

TEACHING ENVIRONMENTAL SUSTAINABILITY FOR DENTAL SURGEONS: REVERBERATIONS OF ACADEMIC TRAINING IN PROFESSIONAL PRACTICE

O ENSINO DA SUSTENTABILIDADE AMBIENTAL PARA CIRURGIÕES- DENTISTAS: REVERBERAÇÕES DA FORMAÇÃO ACADÊMICA NA PRÁTICA PROFISSIONAL

LA ENSEÑANZA DE LA SOSTENIBILIDAD AMBIENTAL PARA CIRUJANOS DENTISTAS: REVERBERACIONES DE LA FORMACIÓN ACADÉMICA EN LA PRÁCTICA PROFESIONAL

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ABSTRACT: This study seeks to answer whether the theme of Sustainability/Environmental Education is present in undergraduate dental courses. The research is quantitative in nature. The first step was to search the undergraduate curricula. Then, a questionnaire was applied to the dentists. From the survey in the Higher Education Institutions, it was found that the theme Sustainability/Environmental Education, specifically, is not approached in the Dentistry courses; only related disciplines with superficial contents were found. The field research indicated that for 88% of the participants, the theme Sustainability/Environmental Education was not part of their curriculum, and only 12% of the participants affirmed having received this knowledge during their undergraduate studies. Thus, the research shows a gap in the academic training of dental surgeons during graduation, since the role and responsibility of universities is to contribute to a future of sustainable development through education.

KEYWORDS: Education. Higher education. Dentistry. Environmental education.

RESUMO: Este estudo busca responder se a temática da Sustentabilidade/Educação Ambiental está presente nos cursos de graduação em Odontologia. A pesquisa é de natureza quantitativa. Num primeiro momento foi realizada uma busca nas grades curriculares da graduação. Em seguida, realizou-se a aplicação de um questionário aos cirurgiões-dentistas. A partir do levantamento nas Instituições de Ensino Superior, foi constatado que o tema Sustentabilidade/Educação Ambiental, especificamente, não é abordado nos cursos de Odontologia: foram localizadas somente disciplinas correlatas e com conteúdos superficiais. A pesquisa de campo indicou que para 88% dos participantes o tema Sustentabilidade/Educação Ambiental não fez parte da sua grade curricular; somente 12% dos participantes afirmaram ter recebido esse conhecimento durante sua formação na

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graduação. Assim sendo, a pesquisa apresenta uma lacuna na formação acadêmica do profissional cirurgião-dentista durante a graduação, uma vez que o papel e a responsabilidade das universidades é de contribuir para um futuro de desenvolvimento sustentável, por meio da educação.

PALAVRAS-CHAVE: *Educação. Ensino superior. Odontologia. Educação ambiental.*

RESUMEN: *Este estudio busca responder si el tema de la Sostenibilidad / Educación Ambiental está presente en los cursos de pregrado en Odontología. La investigación es de naturaleza cuantitativa. En un primer momento, se realizó una búsqueda en los planes de estudio del programa de pregrado. Luego, se aplicó un cuestionario a los dentistas. De la encuesta en instituciones de educación superior, se encontró que el tema Sostenibilidad / Educación Ambiental, específicamente, no se aborda en los cursos de odontología: solo se localizaron disciplinas relacionadas con contenidos superficiales. La investigación de campo indicó que para el 88% de los participantes el tema Sostenibilidad / Educación Ambiental no formaba parte de su plan de estudios; solo el 12% de los participantes declararon que habían recibido este conocimiento durante su graduación. Así, la investigación presenta una brecha en la formación académica del odontólogo profesional durante la graduación, ya que el papel y la responsabilidad de las universidades es contribuir a un futuro de desarrollo sostenible, a través de la educación.*

PALABRAS CLAVE: *Educación. Educación superior. Odontología. Educación ambiental.*

Introduction

This study investigates how the educational approaches, i.e., the teaching, of environmental sustainability have occurred in undergraduate dental courses, which train dental surgeons for the labor market. Based on the literature in the area of dentistry, in an educational perspective, this study is justified, considering that authors such as Gameleira (2016), Leme (2009) and Lucietto *et al.* (2007) argue that undergraduate dental courses have rarely addressed the issue of sustainability.

