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Problem-based learning using comics in Forensic Dentistry

Deisy Satie Moritsugui[1]
0000-0003-1999-9718

Gabriela Nobre Silva[1]
0000-0003-3004-8745

Flávia Vanessa Greb Fugiwara[1]
0000-0001-8984-5162

Flavia Nicolle Stefani Vassallo[1]
0000-0001-5951-037X

Letícia Vilela Santos[1]
0000-0002-9899-5573

Guilherme Salomão Balbino[1]
0000-0002-4818-4801

Naira Fernandes de Oliveira[1]
0000-0002-1490-062X

Rodolfo Francisco Haltenhoff Melani[1]
0000-0001-7148-3503

[1]Faculdade de Odontologia da Universidade de São Paulo (FOUSP), São Paulo, São Paulo, Brasil.

Correspondence:
Rodolfo Francisco Haltenhoff Melani
E-mail: rfmelani@usp.br

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Abstract The objective of this study was to evaluate the students' perception and acceptance of problem-based learning methodology (PBL) modified for online application. Forensic Dentistry students were inserted into a simulated crime scene in comic book format. Divided into "forensic teams", they were assigned the task of preparing an expert report on this crime scene with the help of a tutor. At completion of the semester, a questionnaire was produced using the Google Forms platform with questions about the methodology used, availability of materials on the virtual platform and the use of an environment simulating forensic reality. A closed model questionnaire was used, and responses were based on the Likert scale. The sample consisted of 58 participants, of which 50 (86.2%) agreed or completely agreed that the methodology was stimulating and that it provided solid and purposeful learning. Among the participants, 49 (84.5%) agreed or strongly agreed that the use of PBL contributed to developing student autonomy. In the students' perception, the application of PBL methodology in the virtual environment, using the comic resource, contributed positively to the development of student's autonomy in their own learning.
Descriptors: Teaching. Forensic Dentistry. Crime. Computer-Assisted Instruction.

Aprendizaje basado en problemas utilizando cómics en Odontología Forense
Resumen El objetivo de este estudio fue evaluar la percepción y aceptación de los estudiantes sobre la metodología de aprendizaje basada en problemas (problem based learning - PBL) modificada para la modalidad en línea. Estudiantes de Odontología Forense fueron insertados en una escena del crimen simulada en formato de cómic. Divididos en "equipos forenses", se les encomendó la tarea de elaborar un informe pericial sobre esta escena del crimen con la ayuda de un tutor. Al final del semestre, se elaboró un cuestionario utilizando la plataforma Google Forms con preguntas sobre la metodología utilizada, la disponibilidad de materiales en la plataforma virtual y el uso de un entorno que simula la realidad forense. Se utilizó un modelo de cuestionario cerrado y respuestas basadas en la escala de Likert. La muestra estuvo conformada por 58 participantes, de los cuales 50 (86,2%) estuvieron de acuerdo o totalmente de acuerdo en que la metodología fue estimulante y proporcionó un aprendizaje sólido y propositivo. Entre los participantes, 49 (84,5%) estuvieron de acuerdo o muy de acuerdo en que el uso del método PBL contribuyó al desarrollo de la autonomía de los estudiantes. En la percepción de los estudiantes, la aplicación de la metodología PBL en el entorno virtual, a través del recurso del cómic, contribuyó positivamente al desarrollo de la autonomía del estudiante sobre su propio aprendizaje.
Descriptores: Enseñanza. Odontología Forense. Crimen. Instrucción por Computador.

Aprendizado baseado em problemas utilizando histórias em quadrinhos na Odontologia Forense
Resumo O objetivo desse estudo foi avaliar a percepção e aceitação dos discentes acerca da metodologia de aprendizado baseado em problemas (*problem based learning* - PBL) modificada para a modalidade *online*. Os estudantes da disciplina de Odontologia Forense foram inseridos em uma cena de crime simulada em formato de história em quadrinhos (HQ). Divididos em "equipes forenses", receberam como tarefa elaborar um laudo pericial desse local de crime com o auxílio de um tutor. Ao final do semestre, foi produzido um questionário pela plataforma Google Forms com perguntas acerca da metodologia utilizada, da disponibilização de materiais na plataforma virtual e do uso de um ambiente simulando a realidade forense. Utilizou-se questionário de modelo fechado e respostas baseadas na escala Likert. A amostra foi composta por 58 participantes, dos quais 50

