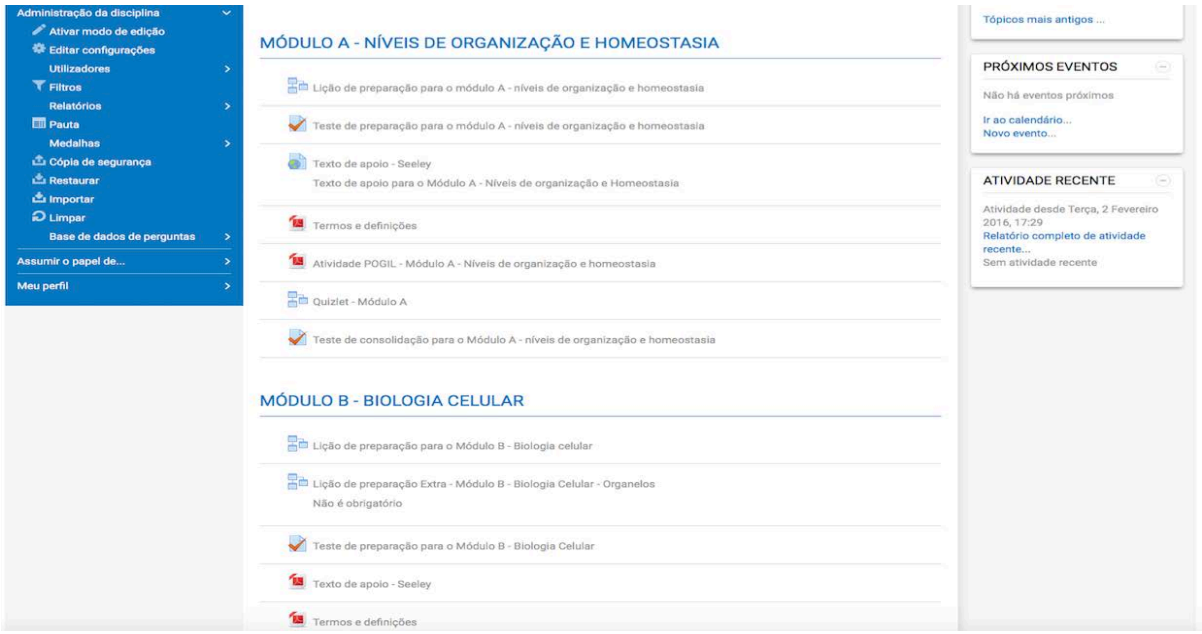

Figure 1. Print screen of Physiology 1 organization on Moodle

Table 1. Activities used in each of the thematic modules.

Module	*Number of hours*	*Activities*
A - Levels of organization and homeostasis	2	POGIL activity and concept-map
B - Cell biology	4	POGIL activity and clinical case
C - Histology	2	POGIL activity and concept-map
D - Integumentary system	2	POGIL activity and concept-map
E - Skeletal system	4	Clinical case
F – Nervous system	6	POGIL activity, concept-map and collaborative test
G – Muscular system	6	POGIL activity, concept-map and collaborative test
H - Endocrine system	4	POGIL activity

3 RESULTS

Below we present the results divided by the study objectives.

3.1 Compare the two teaching methods (expository and flip) in the test means

In this objective we intend to compare the two groups in a quantitative dependent variable (Test means, scale 0-20), both groups have an n greater than 30 (n = 53 in the expository group and n = 57 in the Flip group), thus the theorem of central limit is applicable with an approximation to the normal distribution. We can thus apply student's parametric test t to independent samples. Student's t-test revealed the existence of a significant difference between the EA group (n = 53) and the FC group (n = 57) at the means of the tests [t (108) = -7,004, p = 0,000]. The FC group (mean = 17.096) had a significantly higher mean compared to the EA group (mean = 14.953)

3.2 Compare the two teaching methods (expository and Flip) in satisfaction with the course and with the teacher

In this objective we intend to compare two groups in the satisfaction variable with the curricular unit and the teacher, having these variables quantitative scale (are the result of an average score where items with scale between 1 and 7 are added, dividing this sum by the number of items that make up

each scale: 7 items for satisfaction with the curricular unit and 5 items for satisfaction with the teacher, thus obtaining an average score ranging from 1 to 7). Both groups have an n greater than 30 (n = 53 in the expository group and n = 57 in the Flip group), so the central limit theorem is applicable with an approximation to the normal distribution. One can also apply student's parametric test t for independent samples. Student's t-test revealed for $p \leq 0.001$ the existence of a significant difference between the expository group (n = 53) and the Flip group (n = 57) in the satisfaction with the curricular unit [t (113) = --5,685 , p = 0.000] and satisfaction with the teacher [t (113) = -3,634, p = 0.000]. The group subjected to the FC method has a significantly higher satisfaction, compared to the group subjected to the expository method, with the curricular unit (average Flip = 6.466, expository average = 5.714) and with the teacher (Flip average = 6.462, average expository = 5,849).

4 CONCLUSIONS

This demonstrates that FC, if properly implemented with cooperative learning, can lead to increased academic performance and student satisfaction and it can be an effective means to disseminate key physiological concepts to graduate students.

The implementation of FC in a physiology course in the Physiotherapy undergraduate program was successful based on the grades obtained by the students in the academic performance measures, as well as in the course satisfaction and teacher performance questionnaires.

Although the implementation of the course under this methodology has led to careful planning and considerable time spent, student satisfaction has more than justified these efforts.

However, there are still outstanding issues to be resolved before all physiotherapy teachers adopt this approach in training these professionals.

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