“Physiologying” study group using active methods: the student's perception about the use of this strategy in human Physiology teaching-learning

Grupo de estudo “fisiologiando” utilizando metodologias ativas: a percepção dos estudantes sobre o uso dessa estratégia no ensino-aprendizagem de Fisiologia humana

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Abstract

The creation of strategies that modify the classic model of teaching and facilitate the learning is a challenge for professors. Physiology, as a basic science, requires approaches that allow the construction of knowledge that are essential to health professionals and that stimulate the interest of students in the contents worked in classes. Therefore, we created the "Physiologying": a study group on human physiology. Our proposal included weekly meetings of students enrolled in the Human Physiology courses and students previously selected that acted as tutors. In the meetings different active methodologies were used to discuss the physiology contents. From the students’ opinion, we verified that a weekly study group using active methods represents an important strategy to facilitate the learning process of physiology contents previously worked in class.

Keywords: Biological sciences; study group; learning.

Resumo

A criação de estratégias que modifiquem o modelo clássico de ensino e facilitem a aprendizagem é um desafio para professores. A fisiologia, enquanto ciência básica, necessita de abordagens que permitam a construção de conhecimentos essenciais aos profissionais da saúde e estimulem o interesse dos estudantes nos conteúdos trabalhados em aula. Diante disso, nós criamos o “Fisiologiando”: um grupo de estudo em fisiologia humana. Nossa proposta contou com encontros semanais entre estudantes matriculados na disciplina de Fisiologia Humana e estudantes monitores previamente selecionados. Nos encontros, diferentes metodologias ativas eram usadas para discutir os conteúdos de fisiologia. A partir da opinião dos alunos, verificamos que a realização de um grupo de estudo semanal utilizando metodologias ativas representa uma estratégia importante para a facilitação do processo de aprendizagem de conteúdos de fisiologia previamente trabalhados em aula.

Palavras-chave: Ciências Biológicas; grupo de estudos; aprendizagem.
1 Introduction

The success of the teaching-learning process is a challenge to professors. Recently, there is a wide interest in the development of teaching strategies that stimulates the enhanced of the learning and content retention, expanding the student participation on this process [1-3].

The area of biological sciences can be very favored when strategies that facilitate the learning process are used, but, it is necessary that these strategies be dynamic, creative, interactive and that stimulate the students to debate on the contents [4, 5].

In the last decades, the professor-student relationship was characterized by the vertical transmission of knowledge, and the student had a passive role in the learning [6]; the professor dominates the contents, that were organized and structured to be transmitted to the students [7]. This model remains in several educational spaces until today. On the other hand, models of active knowledge construction have been developed. The active teaching has as main characteristic the insertion of student as a protagonist in the construction of knowledge, using different active methodologies to promote the learning [8-11].

The teamwork, an strategy that could be included in study groups, is an efficient alternative of active method to increase the students’ learning and interest in the contents [8, 9], promoting the students' responsibility for the learning [9]. From this perspective, we propose the creation of a study group using teamwork and other active methods as a way to increase the students' interest and facilitate their learning of human physiology. Here, we describe this strategy and relate the students’ perception about their physiology learning and understanding after their participation in the study group.

2 Study design

2.1 Participants

We developed this work with students’ enrolled in Human Physiology courses, which are taught in the first and second year of Nursing and Physiotherapy undergraduate careers of Federal University of Pampa, Uruguaiana/RS (Brazil). This activity was approved by the local Institutional Education Committee (Institutional Review Board n°. 10.006.16) and was fulfilled in the first academic semester of 2016.

At the beginning of the semester, on the first day of Human Physiology class, the students were invited to participate in the “Physiologying” study group (PSG). We
proposed weekly extra-classes meetings with the students (2 h/wk). During these meetings, the students had the opportunity to work in teams, review concepts, solve doubts and discuss contents previously worked in theoretical classes.

The methodologies and contents were guided by the tutors (students that previously concluded Human Physiology courses with success and were selected and trained by professor).

Different active methodologies to work in teams were proposed in the study group, looking for the facilitation of the teaching-learning process. These methodologies include the use of educational games, discussions about the contents, and the use of pre-defined questions to guide the study.

2.2 The use of educational games

The educational games were organized using slides. Previously to the meeting, the tutors organized questions related to the content worked in theoretical and practical physiology classes.

In the first moment of the meeting, they divided the students in two teams, and each elected a representative. Like a television quiz show, the tutors projected questions in slides (e.g. What is the alternative that shows an example of positive feedback?), together with possible alternatives (e.g., for the exemplified question: a- Increased heart rate during exercise; b- Increased respiratory rate during physical exercise; c- Increased uterine contraction during delivery; or d- Decreased heart rate after physical exercise).

Subsequently, each student representative had 5 minutes to discuss about the alternatives with their team and choose the answer the team consider as correct. Moreover, the students were instigated to justify their choice of answer, and if their choice was wrong, the tutors stimulated them to reflect about it. In addition to presenting the correct alternative, the tutors stimulated the discussion and, if necessary, explained about the content using slides, debating on the contents developed in theoretical and practical classes.

