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Teaching Environmental Impact Assessment in Brazil: is it just a 'Make-believe' approach?

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Abstract: Teaching Environmental Impact Assessment (EIA) is fundamental for EIA effective practice. Nevertheless, this topic has not been addressed sufficiently, yet. In this context, this paper analyzes EIA teaching in Brazil based on the curriculum of EIA courses within Environmental Engineering programs, considering best practice principles. In addition, we proposed an analytical framework that categorizes nine EIA teaching profiles. The results show that EIA teaching is present in all the programs assessed. However, the prevailing teaching profiles reveal a limited perspective of EIA, not addressing the minimum necessary for understanding EIA as an environmental policy instrument. The weaknesses highlighted indicate that EIA teaching may be negatively influencing EIA practice and vice versa, creating a vicious cycle. Thus, this highlights the urgency for improving EIA teaching in Brazil, which should contribute to Brazilian EIA practice.

Keywords: Teaching profile, teaching curriculum, Environmental Engineering, Environmental Licensing.

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Introduction

Teaching Environmental Impact Assessment (EIA) is a challenge itself, but teaching undergraduate students can be even more challenging, requiring carefully designed methods and approaches (SÁNCHEZ, 2010). This challenge is partially related to skills needed to work with EIA, which requires professionals capable of integrating contributions from a multidisciplinary team (SÁNCHEZ, 2020). High quality environmental assessments require specialized practitioners, with adequate education, training, and professional experience (ENRÍQUEZ-DE-SALAMANCA, 2019; SÁNCHEZ; MITCHELL, 2017). Well-prepared students are likely to develop these skills earlier on and in greater depth than those with gaps in their education. Thus, training good EIA professionals is of great importance to avoid bad practices (SÁNCHEZ, 2010).

The National Environmental Policy Act of the United States of America (USA), approved in 1969, is the legislative basis for EIA. At that time, EIA was not a ready-made instrument, but rather an idea that was to be developed (SÁNCHEZ, 2020). Since then, EIA has been institutionalized by several jurisdictions, evolving together with other concerns for environmental issues, and becoming internationally established as a fundamental instrument for environmental management (MORGAN, 2012). EIA teaching followed a similar path. It was first mentioned in 1972, in the USA, and in 1973 Canada, Italy, and South Africa started teaching EIA (SÁNCHEZ; MORRISON-SAUNDERS, 2010).

Research on EIA teaching has been carried out for different contexts. For example, the studies by Stelmack, Sinclair and Fitzpatrick (2005), in Canada; Ramos, Cecílio and Melo (2008), in Portugal; Sánchez (2010), in Brazil; Weiland (2012), in Germany; Kabera (2017), in Rwanda; and Fischer et al. (2013), in Pakistan. Other studies evaluated broader contexts: Sánchez and Morrison-Saunders (2010) analyzed EIA teaching at undergraduate and graduate programs in 18 countries; Gazzola (2008), and Fischer and Jha-Thakur (2013) researched on EIA teaching in Europe; and Ramos et al. (2015) studied Strategic Environmental Assessment (SEA) teaching in Brazil and Portugal.

However, there is no methodological pattern among the different researches, making it difficult to compare the results. Moreover, international literature recently discussed the establishing of best practice principles for EIA teaching (MORRISON-SAUNDERS; POPE; JONES, 2020). These principles can be applied to EIA teaching practice (ALMEIDA; MALVESTIO; VERONEZ, 2021) as well as they can orientate new researches' methodology, allowing the comparison and strengthening of EIA teaching.

Furthermore, the aforementioned researches are mostly based on perceptions – applying questionnaires and interviews – or course descriptions. Thus, there is a gap related to more in-depth studies that analyze what EIA courses curriculum contain. Then, EIA teaching has not been sufficiently scientifically addressed (FISCHER; JHA-THAKUR, 2013; KABERA, 2017).

This research can contribute to fill in this gap by analyzing EIA teaching in Brazil through the curriculums of Environmental Engineering programs, and using the EIA teaching best practice principles for content as a reference (MORRISON- SAUNDERS;

POPE; JONES, 2020). The focus on Environmental Engineering programs is reasoned on the relevant role that the professionals graduating in this area play in EIA practice in Brazil and worldwide, since they often end up designing and coordinating environmental assessments (RAMOS; CECÍLIO; MELO, 2008; SÁNCHEZ, 2010; SÁNCHEZ; MORRISON-SAUNDERS, 2010).

Furthermore, teaching EIA as a mandatory course in Environmental Engineering programs is a recommendation from the Brazilian Ministry of Education (MINISTÉRIO DA EDUCAÇÃO, 1994). EIA teaching is also taught in other undergraduate and graduate programs, such as Forestry Engineering, Geography, Environmental Management and Biology. However, a survey or a complete and official list of programs that teach EIA is not known.

The article is divided into five sections. After this introduction, the methodology is presented, indicating how the survey, document selection and analysis were carried out. Subsequently, the protocol for curriculum content analysis is presented, followed by results and discussion, and conclusions.

Methodology

This study is based on document and content analysis and involves the proposition of an analysis protocol and its application to EIA teaching in Environmental Engineering programs in Brazil.

Document and content analysis focused on official documents of Environmental Engineering programs (Political and Pedagogical Project (PPP) of the undergraduate program). According to the Anísio Teixeira National Institute of Educational Studies and Research (INEP, 2017), PPP is a guiding document for undergraduate programs, following the institutional academic policies from National Curriculum Guidelines. PPP contain the curriculum and other information on all courses offered by the program, making it possible to identify courses that teach EIA and how it is done. Given the analyzed PPP, the analysis protocol was developed to identify and classify the different EIA teaching profiles.

Programs surveyed

The Environmental Engineering programs were identified through a survey on the Brazilian Ministry of Education website, which gathers the National Register of Higher Education Programs and Institutions (http://emec.mec.gov.br/). The survey took place on February 4th, 2020, and included only programs that were active. To cover variations in programs names, the following terms were used as search criteria: 'environmental engineering' (from the Portuguese term 'engenharia ambiental'), and 'sanitary and environmental engineering' (from the Portuguese term 'engenharia sanitária e ambiental' and its typo - missing an accent - 'engenharia sanitaria e ambiental'). Altogether, 383 active undergraduate programs were identified, including in-person or at-distance programs.

