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EXPERIENCE REPORT

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Why and how to reform an innovative curriculum? An experience report from Londrina

Por que e como reformar um currículo inovador? Um relato de experiência de Londrina

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ABSTRACT

Introduction: The undergraduate medical course of the State University of Londrina was the second in Brazil to adopt an integrated curriculum and Problem-Based Learning (PBL). Despite its innovative curriculum, which became a reference for other schools, new assessments showed the need to reform it.

Experience Report: Systematic course evaluations showed some issues: difficulties in adaptation of new students attending the first year; disorganized sequence of contents throughout the course; teachers' lack of motivation for activities from first to the fourth years; need to include new contents; and deterioration of the methodology (PBL) in third and fourth years. A wide collective effort for curricular reform was initiated, which led to important changes, such as: a more welcoming first year, by including mentoring and activities for the leveling of basic knowledge; chronological reorganization of contents; redesign of modules around great areas of knowledge or related specialties; adoption of new and more motivating active learning and teaching methodologies, and the inclusion of new topics/trends.

Discussion: The adoption of other active learning and teaching methodologies present strategic advantages in replacement for PBL. Team-Based Learning (TBL) is a more structured method than PBL, so it can help newcomers to adapt to the first year and make it easier to implement active methodologies in a context of teacher shortage. Case-Based Learning (CBL) generates higher motivation and can be more effective to foster the development of clinical reasoning skills in the preclinical years.

Conclusion: The new curriculum, incorporating the changes described above, started in 2022. Further evaluations will show whether the changes will improve the course in terms of adaptability, motivation and learning outcomes.

Keywords: Undergraduate Medical Education; Educational Measurement; Problem-Based Curriculum; Problem-Based Learning; Teaching Methods.

RESUMO

Introdução: *O curso de graduação em Medicina da Universidade Estadual de Londrina foi o segundo do Brasil a adotar currículo integrado e Aprendizagem Baseada em Problemas (PBL). Apesar de seu currículo inovador ter servido de referência a outras escolas, avaliações recentes mostraram a necessidade de reforma.*

Relato de experiência: *As avaliações sistemáticas do curso indicaram os seguintes problemas: dificuldade de adaptação dos ingressantes à primeira série; desorganização da sequência de conteúdos ao longo do curso; falta de motivação docente para as atividades da primeira à quarta série; necessidade de incluir tópicos obrigatórios e novas tendências; e desgaste da metodologia (PBL) a partir da terceira série. Um amplo trabalho de reforma curricular foi iniciado, baseado na construção coletiva, culminando em mudanças, como: o desenho de uma primeira série mais acolhedora por meio da inclusão de nivelamento de ciências básicas e mentoria; a reorganização cronológica dos conteúdos; o redesenho dos módulos, agora organizados ao redor de grandes áreas ou especialidades afins; a adoção de metodologias ativas mais motivadoras; e a inclusão de novos conteúdos.*

Discussão: *A adoção de novas metodologias ativas em substituição à PBL em alguns momentos apresenta vantagens estratégicas. A Aprendizagem Baseada em Equipes (TBL), mais estruturada que a PBL, pode ajudar na adaptação dos ingressantes à primeira série e facilitar a realização de metodologias ativas num contexto de escassez de docentes. A Aprendizagem Baseada em Casos (CBL) é mais motivadora e pode ser mais efetiva para desenvolver habilidades de raciocínio clínico nas séries pré-internato.*

Conclusão: *O novo currículo, que incorpora as mudanças mencionadas, foi implantado em 2022. Novas avaliações mostrarão se as mudanças trarão melhorias ao curso em termos de adaptação, motivação e resultados de aprendizagem.*

Palavras-chave: *Educação de Graduação em Medicina; Avaliação do Ensino; Currículo Baseado em Problemas; Aprendizagem Baseada em Problemas; Métodos de Ensino.*

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INTRODUCTION

The undergraduate course in Medicine at the State University of Londrina (UEL, *Universidade Estadual de Londrina*) celebrated its 55th anniversary in 2022. Its activities began in 1967, thanks to pioneering initiatives by the local society, notably the Medical Association of Londrina (*Associação Médica de Londrina*) and the newspaper *Folha de Londrina*. The founders of the course looked for professors of reference in traditional medical schools, especially São Paulo and Curitiba. The course trajectory is characterized by its commitment to innovation and quality. It integrated important initiatives (both national and international) for the evaluation and reform of medical education, such as the CINAEM Project, the UNI proposal ("A new initiative in the education of health professionals: unity with the community") and the Network of Community-Oriented Educational Institutions for Health Sciences (currently, The Network: Towards Unity for Health)[1].

