

# Blended learning strategies in teaching general pathology at a medical course

## *Estratégias de blended learning (ensino híbrido) no ensino de patologia geral em um curso de medicina*

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### ABSTRACT

**Introduction:** In many medical schools, it is evident that learning of general pathology is deficient, mainly due to the disinterest in knowledge not directly related to professional practice and the lack of pedagogical resources that motivate learning. Blended learning (BL) is an active method of hybrid teaching that uses different technological resources, promoting greater dynamism and integration of students. **Objective:** The objective of this research was to evaluate, from the perspective of the students of the medical course of Pontifícia Universidade Católica de São Paulo (PUC-SP), the motivation and the capacity to contextualize provided by the employment of BL to the teaching of general pathology. **Material and method:** The BL sessions were performed during the applied in-class activities of pathology in the period from October 6 to 31, 2014, in the Neoplasms Module, with the second-year students of the medicine course at PUC-SP. **Results:** Most of the students showed acceptance of the method, greater motivation and ability to contextualize the pathological processes. **Conclusion:** The use of BL can provide students with greater contextualization of pathology in medical practice, contributing to a more meaningful learning.

**Key words:** pathology; medical school education; teaching.

### INTRODUCTION

In the latest decades, much has been said about pathology teaching at medical schools. Lecturers have been defied to face a series of curriculum alterations that focus on an integrated teaching model<sup>(1,2)</sup>. Such alterations emerged from the necessity of forming professionals to meet society demands, with greater capacity for action in resolution of individual and community health problems, prioritizing the development of skills and the stimulus to the use of active learning methods<sup>(3-5)</sup>.

According to classroom experience, many pathology instructors in Brazilian medical schools have observed students' deficient learning, especially due to the shortage of educational resources to aid with learning pathological processes in a contextualized stimulating way, integrated with the other specialties<sup>(6)</sup>.

Over the years, pathology advanced a lot in the diagnostic area, with the development of histological, molecular, and genetic techniques. The focus of pathology evolved into diagnostic

precision for a personalized therapy with major impact on patients' prognosis. In this context, many pathologists became more and more specialized. High-complexity medicine was incorporated to pathology teaching and created a context of disinterest, on the part of students, in histological or molecular diagnostic criteria<sup>(6)</sup>.

Medical education, in general, has been going through a period of questioning on the quality of the teaching-learning process. There is a growing trend towards the search for innovating methods that admit a critical, reflexive and transforming pedagogical practice, exceeding the limits of the formation period. Professors must recognize the need to look for new methods that make learning more stimulating and meaningful, and, if possible, integrate them to technological resources currently available, favoring students' active participation in knowledge construction, and in connection with practice<sup>(7,8)</sup>.

Considering these new scenarios of medical teaching, a new model of pedagogical management must be searched for, so that teaching is according to the new national curricular guidelines

in the medicine course<sup>(9)</sup>, accessible to students in an effort to comprise the necessary contents for an adequate medical formation. In order to reach these objectives, we may highlight the development of competencies<sup>(10)</sup>.

This model encourages colleges to mobilize a group of cognitive resources – such as knowledge, skills, and information – to solve different situations with pertinence and efficacy, aiming at connecting the issues worked in the classroom with students' reality. Dynamic and contextualized activities must be carried out, with different pedagogical techniques and approaches, bringing students closer to their future medical practice<sup>(11)</sup>. Professors must establish learning objectives and adapt contents to each reality, facilitating contextualization of pathological processes.

Many discussions have broken out on the current ways of pathology teaching. It has been more and more necessary to integrate pathology teaching to the new educational skills. In this search for new proposed active methods to stimulate the learning process and the development of skills is blended learning (BL)<sup>(12)</sup>.

BL is a method of teaching in which part of knowledge construction is completed virtually, with different technological resources, enabling synchronous or asynchronous activities. Combined with this virtual environment, face-to-face situations are necessary with professors trained for activities with practical application, so as to generate more dynamism, mobilization and integration of the involved ones<sup>(13-15)</sup>.

In order to understand the method definition, one can cite the characterization prepared by researchers of the Christensen Institute, which considers BL any formal educational program in which students learn, at least in part, by virtual teaching, with an element of control over time, place and rhythm of learning, joining face-to-face moments with lecturers that develop integrated practical activities<sup>(16)</sup>.

