

ILLUMINATIONS

Bang the gavel: animal experimentation on trial—an interdisciplinary mock trial at the school of health sciences

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Abstract

Active learning activities offer opportunities for medical students to facilitate the retention of knowledge and develop soft skills. We aimed to create a guide for an interdisciplinary mock trial learning activity within the medical curriculum of the College of Medicine, Anhembi Morumbi University—Laureate International Universities, Sao Paulo, Brazil. We designed an “Animal Experimentation Mock Trial” in which students are coached to search for scientific, legal, and ethical arguments pro and contra animal experimentation in medical research. The mock trial is prepared and staged with student teams to play the 1) presiding judge, 2) the plaintiff's attorney and expert witnesses contra animal research, 3) the defense attorney and expert witnesses pro animal research, and 4) the jury. The plaintiff and defense teams made presentations, and between each presentation the jury put questions to presenters (cross-examination). The jury team gave two evaluation scores after the plaintiff's presentation and then after the defense presentation. The formal feedback for this active learning activity indicated that students expressed satisfaction with the teaching strategies employed in the course. The mock trial with the lesson plan provides a learning mean to exemplify the complex relationship between animal experimentation, medical evidence, ethics, and law/regulations. This mock trial helps medical students to develop their soft skills, such as the ability to collaborate and also to recognize the limits of their own knowledge, important for professional development. The importance of interdisciplinary discussions is demonstrated by increasing the awareness of the multidisciplinary aspect of animal research.

health sciences curriculum; higher education; mock trial; student engagement; student-centered learning; 21st century skills

INTRODUCTION

In the last decade, the health sciences educational paradigm has shifted from memorizing and reproducing knowledge to student-centered learning, thus allowing students to effectively acquire needed skills for their future careers such as self-reliability, independence, and adaptability to changing healthcare needs (1, 2).

Deep learning requires a critical analysis of new ideas followed by their integration into preexisting concepts and principles, which can be used to solve unfamiliar problems (3). As a consequence, students in the learner-centered approach have more responsibility toward their own learning (4). Therefore, a recognition of the importance of student engagement followed by the implementation of effective strategies are essential. In health sciences, student engagement was found to be associated with active learning and participation (5–7), with the use of new technologies (8, 9). With professors endorsing more supportive roles as facilitators and resource providers, different ways of teaching and new educational tools have been developed, tried, and tested

(10). The development of new effective teaching methods and activities for health science students would further improve the positive outcomes of medical education.

Based on the need to continuously innovate and the understanding of the importance of active learning experience the mock trial was created, and it has been proven to be an exciting and effective tool as a learning method for law students. The mock trial offers the ability to gain specific skills that cannot be taught in classrooms. It helps students develop useful knowledge about law and politics, questioning techniques, oral advocacy skills, critical and analytical thinking, research, and creative adaptation skills (11). There are many interdisciplinary dilemmas/hot topics (controversial?) in health sciences, and the use of animal experimentation in research is one of these. Here we propose to transpose and adapt the use of the mock trial from law to health sciences to explore the topic of animal experimentation in medical research. The intentions behind this practice are twofold: to facilitate the retention of knowledge coupled to the development of student soft skills in communicating information and to develop their ability to stand their ground when



defending an idea. Furthermore, it teaches the students to listen to others and often to rethink or reconsider their own arguments.

We aimed to create a classroom guide for an interdisciplinary mock trial learning activity within the professional health sciences curriculum. We propose an interdisciplinary mock trial as an active learning tool that can enhance students' engagement and help in building and developing a range of needed skills.

SETTING AND PARTICIPANTS

Participants in the "Animal Experimentation on Trial" mock trial were sophomores in the medical school. Student teams were formed to play as

1. The presiding judge
2. The plaintiff's attorney and expert witnesses against animal research
3. The defense attorney and expert witnesses in favor of animal research
4. The jury

The students were split into three evenly divided teams: one-third to be the plaintiff, one-third the defense, and one-third the jury group. In this mock trial, the judge and jury played an active role in cross-examining witnesses. The bailiff's role was played by a professor who acted as a facilitator in the mock trial, keeping all the students focused on the mock trial.

PROGRAM DESCRIPTION

The mock trial proposed can be assigned to the students either as a graded in-class assessment or an extracurricular activity. The total duration of this activity ranges from 50 min to 2 h, but it can be extended as deemed necessary.