In 1998, UEL was the second school in Brazil to adopt an integrated, modular curriculum, using active student-centered, teaching-learning methodologies, such as Problem-Based Learning (PBL) and problematization. The course curriculum was strongly influenced by the Network and the University of Maastricht medical school (the Netherlands). Since then, the course has accumulated more than two decades of experience with integrated curriculum and active methodologies, especially PBL, taking on a prominent place at the forefront of Brazilian medical education and impacting countless other schools, also participating in the creation of the first National Curricular Guidelines (DCN, *Diretrizes Curriculares Nacionais*) of Medicine[2], published in 2001[3].

However, as of 2018, new course evaluations, carried out with the wide participation of teachers and students, indicated the need for change. That constituted a matter of concern: how to advance even further a course that was already considered innovative in the 1990s?

In this experience report, the product of reflections promoted in the academic community of the assessed course, we would like to share the challenges, opportunities and lessons learned during this curricular reform process of the UEL Medical Course.

EXPERIENCE REPORT

In 2018, the UEL Medical Course celebrated 20 years since the start of the first class in the integrated curriculum. Throughout this period, the course trained approximately 1,200 physicians, qualified hundreds of teachers in the use of active teaching-learning methodologies, and also showed it had a cost[4] and training quality[5] comparable to the best schools in the country.

The current pedagogical project (originally published in 1997, with minor adjustments in 2005 and 2009) provided for: annual classes of 80 students; curricular structure in interdisciplinary modules, grouped by major symptoms/syndromes, integrating basic and clinical contents and theory and practice; student-centered teaching methodology using PBL in groups of 8 students from years 1 to 4; student insertion in the community since the first year; offer of elective modules and practices, and a two-year internship[6].

Reasons for change: the "whys"

The course has a long tradition of permanent evaluation: it was the first to join CINAEM and participated in the first national Progress Test, in the 1990s. From 2003 onwards, this tradition was institutionalized in the Integrated System for Evaluation of the Course of Medicine (SIAMed, *Sistema Integrado de Avaliação do Curso de Medicina*), using as a reference the 2001[2] DCN and the National Higher Education Evaluation System (SINAES, *Sistema Nacional de Avaliação da Educação Superior*), proposed at the time by National Institute of Educational Studies and Research *Anísio Teixeira* (INEP) and Ministry of Education (MEC) - INEP/MEC[3].

In 2018, in the ongoing evaluation effort, students from the 1st to 4th years performed written evaluations at the end of all modules and were invited to point out the main problems of the course and suggestions for improvement. Questionnaires, meetings and workshops were organized in 2018-2019 to collect the opinions of the entire academic community on the course.

All these data were carefully reviewed by the Structuring Faculty Nucleus (NDE, *Núcleo Docente Estruturante*). Based on this analysis, the most commonly mentioned problems were grouped into five broad categories:

- Problem 1: first-year students' difficulty in adapting to academic life in the first year, related to the intense stress associated with the new methodology (PBL) since the first month of the course;
- Problem 2: disorganization of the sequence of course contents, which needed to be revised to ensure a progression from simpler contents to more complex ones;
- Problem 3: teachers' lack of motivation for activities from the 1st to 4th years of the course, attributed at least in part to the considered "artificial" division of the modules around major symptoms or syndromes (for instance: "Pain" or "Dyspnea, Pain Chest and Edema");
- Problem 4: need to include/complement mandatory topics (English, health management and education, Brazilian Sign Language (LIBRAS, *Linguagem Brasileira de Sinais*), ethnic-racial relations, etc.) by

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the 2014 National Curriculum Guidelines[7] and/or strategic areas or trends (Family and Community Medicine, Evidence-based Medicine/Undergraduate Research, Palliative Care, Spirituality, etc.);