The questions used in the educational games were simple and could be any multiple-choice question, or even descriptive questions. The differential here was the teamwork and the discussions stimulated by the tutors.

Using this methodology, we revised the mechanisms of homeostasis regulation, including negative (as changes in heart rate and blood pressure during and after physical exercise) and positive feedback (as the mechanism of uterine muscle contraction during
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delivery), and also cellular physiology, such as the principles of ionic changes in resting cells and during the action potential and synaptic transmission in specific cells.

2.3 Guided discussions about the contents

The physiology contents were discussed in teams through the use of dialogue in an informal conversation. The knowledge, previously and individually constructed in the theoretical and practical classes, was shared with the other students. In each meeting, tutors introduce the content worked in theoretical class, so each student made a brief explanation about what he/she understand of the content.

The tutors guided the discussion, but the idea of this methodology was to minimize the effects of vertical transmission of knowledge, providing to student a moment of knowledge construction thought teamwork. Using this method we discussed contents as properties of smooth, skeletal and cardiac muscles and the differences in the contraction of each one.

2.4 Use of pre-defined questions

The contents worked in theoretical and practical physiology classes were divided in themes by tutors and professor, and they created open questions addressing the most important topics of each content.

The pre-defined questions were written on a piece of paper. In the meeting, each student handled a piece of paper and should think about the question and explain to the others students.

In this part, the students were free to use creativity: they could use whiteboard, images, drawings or whatever he/she considered interesting to explain the content. Using this method we revised the divisions of the central nervous system and its functions, as well as the functions of the motor system and the different types of movements.

2.5 Evaluation of the propose

At the end of the semester, after completing all the activities, the students who participated in the PSG meetings were invited to answer a questionnaire evaluating the activities [Tab. 1]. The data from this questionnaire were tabulated and converted in percentage to show the frequency of each response and the total number of responses (n) in each option.
Table 1. Questions used to evaluate the “Physiologying” Study Group and students’ response.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Objectives</th>
<th>Answers</th>
</tr>
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<tbody>
<tr>
<td>How do you evaluate your performance in this course?</td>
<td>Verify the students’ perception about their performance in the Human Physiology course.</td>
<td>( ) Excellent&lt;br&gt; ( ) Good&lt;br&gt; ( ) Regular&lt;br&gt; ( ) Poor</td>
</tr>
<tr>
<td>Do you believe that your participation in the Study Group contributed positively to your performance in Human Physiology course?</td>
<td>Verify if the students consider that their participation in the Study Group contributed to their performance in the Human Physiology course.</td>
<td>( ) Yes&lt;br&gt; ( ) No</td>
</tr>
<tr>
<td>Do you believe that your participation in the Study Group contribute to your performance in other courses?</td>
<td>Verify if the students consider that their participation in the Study Group contributed to their performance in other courses.</td>
<td>( ) Yes&lt;br&gt; ( ) No&lt;br&gt; If yes, which courses?</td>
</tr>
<tr>
<td>Complete the sentence: The Study Group in Human Physiology ...</td>
<td>Verify the students’ general opinion about the Study Group.</td>
<td>( ) Was essential for my understanding of Human Physiology, because only with the classes I could not understand content.&lt;br&gt; ( ) Collaborated for my understanding of the Human Physiology concepts, complementing the theoretical classes&lt;br&gt; ( ) Unnecessary</td>
</tr>
<tr>
<td>If there was no Study Group, do you believe that your productivity in the Human Physiology course would have be the same?</td>
<td>Verify if the students consider that their productivity on Human Physiology course would be the same without the Study Group.</td>
<td>( ) Yes&lt;br&gt; ( ) No&lt;br&gt; ( ) Maybe</td>
</tr>
<tr>
<td>Considering the methodologies used in the PSG, which one did you consider as the most effective for your learning?</td>
<td>Verify the opinion of students about the most effective methodology for learning.</td>
<td>( ) Educational games (quizzes)&lt;br&gt; ( ) Guided discussions about the contents</td>
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You consider that the methodologies used in the study groups ... (check as many options as you wish)

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<th>( ) The use of pre-defined questions</th>
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<tr>
<td>Verify the opinion of students about methodologies used.</td>
<td>( ) were interesting</td>
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<td></td>
<td>( ) enabled a better understanding of the content worked in the classes</td>
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<td></td>
<td>( ) were fun</td>
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<tr>
<td></td>
<td>( ) instigated my curiosity and desire to understand more about Physiology</td>
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<td></td>
<td>( ) were boring</td>
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Additionally, the final grades of students who participated in the PSG were compared to the final grades of students who did not participated using an unpaired Student's t-test. The differences were considered significant when P < 0.05.

3 Results

A total of 12 students completed the questionnaires, all from the Physiotherapy. The participants’ age was between 18 and 54 years old (mean 22.6 ± 10.04). The mean age for the males (n = 2; 16.7%) was 21.0 (± 0) yr, whereas the female (n = 10; 83.7%) was 22.9 (± 11.1) yr.