TOPIC SELECTION AND PREPARATION

The topic "Animal Experimentation on Trial" was selected by the faculty and announced to the students with a 2-wk preparation period before the trial to allow the students to search for publicly available material and construct the arguments. The topic of animal experimentation was chosen because it is a major subject of biomedical research. Students were asked to volunteer for the parts they would like to take in the mock trial. One student volunteered to be the presiding judge, and the rest formed three teams: 1) plaintiff's attorneys and witnesses (against animal research), 2) defense attorneys and witnesses (in favor of animal research), and 3) the jury. Guidelines explaining the mock trial format and procedures, including some guidance material on animal experimentation, were shared with the students (as shown in this article). Some of the guiding resources recommended for the students, with the recommendation to find additional resources, are Animal Testing—Pros & Cons (<https://animal-testing.procon.org/>), Animals in Research and Education—FASEB (<https://www.faseb.org/Science-Policy-and-Advocacy/Science-Policy-Research-Issues/Animals-in-Research-and-Education>), and Is Animal Testing Justified? (The Big Questions) (<https://youtu.be/bD51eAOPSKc>). The students were coached by the professor on how to search

the internet for publicly available scientific, legal, and ethical arguments in favor of and against animal experimentation in medical research, so as to build their case. As such, the importance of interdisciplinary discussions is demonstrated by increasing the awareness of the multidisciplinary aspect of animal research. Finally, before the beginning of the session, students were given 15 min to review their statements, questions, and opening and closing sessions.

MOCK TRIAL FORMAT

The format for the mock trial included

1. Opening statements
2. Presentation of evidence and cross-examinations
3. Closing arguments
4. Deliberation and verdict

Opening of Trial: Bailiff says: "Please rise. The Court of Medical Students is now in session, the Honorable _____ presiding." Everyone remains standing until the judge is seated. The judge asks that the calendar be called, and the bailiff says, "Your Honor, today's case is pro and against animal experimentation in medical research." Judge asks if both attorneys are ready.

Opening Statements

In the opening statements, attorneys representing both sides introduce their case briefly. In their statements, the plaintiff's attorney and the defendant's attorney introduce themselves and state what their side hopes to prove. The evidence is presented as "evidence will show" in a clear, short, convincing, and factual manner. This statement should not be confrontational but rather should lay out a general picture of the facts.

Presenting Evidence and Questioning Witnesses (Cross-Examination)

Presenting evidence.

The plaintiff and then the defense presents the case. Plaintiff's attorneys and witnesses (against animal research) followed by defense attorneys and witnesses (pro animal research) constitute four presentations of 5 min (max 10) each. Multimedia material (PowerPoint, videos) is permitted. Between presentations, the jury puts questions to the witness presenter (cross-examination).

Cross-examination.

Before the trial, the judge and the jury should try to anticipate witnesses' testimony and prepare a list of prospective questions to ask when cross-examining the witnesses. Anyone from the group of witnesses is allowed to answer the questions of the judge and jury.

Either the plaintiff's or the defendant's attorneys may object to an opposing statement or question. The judge has the power in his/her courtroom to ask the person objecting "What rule of evidence are you relying on?" He/she then has to evaluate the reason for objection and either allow the objection or overrule it. The rules of evidence being relied on for objections include

1. Leading questions: The attorneys must not lead witnesses through their story.

2. Hearsay: The questions must limit witnesses to actual scientific facts. Arguments based merely on feelings or any kind of nonscientific knowledge is not permitted.
3. Immaterial or irrelevant: The information is not closely related to the case and is irrelevant.
4. Opinions and conclusions: Unless the witness is an expert, he or she should not give opinions and conclusions.
5. Nonresponsive answer: The witness is not answering the question asked.

Attorneys must use any of these objection-based rules if considered appropriate, not exceeding the 2-h timeline.

During the trial, the judge and jury take notes of witness testimony to prepare them for cross-examination. Jury members give their feedback (whether they have been convinced or not) after each presentation and witness's answers to the cross-examination questions, using their electronic devices (smartphone, laptop, or tablet) and by connecting to *Poll Everywhere* (<https://www.polleverywhere.com/>). Hence, the impact of the argument given by each student upon the jury can be monitored in real time. The jury gives two overall evaluation scores: one provisional after the plaintiff's team's presentations and a final one after the closing statements. These scores correspond to the number of jury members for and against the use of animal experimentation in research and can demonstrate how jury opinions can evolve or change as evidence is presented from both the plaintiff and the defense.

Closing Statements

In closing statements, the plaintiff's attorney speaks first to the jury and tries to convince them to give their verdict in his or her team's favor. The defense attorney repeats the process. Both attorneys

1. Highlight the main pieces of evidence presented and attempt to persuade the jury that the evidence supports their perspective
2. Use specific points offered by the opposing team that can be either directly contested or criticized

Deliberation and Verdict

The judge adjourns the session and asks the jury to retire and deliberate on the case. Once ready, the jury comes back to the "courtroom" and reports the verdict to the judge. Then the judge makes a clear and short statement to explain which side made a stronger case. Finally, the judge announces the end of the trial.