In the literature, among the main reports of experience with the method in medical practice, there is the work by Rowe, Frantz and Bozalek (2012)<sup>(17)</sup>, who analyzed all BL publications in the healthcare area in 2000-2010. During that period, most interventions occurred in countries such as the United Kingdom, USA, Canada, and Australia. Among the different conducted studies, a great benefit in common was seen in the development of competencies and skills of students who use that method.

Since then, researches involving BL in medical teaching have grown exponentially. The new method creates the possibility of reinventing classrooms in a way that makes students able to develop cognitive skills and meaningful learning, contributing to the formation of more competent professionals<sup>(18)</sup>.

With this aim, because of the unavailability of studies associating BL strategies, specifically with the teaching of general pathology, the objective of this study is to evaluate the effect of BL strategies in the teaching of general pathology at the medicine course of Pontifícia Universidade Católica de São Paulo (PUC-SP), under the students' point of view, according to the capacity of contextualization of pathological processes and the motivation provided by the method.

## MATERIAL AND METHODS

### Description of the module and the students

This is an exploratory quantitative study that proposes the association of BL in the activities of general pathology for students of the second year of the medicine course of Faculdade de Ciências Médicas e da Saúde of PUC-SP. This project was approved by the Research Ethics Committee (CAAE: 28278214.4.0000.5373, report on June 10, 2014).

The intervention was carried out with these students, because this series has general pathology as one of the main theme axis. It was stipulated that the intervention would be applied in the Module Neoplasms (October 2014, duration of four weeks), as that module presents higher complexity and a great variety of themes, which can be integrated with different medical areas. Besides, because it is the last theme module of general pathology, it would make longer time available for preparation of material and practical activities, and students would have more parameters for comparisons. The theoretical content and the developed practical activities were aimed at fulfilling the learning objectives predefined in the course pedagogical project.

The population was composed of 107 students divided into four groups, and for this intervention, they were advised to divide themselves into four subgroups, respecting the limit of 6-7 components per group.

### Intervention description

The flipped class (FC) modality of BL was chosen. In this model, the theoretical content is individually accessed by means of technological resources, prior to a class session. In the classroom, students engage in practical activities related to the theoretical content<sup>(19)</sup>. The professors responsible for the intervention were trained by the center of didactic support of PUC-SP school of medicine.

Some weeks before the Module Neoplasms, students were informed about the introduction of the new method, besides signing the free informed consent. The material would be made available in the virtual modular object-oriented dynamic learning environment (Moodle) a week before face-to-face activity, so that

each student accessed the material and studied individually or in group, respecting their learning rhythm. That material provided at distance contained videos, lessons on the theme to be approached, texts for review, photos of slides and pieces, descriptive reports, etc.

On the day of face-to-face sessions, practical activities were developed in which small groups took turns around the different stations, that is, while two groups discussed about one activity, the other two performed another. With small rotational groups, classes are more dynamic; and discussions, more efficient. Professors can observe and guide students better in the process of learning. Each activity had, on average, one hour and a half duration: 25 minutes for each activity, and the last 30 minutes were reserved for a feedback by the professor about the developed activities. These activities privileged problem solving, as the resolution of different questions, delivery of reports based on a case associated with a slide or anatomical piece.

For evaluation of the project, a questionnaire with 11 questions was designed, in which students signaled their agreement, disagreement or indifference by means of the Likert scale with five variables. For evaluation of this research, we used as an instrument a questionnaire with the Likert scale and variables from 1 to 5, qualitatively and respectively represented by the following perceptions: 1) I totally disagree, partially disagree, indifferent, partially agree, or totally agree; or 2) very bad, bad, indifferent, good, or very good.

### Result analysis

As any use of an instrument must imply the analysis of its metrical characteristics and the validity of data to be interpreted,

the obtained results underwent a reliability analysis by the Cronbach's alpha coefficient. In general, an instrument or test is classified as having appropriate reliability when  $\alpha$  is at least 0.7063. The use of a single reliability estimate as a basis to take conclusions on an instrument is subject to error, as any estimate is equally subject to error. In the statistical analysis, a coefficient was obtained of 0.7605, classified as having appropriate reliability.

