Interdisciplinarity in health education: updating, successes and challenges

ABSTRACT
The advent of the concept of interdisciplinarity arose from the need to update traditional curricula in view of the complexity of health problems and the search for training professionals with a more global vision and a reflective attitude, less fragmented and biological, resulting in the correlation between the disciplines as an important tool in current healthcare education. The aim of the study is to present an update on the importance of interdisciplinarity in the curricular formation of health education and its applicability in the context of health work. A literature review was carried out in the Scielo, Lilacs and PUBMED/Medline databases, between January 2016 and April 2021 with the keywords interdisciplinarity, education and health. 77 publications related to the keywords were identified. Of these, 23 were considered relevant to the scope of the study. The publications show successful examples of the implementation of interdisciplinarity as a curricular model tool in healthcare courses and between different courses in this area (interprofessionality), cases of educational institutions that have already used it for a long time in their curricula and discuss the challenges to its implementation and its benefits to the professional egress and to the society that receives their service. It is necessary to
implement interdisciplinarity in the curricula of health schools so that we can train professionals who have a more global and reflective vision for patients and society.

**Keywords:** interdisciplinary practice, university education, transdisciplinary communication.

**RESUMO**
O advento do conceito de interdisciplinaridade surgiu da necessidade de atualização dos currículos tradicionais, tendo em vista a complexidade dos problemas de saúde e a busca pela formação de profissionais com uma visão mais global e uma atitude reflexiva, menos fragmentada e biológica, resultando na correlação entre as disciplinas como uma importante ferramenta na atual formação em saúde. O objetivo do estudo é apresentar uma atualização sobre a importância da interdisciplinaridade na formação curricular da educação em saúde e sua aplicabilidade no contexto do trabalho em saúde. Foi realizada uma revisão da literatura nas bases de dados Scielo, Lilacs e PUBMED/Medline, entre janeiro de 2016 e abril de 2021, com as palavras-chave interdisciplinaridade, educação e saúde. Foram identificadas 77 publicações relacionadas às palavras-chave. Dessas, 23 foram consideradas relevantes para o escopo do estudo. As publicações mostram exemplos bem-sucedidos da implementação da interdisciplinaridade como ferramenta de modelo curricular em cursos da área da saúde e entre diferentes cursos dessa área (interprofissionalidade), casos de instituições de ensino que já a utilizam há muito tempo em seus currículos e discutem os desafios para sua implementação e seus benefícios para o profissional egresso e para a sociedade que recebe seu serviço. É necessário implementar a interdisciplinaridade nos currículos das escolas de saúde para que possamos formar profissionais que tenham uma visão mais global e reflexiva em relação aos pacientes e à sociedade.

**Palavras-chave:** prática interdisciplinar, educação universitária, comunicação transdisciplinar.

**1 INTRODUCTION**

In education, discipline refers to the area of knowledge taught or studied. The term "interdisciplinarity" refers to the relationship between different disciplines with the purpose of serving as an alternative to the anatomical and biological teaching method in the area of health. This tool, widely used in teaching scenarios in which it is used active methodologies, can also be defined as a transfer of knowledge between the disciplines, jointly discussing a problem or situation, correlating them with each other¹.

Therefore, it should not be understood as a teaching technique or means of investigation, much less as a reductive way to problematize a situation, but rather as a methodological and theoretical element for diversity and creativity. Its application allows the correlation between disciplines to ease the consequences of the fragmentation of traditional education, in an attempt to lead to a comprehensive training of students, making them capable of facing problems complexes of reality².
Thus, interdisciplinarity is opposed to "fragmented" teaching, in which teaching and tries to learn by parts for so many times¹ topographical. For example, in the traditional curriculums, still with the majority in force in medicine courses in Brazil, it is learned bone anatomy in the 1st year and later, in the 5th year of the course (without any opportunity to review) apply this knowledge in the discipline of Orthopedic Surgery. This biologicist and specialized view of health education is opposed to the concept of interdisciplinarity and illustrates it. Teaching based on the transmission of knowledge, increasingly specific about each function and organ dysfunction, leads to a vision misleading segmentation of the human body. The fragmentation of knowledge into several incommunicating disciplines and the appreciation of specialization and subspecialization professionals are side effects resulting from it³.

