Role-Play Preceded by Fieldwork in the Teaching of Pharmacology: from "Raw Sap" to "Elaborated Sap"

Role-Play Precedido por Trabalho de Campo para o Ensino de Farmacologia: da "Seiva Bruta" à "Seiva Elaborada"

Daniel Riani Gotardelo[I]
Valdes Roberto Bollela[II]
Anderson Proust Gonçalves Souza[I]
Daiane de Paula Barros[I]
Jesus Mística Ventura Balbino[I]
Denise Ballester[III]

KEYWORDS

– Role Playing.
– Pharmacology.
– Teaching.
– Medical Education.
– Undergraduate.

ABSTRACT

Background: *The task of teaching abilities, attitudes and knowledge, which can sometimes be complex, related to the safe and efficient use of medications, stands as a great challenge faced by medical schools nowadays. The role of the prescriber, therefore, who promotes the rational use of medication at undergraduate level gains importance in professional training, with a direct impact on public healthcare. In this context, the implementation of teaching methods that allow an active, critical and reflexive medical training for students is desirable in order to enable them to develop the skills required to manage the main pharmacological classes used by the general practitioner.We intend to describe and analyze role-play preceded by fieldwork as an educational strategy.* **Methods:** *Following the fieldwork regarding the utilization of the main pharmacological classes used in primary healthcare, 5-6 groups of students prepared scripts and staged role--plays involving practical aspects of pharmacokinetics, pharmacodynamics, side effects, and potential drug interactions regarding the main drug types. The intervention was assessed using students' responses to questionnaires coupled with Likert scales, the Dundee Ready Education Environment Measure (DREMM) and semi-structured interviews. There was a correlation between participation in teaching practice and performance in multiple-choice questions in the final course evaluation.* **Results:** *All students felt involved and motivated in the activity. 78.5% strongly agreed and 19% partially agreed that the method allowed reflection on knowledge, abilities and attitude, all important to professional practice regarding rational therapeutic prescribing.The DREMM revealed a score of 129.23, consistent with a more positive learning environment in a reliable sample (Cronbach's alpha=0.86). Analysis of the open interviews allowed us to infer that the students considered the method efficient, dynamic, fun, and enjoyable, which enabled greater understanding and consolidation of the content. The strategy was considered stimulating regarding group activities, with active participation. Furthermore, it allowed students an opportunity to experience their future professional reality. The main weaknesses found were the unequal involvement of individuals in some groups and the great length of time spent in the preparation of activities. In the final exam, the students who participated in the intervention had, on average, a higher performance than those who did not take part in it. However, there was no statistically significant difference.* **Discussion:** *Role-play preceded by fieldwork proved to be a promising pedagogical strategy and may be used in other basic sciences.*

[I] *Instituto Metropolitano de Ensino Superior, Ipatinga, MG, Brasil. NRE Educacional.*
[II] *Universidade de São Paulo, Ribeirão Preto, SP, Brasil.*
[III] *Universidade de São Paulo, São Paulo, SP, Brasil.*

DOI: http://dx.doi.org/10.1590/1981-52712015v41n3RB20160043

PALAVRAS-CHAVE

– *Role Playing*.

– Farmacologia.

– Educação Médica.

– Educação de Graduação em Medicina.

– Ensino.