For the statistical analysis, a chi-square test ( $\chi^2$ ) was conducted for adherence to determine if the obtained data set followed a certain distribution of probabilities.

## RESULTS

The results of questionnaires were evaluated individually, by assertions. At a second moment, scores of the Likert scale were grouped in favorable aspects of the intervention (variables 5 and 4: partially agree and totally agree, or good and very good), and indifferent non-favorable aspects of the intervention (variables 3, 2, and 1: totally disagree, partially disagree, indifferent, or very bad, bad and indifferent). We decided to include the item "indifferent" as not favorable to the intervention, because students who answered that way did not reinforce positive points and did not have a favorable view on the intervention. Thus, the positive perception of the intervention would be more clearly exhibited. Among the total of 107 students, 71 answered the questionnaire on the performed intervention. The questionnaire result is in the **Table**.

TABLE – Results in percentage favorable or not favorable/indifferent to the intervention

	Indifferent/unfavorable to the intervention (%)	Favorable to the intervention (%)	Total	<i>p</i>
I found no difficulties in accessing the teaching material available in Moodle	26	74	100%	< 0.05
Every time a teaching material was made available in Moodle, I accessed it and studied prior to applied in-class sessions	74	36	100%	< 0.05
Materials delivered via Moodle were used mainly in the moments before evaluations	13	87	100%	< 0.05
Quality of the teaching material made available in Moodle for the Module Neoplasms	19	81	100%	< 0.05
The theoretical pathology content of the material available in Moodle along with applied in-class sessions encompassed the objectives of the Module Neoplasms	10	90	100%	< 0.05
The possibility of studying before classes and personally was great, because it helped a lot to consolidate my studies	31	69	100%	< 0.05
In the applied in-class sessions of pathology, it was possible to solve all doubts that arouse during the individual previous study	24	76	100%	< 0.05
Evaluation of practical activities developed in the applied in-class sessions	24	76	100%	< 0.05
The activities developed in the in-class sessions, along with previous study of theoretical contents, helped me associate pathological processes in several situations of medical practice	19	81	100%	< 0.05
I believe the applied method increased my interest in studying, thus improving my degree of integration between pathology and clinic	31	69	100%	< 0.05
General evaluation on the experience of blending face-to-face practical teaching with a previous individual study (blended learning)	30	70	100%	< 0.05

## DISCUSSION

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During implementation of BL, one could observe that most students were receptive to the new method and very helpful, what demonstrated consonance with the literature on acceptability of the method and lecturers' satisfaction with it.

A study conducted by Sadegui (2014)<sup>(20)</sup>, at the School of Public Health of the Tehran University of Medical Sciences, between 2012 and 2013, compared the impact of BL classes with traditional classes. At the end of intervention, students' knowledge in both groups was evaluated and measured by means of pre- and post-tests. Students' satisfaction and commentaries about both methods were collected by means of questionnaires. Knowledge scores increased in both groups after intervention. However, students' satisfaction with BL was greater than that with the traditional method. Results revealed that BL has acceptability and can be efficient to motivate learning.

Another observation made during the intervention and that deserves being discussed is the relationship that students showed with histopathology. During some practical activities, there was approach to the microscopic study; however it was not necessary to produce specific diagnoses on the displayed cases. Histology was presented just for students to identify some general characteristics of benign and malignant neoplasms. Yet, most of students demonstrated great difficulty to perform these activities. Many could not identify the tissue or organ being studied. Besides, many also showed disinterest in learning.

This makes us question the role of the histopathological approach in teaching. Is learning microscopic alterations of pathological processes really important? How to underscore this knowledge to students and how to apply it in a contextualized manner? These issues raised in the present survey confirm the importance of rethinking pedagogical practice, and, because of that, have already been put in doubt by several experts in pathology<sup>(21-23)</sup>. Deep histological and diagnostic knowledge is not necessary for most medical specialties. The establishment of diagnoses and the preparation of anatomical pathological reports demand intensive training, a lot of technique and specific knowledge<sup>(24)</sup>. It is not possible to demand such knowledge from medicine students or general practitioners. However, one must consider a minimal content of histopathology so that there is adequate comprehension of disease mechanisms and the impacts caused by them<sup>(25)</sup>. A discussion becomes necessary on the pathology contents that must be taught at undergraduate courses, and, principally, which methods must be used for a meaningful learning<sup>(26, 27)</sup>.