The PPP search for the identified programs took place between February 4th

and March 3rd, 2020 and followed two stages. First, by using Google as a search engine (https://www.google.com/) with the terms 'Environmental Engineering' and 'Political and Pedagogical Project' (from the Portuguese term 'Projeto Pedagógico de Curso'). Second, by consulting the websites from the Higher Education Institutions responsible for offering these programs. When more than one PPP were identified for the same program, the most recent was selected. Of the 383 courses identified, only 105 had the PPP available on the Internet. The search for the documents exclusively by internet tools has limitations; it depends on the existence of educational institutions' websites, the type of information published, and the frequency with which it is updated (GAZZOLA, 2008). Nonetheless, it allowed the reach of programs from all regions of Brazil.

During document analysis, 17 PPP were discarded for not having details of the courses, thereby making content analysis impossible. Finally, the PPP from 88 programs were further analyzed.

Document and content analysis

The following information was collected from the PPP: the name of the program, the year of the PPP, the names of the course(s) that teach EIA, if the course(s) is(are) mandatory or optional, the period when course(s) is(are) offered, and the workload (total, theoretical and practical). The data were used to assess the courses that teach EIA and to generally characterize the programs involved in this research.

The program curriculums were analyzed searching for the terms 'impact' and 'licensing' to identify courses that teach EIA. The term 'licensing' is related to Brazilian context: EIA is integrated with Environmental Licensing (LA), being a mandatory requirement for the Environmental Licensing of projects that potentially causes significant environmental degradation (CONAMA, 1988; 1997).

For each course, the following information was identified and analyzed: the course description, objectives, study program, and bibliography. This analysis was performed only for mandatory courses because they represent trainings for all students in the program. In some cases, the PPP did not contain all the course items. However, partial information was present for all cases, and the analyses were based on the available content.

After reading the content, categories and subcategories for content analysis were identified. It should be noted that this identification occurred after reading the courses' information. Thus, categories and subcategories were based on observations of recurring characteristics and elements presented by the PPP, as well as on the absence of important elements for an EIA course. EIA teaching best practice principles for content, proposed by Morrison-Saunders, Pope and Jones (2020), were used as reference. This allowed for an overview of EIA teaching in Brazil and enable the proposition of an analysis protocol with a combination of categories and subcategories, resulting in EIA course classification for teaching profiles, as shown in the next section.

Content analysis protocol

The content analysis of the mandatory courses teaching EIA allowed to understand how EIA is taught at Environmental Engineering undergraduate programs in Brazil. We classified them according to three categories: the scope, the approach, and the compatibility between workload and content (Table 1). These categories and the associated subcategories were designed to provide a better organization and understanding of the information that was present in the descriptions of the courses that teach EIA in the analyzed programs.

Table 1 - PPP content analysis categories and subcategories, and their descriptions

Category	Subcategory	Description
Scope	Diffuse	The teaching of EIA is associated with a mix of concepts and with the teaching of other contents, even being confused with the teaching of other instruments of environmental policy and management.
	Focused on EIA	EIA is specific content and the course focuses on teaching it.
Approach	Reductionist	Teaching is directed to elaborating environmental studies and/or focused only on Environmental Licensing, not covering all the essential content for understanding EIA as an environmental policy instrument.
	Essentialist	Teaching covers all essential content for understanding EIA as an environmental policy instrument.
	Comprehensive	In addition to the essential content, teaching addresses some EIA best practice elements.
	Ideal	Teaching meets all content best practice principles for IA teaching (MORRISON-SAUNDERS; POPE; JONES, 2020).
Relationship workload/ content	Not adequate	The workload is very reduced in relation to the content.
	Adequate	intended to be addressed."

Source: Prepared by the authors.

Regarding the scope category, it was evaluated whether the courses focused on teaching EIA, i.e., if it perceives EIA as specific content. Programs classified as diffuse scope did not have a specific course that teaches EIA (even if they are named EIA). In these cases, EIA is mentioned only as a topic of courses that cover a variety of instruments

or in a course with generic objectives and content, or in the name or description of a course. However, the content does not correspond to this instrument according to its best practices.

Among the programs classified as focused on EIA, there were cases that have specific EIA course, and cases that one course teaches EIA and other instruments; however, in these cases EIA content was clearly presented and individualized, showing that the course does teach specific EIA concepts.

The second category refers to the approaches adopted. Initially, three subcategories were identified: reductionist, essentialists and comprehensive. In the reductionist approach, teaching is directed to applying and preparing Environmental Impact Statement (EIS), and/or focused in on Environmental Licensing, without addressing all essential content for understanding EIA as a process and environmental policy instrument. In this approach, the courses generally included teaching impact assessment methodologies, EIS content and legislation. However, they did not include the teaching of EIA process or the teaching of all stages of this process. Therefore, they present a partial view of EIA.

In the essentialist approach, courses dealt with essential content for understanding EIA as a process and environmental policy instrument. It was understood that the 'essential' content was the one that included EIA steps, and/or presented EIA as a process (MORRISON-SAUNDERS; POPE; JONES, 2020). However, this essentialist approach did not represent an 'ideal content', but rather the minimum necessary content considering EIA concepts and fundamentals (IAIA; IEA, 1999).

The third approach is the comprehensive approach. In addition to the essential approach, it also included good practices, like the relationship between EIA and sustainability, cumulative impacts, alternatives, and SEA. Although alternatives and cumulative impact assessments are part of mandatory EIA content under Brazilian law (CONAMA, 1986), these assessments are not generally presented in literature as an EIA step (GLASSON; THERIVEL; CHADWICK, 2012; IAIA; IEA, 1999). For this reason, the specific mention of these topics in the PPP was understood as an element of good practice and not as part of the essential content of the EIA. EIA literature mentions a number of other good practice elements (see publications in the IAIA Best Practice Principles - https://www.iaia.org/publications.php). Therefore, other elements can be considered for the application of this protocol in other contexts. Similar to the essentialist approach, the comprehensive approach did not reflect an 'ideal content' for teaching EIA, but rather a step forward from the essentialist approach.

A fourth subcategory was included to complement the analysis protocol, referring to the 'ideal content' for teaching EIA. It was considered that the 'ideal' was to meet all EIA teaching best practice principles for content, as proposed by Morrison-Saunders, Pope and Jones (2020).

The third analysis category dealt with the relationship between workload for teaching EIA and content covered, and was assessed as adequate or not adequate. This relationship was assessed qualitatively and referenced on the authors' experience in teaching EIA to undergraduate programs, and on to the characteristics of the set of

programs analyzed. This category was meant to identify cases with evident incompatibility between workload and content; for example, situations where all essential content should be taught in less than 45 hours.

Aiming at an overall assessment of the courses, the three categories (and associated subcategories) were combined, as shown in Figure 1, resulting in nine possible EIA teaching profiles:

- Make-believe: teaching is not focused on EIA, i.e., there is no specific EIA content. Teaching is associated with a mix of other concepts and, in some cases, confused with the teaching of other content.

