

## The Law and Science Trial: a learning experience through role-playing

### O Processo da Lei e da Ciência: uma experiência de aprendizagem através da encenação

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**ABSTRACT | INTRODUCTION:** Problem-based learning and role-play allow students to develop an active role in their learning process and make them implement classroom-acquired theoretical concepts in a practical environment. **METHODS:** The group of students was divided into two groups, the first representing the patient's family and the second the patient's insurance company. Each group defends its interests, the family defends the need for gene therapy and the insurance company defends the limitations that may occur with it. **MAIN OBJECTIVE:** In this article, we present an educational experience based on role-playing and problem-based learning developed for a Molecular Biology course in a Faculty of Medicine of a Colombian university, where students are asked to act out specific roles on a simulated trial. **RESULTS:** As many concepts taught through the course are easily forgotten, the Law & Science Gene Therapy Trial was developed to make learning a more didactical process and, therefore, improve academic results. This experience allows a theoretical-practical integration based on the students' knowledge of gene therapy, its molecular basis, and clinical implications. **CONCLUSION:** The trial is a meaningful experience that has been implemented for more than 10 years with Institutional support. Academic results from the experience have been exceptional, and students are motivated to develop assertive communication and teamwork capacities.

**KEYWORDS:** Collaborative Learning. Group Processes. Drama and role-playing. Teaching.

**RESUMO | INTRODUÇÃO:** A aprendizagem baseada em problemas e a encenação permitem aos estudantes desenvolver um papel ativo em seu processo de aprendizagem e fazê-los implementar conceitos teóricos adquiridos na aula num ambiente prático. **MÉTODOS:** O grupo de estudantes foi dividido em dois grupos, o primeiro representando a família do paciente e o segundo representando a companhia de seguros do paciente. Cada grupo defende os seus interesses, a família defende a necessidade de terapia genética e a companhia de seguros defende as limitações que podem ocorrer com ela. **OBJETIVO PRINCIPAL:** Neste artigo, apresentamos uma experiência de ensino pautada na encenação e na aprendizagem baseada em problemas desenvolvida para a aula de Biologia Molecular na Faculdade de Medicina numa universidade colombiana, na qual os estudantes são solicitados a atuar em papéis específicos num processo judicial simulado. **RESULTADOS:** Como muitos conceitos ensinados nas aulas são esquecidos facilmente, o Processo de Terapia Genética "a Lei e a Ciência" foi desenvolvido para fazer da aprendizagem um processo mais didático e, assim, melhorar os resultados acadêmicos. Esta experiência permite uma integração entre a teoria e a prática baseada no conhecimento dos estudantes da terapia genética, a sua base molecular, e as suas implicações clínicas. **CONCLUSÃO:** O processo é uma experiência significativa que foi implementada por mais de 10 anos com apoio institucional. Os resultados acadêmicos da experiência têm sido excepcionais, e os estudantes são motivados para desenvolver capacidades de comunicação assertiva e trabalho em equipe.

**PALAVRAS-CHAVE:** Aprendizagem Colaborativa. Processos Grupais. Drama e Encenação. Ensino.

## Introduction

As new demands on academic formation rise worldwide, higher-education teaching must evolve to fulfill the needs of globalized communities. Both university educators and graduates must develop specific skills to answer such needs.<sup>1</sup> Cooperative learning is a useful tool that allows teaching to evolve. Piaget and Vygotsky provide ideas for cooperative-learning application; Piaget's theory is centered on individual cognitive elements, while Vygotsky's focuses on individual development in a context of social interaction.<sup>2</sup> Social interaction and individual cognitive exchange are vital to transforming socially constructed knowledge into practical experiences.<sup>2,3</sup> Cooperative learning has six categories: group reward, positive connection, individual evaluation, face-to-face interaction, social evaluation, and equality of opportunities; the harmonious application of such categories allows to successfully attain knowledge.<sup>2,3</sup>

Role-playing as an educational tool could be regarded as a mix between cooperative learning and theatrics. In 1898, VanMents defined role-play as an example of simulation centered on group interaction; this learning strategy is widely used in medical education.<sup>3</sup> Role-play eases the acquisition of knowledge, attitudes, and abilities in different disciplines, and educational theory provides a solid justification for its use.<sup>3,4</sup> This tool obliges students to analyze their responses to real-life situations by putting them in a simulated context.<sup>5</sup> There is evidence that programs that incorporate interactive strategies are more successful in helping students gain communication abilities.<sup>6</sup> Reaching a goal requires teachers to use updated methods for learning.<sup>7</sup> Universities must leave behind traditional memory-centered practices to incorporate interactive lectures that make use of technologies, debates, case studies, and activities that emphasize more on an analytical component.<sup>1,8</sup>

## Methods

Students were presented with a hypothetical clinical case of a patient suffering from a genetic disease requiring gene therapy. The group of students was divided into 2 groups, the first representing

the patient's family and the second the patient's insurance company. Each group must inquire about the disease, types of therapies available, costs, and characteristics, among other aspects. After this, an oral trial takes place in which the students have roles such as lawyers, treating physicians, experts, family members, and witnesses, among others. Each group defends its interests, the family defends the need for gene therapy and the insurance company defends the limitations that may occur with it.