When questioned about their performance in the Human Physiology course, 16.7% (n = 2) considered that it was great, 58% (n = 7) considered as good; 16.7% (n = 2) considered as regular, and 8.3% (n = 1) considered as a poor performance [Fig. 1A]. When questioned if their participation in the PSG contributed positively to their performance in the Human Physiology course, 100% (n = 12) considered that it contributed [Fig. 1B].

Furthermore, when questioned whether participation in the PSG contributed to performance in other courses, 91.7% (n = 11) answered yes, and only one student said no [Fig. 1C]. Between the courses cited by students, anatomy (cited by 75%; n = 9), histology (cited by 41%; n = 5), biomechanics (cited by 8.3%; n = 1) and immunology (cited by 8.3%; n = 1) are considered courses to which the PSG also contributed to the students’ learning [Fig. 1D].
Figure 1. Students’ opinion about the contributions of PSG to their Human Physiology learning.
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Instigated to opinion, 16.7% (n = 2) of the students considered the PSG as essential for their understanding of Human Physiology, because only with the classes they considered that they could not understand the content; 83.3% (n = 10) considered that the PSG collaborated for their understanding of the Human Physiology concepts, complementing the theoretical and practical classes [Fig. 1E].

When questioned if they think that their performance in the Human Physiology course would be the same without the PSG, 91.7 % (n = 11) of the students considered that it would not be the same, and only one student said that maybe he/she would have the same performance [Fig. 1F].

When questioned about which of the methodologies used in the PSG they considered most effective, 50% (n = 6) of the students cited the explanations using educational games, 16.7% (n = 2) cited the guided discussions about the contents, and 33.3% (n = 4) the use of pre-defined questions [Fig. 1G].

When we asked the students to opine on the methodologies used, 100% (n = 12) of the students considered that the activities allowed a better understanding of the contents worked in the class, 91.7% (n = 11) characterized the methods as interesting, 50% (n = 6) considered the activities as fun, and 33.3% (n = 4) considered that the activities instigated their curiosity and generated a desire to understand more about physiology [Fig. 2A]. Nobody considers the activity as boring [Fig. 2A].

Finally, when we compared the final grades of the students that participated in the PSG with the grades of the students who did not participate in the PSG (NPSG), we verified that the first group showed a better performance in the course (P < 0.0001) [Fig. 2B].

Figure 2. Student’s opinion about methodologies used (A) and the comparison of the final grade of students that participated on PSG and the students that did not participate (NPSG). *** P < 0.0001, unpaired t-test. NPSG, students who did not participate in the “Physiologying” Study Group; PSG, students who participated in the “Physiologying” Study Group.
4 Discussion

Our results showed the importance of teamwork extra-class activities using active methodologies in the biological sciences teaching-learning process. More than half of the students enrolled considered that their performance in the Human Physiology course was great or good and said that PSG contributed to it. In addition, we demonstrate that the impact of PSG in the teaching-learning process went beyond the Human Physiology course, extending to other courses such as anatomy, histology and immunology.

The extra-class activities provided a moment to revise contents previously worked in classes, contributing to the understanding of physiological concepts, complementing the theoretical and practical classes, and increasing students’ interest, as verified previously by other authors [2, 12-15]. Different methodologies were used in the PSG. Among these methodologies was the use of educational games, which was considered the better strategy by students. The use of educational games has been widely disseminated [11, 16-19] and previously researches demonstrated that the games allow that students be more involved with the proposed content, increasing their interest in the explanations and their active participation [20-22].

Beyond the games, discussions and guided questions were used. The activities proposed for PSG allowed both the student and the tutor to retrieval, systematize and build knowledge of previously worked contents. Activities involving groups tend to stimulate students' interest, curiosity and desire to better understand the content, providing a significant exchange of knowledge between peers, as well as providing a relaxed and fun atmosphere, what not always happen in the class [8, 23]. Based on the stimulation of students’ own construction of knowledge, active methodologies strongly stimulate the teaching-learning process, developing critical thinking [24-27]. So, our results reinforce the hypothesis that the teamwork improves the students' performance, helping them assimilate the contents [8, 9].

Finally, in the present work, we evaluated the impact of PSG on physiology contents’ learning, demonstrating that students who participated in extra-class activities had a better performance (courses’ final grade) when compared to those who did not participate in PSG. In this sense, extra-class activities, at least in the way proposed here represent an important mean to learn. Probably the neurobiological explanation beyond that involves the fact that the weekly participation in the study group and the consequently exposure to different methodologies allowed the reactivation of concepts previously studied in the class, contributing to a better performance in the final grade.
5 Conclusion

The “Physiologying” Study Group is a tool that helped the students’ in the teaching-learning process, both in the physiology course as in other related courses. The different active methodologies and the teamwork proposed increased students’ interest in physiology, as well as improved their performance in the Human Physiology course.

References


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