- Mechanized: teaching is focused on the elaboration of EIS and application of the Environmental Licensing, but it does not include the minimum content (essential) needed for teaching EIA.

- Mechanized Fast Track: teaching resembles Mechanized teaching, but the workload and the proposed content seem incompatible.

- Sufficient: Teaching perceives EIA as specific content (usually taught by a specific course) and covers essential content (minimum content recognizing EIA as a process). Generally, attention is also paid to the multidisciplinary and participatory nature of EIA.

- Sufficient Express: teaching is similar to Sufficient teaching, but the workload and the proposed content seem incompatible.

- Plus: in addition to the characteristics of the Sufficient profile, it includes one or more best practice elements, e.g. sustainability, cumulative impacts, alternative, and SEA.

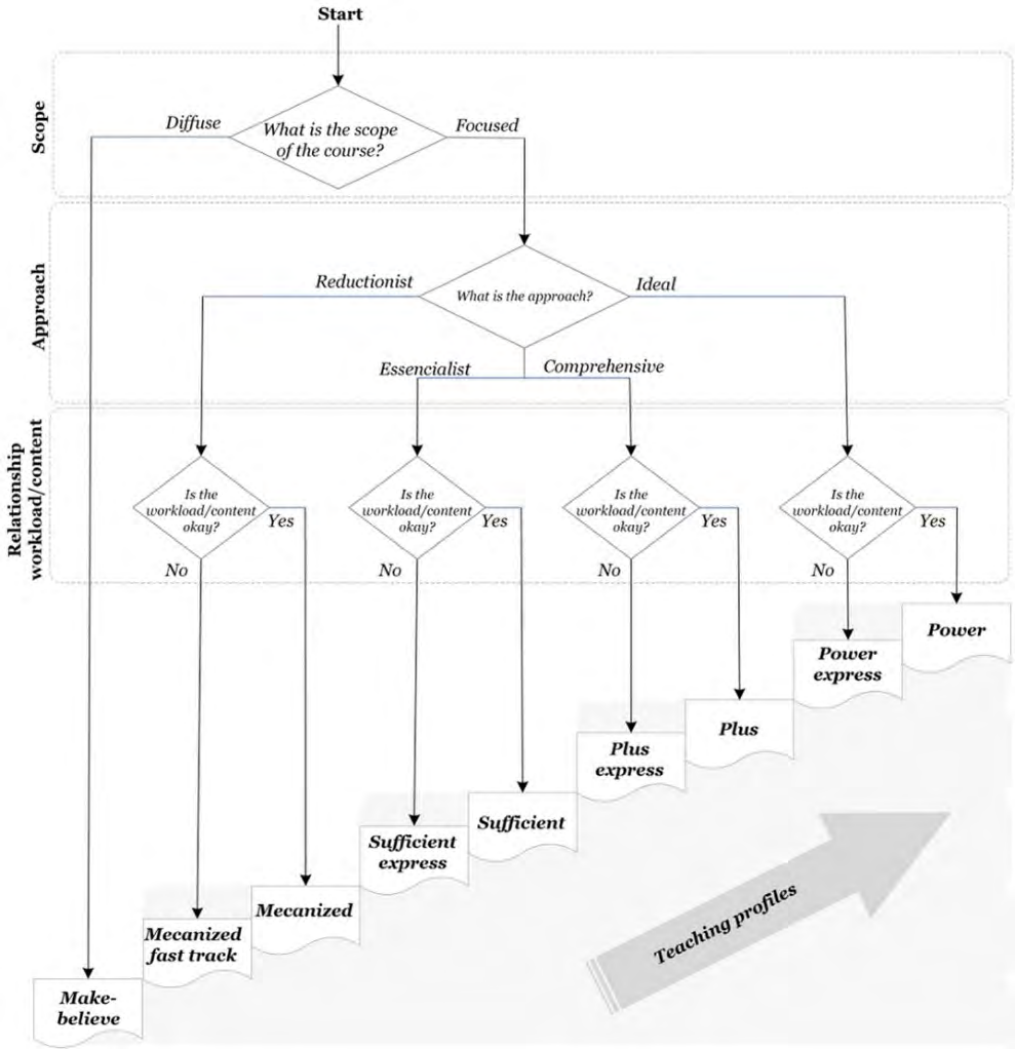
- Plus express: teaching is similar to Plus profile, but the workload and the proposed content seem incompatible.

- Power: teaching encompasses all EIA teaching best practice principles as proposed by Morrison-Saunders, Pope and Jones (2020).

- Power express: teaching resembles Power teaching, but the workload and the proposed content seem incompatible.

Considering the plurality of courses that teach EIA, it is highlighted that, although these profiles were identified based on the PPP at Environmental Engineering programs in Brazil, this protocol can also be used to assess EIA teaching at other undergraduate, technical, postgraduate, or even professional training programs in Brazil or other countries.

Figure 1 – Flowchart categorizing the teaching profiles from the scope, approach, and relationship workload/content categories



Source: Prepared by the authors.

Results and discussion

The results are presented in two subsections: a general presentation of the programs and courses analyzed, and the results of the content analysis protocol application.

General description of programs and courses

The search for Environmental Engineering programs in Brazil resulted in 383 active programs at the beginning of 2020. Among them, 88 (23%) had information for analysis. The sample is not statistically representative, but it includes all programs whose

PPP were electronically available. Table 2 shows variations in program names; the most common were: Environmental and Sanitary Engineering, Environmental Engineering and Sanitary, and Environmental Engineering.

Table 2 – Names and number of Environmental Engineering programs in Brazil identified and analyzed in this study

Program Names	Number of programs Identified	Number of programs Analyzed
Environmental and Sanitary Engineering	190	32
Environmental Engineering	173	40
Sanitary and Environmental Engineering	14	11
Environmental Engineering and Renewable Energy	3	3
Environmental and Sustainability Engineering	1	1
Environmental and Urban Engineering	1	1
Water Resources and Environmental Engineering	1	0
Total	**383**	**88**