The understanding of health in its expanded concept in Latin America, mainly in the 1970s and 1980s, in contrast to the conceptions of health centered in illness. The vision of the human being as a complex, multi-system and interconnected being started to be considered as the most effective alternative for showing results in teaching in health⁴. In this context, pedagogical examples have successfully emerged that contemplate the articulation of contents in a problematizing approach, allied to the medical practice in the context of health work.

In this work, the authors seek to bring an update based on a review of the recent literature on the relevance of interdisciplinarity and its examples of success intra- and extra-curricular, including best examples of delivering education and health to social units.

2 METHOD

It was done a biography literature review in health using the keywords "interdisciplinarity, education and health" (and their respective English vocable “interdisciplinarity, education and health”). It was searched the following databases: Scielo (no date filter), Lilacs and PUBMED/Medline (both from January 2016 to April 2021). Altogether, after the intersection’s review of bases and relevance/specificity of the scope and study, were identified 77 publications able to review by the authors. Of these, 23 were used as references for this publication.

3 RESULTS

3.1 THE INTERDISCIPLINARITY IN HEALTH CURRICULUMS.

A qualitative study carried out from 2005 to 2015, involving five different nursing courses in five higher education institutions in Santa Catarina from techniques such as interviews and a focus group with 22 teachers and 14 professionals from the basic health care
services, organized its results into three categories: hegemony and counter-hegemony (the coexistence of two approaches in health care); from theory to practice (how the health care model is expressed in two areas of nursing education) and interdisciplinarity (advances and biases). In what it refers to hegemony and counter-hegemony, the coexistence of the clinical model was the main evidence reported by those involved with significant gains in the ways of think and do in health. The authors report that due to the historical dynamism of facts between past and future and the institutional structures and its subjects, it could be understood that, in the same reality, both models can still coexist in health care. The data showed experiences in training where the interdisciplinarity or interdisciplinary strategies became focus on development of activities in the teaching-learning process and realizing as a bias the intention to provide interdisciplinarity in nursing courses, both in classrooms and in patient care⁵.

The Interdisciplinarity in the production and dissemination of the knowledge in times of pandemic is the subject of a study made by the Aurora de Afonso School of Nursing Costa (EEAAC) of the Fluminense Federal University, which excels in the training of Nurses with technical, scientific, political and ethical competence. stands out in production of knowledge through research developed in post-graduate programs. University graduate *strict sense*, which deepens in the inter and transdisciplinarity in the dissemination of knowledge. The EEAAC has a significant role in extension actions aimed at interdisciplinarity in welcoming students and professionals who contribute to the knowledge of nursing and health care. The editorial reinforces that, in times of pandemic, dealing with differences in the face of adversity and valuing concepts such as understanding, cooperation and inclusion with respect to differences are approaches that complement each other in a perspective of a fairer society, democratic and tolerant. According to the author, investments are needed to maintain the activities related to advances in the training and qualification of members and thus, generate good working relationships. It concludes that the rescue of health promotion in University permeates the art of caring, teaching and researching⁶.

Another study, carried out at the University of Brasília (UnB), sought to identify, according to the multidisciplinary training of students, information that would allow analyze interdisciplinarity as a teaching-learning tool through annual public notices between the years 2008 and 2015. From the secretariat's archives of the program and of the Lattes Platform, collected data such as age, sex, origin, professional training and postgraduate courses *Lato or stricto sensu*. In all, 145 students were enrolled; of these 57% enrolled in the course of master's degree, 41% in the doctoral course. In relation to areas of knowledge in the Graduate Program in Bioethics at UnB, in the first place health sciences prevailed with 58%, followed by
humanities and social sciences with 34%. It can be inferred that the participants believe that interdisciplinarity is the philosophical identity of bioethics, promoting moral values in order to transforming reality towards the common good and justice in the field of knowledge¹.

Eveillard et al.⁷ reported the assessment of students and teachers in relation to their feelings about an innovative master's program, in which the integration of Microbiology and Infectious Diseases courses in an interdisciplinary way. Integration was evaluated by recording the placement of these topics in five teaching units, identifying the contributions in the interactions between the different higher education units. Student satisfaction was assessed through a survey, quantitative analysis and feelings through interviews. It was shown that Microbiology and Infectious Diseases disciplines were extensively involved in interactions between teaching units, constituting a solid foundation for the program. The authors also mention that there were reports of problems in communication, probably due to the class’ multiculturalism⁷.