## Problem-based learning

Socioeconomic, technological, and scientific changes require teaching strategies to allow effective personal development and to reach certain professional skills in line with society's needs.<sup>9,10</sup> According to López (2008), Problem-based learning (PBL) is a basic process for human learning that allowed primitive humans to survive; this process resulted from the understanding and solving of a problem.<sup>9</sup> PBL, as it is known today, is originated in the 1950s at the Faculty of Medicine of McMaster University, in Canada, as a response to discontent with medical education practices.<sup>11,12</sup> This pedagogy has been implemented at the Faculty of Medicine of the National Autonomous University of Mexico since 1993 as a method that provides students with clinical records of simulated or real patients to face them with health-related problems through their learning process.<sup>11</sup>

PBL provides various advantages (shown in Table 1) and favors the capacity to create alternative solutions to presented issues.<sup>11,13</sup> Real-world problems are used to motivate students to solve them by identifying specific concepts; teamwork is essential, as students combine communication and information integration skills to solve the case.<sup>11</sup> Therefore, PBL transforms the traditional teaching-learning process into a more flexible one, centered on the student and oriented towards a multidisciplinary approach; teachers must have the skills to create PBL-based environments to stimulate intellectual development.<sup>11,14</sup> Meaningful teaching strategies guarantee quality professionals able to understand problems and solve them.<sup>8</sup>

**Table 1.** Advantages of PBL<sup>11,13</sup>

<b>Advantage</b>	<b>Characteristic</b>
Increases motivation	Awakens students' interest in learning, under the attraction or incentive that gives the dissonance and tension raised by the problem.
Real-world significant learning	It offers students a clear answer to questions such as "why do we have to learn this information?" and "what is the relation between schoolwork and real-life problems?".
Promotes "higher-order" thinking	Requires the application of critical and creative thinking.
Encourages learning "how to learn"	Promotes meta-cognition and self-regulated learning while the students generate strategies to define the problem, get the information, analyze the data, build a hypothesis, and test it.
Requires authenticity	Evaluates learners giving preference to those that demonstrate comprehension rather than shallow repetition.

## Role-playing and education

Worldwide, educational drama is increasingly used, especially when trying to develop complex communication skills. The main idea of including role-playing in a curriculum is to offer an opportunity for undergraduate students to experience circumstances that they might encounter on their career paths.<sup>4,15</sup> In medical schools, educational drama has gained importance with professional performers and ordinary people trained to present disease in a standard way.<sup>16</sup> It usually appears as a role-play exercise based on three items: a standard patient played by an actor that portrays a medical consult, students interacting with each other or with the standard patient, and students getting feedback after the exercise.<sup>16</sup>

The use of role-play in medical education creates a fictional theater-like situation where both time and space can be controlled: some people participate first-hand while others observe.<sup>16</sup> Scenarios can be modified and replicated as needed by standard and customized simulated patients, and teachers can give feedback to students and improve the process.<sup>5</sup> Nevertheless, some students show some resistance to participating in role-play simulations as they may feel "artificial"; this is due to certain students' ability to be more "theatrical", willing, and able to play a role, compared to their peers.<sup>17</sup>

Experience-based interactive methodologies offer advantages (shown in Table 2) because they allow the teaching of things that are difficult to explain: participants evaluating their learning process recognize theoretical and practical integration and state their delight with the experience.<sup>18</sup> Role-playing is a tool that allows participants to develop skills and competencies to improve their cognitive and intellectual comprehension, broadening their emotional awareness.<sup>4</sup> Professors must be open to making use of innovative non-traditional teaching strategies; this compels them to make an effort for a constructivist practice.<sup>8</sup>

**Table 2.** Advantages of role-play simulation<sup>a</sup>

Advantage	Characteristic
Feedback and evaluation	Represents reality. Implements communication skills. Evaluates and develop attitudes, interests, and/or values.
Student training	Encourages to not jump to conclusions. Urges to get over stereotypes and first impressions. Proves there are consequences to every action.

## Experience development

The Molecular Biology course is part of a multidisciplinary curriculum for the Medicine program at the Universidad Pontificia Bolivariana. The course aims to facilitate the acquisition of theoretical and practical knowledge that allows the application of molecular biology in clinical practice. Over the course, teachers guide students through basic cellular processes to understand current and future diagnosis and treatment techniques and to be able to diagnose and treat patients accordingly.