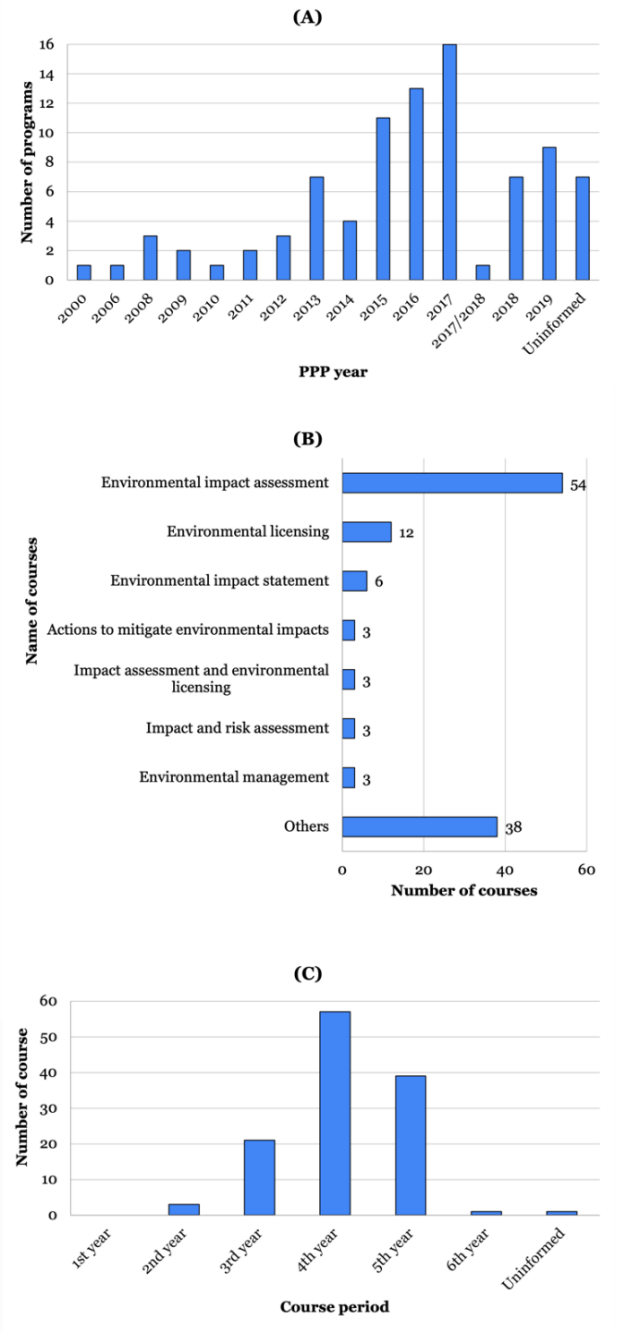
Source: Data obtained from the National Register of Higher Education Programs and Institutions (2020).

The information below focuses on the 88 analyzed programs (Figure 2). Figure 2A shows the year of PPP publication, which were mostly recent (2015-2019).

A mandatory course that teaches EIA was identified for all analyzed programs, with 58 programs containing 1 mandatory course, 26 programs containing 2 mandatory courses, and 4 programs containing 3 mandatory courses. It evidences that EIA teaching in Environmental Engineering programs in Brazil is well established. Moreover, EIA teaching through mandatory courses is important because placing EIA just as an optional course could lead to negative implications for EIA practice as a sustainable development tool (STELMACK; SINCLAIR; FITZPATRICK, 2005). Internationally, many Environmental Engineering programs also include mandatory EIA courses at the undergraduate level and optional courses at the postgraduate level (RAMOS; CECÍLIO; MELO, 2008; SMITH; BISWAS, 2002).

Altogether, 122 mandatory courses that teach EIA somehow were identified within the 88 programs analyzed; the majority (54) were called 'Environmental impact assessment' (Figure 2B). Other courses including EIA were also identified, like 'Environmental licensing' (12), and 'Environmental management' (3). Since names varied greatly, course names appearing only once or twice were grouped under the 'Others' category, which encompasses 28 variations. Among these variations, some courses teach EIA together with other environmental subjects or instruments, e.g. 'Environmental management and planning', 'Environmental impact assessment and recovering degraded areas', and 'Environmental audits'. More comprehensive names were also identified, e.g. 'Environmental analysis', 'Environmental studies', 'Environmental projects', and 'Case studies in sanitary and environmental engineering'.

Figure 2 – Information on the courses. (A) Program distribution per PPP publication year. (B) Number of courses that teach EIA per name. (C) Distribution of courses that teach EIA according to the stage in which they are offered



Source: Prepared by the authors.

Similar results were found by Sánchez and Morrison-Saunders (2010), with 'Environmental impact assessment' being most frequent (present in 14 responses from 32 respondents from 18 countries), although they also identified many other name variations. These results indicate that EIA may have been misunderstood and confused with other environmental instruments. This is discussed further in the next section.

EIA courses were most frequently offered during the 4th and 5th years of undergraduate programs (Figure 2C), similar to results from Canada (STELMACK; SINCLAIR; FITZPATRICK, 2005), and Rwanda (KABERA, 2017), where EIA courses were usually offered in the 3rd or 4th years. Although annual and semester courses were analyzed, this information was standardized considering the course year to allow courses comparison (1st and 2nd periods - 1st year; 3rd and 4th periods - 2nd year; etc.).

Regarding the bibliography, in some cases, it was divided into basic and complementary references; in other cases, there were no divisions; and for 12 cases, this information was absent. The number of references and titles varied greatly. Three book titles in Portuguese stood out: 'Environmental Impact Assessment: concepts and methods' (SÁNCHEZ, 2020), 'Environmental Assessment and Expertise' (CUNHA; GUERRA, 2004) and 'Urban Environmental Impacts in Brazil' (GUERRA; CUNHA, 2001). These titles were mentioned 69, 37, and 35 times, respectively, in the 122 courses analyzed. The most widely used bibliographic reference was the same identified by Sánchez (2010). Good textbooks were claimed to be necessary for EIA teaching by two-thirds of those interviewed by Stelmack, Sinclair, and Fitzpatrick (2005), and by all those interviewed by Kabera (2017). Moreover, Sánchez and Morrison-Saunders (2010) state that 53% of all educators who participated in their survey said they used textbooks.

Legislation and guidelines from environmental agencies and other organizations involved in EIA were also present in the bibliography. This is similar to what Kabera (2017) found, indicating that books were the most popular bibliography resource, followed by governmental documents, such as guidelines, manuals and laws. On the other hand, international references and articles were rare in Environmental Engineering programs in Brazil, differing from international EIA teaching practice. Integration between teaching and research is an extremely important practice for EIA teaching, and students should be involved in researching (MORRISON-SAUNDERS; POPE; JONES, 2020). Articles used in bibliographies at EIA courses are widespread in the international context, suggesting that research is an important source of knowledge when teaching EIA (SÁNCHEZ; MORRISON-SAUNDERS, 2010).

