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Environmental management: an overview in higher education institutions

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Abstract

Since the 1990s, higher education institutions have introduced initiatives regarding environmental management, given that higher education institutions play a significant role in the instruction and the mentality of current generations. In this regard, we have environmental education, which aims to, continually and actively, develop mindfulness, awareness of the need to keep the environment as sustainable as possible, seeking alternatives to prevailing problems, thus creating means to sustain and intensify actions of improvement and maintenance towards nature's preservation. Therefore, in this context, this article has demonstrated, through a bibliographical investigation, the dynamic by which the Higher Education Institutions present the Environmental Management subject as well as to locate in the literature authors who study this theme and the HEIs which already apply the protection and the concern for the environment in which they are inserted in their quotidian. These actions influence directly and indirectly the awareness of all the people involved in the process. In this research, we also present ideas and suggestions from authors, analyzing themes such as solid and organic residue, the proper use of water and the matter of recycling, among others. We have attempted to present this data through a chart that represents our findings. As a main result, we have identified that some HEIs present in their daily routine some indicators, which induce the preservation of the environment, engendering a day-by-day commitment with the cause.

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1. Introduction

Throughout history, men has utilized natural resources, generating residues that somehow harmed mankind, therefore, there came a time in which consciousness raising was made necessary, as well as the development of actions that could minimize this fact, as a means not to exhaust nature's resources, for this would harm human beings profoundly.

Thus, we began seeking alternatives to change this reality, throughout the years, for caring about the environment became relevant as a collective commitment, especially in the Higher Education Institutions (HEIs), which structurally present knowledge as applied to the academics', teachers' and staff's daily life, that are in themselves parts of the social, cultural, economic and, why not, environmental, reality. "It has been observed that the environmental education is associated to the directing of human behavior towards a culture focused on citizen attitudes in relation with environmental issues" [1], hence, there should be an interaction between man and nature, as to create a network that should grow every day.

We aim to demonstrate, in a bibliometric study, the dynamics by which the HEIs have introduced the Environmental Management subject, presenting mechanisms that intensify environmental management, improvement and cultivation, be it in the gathering of residues and other materials and/or the daily water savings. Recycling is one of the major factors in the new guise that the HEIs must carry out as a way to remain as an institution that affects many people's reality and the community in which they are situated.

2. Environmental management in higher education institutions

Currently the higher education institutions perceive their commitment to society but it is essential that they know the reality in which they are inserted, so that means, which benefit both society and Higher Education Institution (HEI), can be implemented without discomfort in the environment or in nature in general.

Environmental education, one of the pillars of sustainable development, contributes to the fundamental understanding of the relationship and interaction between mankind and the whole environment and promotes public environmental ethics regarding the ecological balance and quality of life, awakening, in individuals and organized social groups, the desire to participate in the construction of their citizenship [2]. HEIs started to introduce environmental issues in their management schemes in the sixties. The first experiences emerged in the United States, along with the promotion of professionals in the environmental sciences, which extended through the seventies. In the eighties, the focus was on more specific policies towards waste management and energetic efficiency. During the nineties, global environmental policies were developed, which congregated all institutions' spheres, such as it was on the Campus Ecology at the University of Wisconsin at Madison or Brown is Green at the University of Brown, in the United States [3].

Being aware of new changes the environment is undergoing and centralizing their efforts in benefit of a HEI that provides education, information and prepares their academics to life in society, is the fundamental part of an environmental management which seeks to raise consciousness, a continuous alert, as well as a knowledge proposition in every level of society, since "[...] they must think and act strategically as to make increasingly efficient decisions, thus being able to suggest better options to conduct the HEI's interests" [4].

Collective involvement in this process must be guided towards the path of new ideas and new ways to perceive the manner the HEIs are positioned in nowadays society, promoting the structured commitment that has relevant meanings to all those involved. "In this sense, nature, man, society and environment establish a relation of mutual interaction, forming a single world" [5]. In this worldview that the HEI must establish towards the environmental management, we should give vital importance to what we can still reuse of nature: the rain water, utilizing it to wash floors, walls, etc.; take advantage of the wind to promote wind power in benefit of the institution; amongst other things that can be reutilized, bringing about a positive connection with the environment. Environmental education is a vital and indispensable part in the attempt to achieve sustainable development, as it is the most direct and practical way to achieve at least one of its goals: the popular participation. "One way to introduce environmental education to the community is by direct action of the teacher in the classroom and in extracurricular activities. Through activities such as reading, school work, research and discussions, students can understand the issues that affect the community

where they live, to reflect and criticize the actions that disrespect and often destroy a heritage that belongs to everyone" [6].