3.2 INTERDISCIPLINARITY BETWEEN COURSES IN THE TRAINING OF HEALTH PROFESSIONALS (THE "INTERPROFESSIONALITY")

According to Pimentel et al.⁸, the diversification of the practice scenario, mainly when it comes to teaching in health, it allows the student an experience very close to what he will find in his professional life. The teaching-learning process is linked to the way of thinking about health, through integration, the commitment to individual comprehensive care, teamwork and interdisciplinary actions, based on SUS principles.

Panciera et al.⁹ follow the same line and concluded that students and teachers evaluated that the interdisciplinary teaching strategy favors a more experiential appropriation, critical and a reflective way to the contents worked, approximations with other forms of thinking and doing, in addition to listening skills and negotiating points of view.

Two works showed encouraging results regarding the PET strategy. Pink and al.10 claim that new perspectives on mental health care must be linked directly to work processes, and permanent health education integrating the IES to the daily life services from initiatives such as PET-Saúde/Redes. THE training takes place in practice, and serves everyone: students, tutors and above all, the user. Pereira et al.11 seek to demonstrate that PET-Saúde na Escola (health in school) provided the experiences to the students from various courses in the health area at UFMG in health units and public schools that have the highest social vulnerability, contributing not only to minimize limitations of fragmented teaching, but also for the practice of interdisciplinarity.
The action research methodology also had positive results as shown by Toledo et al.\textsuperscript{12} who claimed that in the face of social and environmental problems, health and educational action research methodology, when developed based on principles of participation, reflection, action and knowledge production, proved to be adequate facing the challenges imposed by the interdisciplinary character of these issues and by the need to appropriate new knowledges, values and skills.

To Moraes and Costa\textsuperscript{13} the PPC of courses in the health area meet the general premises of the DCN and health training policies, through innovative proposals for teaching, training a health professional with generalist, critical, reflective knowledge, team work, insertion in different fields of activity since the beginning of graduation at increasing levels of complexity, aiming at the development of competencies and skills required for a health professional who responds to the demands of the population.

Oliveira et al.\textsuperscript{14} questioned how the meanings of completeness have been addressed in graduation and even the understanding of teachers about the term. the model of teaching needs to be rethought and reformulated, as professional training will not be adequate if it does not work practices of integrality. Silva et al. made an alert in which exposed that despite the advances in the processes of inclusive education, it is observed still an inclusion that seeks to adapt to the legislative molds, defined by the teachers as "beautiful and perfect on paper", although, in practice, have been presenting themselves in a fragmented way in different instances of caring for children with disabilities or pervasive developmental disorder\textsuperscript{15}.

3.3 INTERDISCIPLINARITY AND ITS INFLUENCES ON SOCIETIES, IN GEOPOLITICAL UNITS AND/OR AT UNIVERSITIES

The university is based on three pillars: teaching, research and extension, which are worked inseparably. In this context, the interdisciplinarity manifests itself as an important tool in the process. The curriculum of undergraduate courses in the university is shaped in order to guarantee the production of academic knowledge, the significant advances which this provides to different areas of knowledge and the important formative premise of understanding the human being and life in society\textsuperscript{16}.