In 2015, the Canadian Association of Pathologists (CAP) decided to establish the basic competencies in pathology and laboratory medicine that should be developed in all undergraduates<sup>(26)</sup>. Those competencies were later approved by the executive service of CAP and the Canadian Leadership Council on Laboratory Medicine. That document provides the first list comprising competencies in pathology and laboratory medicine expected for the formation of a good general practitioner, regardless of the medical specialty that will be chosen. Among the established competencies one may highlight the understanding of general mechanisms of diseases, permitting correlating their signs and symptoms; development of an adequate medical reasoning about etiopathogenesis of the main diseases, with capacity for planning actions of prevention or treatment; the adequate theoretical-scientific conditions to dialogue on the pathogenesis of a disease, in a clear and secure way, with other professionals of the healthcare area or patients; and search for general knowledge in pathology to reach plausible differential diagnoses. The study also stresses the importance of integrating pathology to laboratory medicine, supplying conditions for medicine undergraduates to know how to order specific medical tests adequately and with the necessary information, considering the limitations of each test.

An American study conducted by Sadofsky *et al.* (2014)<sup>(27)</sup> also proposed the development of specific competencies in pathology to be implemented in the whole country by means of a coherent group of learning objectives and an adequate instrument to assess acquisition, integration and application of knowledge. The study claims that the existence of national norms for the competencies preserves the independence of schools in the specific design of the curriculum, simultaneously assuring that all students meet the growing demands of medical practice.

Access to technology and handling of tools is one of the most important factors for the adequate employment of BL and the consequent satisfaction of students that use this method<sup>(28)</sup>. In this intervention, 74% of students reported easy access to virtual environment. The material was made available in Moodle a week prior to applied activities during class. There was communication in the general forum of the second year medicine about the supplied material. Even though, some students (26%) presented difficulty in the access, what may impair their performance in the method, as for an efficient employment of BL, students should have previous online study on the proposed themes<sup>(29)</sup>.

Another important aspect was that 87% of students stated that they just accessed the didactic material to study before evaluations. It can be clearly perceived that many only feel the necessity to consolidate learning to obtain a better performance in the evaluation process. This result reflects that although students

attend an institution that praises student-centered active learning methods, they are still tied to concepts of traditional teaching and have summative assessments as the main motivator for knowledge acquisition<sup>(30)</sup>.

At BL, especially in the flipped class model, practical sessions are more productive when the student makes the pre-class individual studying. So, during discussions and questionings, students can note their deficiencies and take measures to overcome them<sup>(31, 32)</sup>. However, one must consider the difficulties students may have due to immaturity, inherent in different factors, such as age and the strong presence of the traditional method in their academic life so far. Many times, this can lead to misunderstanding of the role active methods and independence must acquire in knowledge construction<sup>(33)</sup>. Teaching institutions shall provide students with information on the used proposed methods so as to create with them a partnership that will go on closely knit up to the end of the course, making them feel more secure and confident in the learning process<sup>(34)</sup>.

Regarding the contents of pathology that must be taught in undergraduation, clear well-established learning objectives are necessary, as well as what it is expected from students for practical activities, evaluations and professional future. In this intervention, 90% of students considered that the developed themes (theoretical content and practical sessions) adequately comprised the proposed objectives in the Module Neoplasms of the college pedagogical project. In the practical activities developed in classroom, 76% of students stated that they could solve doubts they had, what can provide more efficient pathology learning.

It is important to highlight that the conducted activities did not have a summative character, and some students did not participate effectively in the previous preparation of activities. The use of active learning methods requires an active role from students, and when it does not happen, any learning tool tends to failure<sup>(5)</sup>.

Most medical schools are likely to concentrate the teaching of general pathological processes of the most common diseases based on the observation that most students will be general practitioners and will act within a limited number of diseases, according to epidemiological data. Even so, there is the perception that learning pathology is difficult, for not all knowledge is clear and directly related to professional practice, what does not arouse students' interest<sup>(6)</sup>. Contextualization is one of the andragogical assumptions that present themselves as facilitators and orientators of the learning relationship among adults. In andragogy there is the necessity of establishing coherence between the theoretical field and the realities found in the learning process<sup>(35)</sup>.