SIGNIFICANCE AND OBSERVED BENEFITS

Adaptation

We wanted to engage students by giving them an opportunity to participate in a mock trial, which was adapted from and akin to trials used as teaching tools in law schools. The cross-examination questions had to be developed and asked by the judge and jury, not the opposing team, as this is the common practice for law students. The judge's role is more prominent in the present health sciences mock trial version. He/she has to keep order in place and ask questions during

the cross-examination. He/she also has to lead the discussion in a clear direction to enable the jury make an informed decision. We wanted to measure in real time the impact and influence of every argument and answer given by both the plaintiff and defense teams on the jury. This real-time monitoring is added to the provisional and final jury team evaluation, to highlight how individual opinions can change over time when confronted in a team brainstorming context. Furthermore, we encouraged both the judge and the jury to maximize the questions asked and critique given both during the preparation and after, from listening to both presiding presentations. Consequently, students are more involved and more engaged during the preparation for the mock trial, as they are forced to anticipate different possible scenarios and questions. This engagement allows them to delve deeper into subject matter theoretical knowledge, research both sides of the argument, and construct convincing arguments to win their side over. It further increases opportunities to develop oral advocacy, be creative, think on the spot, and adapt when faced with challenging questions and arguments. Students had the opportunity to use multimedia tools (PowerPoint and video) and poll-based real-time surveys to measure how successful their arguments were in convincing the jury and to strengthen their arguments. Such tools have been associated with an enhancement of student engagement and commitment to deep learning (8, 9, 12).

Instructor's Role

The instructor's role fluctuates throughout the different phases of the activity based on students' needs. In preparation for the trial, the instructor endorses the roles of facilitator, advisor, devil's advocate, and taskmaster, which aligns with the description of the instructor's role as a guide on the side in student-centered learning. During the trial, the instructor wears the bailiff's hat, intervening only when there is a need to clarify and address an important concern, keeping the students on task. After the deliberation and the closing of the mock trial, the instructor facilitates a mock trial debrief that encourages participation of all students in the discussion. Asking questions such as "Did any students change their mind during the trial? At what point and why? Who was the most credible witness or attorney? Why?" can facilitate students' participation in the discussion. The facilitator, acting as an ally and supporter throughout the process, creates a more pleasant and productive learning environment (13).

Student Assessment

This mock trial has been conducted as a course requirement, and student participation is assessed. In our case, the mock trial was incorporated as part of the "Professional Communication" course for the second year of the medical school curriculum. In the light of the rules and regulations of the university, the professor-student communication for "out-of-class" activities for the preparation of the mock trial were via Blackboard and institutional e-mail. The instructor may consider breaking the participation grade into the following components: the individual courtroom performance and the group work toward the final verdict. The students were graded as pass/fail for each student. To pass, the

student needed to avoid the following unprofessional behaviors: 1) Involvement—absence from the mock trial, 2) Interaction—disruptive behavior or bullying, 3) Integrity—acting without required consent, not obeying rules and regulations of the mock trial, 4) Introspection—not accepting feedback (14). The student needs to pass in order to get the credits from the class. If the trial is carried out as an extracurricular activity, such as through cooperative learning (15), the organizers may consider giving participation certificates to all of the students.

PROGRAM EVALUATION—PERCEPTIONS AND FEEDBACK

Student feedback during an informal survey included the following: “We have learned how to scientifically argue an article or in this case the pros and cons regarding animal experimentation” and “We can see that depending on how the attorneys present their beliefs about animal experimentation we changed our beliefs as well and shifted sides.” When the students were asked whether they would like to have this approach applicable to other controversial topics such as gene editing or ethics in clinical trials, they said that it would be of great benefit to use such a platform in other topics or even courses because of its interactivity and free dialog approach. Since the “Animal Experimentation on Trial” mock trial is based on scientific facts, research findings, argumentation, and confrontation of a rival set of ideas, more opportunities are offered to expand students’ knowledge than with traditional didactic teaching methods.

The majority of students who took part in this mock trial reported that they enjoyed the actual experience and the thrill and excitement of the competition, they learned a lot more about animal experiments in medical research through independent research, and they acquired and developed additional skills such as communication skills and analytical and critical thinking skills.

DISCUSSION

The “Animal Experimentation on Trial” mock trial is a novel student-centered teaching tool to enhance students’ creativity, critical and analytical thinking, self-confidence, cooperation, communication, and collaboration skills. It aligns with a deep learning experience and combines features found in team-based learning, case study, public debate, and thesis defense. Based on our observations and students’ positive feedback, the present mock trial can be presented as an engaging and effective activity for an in-depth study or analysis of a controversial topic akin to the animal experimentation topic presented in this case. The concept and methodology created can be applied to other debatable health science interdisciplinary topics such as vaccination adjuvant use, end-of-life procedures, surrogate mothers, vaping, and many others. As an extension, we propose to analyze whether the use of this teaching tool is positively correlated with an enhancement of knowledge acquisition, soft skills development, and the overall academic achievement of students in the health sciences.

DISCLOSURES

No conflicts of interest, financial or otherwise, are declared by the authors.

AUTHOR CONTRIBUTIONS

O.C.B. and L.A.C. conceived and designed research; R.G., S.O., and L.A.C. interpreted results of experiments; R.G. and L.A.C. drafted manuscript; R.G., S.O., O.C.B., and L.A.C. edited and revised manuscript; R.G., S.O., O.C.B., and L.A.C. approved final version of manuscript.

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