The cited authors, when considering Law No. 6938 of August 31, 1981 (BRAZIL, 1981), which provides for the National Environmental Policy, infer how worrying it is that sustainability is not being adequately addressed at different levels of education (Elementary, High School and Higher Education). Such concern is due to the awareness that the very Law no. 9.394, of December 20, 1996, of the Directives and Bases of National Education - LDB (BRAZIL, 1996), foresaw the insertion of the theme, problematizing it in the relationship between human beings and the environment. Silva and Leite (2008) state that there will be no sustainability in the absence of Environmental Education and without changes in the educational contexts prevailing in today's society. Thus, it is extremely necessary that

Environmental Education reaches schools and universities, breaking paradigms in the search for a new environmental awareness.

Given this scenario, this study of quantitative approach is dedicated to perform, initially, a survey about the composition of the curricular grid of the Dentistry course of 5 (five) different institutions of higher education (Community, Federal and Private in the state of Rio Grande do Sul), in order to identify or not the teaching of environmental education through a specific discipline. Complementarily, a field research is carried out, focusing on environmental sustainability in the formation of dental surgeons working in the labor market. It is verified how much the theme environmental sustainability was or is inserted in the training of dental surgeons, how the academic training can reverberate, positively or negatively, in the professional performance of the dental surgeon.

In order to cover the presented perspective, it is adopted, from the theoretical and methodological point of view, the postulations of (BRAZIL,1996; LEME, 2009; LUCIETTO *et al.*, 2007; SOARES, 2020; VEIGA, 2005). As for the teaching of environmental sustainability in the academic training of dental surgeons, according to (GAMELEIRA,2016; HOFMAN-BERGHOLM, 2018; MANHÃES; OLIVEIRA; SIQUEIRA, 2020; ZANELLA; KRÜGER; BARICHELLO, 2019).

Still in this regard, and based on the postulations of (AVINASH *et al.*, 2013; Conselho FEDERAL DE ODONTOLOGIA, 2020; D'AVANZO *et al.*, 2018; DUANE *et al.*, 2019; MORITTA; HADDAD; ARAÚJO, 2010), it is discussed the role and importance of environmental sustainability to be inserted in the training of the professional dental surgeon, taking into account that the number of dental surgeons per number of inhabitants in Brazil is exponential. It is estimated that 20% of all these professionals in the world are in Brazil (Conselho Federal de Odontologia, 2020). In addition, the consumption of natural resources, namely energy and water, is considerable in dentistry (D'AVANZO *et al.*, 2018).

This article is divided from the following sections: 1. Introduction; 2. Environmental Education; 3. Methodology; 4. Data Analysis; and 5. Final Remarks, followed by the References.

Environmental Education

One of the purposes of education is the preparation for the exercise of citizenship, in a clear and reliable way, aiming at the socialization and sensitization of citizens regarding their civil responsibilities, one of them being the control of environmental conservation (BRASIL,

1996). This is because the education of every citizen must ensure access to knowledge and understanding about their relationship with the environment. To this end, the Federal Constitution (FC) of 1988 (BRAZIL, 1988), in item VI of § 1 of Article 225, determines that the government must promote Environmental Education at all levels of education, because "everyone has the right to an ecologically balanced environment, an asset for common use by the people and essential to the quality of life, imposing on the government and the community the duty to defend and preserve it for present and future generations.

In this scenario, there is a need to intervene in society, in order to make it aware of the possible construction of effective and minimizing solutions to the environmental crisis, based on scientific foundations in the area of Environmental Education. For this education to be effective, it is extremely important that human beings become aware of nature, since the current lack of awareness, circumscribed by indifference and domination, has led nations to poverty and mismanagement of natural resources, as stated by Leme (2009).