The HEI needs to be committed in practice with the environment that surrounds it, however, it is worth noting, the first step would be to place internal mechanisms so that the institution structures itself within its own spheres, so as to meet its demand which utilizes the environment, to insert new modes of working the mechanisms which prioritize nature and its resources, as well as to reutilize and recycle satisfactorily the environmental demand which all HEI must overcome. "Various sustainable models are present in literature, but we must realize that the work involves social elements and our own participation" [7], more compromising than each one of us.

According to Rossato, Zanichelli and Bellen (2009, p. 09): "environmental management has achieved prominence in discussions on different layers and sectors of society and sustainable development has become an indispensable theme of economic development policies that consider environmental and social factors in their actions. Given this, and knowing the importance of sustainable development today as a regulator of administrative and operational issues, organizations have begun to see this challenge as a growth strategy and survival, investing in technology, adopting efficient processes and establishing policies that allow supply products at competitive prices that satisfy human needs and bring quality of life, while progressively reducing environmental impact and resource consumption throughout the life cycle, to a level at least equivalent to the carrying capacity estimated earth." Thus, the challenge to achieve a society wherein the environment is sustainable – where we may seek nature and living healthily – remains a strong presence in the present and in the future.

3. Methodology

This section presents the methodological procedures used in the construction and analysis of the bibliographic database on higher education institutions and environmental management.

The methodological procedures were developed to gather references on the subject of study through bibliometric analysis on the article selection and further analysis of content. The systematic analysis of the content identifies the year of publication, title, authors, objectives, buildings and concepts, methodology, results and future recommendations on selected articles from the database.

3.1. Classification

The research on this topic is theoretical in nature. The objectives are exploratory and descriptive, since we seek specific information on what is being studied. According to Tasca et al. [9], this type of study has been classified as a mixed method, because it combines quantitative and qualitative aspects (bibliometrics and content analysis).

3.2. Procedures

The procedures for conducting the bibliographical research were divided into three stages: data collection, data analysis and synthesis of results. The steps for the procedures went as such:

A. Selection of databases, two bases were consulted, Web of Knowledge and Science Direct.

- Web of Knowledge was selected for consultation due to its status as a multidisciplinary index with the most cited journals in their respective fields. The database has over 9,000 journals indexed.
- Science Direct was selected because it contains more than 13 million articles from more than 2,500 journals and 26,000 books.

B. Criteria for inclusion or exclusion of reference:

- Selected articles containing title, abstract, or the presence of keywords referring to relative terms to higher education institutions and environmental management within the body text.
- Items were available with access to full text through CAPES (Coordination for the Improvement of Higher Education Personnel)

C. The terms utilized in the research:

- The research was established with the following query: ("enviro * manage * syste *" OR "ems") AND ("high * educate *" OR "colleg" OR "universit *") AND ("sustainab *"). This query was utilized on the basis to compose the bibliographic database.

D. Software: the EndNote X5 software was utilized to manage and treat the references gathered from databases. This software is a reference manager produced by Thomson Scientific, which facilitates scientific research and writing with the possibility of importing metadata for analysis.

E. The criteria for article selection during the bibliometric analysis: the titles, abstracts, keywords and their location in the body text were observed. The texts were selected by their alignment with the researched topic. The texts found available in its entirety were read.

F. The criteria for the systematic review: the criteria for the systematic analysis were defined by the content analysis in relation to the conceptual definitions presented in the text, which referred to the research topic, as well as found opportunities for research.

Table 1 shows the amount of items taken from databases, as well as their entirety, which summarize the search strategies. Figure 1 shows the number of articles per year found in the research.

The search gathered 673 documents. 29 of them were duplicated, resulting in 644 documents, and only 43 were aligned with the topic researched. Of the selected 43, 42 had the full text available via Portal CAPES. Table 2 presents a list of 30 articles in our portfolio, with the number of citations of each; the remaining 43 have no citations. The article "Review of sustainability terms and their definitions" has 275 citations, followed by "An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices" with 163 citations and "Sustainable university: what can be the matter?" with 149 citations.