Regarding the workload, in this research, it was not possible to establish an average workload for the courses because in some cases EIA was taught together with other themes and, in other cases PPP did not specify the unit used – hour (h) or 'lesson hours' (h/class). However, it was possible to note a variety of situations, with class loads ranging from 30 h to 136 h/class. Literature also shows a considerable range for workloads when teaching EIA. For example, Ramos, Cecílio and Melo (2008) observed that the workloads of most undergraduate EIA courses in Portugal varied from 4 to 5 h/week. Sánchez (2010) reported that his course was 64 hours long, over two semesters, and Sánchez and Morrison-Saunders

(2010) showed that 36 h was the most common EIA teaching workload.

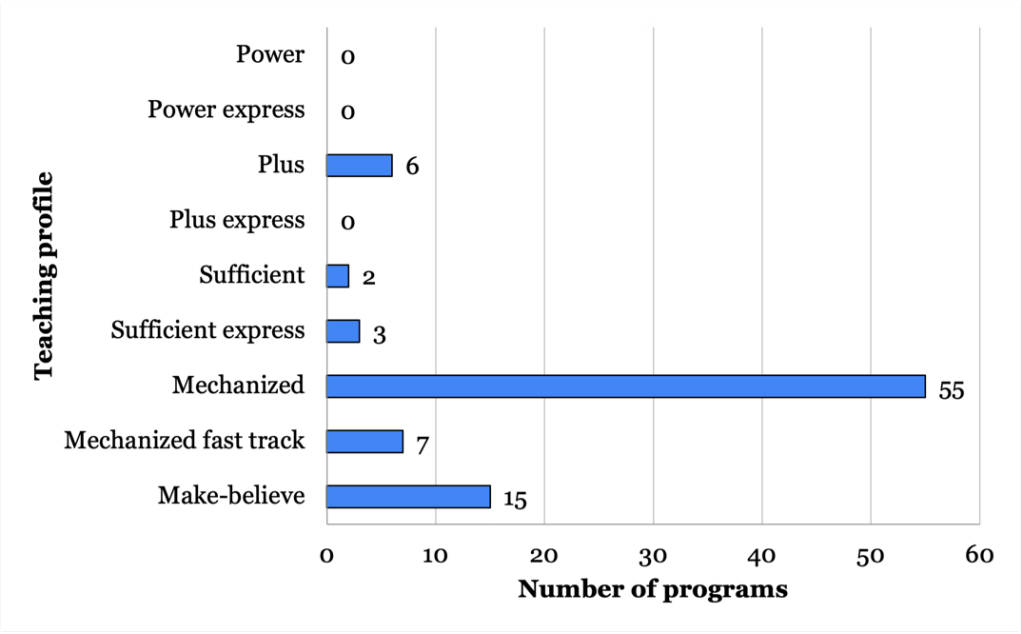
Of the 88 programs analyzed, 70% (62) showed some evidence for teaching EIA practice, either by dividing the workload into theoretical and practical approaches or by including the study of EIA practice (for example, case studies). Integration between theory and practice is one of the best practice principles for EIA teaching (MORRISON-SAUNDERS; POPE; JONES, 2020).

Course Profiles

Based on the PPP content and the analysis protocol, each of the 88 courses were classified into the profiles proposed by this research (Figure 3).

Teaching EIA was classified in the Make-believe profile for 15 courses (17%). The main characteristic of this profile is that it mixes or confuses EIA with other environmental management instruments. EIA is often mixed or confused with risk analysis, environmental audits, environmental indicators, environmental management systems, ISO 14000 certifications, life cycle assessment, recovering degraded areas, and environmental legislation. In some cases, course names led to these mix-ups (Figure 2B).

Figure 3 – Distribution of courses according to their teaching profiles



Source: Prepared by the authors

Although EIA can be integrated with other environmental management instruments - since these instruments contribute to each other (FISCHER; JHA-THAKUR, 2013), one must recognize the individuality and specificity of EIA functions,

objectives, and procedures. Without acknowledging this, one risks mischaracterizing EIA. Internationally, EIA is generally taught as a specific course (SÁNCHEZ; MORRISON-SAUNDERS, 2010). Thus, the main implication of the Make-believe teaching might be that professionals are not trained properly. An example of this teaching profile is shown below and indicates that the course does not focus on EIA and addresses other subjects.

> COURSE DESCRIPTION: Environmental licenses. Environmental impact statement. Environmental impact assessment methods. ISO 14000 certification. Environmental management systems. Environmental audits. Life Cycle Assessments and environmental labeling (PPC 3).

The most recurrent teaching profile was the Mechanized teaching, which was observed in 55 courses (62%), in addition to another seven courses using the Mechanized Fast Track profile (8%). The main characteristic of the Mechanized teaching is its focus on EIS and/or Environmental Licensing, which is insufficient for understanding EIA as an environmental policy instrument. Generally, these programs have specific courses on EIA that focus on presenting rules and legislations associated with the Environmental Licensing process and presenting methods and practical tools applied to environmental studies. However, these courses fail to address other steps of the EIA process (e.g., scope, technical analysis, and follow-up). Thus, it takes a reductionist approach to the content taught. An example of this course profile is:

> COURSE DESCRIPTION: Fundamental concepts. Documents for environmental licensing. Evolution of environmental impact assessment methodologies. Identification methodologies. Description, qualification and quantification of environmental impacts. Applying environmental impact assessment techniques in developed and developing countries. Environmental impact assessment instruments: environmental impact studies (e.g. EIS) (PPC 19).

Teaching EIA methods, tools, and local legislations is very important, and these topics are frequently present in other EIA teaching contexts (KABERA, 2017; MORRISON-SAUNDERS; POPE; JONES, 2020; RAMOS; CECÍLIO; MELO, 2008; STELMACK; SINCLAIR; FITZPATRICK, 2005). However, this approach is problematic when it is limited to teaching practical aspects and preparing studies, disregarding EIA process as a whole. Thus, the main implication of a Mechanized profile is not being able to teach EIA as a process itself, diminishing its importance or confusing it with the environmental impact statement.

'EIA as a process' is an essential EIA principle (IAIA; IEA, 1999), and the importance of highlighting this characteristic within EIA teaching was indicated by Sánchez (2010). This practice was also observed in different EIA teaching contexts (SÁNCHEZ; MORRISON-SAUNDERS, 2010; WEILAND, 2012). In this regard, most courses analyzed in this study distanced themselves from EIA principles and international practice of EIA teaching.

A limited understanding of EIA and its confusion with EIS in Brazil have been observed by other studies. Montaño and Veronez (2018) stated that Brazilian environmental professionals often have a blurred understanding of the EIA process, confusing EIA as part of the EIS (and not the other way around). This seems to be related to the fact that in Brazil EIA was regulated coupled with Environmental licensing processes and to the fact that current legal regulation for EIA/Environmental Licensing system does not explicitly mention EIA processes, but only that EIA is required for all Environmental Licensing processes at projects that might cause significant environmental degradation (CONAMA, 1988; 1997).