(86,2%) concordaram ou concordaram totalmente que a metodologia foi estimulante e que proporcionou um aprendizado sólido e com propósito. Dentre os participantes, 49 (84,5%) concordaram ou concordaram totalmente que o uso do método PBL contribuiu para desenvolver a autonomia do aluno. Na percepção dos estudantes, a aplicação da metodologia PBL no ambiente virtual, por meio do recurso de HQ, contribuiu positivamente para o desenvolvimento da autonomia do aluno sobre o próprio aprendizado.
Descritores: Ensino. Odontologia Forense. Odontologia Legal. Crime. Instrução por Computador.

INTRODUCTION

The generation born connected to the internet, the so-called digital natives, are used to achieving all kinds of information more quickly. To meet this reality, the learning process becomes increasingly focused on these new needs[1]. To improve the online classes, professors are looking for alternatives to involve the students in this new teaching-learning process[2].

Based on the concept that solving problems and overcoming challenges encourages learning[3], the Problem Based Learning (PBL) methodology has been gradually implemented[4]. The approach is traditionally performed face-to-face, dividing students into small groups of 6 to 8 students with the respective tutor, proposing problem situations for discussion[5]. The problems must be relevant enough to catch the curiosity and awaken the students' critical and reflective thinking. The students identify the main issue and, by sharing the knowledge achieved from group discussions and/or individual research, they develop a deeper understanding.

Tools from pop culture and popularly frequent among younger people can aid the process of inserting the active method in areas where the traditional method is consolidated. For example, comics show positive results in other fields of knowledge by creating a favorable space for the assimilation between theory and practical concepts[6]. This study aimed to evaluate the perception and acceptance of Forensic Dentistry students regarding the PBL methodology in the online modality, by the use of comics.

METHOD

The research consisted of an observational cross-sectional study. The theme chosen for application of the PBL method was the “crime scene”. The professors of the discipline created a script simulating a crime scene, in which the scenario and the proposed narrative mixed a series of circumstances and evidence. The site used was the parking lot of the School of Dentistry, in open air. The materials used were a firearm (simulated), rope, knife (simulated), identification plates, striped tape for isolation and a skeletonized corpse, elements associated with the scene proposed: violence and homicide. Besides these traces, a model victim was part of the scene, and the wounds were characterized using artistic make-up, simulating the different types of bodily injury (Figure 1).

The scene was photographed with a Nikon D5 100 camera and a Nikon DX AF-S Nikkor 18-55 mm lens (Natori, Miyagi, Japan). The photographs were treated in the Clip2comic app (Digital Masterpieces GmbH, Potsdam, Brandenburg, Germany) and assembled in a comic book style (Figure 2). This resource allowed recording the sequence of the technical approach, which, besides the visual and written message, had a narration of the scene describing the dynamics of events (Figure 3).

The “forensic teams”, made up of undergraduate students, were assigned the task of preparing an expert report of the crime scene, respecting the previously demonstrated structural and methodological elements. Description of the site, the differentiation and characterization of injuries, and synthesis of technical impressions are constitutive and necessary aspects in the report of each forensic team.

Also, the students achieved access to didactic resources, such as video classes and handouts about the fundamental concepts of the discipline, and all teams met with a tutor by Google Meet to elucidate doubts and encourage the discussion.

At the end of the discipline, to assess the students' perspective on the applied methodology, a questionnaire was designed on the Google Forms platform and made available on the Google Classroom platform for all students enrolled in the first semester of 2021 in the Forensic Dentistry course. The study was approved by the Institutional Review Board of the School of Dentistry of University of São Paulo under protocol CAAE 46184521.7.0000.0075. The questions focused on evaluating the methodology and using an environment simulating forensic reality. A closed questionnaire was used with answers on a Likert scale, containing the options totally agree, agree, totally disagree, disagree and no reply.

Data collected by Google Forms form were tabulated in Microsoft Word and analyzed descriptively.

Figure 1. Crime scene and characterization of bodily injuries with artistic make-up (realistic simulation, black stripe added for publication).

Figure 2. Original photographs (left) and the result after image processing in the Clip2comic app (right) (black stripe added for the publication).