- Problem 5: deterioration of the teaching-learning methodology (PBL). Despite being perceived as an advance in relation to the so-called traditional pedagogy, from the 3rd year onwards, many groups no longer follow the method's sequence of steps. In the case of students, this seems to occur due to haste or immediacy. Among the faculty, one factor is a tendency to overestimate the importance of topics in one's field. This results in heterogeneity between groups regarding the achievement of study objectives and dissatisfaction. Added to that is the observation that leading medical schools have been adopting new active teaching-learning methodologies, such as, for instance, Team-Based Learning (TBL) at the School of Medicine of Hospital Albert Einstein[8] and Case-Based Learning (CBL) at Harvard Medical School[9]. The medical school in Maastricht itself, on which UEL modeled itself to design its curriculum, was already combining PBL with simulations and other approaches[10].

In addition to the abovementioned issues, other justifications for change were accumulating. The course score in the National Student Performance Examination (ENADE, *Exame Nacional de Desempenho dos Estudantes*) decreased from 5 in 2010-2013 to 4 in 2016-2019. The student profile changed: from 2010 to 2020, the students' mean age increased and the average family income and the proportion of students from private high schools decreased, in parallel with the adoption of the universal quota system at UEL from 2011-2012 onwards. The University has suffered a downsizing of the teaching and technical-administrative staff in recent decades, impacting the staff available for pedagogical activities. Finally, new rules and requirements for the course emerged, such as the DCN of 2014[7] and the extension curriculum[11,12].

The curriculum reform process: the "how"

Given the abovementioned reasons, the need for change was undeniable. But a great challenge was imposed on the NDE: how to reform a curriculum with more than 20 years of tradition, which served as a model for so many other schools? How to convince teachers to change again? How to enlist the support of students, many of whom had chosen UEL precisely because of the integrated curriculum and PBL?

The answer was the *collective construction*. Feuerwerker had already stated regarding the previous reform process of the same course, in 1997: "the change [...] starts in the very process of building the proposal for transformation, which must be done through the creation of collective spaces, enabling the participation of the greatest possible number of teachers and students, of the greatest possible number of areas and departments[13]."

On the one hand, it was not that difficult: many teachers and students were dissatisfied with the situation, and the NDE had many arguments to justify the change. Moreover, the majority of the current faculty was in favor of redesigning the curriculum and adopting new active methodologies.

On the other hand, the intense course evaluation work in 2018-2019 had already been a collective construction. Discussing changes based on these evaluations ended up being the natural continuation of this work. In 2019, the NDE promoted workshops on active methodologies, medical internship and curriculum reform, with broad participation from the academic community, interested in helping to suggest new directions.

But it was necessary to define a place to start. As in the late 1990s, the reform received strong support from teachers of basic sciences[13]. Therefore, the NDE chose to start there. Meetings were held with teachers from the several areas of Biological, Exact and Human Sciences who participated in the course, where the NDE asked them the following question: "*What do you think would be the ideal way to approach your content within the Medicine course?*" Next, working groups were created, bringing together teacher from related areas (for instance: Cell Biology, Biochemistry and Genetics) to suggest joint proposals. Thus, curricular integration was preserved - but in a more focal manner, between closer areas.

After the reflection on the first two years, mainly adding content from the basic sciences, a similar approach was taken in the clinical areas. The new modules for the 3rd and 4th years were also planned aimed at a more focused integration, around specialties/areas of activity that are naturally close (for instance: Pulmonology, Pediatric Pulmonology and Thoracic Surgery), more similarly to the division seen in actual clinical practice. These new transdisciplinary modules are expected to stimulate the teachers' sense of belonging and, consequently, their motivation (Problem 3).

The proposals of the areas were analyzed by the NDE and then repeatedly discussed with the teachers involved to negotiate adjustments, which were necessary to guarantee a macroscopic design of each year that was consistent among them and with the other years and that respected the workload limits.

At this stage, the contents of the 1st to 4th years were carefully mapped and ordered, to solve Problem 2

(disorganization of the sequence of contents). In the end, dozens of meetings were held over three years, with more than 200 teachers from 19 Departments and five Study Centers, until a curriculum design was attained that was accepted by all.