RESUMO

Introdução: *A tarefa de ensinar habilidades, atitudes e conhecimentos, às vezes complexos, relativos ao uso seguro e efetivo de medicamentos representa hoje um grande desafio para as escolas médicas, motivo por que o ordenamento de prescritores que promovam o uso racional de medicamentos em nível de graduação assume importante papel na formação profissional, impactando diretamente o cuidado à saúde da população. Nesse contexto, a implementação de métodos de ensino que permitam uma formação ativa, crítica e reflexiva dos estudantes é desejável, a fim de que estes desenvolvam competências para manejar as principais classes farmacológicas utilizadas pelo médico generalista.* **Objetivo:** *Descrever e analisar o role-play precedido por trabalho de campo como estratégia pedagógica para o ensino de Farmacologia Clínica no curso médico.* **Métodos:** *Após trabalho de campo sobre a utilização das principais classes farmacológicas utilizadas na Atenção Primária em Saúde, grupos de cinco a seis estudantes prepararam e encenaram roteiros envolvendo aspectos práticos de farmacocinética, farmacodinâmica, efeitos adversos e potenciais interações medicamentosas relativas aos medicamentos utilizados. A intervenção foi avaliada por meio das respostas dos estudantes a questionários acoplados a escalas Likert, ao Dundee Ready Education Environment Measure (DREMM) e a entrevista semiestruturada. Verificou-se a correlação entre a participação na prática de ensino e o desempenho em questões de múltipla escolha na avaliação final do curso.* **Resultados:** *Todos os estudantes se sentiram envolvidos e motivados para a atividade. Concordaram fortemente 78,5% e concordaram parcialmente 19% em que o método permitiu a reflexão sobre conhecimentos, habilidades e atitudes importantes para a prática profissional no tocante à prescrição terapêutica racional.O DREEM revelou escore de 129,23, compatível com um ambiente de aprendizagem mais positivo do que negativo, numa amostra confiável (alfa de Cronbach = 0,86). A análise das entrevistas abertas permitiu inferir que os estudantes consideraram o método eficiente, dinâmico, divertido e prazeroso, possibilitando maior compreensão e fixação do conteúdo. A estratégia foi considerada estimuladora para a realização de atividades em grupo, participação ativa, além de possibilitar o contato com a futura realidade profissional. As principais fragilidades apontadas foram o envolvimento desigual de componentes de alguns grupos e o significativo tempo despendido na preparação das atividades. Os estudantes que participaram da intervenção tiveram desempenho na avaliação final da disciplina, em média, superior aos que não participaram, mas sem diferença estatisticamente significativa.* **Conclusão:** *O role-play precedido por trabalho de campo demonstrou ser uma estratégia pedagógica promissora, promovendo aprendizagem ativa e significativa em Farmacologia, com possibilidade de utilização em outras ciências básicas.*

Recebido em: 09/03/2017

Aprovado em: 20/04/2017

BACKGROUND

The teaching of pharmacology in Brazil and several other developing countries has focused on theoretical knowledge of medicines over the practical aspects of its use. During undergraduate training, future prescribers are often encouraged to memorize information on drugs regardless of the clinical setting. Even the references and textbooks, classically used in the discipline, present contents based on drug information, which causes variables such as the context of use, cost-effectiveness and other essential aspects of the professional practice to remain unclear to students[1].

One possible reason for this matter lies in the fact that many curricula are still divided – though not always explicitly – into pre-clinical and clinical stages. Students may perceive Basic Pharmacology as something completely different from Clinical Pharmacology, which gives them a fragmented knowledge and a perception that the teachers and the learning of Clinical Pharmacology are more "important" and qualified because they are more applied to the professional practice in later stages of the course[2].

Nowadays, the role of Pharmacology, considered as a basic science, should be to develop contextualized learning and not just the mere memorization of facts[3]. In addition, the integration of knowledge with social and environmental aspects, which are decisive in the health-disease process, is disadvantaged by some disciplines that focus on dividing their content into systems, such as in Pharmacology. And that can contribute to disintegration among these systems and a reduced ability to perceive the interactions among the mentioned aspects[4].

The implementation of a training based on real "problem solving situations" is one of the proven strategies to minimize

 DOI: http://dx.doi.org/10.1590/1981-52712015v41n3RB20160043

these difficulties and promote the rational use of medicines in developing countries. In many respects, the content of basic sciences in pharmacology could be reduced, reserving the traditional classes (lectures) to those situations in which the systematization and synthesis of information are essential. Learning objectives should be based not only on the acquisition of knowledge, but also on developing the skills and behaviour required of future prescribers[5].

Few studies aim at describing and evaluating educational strategies that can potentially contribute to the qualification of future prescribers. We intend to demonstrate that the use of two active learning methods – role-play and fieldwork – regardless of the curricular format to which they belong, are feasible and capable of providing a meaningful Pharmacology learning in terms of the drug types found in primary health care.This level of attention represents an important focus in the training of health professionals in Brazil and many other countries in the world.