The search gathered 105 unique keywords used by the authors in the portfolio, with 94 utilized once, the most cited are listed in Table 3.

Table 1. Amount of items taken from databases, as well as their entirety.

Databases	# of reference
Web of Knowledge	25
Science direct	648
All	673

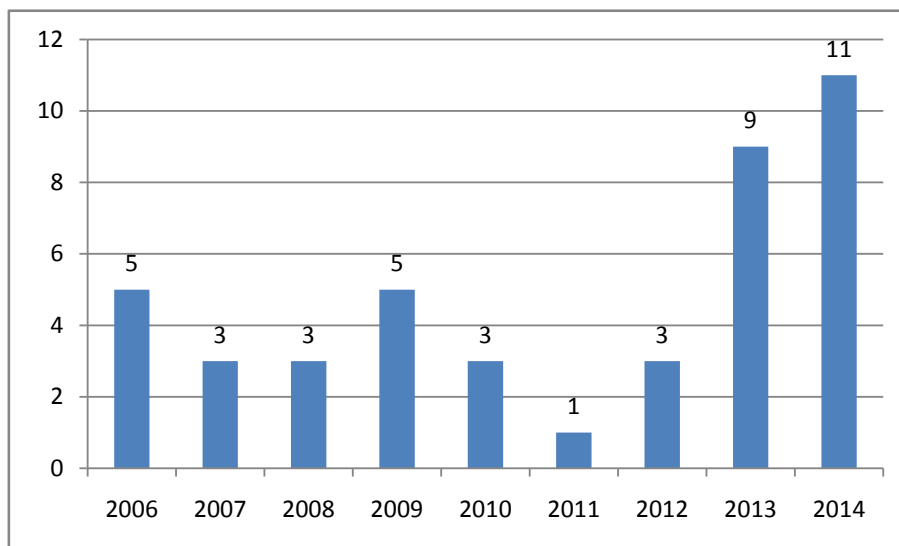


Fig. 1. Number of articles per year found in the research.

Table 2.30 articles in our portfolio.

Author	# of citations
Alshuwaikhat, H. M., Abubakar, I. (2008)	163
Barratt, R. S. (2006).	11
Boman, J. and U. P. Andersson (2013).	5
Clarke, A. and R. Kouri (2009).	54
Disterheft, A., S. S. Ferreira da Silva Caeiro, et al. (2012).	6
Evangelinos, K. I., N. Jones, et al. (2009) [10].	31
Ferrer-Balas, D., H. Buckland, et al. (2009).	43
Ferrer-Balas, D., R. Lozano, et al. (2010).	57
Glavi, P. and R. Lukman (2007).	275
Godemann, J., J. Bebbington, et al. (2014).	1
Hens, L., T. Wiedemann, et al. (2010)(1).	6
Hens, L., T. Wiedemann, et al. (2010).	9
Jones, D. R. (2013).	5
Jones, N., E. Panoriou, et al. (2012).	1
Juárez-Nájera, M., H. Dieleman, et al. (2006).	45
Karatzoglou, B. (2013).	85
Khalili, N. R., S. Duecker, et al. (2014).	7
Kobori, H. (2009).	20
Koscielniak, C (2104).	4
Labodová, A., V.Lapík, et al. (2014).	4
Lozano, R. (2006).	92
Navarro-Antinez, R., C. Vintro-Sanchez, et al. (2014).	1
Ramos, T. B., T. Cecilio, et al. (2008).	15
Sammalisto, K. and T. Brorson (2008).	81
Savely, S. M., A. I. Carson, et al. (2007).	15
Savely, S. M., A. I. Carson, et al. (2007).	29
Velazquez, L., N. Munguia, et al. (2006).	149
Watson, M. K., R. Lozano, et al. (2013).	15
Zhang, N., I. D. Williams, et al. (2011).	31
Zilahy, G. and D. Huisingh (2009).	62

Table 3. Most cited unique words.

Keyword	# of occurrences
China	3
Education for sustainable development	7
E.M.S	3
Environmental management	4
Environmental management systems	6
Higher education	6
Higher education institutions	3
Universities	4
Sustainability	6
Sustainability assessment	3
Sustainable development	6

The initiatives and directions for future researches were enumerated, when encountered, and are listed in Table 4 by name of the reference and indicative for the future.