Table 1 shows some studies done in Brazil and around the world with examples of interdisciplinarity in the curriculum of geopolitical units or universities, showing successes and limitations that need to be thought in teaching practice and learners.
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<tr>
<th>Title/IES</th>
<th>Author/year</th>
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<tr>
<td>Interdisciplinarity in higher education: objective image reality! Severino University Shadow (USS/RJ)</td>
<td>Souza et al. (2012)</td>
<td>To describe the steps construction proposal, adopted methodology, the difficulties and faced resistances</td>
<td>Research itineraries, interviews, guests, debaters, simulated jury, Seminars, argumentative essays</td>
<td>Professors realized the limitations of the isolated process and learners understood the interdisciplinary importance</td>
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<td>Medical training in UFSB: I. Bachelor's Degree interdisciplinary in Health in the First Cycle / University Federal of the South of Bahia (UFSB)</td>
<td>Almeida Filho et al. (2014)</td>
<td>To present, evaluate and describe the interdisciplinary bachelor degree in health as first cycle for medical training, advanced models of medical formation</td>
<td>Integrational seminars about needed questions of subjects inside the world or in an indirect way, trough the structure</td>
<td>Professionals with humanist training, plenty of knowledge on health coletive areas, nursing, psychology, science social and medicine</td>
</tr>
<tr>
<td>Students and Users evaluate permanent Education tool in health – Sieps / Faculty medicine Petrópolis/Faculty Artur de Sá Earp Neto (FMP/Phase)</td>
<td>Ezequiel et al. (2012)</td>
<td>To understand the reflections that was made by Medicine, Nutrition and Nursing students and users about the Sieps</td>
<td>Interactive Sessions in Permanent Education in Health (Sieps) in Health Units of Faculty Family of Medicine of Petrópolis/Faculty Artur de Sá Earp Neto (FMP/Phase). Based in the principles of Permanent Education proposed by the Ministry of Health and in the methodology of problematization. were used a questionnaire based on the Likert scale</td>
<td>Users and students positively perceive Sieps and that, in their opinion and perception, they achieve their goals: they improve teamwork, emphasizing interdisciplinarity; welcome users; bring students closer to the reality of the communities in which they are inserted, with updating and training of the teams.</td>
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<td>Role of the Primary Care Preceptor in Health in Training of Graduation and Post-Graduation at the Federal University of Pernambuco – a Term of Reference / Federal University of Pernambuco (UFPE)</td>
<td>Barreto et al. (2011)</td>
<td>To present a theoretical and practice orientation for the attention preceptors primary health to the linked to the Federal University from Pernambuco</td>
<td>Presupposes primary attention to health as a practice scenario for students of different graduations and postgraduate courses with own characteristics. Approaching important aspects of the teaching-learning process in the community environment, articulating the different actors of it, among which the concept of knowledge in primary attention; The preceptor and student relationship</td>
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<td>Impact Assessment for Programs of Professional Reorientation in Courses in the Health Area / University Federal de Goiás (UFG)</td>
<td>Moraes et al. (2019)</td>
<td>To problematize the actors' perception in the area of health at the University Federal de Goiás on the impact of the National Reorientation Program for Professional Training in articulated health</td>
<td>A cross-sectional study was carried out with the participation of 300 actors from seven courses, including students, tutors, preceptors, professors and undergraduate coordinators. For this, a Likert-type attitudinal instrument was built and validated.</td>
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<td>Perceptions of multiprofessional health residents about interdisciplinarity</td>
<td>Baquião et al. (2019)</td>
<td>To understand the multiprofessional residents comprehensions about: (1) of different atuations forms in teams on the health field; (2) of interdisciplinarity in residence multiprofessional</td>
<td>The results demonstrate that there are, among the participants, significant difficulties in distinguishing between the different modalities of teamwork. In addition, it was observed that, for most participants, the PRMSs to which they</td>
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<td>Scientific debate of an essential theme to the fortification of SUS (Unique health system)</td>
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health programs (PRMSs) are linked only partially, with the personal initiative of the residents being one of the favoring factors, and problems in the dialogue with medical professionals one of the factors. 

The growing challenge of training scientist doctors: recommendations from a Canadian national consensus conference/Canada

Strong et al. (2018)²²

A national canadian conference consensus developed recommendations for training programs and early career suport to doctors and scientists.

Five recommendations were exposed:

(1) To establish a National Independent Council, which mandate is to provide a Canadense supervision for the trainee programes of medical scientists.
(2) To develop the capacity of financing and support from orietation to medical scientists;
(3) To develop networks with clinical scientists, including medical scientists, to thik about cultural diversity and unique Canada geographic and to reflect the interdiscipincarity of health research;
(4) ensure that medical school curricula integrate, as a feature of the core curriculum, an understanding of the scientific basis of health care, including research methodologies; and (5) ensure that physician-scientist-in-training funding is
| The program evaluation on-the-job learning interprofessional among health professionals students: The experience in the Grenoble Alps University/ University of Grenoble Alps | Busi et al. (2020) | To rate the local implementation of this program among Medicine, Pharmacy, Obstetrics, physiotherapy students in the Grenoble Alps University | 400 students participated in this service learning program (207 medical students, 93 pharmacy students, 39 obstetrics students and 61 physical therapy students). 92 teams carried out actions in 91 institutions, including 90 high schools. 96.0% of the students were in interprofessional teams. Of the 7,926 people affected, 7,872 (99.3%) were high school students. This program achieved education and interprofessional practice using activities taught by health students. The interdisciplinarity was a strong point of "health Service". The areas for improvement were the communication and the refund of expenses of transportation |
The main issues addressed were the substance use prevention program based on life skills development, Unplugged (55 schools) and screen time and cyberstalking (17 schools).