Strategy description

We have used role-play preceded by fieldwork at our medical school since 2010. The medical school's curricular structure, within which Clinical Pharmacology is inserted, is mixed; it is composed of theoretical classes, but with the workload corresponding predominantly to practical classes, with the aim of applying active learning methodologies.

In this context, the second-year students (large group) are divided into three medium-sized groups, each with 15 to 18 students. Each of these groups is divided into three smaller groups of 5 to 6 students. The Pharmacology course lasts 20 weeks and the educational strategy occurs every 3 weeks.

Preliminarily, the large group is given important information about at least 3 drug types in weekly lectures lasting 1h40m. This step aims to provide a first contact with the pharmacology content and motivate students for the educational activity itself.

The three types already presented by the teacher are then assigned to each medium-sized group, and the activity is then developed in the smaller groups.

Fieldwork

The fieldwork consists of a general/non-specific question, addressed to a legally authorized prescriber (family physician, pediatrician, etc.), on the drug type assigned to each small group (for example: "Hello, Dr. X, I'm doing Pharmacology fieldwork and would like to know what you think is important for a prescriber to know about anti-inflammatory drugs").

Role-Play

The information collected in the fieldwork, the lectures, and the available references serves as a basis for the small group to develop their script, followed by a theatrical presentation (role-play). During the performance, at least one piece of relevant practical information should be presented or discussed considering the following aspects: (a) pharmacokinetics, (b) pharmacodynamics, (c) adverse reactions, (d) drug interactions (e) principles for the Drug Rational Use based on randomized clinical trials/systematic reviews/meta-analyses. Students are free to create scenarios, characters, and scripts for settings such as medical appointments, ambulatory care visits, among others.

Each small group presents their role-play six times (*student-presenters*) and watches 12 presentations by the other groups (*student-spectators*). The *student-presenters'* performance is assessed through an individual oral test and by the instrument below.

No	Yes	Small group assessment
		Was the presentation up to 20 minutes long?
		Was a written script submitted?
		Was there relevant information on pharmacokinetics?
		Was there relevant information on pharmacodynamics?
		Was there relevant information on drug adverse reactions?
		Was there relevant information about potential drug interactions?
		Was there relevant information on Evidence-Based Medicine/Rational Drug Use principles

METHODS

Strategy Assessment (evaluation)

Study setting and participants

104 students, from two classes (one of 51 and the other of 53 students), in the second year of medical school, were put forward for the intervention.

All the students agreed to participate in the assessment and signed the consent form. The research project was approved by the Research Ethics Committee of Unileste (MG), in the city of Ipatinga, Minas Gerais State, Brazil (protocol 495 299/13).

Evaluation

Questionnaires coupled with the Likert scale were developed and applied after the activities. The *student-spectators* were encouraged to express different levels of agreement with the

DOI: http://dx.doi.org/10.1590/1981-52712015v41n3RB20160043

following: (1) engagement during the activity, and (2) perception of increased knowledge about drug types after the activity. A peer reviewon a scale of 1 to 10 was also requested from the spectators regarding the performance.

At the end of the semester, the Dundee Ready Education Environment Measure (DREMM) was used, which is a validated instrument consisting of 50 questions coupled with a Likert scale (0-4) that evaluates five areas related to the learning environment, the results of which can be interpreted according tothe score below[6].

0-50: very poor learning environment
51-100: troubled learning environment
101-150: more positive (than negative) learning environment
151-200: excellent learning environment

Content analysis was performed through a semi-structured interview, in which students were asked to point out the potential, weaknesses, criticisms, and suggestions for the intervention. There was a correlation between participation in the activity and performance in the multiple-choice questions asked in the end-of-semester theory examination. The 95% significance level t-test was used in order to compare the number of right answers for the drug type questions between the students who presented a role-play and those who only attended the presentation.

RESULTS

For the peer assessment, the groups received, on a scale of 1 (minimum) to 10 (maximum), an average score of 9.15 (± 1.14) points.

Table 1 shows the results of the evaluations carried out immediately after the activity, answered by the students who watched the role-play (n=104).