Table 4. Initiatives and directions for future researches.

Reference	Indication to future research
A consideration of the changing focus on the sustainable development in higher education in Poland	Presented considerations should be continued in future surveys. Important research task is finding an appropriate relation between the needs of sustainability on national and the level and Polish institution of knowledge.
A vision on the role of environmental higher education contributing to the sustainable development in Malaysia	More strategies and actions should be pursued innovatively to speed up the process in creating a sustainable oriented education, which are paramount towards building a sustainable future.
Academic staff engagement in education for sustainable development	More empirical research using critical action research is needed to foster new understandings and professional development on ESD.
Choosing an appropriate university or college environmental management system	More research is also needed on the empirically found implications of different structures and processes for a campus EMS.
Environmental Management Systems (EMS) implementation processes and practices in European higher education institutions e Top-down versus participatory approaches	Future research is needed to develop assessment tools for participatory processes in order to measure their effectiveness and success, helping to answer questions like "Does a high participation mean an effective sustainable campus"?
Evaluating sustainability of an Indian university	Future research papers analyze, for comparison purposes, the adherence of the reality of sustainability of University Alpha with other frameworks available to measure the contributions of Higher Education Institutions to Sustainable Development.
From cleaner production to sustainable development: the role of academia	Need for conducting more studies with larger data sets prior to confirming these results to be universal in nature.
Implementation of sustainability in universities as perceived by faculty and staff e a model from a Swedish university	Future studies could explore students' perceptions in relation to teachers' perceptions of SD implementation.
Investigating benefits from the implementation of Environmental Management Systems in a Greek university	additional research is necessary to investigate the actual behavior of students through field observations
Review of sustainability terms and their definitions	Additional studies are needed to enhance further development and to establish a database for sustainability terms.

This article presented a reflection on the development of scientific research related to the Environmental Management System in Higher Education Institutions, and how it contributes to academic development and presents itself as an example to be followed, also by organizations present in other segments, on the issue of sustainable development.

It is paramount to create a link between what the university wants, their objectives and goals, and what is represented by society, especially by nature, by the environment. Since our natural resources are increasingly scarce, it is evident that we must avoid waste, minding the resources that still exist in the earth, in the community in which the HEI is inserted, converting thusly, with means that may favor the proper use of these goods in our daily life, the quotidian at the HEI.

Therefore "[...] there is an established and systematic approach easily applicable to any reality and with immediate results: in engaging with the cause, the University can choose a particular focus, a program or even a holistic mission" [11], causing the wanted effect, with the subsequent commitments, contributing considerably to the environmental management process.

4. Conclusion

This article presented the topic of Environmental Management as a way to understand the dynamics of project processes that help the environment and nature that surround it, changing the ways of relating to the environment.

Hence, the interest to research the topics presented in this paper emerged from a moment in which much is said about Environmental Management, to give importance to it and to collaborate to sustainable development,

innovating and renovating the environment, as to evidence the struggle towards means which may reduce or mitigate the environmental impact that is current in today's society.

We noticed, in this work, that if a HEI wants to keep up with and develop gradually in the society where it is inserted, it must have a dynamic and innovative management, that allows its' growth.

In view of the analyzed literature, we can perceive that it presents the themes we studied and described in this article as to present perspectives that correspond to society's demand, so that the HEIs may be present and active, as well as ahead of their time, since the sustainability issue is something about we must all be aware so that we can have a better present and, consequently, a guaranteed future, being able to deal with situations arising from progress.

The main interest in investigating the validity of this process is that, for the HEIs that already witness and already operate in innovative projects in their day-to-day or not, it will allow for an open involvement with the environment that will be effective in the realization of positive acts that encourage reflection and for a routine shift in their daily actions, seeking viable alternatives that congregate all towards a mutual commitment.

The movement, the speed by which this will take place, is particular to each HEI, for the new arrangements that are printed in the life of every citizen make these change requirements urgent, due to the fact that we need a society that is engaged in social transformation, in the care of nature and the environment, so that we can build concepts and actions that are part of our reality.

Finally, it is important to note the benefits of environmental management, which are plenty. Among them, we can highlight the savings by improving productivity and the reduction of energy, water and expedient material consumption. Therefore, the evidence of responsible practices enhances the institution's image and the generation of research opportunities.

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