In Brazil, the Medicine University of São Paulo (USP) is one of the most renowned medical schools in the country, passed through two curricular reforms offering high quality teaching, the first one in 2006 and the other one in 2011 for considering that its pedagogical model, until then, was linear and conventional. After the renovations proposals in the national curriculum guidelines, the curriculum became part of the Medical Humanities subjects.

At the University of Oxford, in the United Kingdom, the medicine course is maintained by Anglo-Saxon university tradition. It has a duration of six years, divided into two cycles, the pre-clinical and the clinical. In the pre-clinical cycle, it has disciplines for humanistic, cultural and biologically-based character and, in the clinical cycle, the activities theoretical and practical in medicine. One of the main centers for the creation and dissemination of the active methodology "Problem Based learning (PBL)" is the University of Maastricht, in the Netherlands, where the medical course it is also divided in two cycles, the bachelor's and the master's degrees. In the bachelor's degree, performed in the first three years, the student attends the subjects of the axis "Care in Health", which encompasses biomedical sciences, European public health, health sciences and medicine. In the second cycle, called the Master's, the student will have the practical experience of medicine and, in the last year, the focus on medical practice applied to the complexity of the caring.

In Canada, McMaster University, in the province of Ontario, concentrates the course in medicine on two main pillars. The first one is focused on Clinical Epidemiology and the Evidence-Based Medicine articulated with the public health system and the second works the Active Methodologies using digital technologies. In the United States, the Harvard Medical School is structured different, as it addresses major pillars considering that the future physician needs to understand the subjects in an interactive way, in a context of worldview generalized and specific. First, the understanding and interpretation of the Aesthetics (interaction with the world of arts and literature).
First, the understanding and interpretation of the Aesthetics (interaction with the world of arts and literature). Subsequently, the subjects/pillars of Cultures and Beliefs of Human Societies (production of identities individuals and communities of the population), Empirical and Mathematical Reasoning, ethical Reasoning (analysis of moral and political beliefs and practices, discussing dilemmas concrete ethics), Science of Living Systems, Science of the Universe of Physics, Societies of the World and finally the United States in the World. 

4 DISCUSSION

Interdisciplinarity can be understood as an "educational process", which has, in the path of construction of thinking and doing in health, continuous assessment and dialogue frequently and effectively between different areas of education and health inserted and aimed at society. There are several methods that can involve interdisciplinarity, such as problem-based learning and projects and initiatives in which groups interdisciplinary professionals work in related fields (microbiology and infectology, for example), exercising collegiality between different professors for this modality of teaching). The change in attitude towards knowledge, the conception of unity of different for the same objective are means by which interdisciplinarity concretizes.

For its effective implementation in the practice of higher education, within the project course, it is necessary to build bridges that facilitate this process, such as the commitment of the faculty to methodological innovations and openness in making changes by managers.

A critical look at the studies carried out revealed a point of convergence: the benefit of interdisciplinarity for the training of health professionals as for the society that, ultimately, constitutes those who will receive the provision of the service. For the first ones, it provides a better training, with integration of "all", "generation of empathy" (ability to put yourself in the other's shoes) and better conditions for taking therapeutic interventions. For the patients, the interdisciplinarity promotes an improvement in care in general, without fragmentation of the assistance, but within the integral biopsychosocial model of the human being.

5 CONCLUSION

Interdisciplinarity is a pedagogical model that aims to promote integration of the acquisition of knowledge offering it in a global and problematized way, allowing a greater student intervention and participation and a closer look at the demands of patients and society. Thus, it opposes the biological model, segmented and anatomized of traditional curriculum in
the health area and provides opportunities for training of health professionals with a more global view of their course and their future patient.

Promoting its incorporation in educational training centers is still a challenge for courses in the health area, especially Medicine. The authors show and discuss examples of success and the challenges faced for this 3-level deployment didactic: within the courses curriculum in health areas; between course curriculum distinct in the health area (the “interprofessionality”); in educational institutions where this is already a crystallized reality; and its benefits for society, both for health professionals training and society that would benefit their services.

Through the analysis of these examples, it is demonstrated that the effects of this strategy allows the training of professionals with greater skills in the application of the knowledge, and better integration with clinical practice.
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