Table 1
Feedback from students who attended the role-play (%)

	Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly disagree (%)
I was engaged by("focused on") the activity.	75.0	22.1	2.9	0	0
My knowledge of the addressed drug type increased after my participation in the activity.	66.3	27.9	5.8	0	0

The areas evaluated by the DREEM received an overall score of 129.23 (Cronbach's alpha = 0.86), which is more compatible with a positive learning environment than a negative one (Table 2). Questions 6, 11 and 18 of the DREEM were not considered because there are no health care activities offered by the course.

Table 2
Results of DREEM

	Mean
1. I am encouraged to participate in class	3.21
2. I can understand the teachers in class	3.41
3. There is a good support program for stressed students	1.19
4. I have been so tired I can't enjoy this course	2.79
5. The way I used to study before also works for this course	1.61
6. Teachers have shown patience with the patients	0*
7. The teaching approach is usually stimulating	2.64
8. The teacher ridicules students	3.51
9. The teacher is authoritarian	3.16
10. I'm sure I will be approved this year	3.32
11. The atmosphere is quiet during classes in the wards	0*
12. This college is quite punctual in the courses (punctuality)	2.01
13. The teaching is student-centered (more self-learning)	2.04
14. I rarely feel discouraged in this course	2.07
15. I have good friends in college	2.95
16. The teaching is concerned with developing my competence	2.79
17. The practice of cheating is common in this college	2.04
18. The teachers can communicate well with patients	0*
19. My social life is good	2.41
20. The teaching is quite cohesive and focused	2.88
21. I feel that I am being well prepared for the profession	2.76
22. The teaching method is concerned with developing my confidence	2.45
23. The atmosphere is quiet during classes	2.89
24. The time for teaching is well used	2.13
25. The teaching really emphasizes the learning of memorized facts	2.71
26. The previous year teachings prepared me well for this year	2.39
27. I have good memory capacity for all I need	2.32
28. I hardly ever feel lonely	2.28
29. The teacher gives good feedback to students	3.2
30. I have the chance to develop personal relationships	2.63
31. I learned a lot about personal relationships in this profession	2.76
32. The teacher provides us with constructive criticism	3.12
33. I feel comfortable in the classes	3.07

DOI: http://dx.doi.org/10.1590/1981-52712015v41n3RB20160043

Table 2
Results of DREEM

	Mean
34. The atmosphere is quiet during seminars	3.25
35. My experience here has been disappointing	2.91
36. I have a good attention span	2.41
37. The teacher gives very clear examples	3.31
38. I'm sure about the course objectives	3.15
39. The teacher gets angry in the classroom.	3.19
40. The teacher is well prepared for classes	3.63
41. The search for solutions has been developed in this course	2.87
42. Medical school has given me more satisfaction than stress	2.84
43. The environment encourages me to learn	2.39
44. The school encourages me to be an autonomous learner	2.67
45. Much of what I have seen seems important to the medical field	3.28
46. I live in a comfortable place	3.48
47. The importance of a continuous education is emphasized	3.19
48. The teaching is teacher-centered	2.33
49. I feel free to ask questions in class	2.93
50. The students irritate the teacher	2.69
TOTAL	129.23

** DOES NOT APPLY as it considers welfare aspects that are not offered in the course.*

Table 3
Students' performance in the final evaluation

	Student-presenters*	Student-spectators*	p-value
Antidiabetic drugs	2.69	2.19	0.07
Benzodiazepines	2.27	2.33	0.86
Phosphodiesterase-5 inhibitors	3.1	2.95	0.6
Drugs used in thyroid disorders	2.27	2.39	0.74
Antihypertensives	2.6	2.44	0.58
Antihistamines	3.33	3.16	0.5
Antidepressants	3	2.38	0.21
NSAIDs	2.67	2.17	0.17
Mood stabilizers	2.25	2.57	0.71
Antimicrobial	2.2	2.19	0.97

* Average performance in four questions.