The solving of Problem 5 (reviewing teaching methodologies) was also challenging. When consulting the literature on health education, the NDE and teachers of the 3rd and 4th year modules became interested in Case-Based Learning (CBL) as a possible alternative to PBL as the course enters a more clinical phase. Like PBL, CBL also involves discussions in small groups with a tutor-teacher, but it is more clinically focused, is more structured, has clearer objectives, is more motivating for students and teachers (Problem 3) and seems to be more effective for promoting the development of clinical reasoning skills[14,15]. Another advantage of the CBL, in a context of progressive downsizing of personnel, is that it can be carried out in larger groups (15-20 students) than the PBL (8-10 students), requiring a smaller number of teachers[15]. Experiments were carried out in some modules, the results of which guided the proposition of a specific CBL method, meeting the needs of the course[16].

Regarding the rest of the course, it was observed that the 1st year was being especially affected by the paucity of teachers at that time, making difficult to maintain PBL. That was one of the reasons why Team-Based Learning (TBL) was adopted in this year, since this methodology allows carrying out activities with only 1-2 teachers for the entire class[17] (instead of 6 or 10 teachers, as in CBL and PBL, respectively).

TBL, which is more structured than PBL, will also allow 1st-year students to adapt more gradually to active teaching-learning methodologies, in which the student plays a central role (Problem 1).

Still on adaptation: thanks to the University's quota policy, at least 40% of the current first-year students at the UEL medical course attended public schools, and there is a clear discrepancy in the educational background of these students when compared to their peers who attended private schools. In the current curriculum until then, these two sets of students were randomly merged into small groups and tasked with discussing problems in PBL from the first month of the course onwards. In addition to the natural difficulty in adapting to the new reality of being a university student, the students often felt the comparison with peers and the frequent feeling of "not being able to keep up" with the activities. It is the "impostor syndrome", an important factor for the high prevalence of burnout and mood disorders among medical students[18].

In the new curriculum, the 1st-year students will have more activities (lectures and basic science practices) to level students in these fundamental contents, as well as the inclusion of mentoring as a curricular activity, providing socio-emotional support and educational guidance to freshmen.

Finally, regarding Problem 4 (need to include new contents): concepts for the practice of scientific Medicine will be addressed in a longitudinal module (from the 1st to 4th years) of Mandatory Scientific Work, in which students will learn scientific methodology and carry out a scientific project before starting the internship. LIBRAS and English became curricular disciplines, and other contents required by the DCN that were not fully contemplated before (ethnic-racial relations, history of Afro-Brazilian/indigenous culture and others) now comprise a module of Medicine, Health and Society. Family and Community Medicine gained an annual longitudinal module in the 3rd year, including topics on health management and education. Free spaces were reserved on Friday afternoons throughout the course to organize participation in extension activities (extension curriculum)[11].

The new curricular matrix of the course is published on the UEL website and can be consulted freely at: http://www.uel.br/prograd/documentos/resolucoes/2022/resolucao_05_22.pdf

Chart 1 correlates the problems identified in the course evaluations and the curricular adjustments proposed for their respective solution.

DISCUSSION

A perfect curriculum does not exist. In Medicine, where advances occur at breakneck speed, it is inevitable that medical school curricula will need to be reformed quickly, including those already considered to be innovative. At the end of the 1970s, Abrahamson already warned of the evil of 'curriculum sclerosis', "the most disabling and, tragically, one of the most prevalent diseases of the curriculum[19]." And UEL Medicine, in the words of Perim et al.[20], is "an undergraduate course that requires permanent rethinking."

After being the second school in Brazil to adopt an integrated curriculum and Problem-Based Learning, the UEL Medical course became known almost as a synonym for PBL, but that does not stop us from moving forward. Harvard medical school itself, which boosted the adoption of PBL in other courses by adopting PBL in 1986[21], has already reviewed its methodologies and today adopts a mixture of TBL and CBL, which they call "Case-Based Collaborative Learning" - CBCL, which seems to be effective[22] and very well accepted[23].

The adoption of Case-Based Learning (CBL) to replace PBL in the 3rd and 4th years of our course aims to optimize the development of clinical reasoning and increase the motivation of teachers and students. In other schools that made a similar transition, CBL was preferred because it was more focused and allowed more opportunities for clinical application[24], as

Chart 1. Problems indicated by the evaluations of the UEL Medicine course and respective solutions proposed in the 2022 curriculum reform.