As many concepts taught through the course are easily forgotten, the Law & Science Gene Therapy Trial was developed to make learning more didactical and to improve academic results, as the experience allows students to implement their knowledge in a concrete and practical situation. The theoretical basis is fundamental as, for understating gene therapy, one must understand the basic cellular processes and implications. The Trial is a meaningful experience that has been implemented for more than 10 years with institutional support. Academic results from the experience have been exceptional.

The experience centers on a trial simulation, where teachers create a fictional clinical record of a patient who develops a disease that might be treated through gene therapy. Said clinical record is sent via e-mail to the students two months in advance. The classroom is split into two groups: one representing the patient's family and in favor of gene therapy, and the other representing the insurance company and against it. Additionally, students get a document containing reference material and the following step-by-step on what they should do for the trial.

1. Read and analyze the problem from the assigned role perspective.
2. Make a list of hypotheses or early ideas.
3. Make a list of facts and known information on the problem.
4. Make a list of unknown information and questions on the problem.
5. Make a list of things you need to solve the problem.
6. Define the approach to the problem.
7. Build the case using the information gotten to solve the problem.
8. Present the case on the trial.

It is essential to record the progress and participation of each team member, so the discussions are done via chatrooms with two team members, designated as moderator and secretary, responsible for coordinating the team, guaranteeing adequate communication, and summarizing the information. These chat logs must be sent to the teachers on previously defined dates. Teachers choose the 5 most outstanding members of each group based on their initiative and contributions. Depending on the assigned team, each of them will assume a specific role for the trial, like this:

- Patient's family ("Prosecution"): Must play two family members, a lawyer, a physician or specialist on the disease, and a researcher that endorses the procedure.
- Insurance company ("Defense"): Must play a lawyer, a physician or medical doctor, a bioethics scholar, and two legal representatives for the insurance company.

Before the beginning of the trial, each team presents the jury with digital support of the documents they will use on their case. The jury is played by faculty members and tutors. During the trial, the lawyers must call to the stand the other 4 team representatives and interrogate them as deemed appropriate for their case. There is no script so, as the trial develops, students must improvise based on their case and their role. The jury must be attentive to reach a verdict on which team wins the case.

From our experience with PBL, especially with role-playing games such as the mock trial, the results have been very satisfactory for both the teaching staff and the students. In the first place, for the teachers, it has become a new teaching alternative that allows them to leave the daily routine of lectures that are not very interactive and playful. Also, it allows valuing different aspects of the students that traditional classes do not allow to fully or partially value. From the point of view of the students, from the feedback received, it has been noted that they are interested in these learning methodologies because they are different and unusual alternatives that motivate them to develop other types of skills that add to their professional practice and are different ways of learning that they take advantage of.

In addition, since medicine is a more practical profession, it has been noted that students, through these strategies, present better integration of knowledge and its applicability within a scenario different from the medical practice itself. Another aspect to highlight is facing a trial, which is a situation in which students may be involved when they are practicing their profession and for which there is little or no preparation during the undergraduate medical programs.

The limitations of this academic experience are mostly related to the lack of knowledge of the students about: language related to law or lawyering, lack of knowledge or lack of clarity of some administrative aspects of the Colombian health system; some cases present stage fright at the time of speaking, which can limit the argumentation and execution of these. Another limitation has been the lack of interest of some of the

students, which is evident on certain occasions at the time of the presentation of the oral trial.

## Conclusions

PBL and role-play allow students to develop an active role in their learning process and make them implement classroom-acquired theoretical concepts in a practical environment. The Gene Therapy Trial is a process where learners follow a step-by-step guide to complete the experience, leading to the implementation of a simulated trial with gene therapy as a central topic. This aims to facilitate the acquisition of new concepts through the PBL and role-play methodologies.

Likewise, students can integrate those concepts with other medical-related domains such as medical law and bioethics. This allows the understanding of the problem, the development of possible solutions, and the evolution of behavioral skills. In turn, students are motivated to develop assertive communication and teamwork capacities, which are essential for better academic and personal results. This is a clear example of how role-playing can be used as a teaching tool in medical education.

## Authors' contributions

Martinez-Sanchez LM, Martinez-Hernandez A and Herrera-Almanza L worked on the conceptualization, formal analysis, research, methodology, project management, resources, supervision, validation, visualization, writing - original draft, writing - review and editing. Cuartas-Agudelo YB worked on the conceptualization, formal analysis, research, methodology, project management, resources, writing - original draft, writing - review and editing. Palacio SC worked on the project management, resources, supervision, validation, visualization, writing - original draft, writing - review and editing. All authors agreed with the content of the manuscript.