In this study, contextualization of pathological processes could be explained during practical activities developed in the classroom. In their answers, 81% of students stated that the method contributed for their association of pathology with several situations in medical practice, favoring integration among different areas. This analysis reveals how possible it is to integrate pathology to other areas of knowledge by means of active methods, making comprehension of pathological processes easier. BL enabled students not only to learn the content but also to produce knowledge in a contextualized cooperative and practical manner, reinforcing the potential development of competencies that the method promotes<sup>(17, 36)</sup>.

The complex theme of motivation and learning has been extensively described by Keller (2008)<sup>(37)</sup>. The author highlights that to generate students' motivation it is necessary to arouse curiosity, perceived as a gap in current knowledge, and relevance, that is, when students perceive that the information is relevant for their learning and future professional activity. In the present study, 69% of students felt more interested in studying pathology with this method. This piece of data reinforces the motivating effect of BL in the learning process.

In the general evaluation on students' satisfaction regarding experience with BL, 70% of answers were score 5 and 4, considering approval of the method by most of the students. This result is in agreement with data found in the literature, as the majority of recent studies on BL in the healthcare area demonstrate higher satisfaction of students with the new method<sup>(28, 38)</sup>.

In order to conclude the discussion on the obtained results, it is convenient to stress that the focus of this research was to adopt an active method that helped contextualization of pathological processes. BL was the tool that seemed more adequate for the intervention. We did not aim, in this work, at defending BL as a single strategy or the most efficient method in the present. The challenge of changes in medical formation encompasses the rupture of rigid inflexible pedagogical structures in the search for multiple approaches that form professionals fitting social demands and with stress on quality of assistance to health<sup>(39)</sup>.

Most of the studies carried out on the methodology of BL in the medical area refer to reports of short-term experiences, presenting wide diversity of instructional and limited methods to the evaluation of students' reaction and learning. There are few studies on effective changes in the environment, because for this purpose, a longer time of intervention would be necessary, besides establishing precise criteria to evaluate the intervention and the populational groups.

This work permitted to assure students new environments and learning strategies, searching greater dynamism, involvement, and contextualization of knowledge. The possibility of students to have access to technological support for classes is a motivating factor, with the expectation of improving learning results and diversifying the medical curriculum.

In general, we can conclude that the association of BL could promote a more contextualized and motivating learning for students, what permits integration of pathology teaching to new educational competencies.

This research is important to alert about the approach to pathology teaching in medical schools. There is the perspective in which results are the target of reflection by professors to surpass fragilities and propose alternatives for new editions of the method or other pedagogical proposals. One must emphasize that despite curricular alterations, knowledge of pathological processes is still fundamental for medical formation. For this area of knowledge to have a meaningful and profitable learning, one must evaluate which is the best method approach to promote contextualization of knowledge and integration with the different medical areas.

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## RESUMO

**Introdução:** Atualmente, em muitas escolas médicas, percebe-se que o aprendizado de patologia geral é deficiente, principalmente em decorrência do desinteresse pelos conhecimentos não diretamente relacionados com a prática profissional e da falta de recursos pedagógicos que motivem a aprendizagem. O blended learning (BL) é uma metodologia ativa de ensino híbrido que utiliza diferentes recursos tecnológicos, promovendo maior dinamismo e integração dos estudantes. **Objetivo:** O objetivo desta pesquisa foi avaliar, sob a ótica dos estudantes do curso de medicina da Pontifícia Universidade Católica de São Paulo (PUC-SP), a motivação e a capacidade de contextualização proporcionada pela associação do BL ao ensino de patologia geral. **Material e método:** As sessões de BL foram realizadas durante as sustentações aplicadas de patologia no período de 6 a 31 de outubro de 2014, no Módulo de Neoplasias, com os alunos do segundo ano do curso de medicina da Faculdade de Ciências Médicas e da Saúde da PUC-SP. **Resultados:** A maioria dos discentes mostrou aceitação ao método, maior motivação e capacidade de contextualizar os processos patológicos. **Conclusão:** O uso de BL pode proporcionar aos alunos maior contextualização da patologia na prática médica, contribuindo para um aprendizado mais significativo.

**Unitermos:** patologia; educação de graduação em medicina; ensino.

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