Performance in the multiple-choice questions of the final examination was compared between the students who performed the role-play and those who only watched it. In the evaluations containing 40 multiple choice questions, 4 questions were related to each of the 10 pharmacological classes addressed. The students who participated in the fieldwork followed by the role-play reported, on average, a higher performance than those who did not participate in 7 out of the 10 themes addressed. There was no statistically significant difference, though (Table 3).

Qualitative analysis of the open-ended questionnaires using frequency categorization revealed the following results:

Potential of the method

- Efficient, dynamic, fun, enjoyable;
- Allows greater ease in learning the contents;
- Stimulate teamwork;
- Stimulate active student participation;
- Allows students contact with their future professional reality.

Weaknesses of the method

- Overload of academic activities;
- Unequal engagement of students in some groups;
- The large number of presentations is tiring.

DISCUSSION

Pharmacology courses that are exclusively based on traditional lectures suppress important aspects in the training of a future medicine prescriber. Students passively receive information, analogous to raw sap absorbed by a tree: a substance that is not fit for their development or for their future. In this context, educational interventions should promote students' prior knowledge, the need to know, the thinking, the self-organization, the motivation and other essential aspects for adult learning[7].

Adults enjoy learning meaningful and purposeful things. In the educational intervention addressed in this study, though not assessed in isolation, the fieldwork was used to provide information related directly to the professional practice. The students' contact with established professionals provided them with the opportunity to: (1) exercise the ability to communicate/engage in dialogue, (2) get in touch with the working environment, and above all, (3) acquire significant knowledge that will be used in the profession. We emphasize the need to prepare students for the accomplishment of this activity, which will help avert embarrassment that health professionals may feel due to possible awkward questions and other potentially unwanted variables (egg.: inappropriate place or time for the interview, etc.).

Currently, a major challenge for teachers is keeping students focused and motivated during educational activities.

DOI: http://dx.doi.org/10.1590/1981-52712015v41n3RB20160043

This study showed thatin the *student-spectators* group 97.1% agreed that they had paid attention during the role-play, and 94.2% agreed that they had acquired knowledge about the addressed drug type. These findings were consistent with the peer review, in which the score given to the *student-presenters* was approximately 91% of the maximum performance.

Despite the *student-spectators'*perception of their increased pharmacological knowledge after the presentation, the *student-presenters* demonstrated superior performance in the final written evaluation, even though it was not statistically significant. This seems obvious considering that the *student--presenters* had invested more time and energy in conducting the fieldwork and in studying the script for the role-play, based on the available literature and lectures previously given by the teacher.

The DREEM evaluation revealed a more positive educational environment than a negative one, although three questions of the questionnaire were not answered by the students. We believe that this fact did not influence the result achieved because even if those items had returned a maximum score, there would have been no change in the final score.

The DREEM can also be analyzed through questions, considering anaverage of <2 potentially problematic items in the educational environment[8]. In our study, item 3 ("There is a good support program for stressed students") and item 5 ("The way I used to study before also works for this course") were unsatisfactory. The score for item 3 revealed a deficiency, which can be attributed to either the Pharmacology course teacher or the teachers of other subjects taught in the same semester, which indicates the need to identify and refer stressed students to the effective psycho-pedagogical support program. Despite the score obtained for item 5, we believe that the written exams and the role-play preceded by fieldwork actually require other forms of study and preparation for the course. In our reality, the students' previous educational experience emphasized passive assimilation and memorization of information, which aimed at exams that focused on factual knowledge, with questions of low taxonomy (Bloom)[9]. With the new method, new skills in the cognitive sphere were achieved and other areas were implemented (Table 4).

The intervention results, although positive, demonstrated some limitations. The absence of a control group and the fact that the role-play is considered for evaluation in the discipline may represent a selection bias. Moreover, only the students' satisfaction or reaction and some cognitive or behavioural skills were measured, which places the program evaluation on Kirkpatrick's second-level[10]. After the role-play presentation, the acquired pharmacotherapeutic skills were not assessed, for example, in relation to standardized patients (corresponding to Kirkpatrick's third-level) or in different circumstances in the later stages of the course (corresponding to Kirkpatrick's fourth-level). The impact of the intervention on professional practice could not be evaluated, thus further studies are needed to verify the impact of a long-term intervention.