## Competing interests

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

## References

1. Cabrera ML, Olivares SLO, Leal JAE, García JEV. Propuesta para la continuidad académica y formación médica a distancia ante la pandemia de COVID-19. *Educación Médica Superior* [Internet]. 2021;35. Available from: <http://ems.sld.cu/index.php/ems/article/view/2603>
2. Çerkez Y, Altınay Z, Altınay F, Bashirova E. Drama and Role Playing in Teaching Practice: The Role of Group Works. *Journal of Education and Learning*. 2012;1(2):109-120. <http://dx.doi.org/10.5539/jel.v1n2p109>
3. Acharya S, Shukla S, Acharya N, Vagha J. Role play – an effective tool to teach clinical medicine. *J Contemp Med Edu*. 2014; 2(2):91-6. <http://dx.doi.org/10.5455/jcme.20140619111139>
4. Manzoor I, Mukhtar F, Hashmi NR. Medical students' perspective about role-plays as a teaching strategy in community medicine. *J Coll Physicians Surg Pak*. 2012;22(4):222-5. Cited: PMID: [22482377](https://pubmed.ncbi.nlm.nih.gov/22482377/)
5. Martínez IDL, Carmona BSA. Simuladores virtuales como herramienta fundamental en la educación médica clínica en tiempos de COVID-19. *Educación Médica Superior* [Internet]. 2021;35:e2819. Available from: <http://ems.sld.cu/index.php/ems/article/view/3059>
6. Pawłowicz E, Kulesza M, Szymańska A, Masajtis-Zagajewska A, Bartczak M, Nowicki M. 'I hear and I forget. I see and I remember. I do and I understand.'- incorporating high-fidelity medical simulation into the undergraduate nephrology course. *Ren Fail*. 2020;42(1):1184-1191. <https://doi.org/10.1080%2F0886022X.2020.1847722>
7. Pourghaznein T, Sabeghi H, Shariatinejad K. Effects of e-learning, lectures, and role playing on nursing students' knowledge acquisition, retention and satisfaction. *Med J Islam Repub Iran*. 2015;29(162). Cited: PMID: [26000257](https://pubmed.ncbi.nlm.nih.gov/26000257/)
8. Gaete-Quezada RA. El juego de roles como estrategia de evaluación de aprendizajes universitarios. *Educ Educ*. 2011;14(2):289-307. <https://doi.org/10.5294/edu.2011.14.2.3>
9. Sepulveda P, Cabezas M, García J, Fonseca-Salamanca F. Problem-based learning: Perception of the teaching-learning process of preclinical sciences by students of Kinesiology. *Educación Médica*. 2021;22(2):60-66. <https://doi.org/10.1016/j.edumed.2019.01.004>
10. Fan C, Jiang B, Shi X, Wang E, Li Q. Update on research and application of problem-based learning in medical science education. *Biochem Mol Biol Educ*. 2018;46(2):186-94. <https://doi.org/10.1002/bmb.21105>
11. López MAC. El aprendizaje basado en problemas. Una propuesta en el contexto de la educación superior en México. *Tiempo de Educar* [Internet]. 2008;9(18):199-232. Available from: <https://www.redalyc.org/articulo.oa?id=31111811003>
12. Lawal O, Ramlaul A, Murphy F. Problem based learning in radiography education: A narrative review. *Radiography*. 2021;27(2):727-32. <https://doi.org/10.1016/j.radi.2020.11.001>
13. Santos MZ, Otani MAP, Tonhom SFR, Marin MJS. Degree in Nursing: education through problem-based learning. *Rev Bras Enferm*. 2019;72(4):1128-35. <https://doi.org/10.1590/0034-7167-2018-0298>
14. Bodagh N, Bloomfield J, Birch P, Ricketts W. Problem-based learning: a review. *Br J Hosp Med (Lond)*. 2017;78(11). <https://doi.org/10.12968/hmed.2017.78.11.C167>
15. Kilgour P, Reynaud D, Northcote M, Shields M. Role-playing as a tool to facilitate learning, self-reflection and social awareness in teacher education. *International Journal of Innovative Interdisciplinary Research* [Internet]. 2015;2(4):8-20. Available from: [https://research.avondale.edu.au/edu\\_papers/73/](https://research.avondale.edu.au/edu_papers/73/)
16. Jacobsen T, Baerheim A, Lepp MR, Schei E. Analysis of role-play in medical communication training using a theatrical device the fourth wall. *BMC Med Educ*. 2006; 6(51). <https://doi.org/10.1186/1472-6920-6-51>
17. Lane C, Rollnick S. The use of simulated patients and role-play in communication skills training: a review of the literature to August 2005. *Patient Educ Couns*. 2007;67(1-2):13-20. <https://doi.org/10.1016/j.pec.2007.02.011>
18. García-Castro G, Ruiz-Ortega FJ. Clinical reasoning and medical education: Scoping Review. *Educación Médica*. 2021;22(2):106-10. <https://doi.org/10.1016/j.edumed.2020.11.015>