However, Law No. 6938 of August 31, 1981 (BRAZIL, 1981), which provides for the National Environmental Policy, in subsection X of Article 2, already established that environmental education should be provided for all levels of education, aiming to enable it to actively participate in the defense of the environment. In 1996, Law No. 9.394, of December 20, 1996, the Law of Directives and Bases for National Education - LDB (BRAZIL, 1996), stipulated that the curricula for Elementary and High School covered knowledge of the physical and natural world. As for Higher Education, it should instigate, develop, and provide understanding of the human being and the environment in which he lives.

Law #9795, 1999 (BRAZIL, 1999), established the National Policy of Environmental Education (PNEA in the Portuguese acronym), regulating the propagation of the environmental preservation policy directed to educational institutions and to the society in general. According to the law, both public and private schools, in basic and higher education levels, must develop, within their curricula, Environmental Education, observing its principles and objectives.

However, it has been asked: do the curricular matrices of the area of Dentistry of undergraduate courses contemplate a pedagogical approach aimed at Environmental Education? The resolution of the National Council of Education - Chamber of Higher Education (CNE/CES) n. 03, of February 19, 2002 (BRAZIL, 2002), is the main normative document for application at a national level in the organization, development, and evaluation of pedagogical projects of undergraduate dental courses in higher education institutions, and even though it does not explicitly propose the insertion of Environmental Education in the

curricular matrix of Dentistry, it suggests that such discipline be addressed, according to Art. 6, Paragraph II.

Article 6: The essential contents for the Dentistry Undergraduate Course must be related to the entire citizen, family, and community health-disease process, integrated to the epidemiological and professional reality. The contents should contemplate II - Human and Social Sciences - the contents referring to the various dimensions of the individual/society relationship are included, contributing to the understanding of the social, cultural, behavioral, psychological, ecological, ethical and legal determinants, at the individual and collective levels, of the health-disease process (BRAZIL, 2002).

The interface between environment and health has increasingly permeated academic concerns in recent decades (MANHÃES; OLIVEIRA; SIQUEIRA, 2020). Due to its strict relationship with environmental issues, whether as a cause, consequence or means, health graduations have deserved special attention in the dissemination and incorporation of contents related to Environmental Education and Health. This fact was driven by the construction of international agendas proposed by the United Nations (UN, 1992) and the World Health Organization (WHO); as for insertion in Higher Education, we have the National Program for Environmental Education (ProNEA), which reinforces the understanding of the space to be taken by Higher Education Institutions (HEI) in the development of Environmental Education, recommending that, in university education, in a comprehensive way, the environment theme is addressed transversally in teaching, research and extension (BRAZIL, 2005).

The next section presents the relevance of Environmental Education/Environmental Sustainability in Dentistry.

Environmental sustainability in dentistry

The Environmental Education/Environmental Sustainability focused on the Dentistry area is still something recent, given that it was, from the exponential number of dental offices and clinics, that emerged a latent concern about the destination assigned to material resources from natural and artificial sources used in these professional environments (GAMELEIRA, 2016; LEME, 2009; LUCIETTO *et al.*, 2007).

It is worth noting that it was from 2017 that the concept of sustainability was emphasized in dentistry, having been referred to by the FDI World Dental Federation only in 2018. According to the Federation, sustainable dentistry should "be practiced ethically, with high levels of quality and safety, in the pursuit of good oral health" (FDI WORD DENTAL

FEDERATION, 2018). In dentistry, energy, water and biomaterials (before, during and after clinical use) are highly consumed, also making use of radiation, in addition to the generation of hazardous waste involving mercury, lead and other chemical derivatives.

However, dentistry has been evolving over the centuries not only in terms of materials and techniques, but is also consuming more natural resources, since modern methods of patient care require new products, new packaging and new procedures (MORITTA; HADDAD; ARAÚJO, 2010).

According to the FDI guidelines, dental surgeons should pay attention to the standards of the General Dental Council (GDC), taking into account that there is a relationship between planetary health and human health in their daily practices.