Literature also evidences the low effectiveness of different EIA steps in Brazil, in particular concerning scoping and public participation (ALMEIDA; MONTAÑO, 2017; DUARTE; DIBO; SÁNCHEZ, 2017), indicating that these steps are somehow neglected. Thus, there seems to be a strong influence of Brazilian EIA practice (focus on EIS) at courses framed in the Mechanized teaching profile. This may be an indication that EIA teaching is more concerned with training the students to prepare environmental studies, than properly teaching EIA functions, steps, and objectives. The way of teaching EIA may indicate an attempt by courses to meet labour market demands, similar to what was observed at different undergraduate programs in Brazil (AGAPITO, 2017; SOUZA, 2016).

Consideration for EIA specificities at local contexts (legislations and practices) is largely relevant for EIA teaching (MORRISON-SAUNDERS; POPE; JONES, 2020), and was one of the most mentioned topics at EIA courses (KABERA, 2017; SÁNCHEZ, 2010; SÁNCHEZ; MORRISON-SAUNDERS, 2010). However, the close relationship established by Brazilian legislation in the EIA/Environmental Licensing needs to be viewed and taught carefully, in such a way that the trained professionals do not reduce EIA to the elaboration of an environmental study or the granting of a license or authorization (ROSS; MORRISON -SAUNDERS; MARSHALL, 2006).

Teaching EIA as a 'process' was an essential element in this study, but only 11 of the 88 programs (12.5%) addressed minimum concepts for properly teaching EIA. Two courses were classified under the Sufficient profile, three under the Sufficient express profile, and six under the Plus profile.

Courses classified as Sufficient and Sufficient express profiles frequently highlighted the multidisciplinary and participatory nature of EIA, which are best practice principles for EIA teaching (MORRISON-SAUNDERS; POPE; JONES, 2020), and are usually addressed in EIA teaching internationally (SÁNCHEZ; MORRISON-SAUNDERS, 2010; STELMACK; SINCLAIR; FITZPATRICK, 2005). The following study program indicates this characteristic.

> STUDY PROGRAM:
>
> Unit I: Concepts and Definitions
>
> 1.1 Historical, conceptual and legal aspects of environmental impact assessments (EIA).
>
> Unit II: EIA Process
>
> 2.1 Objectives; 2.2 Environmental licensing; 2.3 Steps in the EIA process.

Unit III: Environmental Studies

3.1 Type of studies; 3.2 Public participation; 3.3 Terms of reference; 3.4 Scoping

Unit IV: EIS and non-technical report

4.1 Planning and elaborating; 4.2 Identifying and assessing impacts; 4.3 Area of influence; 4.4 Impact assessment methodologies; 4.5 Decision making; 4.6 Follow-up of EIA process; 4.7 Management, mitigation, enhancements, and compensatory measures.

Unit V: Technical Analysis of Environmental Studies

5.1 Critical analysis; 5.2 Preparing technical opinions.

Unit VI: Risk Analysis

6.1 Definitions: 6.2 Risk analysis studies.

Participation was included as a topic in some courses categorized under the Mechanized profile; however, in these cases, public participation was focused and limited to public hearings and as a step for fulfilling the Environmental Licensing process supported by EIS (CONAMA, 1987). On the other hand, within the courses under the Sufficient profile, public participation was mentioned in a more comprehensive way and presented as an EIA step. Reducing public participation in EIA to public hearings greatly reduces its goals. According to Glucker et al. (2013), participation within EIA aims at influencing decisions, enhancing democratic capacity, social learning, empowering and emancipating marginalized individuals and groups, harnessing local knowledge and information, incorporating experimental and value-based knowledge, testing the robustness of information from other sources, generating legitimacy, and resolving conflicts.

Observing Brazilian EIA practices, public participation is a recurrent deficiency (ALVES et al., 2020; PIAGENTINI; BENASSI; PENTEADO, 2014; ZHOURI; OLIVEIRA, 2012). In this context, the relevance of teaching this topic should be highlighted; if the importance of involving different stakeholders in processes is not addressed (and, consequently, the plurality of values and perspectives), practitioners will not understand its importance. This teaching gap combined with relatively few legal requirements for public participation within EIA in Brazil, may result in more failures in public participation.

Finally, six courses (7%) were included in the Plus profile. All of them had workloads that were adequate for the content, and no course was classified under the Plus express profile. The best practice elements identified were: sustainability, cumulative impacts, the study of alternatives, and SEA.

Some courses classified under the Make-believe and Mechanized teaching profiles included some best practice elements. However, because they confuse EIA with other instruments or do not recognize it as a process, they did not meet the Plus profile requirements. The excerpt highlighted below (PPP17) shows an example of the Plus teaching profile:

> COURSE DESCRIPTION: Origin and dissemination of environmental impact assessments. Legal and institutional framework for environmental impact assessments in Brazil. Environmental impact assessment processes and their objectives. Determining the scope of environmental study and formulating alternatives. Identifying impacts. Impact predictions. Assessments on the importance of impacts. Risk analysis. Strategic Environmental Assessment. Environmental management plans. Communicating results. Technical analysis for environmental studies. Public participation. Decision making in the environmental impact assessment process. Follow-up steps in environmental impact assessments.

Best practice elements associated with the Plus profile were also present in EIA teaching in other contexts. For example: sustainability was present at almost all EIA courses in Portugal (RAMOS; CECÍLIO; MELO, 2008); cumulative impacts were addressed in Canada (STELMACK; SINCLAIR; FITZPATRICK, 2005) and by about half of the courses evaluated by Sánchez and Morrison-Saunders (2010); and study of alternatives was recurrent both in Rwanda (KABERA, 2017), and internationally (SÁNCHEZ; MORRISON-SAUNDERS, 2010).

Regarding the inclusion of SEA, this was predominantly done by including it as a topic within the EIA course and not as a specific course, similarly to what Ramos et al. (2015) observed to Brazil and Portugal. This is also similar to results from Sánchez and Morrison-Saunders (2010), who observed that teaching EIA applied to projects was more frequent, and that SEA is generally addressed as a topic within a broader EIA course.

In summary, content analysis for the EIA courses at Environmental Engineering programs in Brazil revealed that EIA is frequently misunderstood, either by confusing it with other instruments (diffuse scope) or by reducing it to EIS (reductionist approach). Furthermore, even among the courses that present EIA as a process and environmental policy instruments, best practice elements were rarely included, and no cases showed the presence of all best practice principles, as defined by Morrison-Saunders, Pope and Jones (2020), when teaching EIA. Moreover, no course was classified under the Power or Power express teaching profiles.