Figure 3. Scene with narration in comics format.

RESULTS

The questionnaire was answered by 58 students and the responses presented are summarized in Table 1.

Table 1. Answers to the questionnaire according to the Likert scale.

Questions	Text	Totally agree n (%)	Agree n (%)	Disagree n (%)	Totally disagree n (%)	No reply n (%)
1	Experimenting with the PBL methodology was unprecedented in my Dentistry course and allowed me to discover a new learning method.	16 (27.6)	33 (56.9)	7 (12.1)	1 (1.7)	1 (1.7)
2	The PBL method was useful to develop my ability to learn, promoting autonomy in my own learning.	22 (37.9)	27 (46.6)	5 (8.6)	1 (1.7)	3 (5.2)
3	The use of active methodologies, such as PBL, is stimulating and provides solid and purposeful learning.	16 (27.6)	34 (58.6)	4 (6.9)	2 (3.4)	2 (3.4)
4	The PBL methodology favored my contact with the faculty, reducing the distance between student and professor.	15 (25.9)	24 (41.4)	10 (17.2)	5 (8.6)	4 (6.9)
5	For the PBL activity, the available resources were sufficient for building knowledge and solving the problem.	13 (22.4)	35 (60.3)	7 (12.1)	-	3 (5.2)
6	With the impossibility of developing laboratory classes, I believe that the approaches by the PBL activity allowed to fill, even partially, the existing gap.	14 (24.1)	38 (65.5)	3 (5.2)	1 (1.7)	2 (3.4)
7	Inserting the class in an environment simulating forensic reality contributed to understanding the dynamics of the forensic process.	21 (36.2)	33 (56.9)	1 (1.7)	-	3 (5.2)

DISCUSSION

Dentistry, together with professionals from different areas, acts in crime scenes as foreseen in Law 5081/66, Art. 6[7], which assigns competence to dental professionals to perform forensic dental assessment and report in a criminal context. Also, the Federal Dental Council Resolution 63/2005, in Art. 54 and 55[8], describes the role of the specialist in Forensic Dentistry and its extension to other fields, depending on the interest of justice, including the field of forensic reports in related traces.

The methodology applied in most Dentistry courses in the country is the traditional passive methodology[9,10]. Some didactic resources that allow virtual practical activities can be applied and improved to adapt to the new reality of expanding teaching methods in Dentistry courses[2]. In the PBL methodology, students learn to seek solutions to problems that may arise throughout their professional lives. Thus, the teaching of dentistry can also benefit from this type of approach.

The main result found was positive feedback from students regarding the methodology to develop their learning ability. Participants in this study considered that the methodology used provides solid and purposeful learning. However, the results of question 7, which addresses the resources available on the discipline, show that part of the students stated that these were not sufficient for the construction of knowledge. When compared to traditional methodologies, in PBL the exchange of information occurs at a slower rate, since its objective is to develop critical thinking and autonomous learning[11]. This contrast can be noticed by the students and lead to the negative answer.

When questioned about the distance between student and professor, 67.3% reported that it was reduced. This result emphasizes that, in the active methodology, the professors' role is presented differently from the classic model, no longer as the sole holders of knowledge[12]. Thus, their behavior in this process is modified and they become responsible for guidance and monitoring, occupying the space, named by some authors, as learning facilitators[13].

The application of PBL in Dentistry was found to be an alternative to be considered, since it contributes positively to the development of integrated clinical reasoning skills and diagnostic cognitive skills[14].

Regarding the tool used, the literature considers that comics in the teaching process facilitate learning and understanding and trigger the interest and curiosity of students[15], which was the initial objective of the course. The use of this specific language may have contributed to the positive results, since this tool is not part of the routine of students in this field and may increase their attention level. There is evidence that comics can help consolidate theoretical concepts, since topics considered difficult to explain are benefited by this type of media and thus can arouse the student's interest[16].

Despite the lack of corresponding studies in the literature to compare the results, analysis of the perspective and acceptance of students with the PBL methodology, using the visual resource of comics, demonstrated a significant contribution of this method for teaching in Forensic Dentistry.

CONCLUSION

Forensic Dentistry students had good acceptance of the PBL methodology modified for online teaching using comics and perceived it as a positive contribution to learning and understanding the dynamics of the forensic process.

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