Problem	Description	Proposed solution
1	Difficulty of freshmen students in adapting to the 1st year of the course	More gradual adaptation to active teaching-learning methodologies through the adoption of TBL in the 1st year; inclusion of mentoring; lectures for the "leveling" of basic sciences.
2	Disorganization of course contents (confusing sequence)	Mapping of course contents, reorganization of module contents in a sequence from the simplest to the most complex one.
3	Unmotivated teachers for activities from the 1st to the 4th years	Reorganization of contents in new modules around large areas or related specialties to increase the sense of belonging; adoption of a more motivating methodology in the 3rd and 4th years (CBL).
4	Need for inclusion of new contents	Construction of new modules and disciplines aiming to include these contents.
5	Deterioration of the methodology (PBL) from the 3rd year onwards	Adoption of different active methodologies during the course: TBL in the 1st year, PBL in the 2nd year and CBL in the 3rd and 4th years.

Source: Data collected by the course NDE and compiled by the authors.

well as being more motivating[14] and probably more effective in developing clinical reasoning[15]. Financial incentives are one of the most commonly used ways to try to increase faculty motivation[25], but obviously they are not a viable option in a public university; for this reason, we need to seek other incentives, and curriculum design can be one of them.

In the modules of the new curriculum, we maintained the integration between basic and clinical and/or surgical areas, but the modules were reorganized around major areas or related specialties. This change aimed to meet the demands of teachers and students, who often complained about the "artificial" division of contents around major symptoms or syndromes. One can cite, for instance, the module called "Dyspnea, Chest Pain and Edema", which addressed heart, lung and kidney diseases taught in the 4th year. For years, the teachers of these specialties (Cardiology, Pulmonology, Nephrology) had already been fragmenting the contents and evaluations of the module due to didactic reasons. In the new curriculum, this module was replaced by three independent modules (Respiratory Diseases, Kidney Diseases and Cardiovascular Diseases), each one integrating content and teachers from the clinical, surgical, pediatric and complementary propaedeutics areas.

We also believe that the more welcoming design of the 1st year, with the leveling of activities and gradual adaptation to active methodologies (TBL), in addition to promoting a safe space in mentoring for reflection, self-knowledge and promotion of autonomy[26] will bring advances by facilitating the integration of first-year students[27] and promote their mental health[28].

Finally, the offer of new elective disciplines will allow students to individualize their curriculum by choosing between: Spirituality in Medical Practice, History of Medicine, Finance Management and Entrepreneurship, Sexology and Sexual Therapy, Clinical Toxicology and Palliative Care (the latter, in compliance with the modifications contained in CNE/CES Opinion n. 265/2022)[29]. In addition to developing the general medical culture, these contents may contribute to the formation of well-prepared physicians and to their awareness of their role in today's society.

FINAL CONSIDERATIONS

Quoting Perim[5]: "it is not enough to adopt new teaching methodologies or promote curricular changes, even if these are supported by participatory processes. You have to dare!" Well then: we dared to move forward, supported by participatory processes.

The first class of the new curriculum started their activities in this academic year of 2022. The new pedagogical project[12] foresees the continuity of the efforts related to teacher training and course evaluation, in a systematic and continuous way. We believe the course will gain in terms of teacher motivation, welcoming of students and quality of training. Our future evaluations will show whether we are on the right track.

AUTHORS' CONTRIBUTION

Leandro Arthur Diehl: data collection (research) and original writing of the manuscript; collaboration with the formal analysis and methodology; conceptualization and review/editing support. Neide Tomimura Costa: collaboration in data analysis and validation, review and editing of the manuscript. Lígia Márcia Mário Martin: collaboration in the conceptualization, investigation, methodology and review/editing of the manuscript. Pedro Alejandro Gordan: original

study design (conceptualization), collaboration in the analysis and review/editing of the manuscript, support for coordination, supervision and writing. Marcio José de Almeida: original study design (conceptualization), collaboration in the analysis and validation of data and in the supervision of the study, support for the writing and review of the manuscript. Izabel Cristina Meister Coelho: coordination (administration and supervision) of the study, collaboration in the conceptualization, analysis, methodology and final review of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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