Thus, the results show that in some cases, EIA teaching in Environmental Engineering programs in Brazil is indeed a 'make believe'. However, what predominates is teaching EIA aiming to meet labor market demands regarding EIS elaboration, being quite far from meeting the EIA teaching best practice principles for content.

Based on these results, it is also possible to reflect on the relationship between EIA teaching and EIA practice. According to Gazzola (2008), how EIA is taught depends on how it is practiced and understood in different contexts (GAZZOLA, 2008). In the cases analyzed in this paper, there actually seems to be an influence of practice, since short-sighted views of EIA in Brazil are reflected in teaching, which seems to cater to labor market demands.

At the same time, not approaching EIA more comprehensively and adequately,

may negatively influence EIA practice, creating a vicious cycle. Therefore, actions that positively feed this cycle are needed. For EIA practice improvements in Brazil, teaching practices must be improved, which should be guided by international best practices.

Finally, it is worth mentioning that the teaching practice can sometimes distance itself from the content defined in the PPP. However, given the important role that PPP plays in defining the content that must be taught, its improvement should be an important step towards improving EIA teaching in Brazil.

Conclusions

This study analyzed and discussed EIA teaching in Brazil. All 88 Environmental Engineering programs with available PPP on the Internet were analyzed. The analysis indicated different teaching profiles and led to developing and applying an analysis protocol. Predominant profiles and gaps in EIA teaching were identified based on the protocol application.

The results showed that EIA is present in all the Brazilian Environmental Engineering programs analyzed. Despite this positive aspect, teaching profiles pointed to an alarming scenario. The analysis showed a recurrent restricted comprehension of EIA. In some cases, EIA was mentioned but was not the focus of teaching, being confused with other instruments; those cases resulted in a 'Make-believe' teaching. Moreover, most of the analyzed courses (88%) did not present EIA as a process and did not address the minimum necessary for the understanding and proper practice of EIA as an environmental policy instrument.

The most frequent teaching profile was the Mechanized, which comprises the courses that were focused on teaching EIA methods and tools to comply with legislation, and did not address the entire EIA process and its characteristics. In these cases, EIA teaching seemed to aim at meeting legal issues, but not at best practices. In other words, Environmental Engineering students, which is an important professional field for EIA practice in Brazil, have been trained by courses that do not comprehend the minimum requirements for practicing EIA. This is worrying, with negative impacts on Brazilian EIA practices. Therefore, EIA teaching needs to be improved. Moreover, it is important to highlight that none of the 88 programs analyzed was classified under the Power teaching profile.

In this context, a number of questions should be explored aiming to better understand and improve EIA teaching, for example: what are the education backgrounds of the professionals that draft the PPP and that teaches EIA? To what extent is PPP followed? Thus, future research should investigate the qualification of professionals who teach EIA, if there are gaps between the course descriptions provided by PPP and what is actually taught, as well as the pedagogy and teaching methods used.

Additionally, studying EIA teaching in other contexts (for example, in other undergraduate programs or professional training courses and other countries) might be interesting, since EIA is a multidisciplinary instrument and professionals from different

areas are involved in its practice. In this regard, the analysis protocol proposed in this paper can be adapted and applied as a useful tool for assessing EIA teaching in different contexts.

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References

AGAPITO, A. P. F. Ensino superior no Brasil: expansão e mercantilização na contemporaneidade. Temporalis, v. 16, n. 32, p. 123–140, 26 fev. 2017.

ALMEIDA, M. R. R.; MONTAÑO, M. A Efetividade dos Sistemas de Avaliação de Impacto Ambiental nos Estados de São Paulo e Minas Gerais. Ambiente & Sociedade, v. XX, n. 2, p. 79–106, 2017.

ALMEIDA, M. R. R.; MALVESTIO, A. C.; VERONEZ, F. A. Teaching impact assessment: applying indicators of best practice principles to Brazil. Impact Assessment and Project Appraisal, v. 39, p. 1-11, 2021.

ALVES, G. P. et al. A participação social nas audiências públicas nos processos de Licenciamento Ambiental de empreendimentos minerários em Minas Gerais. Revista Brasileira de Geografia Física, v. 13, n. 5, p. 2154–2169, 2020.

BRASIL. [Constituição (1988)]. Constituição da República Federativa do Brasil de 1988. Brasília, DF: Presidência da República, [2020]. Disponível em: http://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm. Acesso em: 5 fev. 2021.

CONAMA. Resolução n° 01, de 23 de janeiro de 1986. Disponível em: http://www2.mma.gov.br/port/conama/res/res86/res0186.html. Acesso em: 5 fev. 2021.

CONAMA. Resolução n° 09, de 03 de dezembro de 1987. Disponível em: http://www2.mma.gov.br/port/conama/legiabre.cfm?codlegi=60. Acesso em: 5 fev. 2021.

CONAMA. Resolução n° 237, de 19 de dezembro de 1987. Disponível em: http://www2.mma.gov.br/port/conama/res/res97/res23797.html. Acesso em: 5 fev. 2021.

CUNHA, S.; GUERRA, A. J. Avaliação e Perícia Ambiental. Rio de Janeiro: Bertrand Brasil, 2004.

DUARTE, C. G.; DIBO, A. P. A.; SÁNCHEZ, L. E. O que diz a pesquisa acadêmica sobre avaliação de impacto e licenciamento ambiental do Brasil? Ambiente & Sociedade, v. XX, n. 1, p. 245–278, 2017.

ENRÍQUEZ-DE-SALAMANCA, Á. Environmental assessment: a third division subject at the university. Impact Assessment and Project Appraisal, v. 37, n. 5, p. 452–454, 3 set. 2019.

FISCHER, T. B. et al. EIA Teaching at Tertiary Level Institutions in Pakistan - Baseline & Development Needs (paper ID 46). 33 Annual Meeting of the International Association for Impact Assessment. Anais...Alberta, Canada: 2013.

FISCHER, T. B.; JHA-THAKUR, U. Environmental Assessment and Management related Master level degree programmes in the EU: baseline, trends, challenges and opportunities. Journal of Environmental Assessment Policy and Management, v. 15, n. 04, p. 1350020, 2 dez. 2013.

GAZZOLA, P. Trends in education in environmental assessment: a comparative analysis of European EA-related Master programmes. Impact Assessment and Project Appraisal, v. 26, n. 2, p. 148–158, jun. 2008.

GLASSON, J.; THERIVEL, R.; CHADWICK, A. Introduction to Environmental Impact Assessment. 4th ed. London, Routledge, 2012.

GLUCKER, A. N. et al. Public participation in environmental impact assessment: why, who and how? Environmental Impact Assessment Review, v. 43, p. 104–111, nov. 2013.