Table 4
Skills incorporated with the method

Skillsincorporated	Players involved	Activity
Interpersonal relations/Ethics	• **students**	Team work
	• **studentsandprescriber**	Fieldwork
Creativity in the script development	• **students**	Team work
Communication ability	• **studentsandprescriber**	Team work
Analysis/ synthesis capability	• **students**	Team work
Artistic ability	• **students**	Roleplay
Give / receivefeedback	• **studentsandteacher**	Roleplay
Solution of high taxonomy questions	• **students**	Writtenexams

In short, fieldwork followed by role-play proved to be an appropriate strategy to promote an educational "photosynthesis", a transformation of the pre-existing information and the information transmitted by teachers – raw sap – into a meaningful and directly applicable learning to the professional practice – elaborated sap. The educational experience through which the students were submitted allowed them to remain active during the teaching-learning process, in a safe environment, where they were able to discover, discuss and construct. Moreover, the activity also promoted significant learning, seeing that it offered the two conditions for its construction: the presence of a potentially significant content and the adoption of a motivational and favorable attitude towards learning, based on previous, recent and remote experience and knowledge from the students[11].This is a high potential strategy to be also used in other basic science disciplines.

REFERENCES

1. Shankar PR, Jha N, Bajracharya O, Gurung SB, Singh KK. Feedback on and knowledge, attitude, and skills at the end of pharmacology practical sessions.Journal of educational evaluation for health professions. 2011;8:12.
2. McCrorie P. The place of the basic sciences in medical curricula.Medical education. 2000;34(8):594-5.
3. Grande JP. Training of physicians for the twenty-first century: role of the basic sciences. Medical teacher. 2009;31(9):802-6.
4. Alexander EK. Perspective: moving students beyond an organ-based approach when teaching medical inter-

viewing and physical examination skills. Academic medicine : journal of the Association of American Medical Colleges. 2008;83(10):906-9.
5. Laing R, Hogerzeil H, Ross-Degnan D. Ten recommendations to improve use of medicines in developing countries. Health policy and planning. 2001;16(1):13-20.
6. Roff S. The Dundee Ready Educational Environment Measure (DREEM)--a generic instrument for measuring students' perceptions of undergraduate health professions curricula. Medical teacher. 2005;27(4):322-5.
7. Taylor DC, Hamdy H. Adult learning theories: implications for learning and teaching in medical education: AMEE Guide No. 83. Medical teacher. 2013;35(11):e1561-72.
8. Herrera C, Pacheco J, Rosso F, Cisterna C, Daniela A, Becker S, et al. Evaluation of the undergraduate educational environment in six medical schools in Chile. Revistamedica de Chile. 2010;138(6):677-84.
9. Anderson LW, Krathwohl DR. A taxonomy for learning, teaching, and assessing : a revision of Bloom's taxonomy of educational objectives. Complete ed. New York: Longman; 2001. xxix, 352 p.
10. Frye AW, Hemmer PA. Program evaluation models and related theories: AMEE guide no. 67. Medical teacher. 2012;34(5):e288-99.
11. Mitre SM, Siqueira-Batista R, Girardi-de-Mendonça JM, Morais-Pinto NM, Meirelles CAB, Pinto-Porto C, et al. Metodologias ativas de ensino-aprendizagem na formação profissional em saúde: debates atuais. Ciênc. saúde coletiva. 2008;13(Suppl 2):2133-2144.

CONTRIBUTION OF AUTHORS

Daniel Riani Gotardelo, Valdes Bollela and Denise Ballester participated in all stages of the study: planning, execution, writing and final revision of the manuscript. Anderson Proust Gonçalves Souza, Daiane de Paula Barros e Jesus Mistica Ventura Balbino participated in the execution.

CONFLICT OF INTERESTS

There is no conflict of interests.

ENDEREÇO PARA CORRESPONDÊNCIA

Daniel Riani Gotardelo
NRE Educacional SA
Instituto Metropolitano de Ensino Superior (IMES)/Univaço
Rua João Patrício Araújo, 179
Veneza I – Ipatinga, MG
CEP 35164-314
E-mail: danielriani@famevaco.br