According to Henshaw, Garcia, and Weintraub (2018), the dental surgeon, besides being responsible for the oral health of his patients, should also have a closer look at sustainability, since the public that attends dental clinics has a new profile, is more demanding, more informed, and is interested in environmental causes.

Thus, the inclusion of Environmental Education/Environmental Sustainability in the training of dental surgeons plays a key role in three aspects, namely, (i) this professional makes use of natural resources; (ii) impacts on economic development and; (iii) the dental surgeon is also responsible for the health of human beings (GLICK *et al.*, 2016). The dental surgeon should demonstrate that he/she pays attention to sustainable practices in his/her practice: the success of dental professionals, as in other areas of society, will be judged by how well they respond to sustainable practices.

Methodology

The research method used in this study is characterized as being quantitative in nature. The research was divided into two stages: first, a survey was conducted about the composition of the curricula of the Dentistry course of 5 (five) different higher education institutions (Community, Federal and Private in the state of Rio Grande do Sul), in order to identify or not the teaching of environmental education through specific disciplines or correlated. Complementarily, a field research was carried out, focused on environmental sustainability, in order to identify whether the dental surgeon who already works in the labor market had subjects that addressed the environment and sustainability during their academic training.

The field research was conducted using a survey questionnaire (PINSONNEAULT; KRAEMER, 1993), characterized as a quantitative research, composed of sample data

collected through a structured questionnaire. This instrument aimed to identify, from a sample of the population, specific information from the interviewees about environmental sustainability in the dental surgeon's education.

The approach was focused on dental surgeons who already work in the labor market in their own offices or as service providers in dental clinics, hospitals or institutes. This study is part of a doctoral research in the area of Health, related to Dentistry, and approved by the Research Ethics Committee (REC) of the University where this research is registered (blind review), with opinion number CAAE:40586220.2.0000.5341.

As far as data collection is concerned, the aim was to answer the following question: Is Environmental Sustainability/Environmental Education included in the dental surgeon's training?

The research was carried out by means of a semi-structured questionnaire, composed of 21 questions, namely, 20 closed questions and 1 open question, divided into 03 axes: axis 01 - identification data of the dentist; axis 02 - relevance of environmental sustainability as a dentist; and axis 03 - relevance of environmental sustainability in the dentist's work environment.

From the guiding axes cited, it was verified how much the theme environmental sustainability was or is inserted in the dental surgeon's training. In view of the above, 377 dentists participated in the survey; however, only 200 questionnaires were validated because 177 returned blank. No identification was required from the respondents and participation was voluntary. The questionnaire was applied from October 4, 2021 to March 31, 2022, in person, when the questionnaires were delivered and collected.

The sample size calculation was done using the Statulator software⁴. As for the factor of interest, with a population size of 19,867 respondents, the study required a minimum sample size of 377 respondents. In other words, it was inferred that from 377 respondents, 50% of them had factor of interest, which represented 95% confidence factor. However, only 200 questionnaires were counted, since 177 questionnaires were returned blank.

For data analysis the Microsoft Excel spreadsheet package was used, for the purpose of analysis and tabulation of the collected data. In addition, the lapidated data were organized into graphs. The data analysis had the theoretical-methodological support in the area of environmental sustainability (FEIL; SCHREIBER, 2017; MORITTA; HADDAD; ARAÚJO, 2010; TERRES; BRANCHI, 2012). In addition to the authors cited, the Ministry of Education, National Education Council, Full Council through Resolution No. 2, June 15, 2012

⁴ Available at: <http://statulator.com/SampleSize/ss1P.html>. Access on: 10 Mar. 2021.

(BRASIL, 2012), establishes the National Curriculum Guidelines for Environmental Education.

Based on the theoretical reference cited and the field research, aspects such as: (a) how is the environmental dimension inserted in the formation of the dental surgeon; (b) what relationships may exist between the management of a clinic and its responsibility to the environment? (c) where environmental sustainability is inserted in dental clinics?; (d) if yes, what is the relevance of Environmental Education in dentistry? The results of this research are presented below.

Results and data analysis

The first data analysis presents the results of the search in the curricula of undergraduate dental courses. It was found that the theme Environmental Education/Environmental Sustainability, specifically, was not found. Only related disciplines were found, with contents approached in a very subtle way, that is, the student has a very shallow notion of the theme Environmental Sustainability during the dental surgeon formation, even though such approach is foreseen in the Resolution CNE/CES 03, of February 19, 2002 (BRAZIL, 2002). The 5 (five) institutions that were surveyed are represented in Chart 1:

Chart 1 – Universities Researched

Universities
University of Passo Fundo - UPF ⁵
University of Caxias do Sul - UCS ⁶
Pontifical Catholic University of Rio Grande do Sul - PUCRS ⁷
Federal University of Rio Grande do Sul - UFRGS ⁸
Lutheran University of Brazil - Ulbra ⁹

Source: Prepared by the authors (2022)

Attention is drawn to the fact that the HEIs listed in the table presented here offer undergraduate courses in Dentistry for over 80 years. UPF, located in the northwest of Rio

⁵ Available at: <https://secure.upf.br/apps/academico/curriculo/index.php?curso=6454&curriculo=1>. Access on: 22 Nov. 2021.

⁶ Available at: https://www.ucs.br/site/static/uploads/arquivo_curriculo/QcUktqLMOM.pdf. Access on: 22 Nov. 2021.

⁷ Available at: <https://www.pucrs.br/saude/curso/odontologia/#curriculos>. Access on: 22 Nov. 2021.

⁸ Available at: http://www.ufrgs.br/ufrgs/ensino/graduacao/cursos/exibeCurso?cod_curso=340. Access on: 22 Nov. 2021.

⁹ Available at: <https://www.ulbra.br/canoas/graduacao/presencial/odontologia/bacharelado/matriz>. Access on: 22 Nov. 2021.

Grande do Sul, has offered the course for 60 years and offers in its curriculum only two disciplines related to Environmental Education/Environmental Sustainability, namely, Public Health Management and Health and Public Policy. UCS, located in Serra Gaúcha, and for 6 years offering the Dentistry course, brings in its curriculum the discipline of Entrepreneurship and Management in Health, being the discipline closest to the theme of Environmental Education/Environmental Sustainability, which presents as objective in its menu concepts and characteristics of entrepreneurship, proposes analysis of the importance and its purposes in the context of health (UCS, 2022).

At PUCRS, located in Porto Alegre, capital of Rio Grande do Sul state, the course has been offered since 1953, i.e., for 67 years, and the theme Environmental Education/Environmental Sustainability is contemplated in the subject Fundamentals of Biosafety, Anesthesiology and Surgery, which is currently an elective subject.

UFRGS, one of the oldest institutions in RS, with 88 years, makes available the discipline Sociology of Environmental Issues for dentists, but this is a discipline that belongs to the curricular matrix of the Humanities area, thus being a transversal discipline to the course. Its menu contemplates: "General introduction to the field of Sociology of Health and Illness, also called Medical Sociology. It will cover topics that have defined the field in the past as well as contemporary emerging topics such as the analysis of health as a social phenomenon, social factors associated with health and disease processes (including social determinants of health, health disparities, and factors impacting access to health), health policies and systems". ULBRA had the Dentistry course implemented in 1990; it provides the academics with the discipline Public Policies and Health Management.

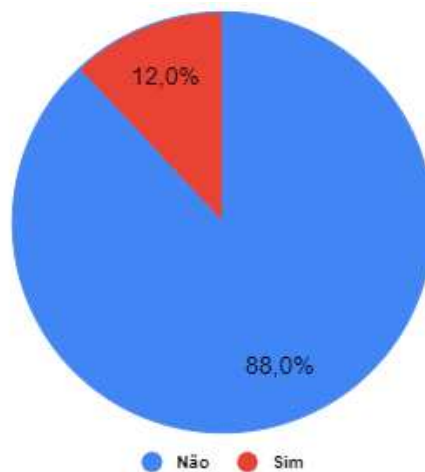
However, the Ministry of Education, the Secretariat of Continuing Education, Literacy and Diversity, the Directorate of Integral Education, Human Rights and Citizenship, the General Coordination of Environmental Education, present in their Proposal for National Curriculum Guidelines for Environmental Education that the theme Environment, Natural Resources, Health and Safety should be contemplated as follows:

In health area courses, promotion of studies on the National Environmental Health Policy, public health, environmental sustainability of products, services and environments, on management and analysis of environmental impacts, sanitation, treatment systems, control and final disposal of waste, energy resources, environmental zoning, water management, conservation units, biodiversity, biosafety, bioethics and biotechnology, with emphasis on food health, international treaties and agreements, and other socio-environmental topics related to environmental health (BRAZIL, 2002).

For Lucietto *et al.* (2007), there is a need for environmental issues to be discussed within the dental academic environment. To this end, they point out that it is essential to adopt a reflective/evaluative attitude by legislators of educational policies, training institutions of human resources in health, associations and class entities, as well as by the dental surgeons themselves, so that there is harmony with a new model of development and practices based on environmental sustainability. In the same direction, Lamonier and Lima (2022) state that educational spaces contribute to the formation of subjects, whatever it may be.

The second analysis presents the results of the field research carried out from October 4, 2021 to March 31, 2022. Graph 1 shows the incipient insertion of the theme Environmental Sustainability/Environmental Education in the dental surgeon's education, when only 12% of the participants said they had received this knowledge during their undergraduate education. For 88% of the participants, the subject was not part of their curriculum.

Graph 1 – During your graduation course did you have subjects that approached the theme environment and sustainability?¹⁰



Source: Prepared by the authors (2022)

The survey also pointed out that 68% of the dental surgeons stated that the clinics are committed to the environment and that this is presented in the mission and principles of these organizations. In 32% of the clinics there are no references to the environment at all. Regarding Environmental Education located in the Dentistry area, 87% of the dentists mentioned this as relevant; on the other hand, 9% made no mention of the area and 4% reported being indifferent.

The dentists were also questioned about their knowledge of Public Health Policies: 52% said they knew them, while 47.5% did not.

¹⁰ Sim = Yes; Não = No

When asked about Law 6.938/1981 (BRAZIL, 1981), of the National Environmental System (Sisnama in the Portuguese acronym), 83% were unaware of the law, 11.5% had never heard of it, while 5.5% said they knew about it.

As for the National Policy for Environmental Education, the result is similar, since 74% are unaware of it, 11.5% have never heard of it, and only 14% are aware of the legislation in question. The National Policy for Solid Waste and its principles are also incipient among dentists: the survey showed that 66% do not know, 13% have never heard, and 21% are aware.

In this regard, it is worth mentioning the importance of the insertion of the Environmental Education theme in the curricula of Dentistry graduation courses, by means of mandatory and non-elective disciplines and with specific themes for Environmental Education. Some directions, arising from this study, suggest directions, such as a) approach contemporary contents; b) meet periodically, defining new themes to be approached, a function of the course coordinator; c) perform a survey with the students, to know about the environmental, social and financial perception of the student, considering that this, as a future professional, will focus on entrepreneurship; d) insert an action plan and define indicators for monitoring the results of this insertion in the formation of dental surgeons and; e) create environmental awareness actions in the academic environment for Dentistry students, showing the importance of Environmental Education and the impact of their actions in their daily lives, in order to promote the formation of the student about the role of public policies in favor of the environment and present them their contributions to an environmentally sustainable society.

The following are the final remarks regarding the findings of this study.

Final remarks

In summary, it is relevant to insert the theme Environmental Sustainability/Environmental Education in the curricula of undergraduate dental courses as a requirement for continuous improvement of their professional training. By considering that teaching is a tool that determines people's behavior, it is evident, through this research, that pedagogically addressing the concept of environmental sustainability in the curricula of higher education courses will help to obtain significant results on the performance of environmental sustainability, not only among professional dentists, but in society as a whole.

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