GUERRA, A. J. T.; CUNHA, S. B. Impactos ambientais urbanos no Brasil. Rio de Janeiro: Bertrand Brasil, 2001.

IAIA; IEA - International Association for Impact Assessment and Institute for Environmental Assessment. Principles of environmental impact assessment best practice. Fargo, ND, USA: IAIA - IEA, 1999. Disponível em: <http://www.iaia.org/publications-resources/downloadable--publications.aspx>.

INEP - Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. Projeto Pedagógico do Curso (PPC): Curso de formação de Avaliadores do Sistema Nacional de Avaliação da Educação Superior. Brasília. 2017.

KABERA, T. Environmental impact assessment in higher education institutions in East Africa: the case of Rwanda. Environmental Science and Pollution Research, v. 24, n. 8, p. 7852–7864, 8 mar. 2017.

MINISTÉRIO DA EDUCAÇÃO. Portaria n° 1693 de 5 de dezembro de 1994. 1994.

MONTAÑO, M.; VERONEZ, F. Perception and discourse analysis of EIA practice. 38 Annual Conference of the International Association for Impact Assessment. Anais...Durban, South Africa: 2018.

ORGAN, R. K. Environmental impact assessment: the state of the art. Impact Assessment and Project Appraisal, v. 30, n. 1, p. 5–14, mar. 2012.

MORRISON-SAUNDERS, A.; POPE, J.; JONES, M. Establishing international best practice principles for impact assessment teaching and training. Impact Assessment and Project Appraisal, v. 38, n. 4, p. 336–353, 3 jul. 2020.

PIAGENTINI, P. M.; BENASSI, R. F.; PENTEADO, C. L. C. Olhares sobre a hidreletricidade e o processo de licenciamento no Brasil. Estudos Avançados, v. 28, n. 82, p. 139–153, dez. 2014.

RAMOS, T. B. et al. Strategic Environmental Assessment in higher education: Portuguese and Brazilian cases. Journal of Cleaner Production, v. 106, p. 222–228, nov. 2015.

RAMOS, T. B.; CECÍLIO, T.; MELO, J. J. DE. Environmental Impact Assessment in higher education and training in Portugal. Journal of Cleaner Production, v. 16, n. 5, p. 639–645, mar. 2008.

ROSS, W. A.; MORRISON-SAUNDERS, A.; MARSHALL, R. Common sense in environmental impact assessment: it is not as common as it should be. Impact Assessment and Project Appraisal, v. 24, n. 1, p. 3–22, 2006.

SÁNCHEZ, L. E. Environmental Impact Assessment teaching at the University of São Paulo: evolving approaches to different needs. Journal of Environmental Assessment Policy and Management, v. 12, n. 03, p. 245–262, 21 set. 2010.

SÁNCHEZ, L. E. Avaliação de Impacto Ambiental: conceitos e métodos. 3. ed. São Paulo: Oficina de Textos, 2020.

SÁNCHEZ, L. E.; MITCHELL, R. Conceptualizing impact assessment as a learning process. Environmental Impact Assessment Review, v. 62, p. 195–204, jan. 2017.

SÁNCHEZ, L. E.; MORRISON-SAUNDERS, A. Teaching impact assessment: results of an international survey. Impact Assessment and Project Appraisal, v. 28, n. 3, p. 245–250, set. 2010.

SMITH, D. W.; BISWAS, N. Environmental engineering education in Canada. Journal of Environmental Engineering and Science, v. 1, n. 1, p. 1–7, fev. 2002.

SOUZA, V. M. DE. Para o mercado ou para a cidadania? a educação ambiental nas instituições públicas de ensino superior no Brasil. Revista Brasileira de Educação, v. 21, n. 64, p. 121–142, mar. 2016.

STELMACK, C. M.; SINCLAIR, A. J.; FITZPATRICK, P. An overview of the state of environmental assessment education at Canadian universities. International Journal of Sustainability in Higher Education, v. 6, n. 1, p. 36–53, mar. 2005.

WEILAND, U. Teaching on Environmental Impact Assessment in geography reflecting demands on the working practice: a German case study. Journal of Environmental Assessment Policy and Management, v. 14, n. 03, p. 1250019, 30 set. 2012.

ZHOURI, A.; OLIVEIRA, R. Development and environmental conflicts in Brazil: challenges for anthropology and anthropologists. Vibrant: Virtual Brazilian Anthropology, v. 9, n. 1, p. 181–208, jun. 2012.

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AMBIENTE & SOCIEDADE 25 anos 25 años 25 years

SciELO

O Ensino da Avaliação de Impacto Ambiental no Brasil: será só um 'Faz de Conta'?

Maria Rita Raimundo e Almeida
Fernanda Aparecida Veronez
Anne Caroline Malvestio

Resumo: O ensino da Avaliação de Impacto Ambiental (AIA) é fundamental para sua prática efetiva. Entretanto, o tema ainda não foi suficientemente estudado. Nesse contexto, este artigo analisa o ensino da AIA no Brasil a partir dos planos de ensino de disciplinas que abordam AIA em cursos de Engenharia Ambiental, tendo como referência princípios de boas práticas, e propõe-se um protocolo de análise, categorizando o ensino da AIA em nove perfis. Os resultados mostram que o ensino da AIA está presente em todos os cursos avaliados. Porém, os perfis de ensino predominantes revelam uma visão limitada, não abordando o mínimo necessário para a compreensão da AIA como um instrumento de política ambiental. As fragilidades evidenciadas indicam que o ensino da AIA pode estar influenciando negativamente sua prática e vice-versa, criando um ciclo vicioso. Ressalta-se, assim, a urgência de melhoria no ensino da AIA no Brasil para contribuir para sua prática.

Palavras-chave: Perfil de ensino, plano de ensino, Engenharia Ambiental, Licenciamento Ambiental.

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Artigo Original

AMBIENTE & SOCIEDADE 25 anos 25 años 25 years

SciELO

La enseñanza de la Evaluación del Impacto Ambiental en Brasil: ¿Es sólo un 'invento'?

Maria Rita Raimundo e Almeida
Fernanda Aparecida Veronez
Anne Caroline Malvestio

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Resumen: La enseñanza de Evaluación de Impacto Ambiental (EIA) es fundamental para su práctica efectiva. Pero, el tema aún no ha sido suficientemente estudiado. Este artículo analiza la enseñanza brasileña de EIA a partir de los planes de enseñanza de disciplinas que abordan la EIA en las carreras de Ingeniería Ambiental, teniendo como referencia principios de buenas prácticas y propone un protocolo de análisis, categorizando la enseñanza en nueve perfiles. Los resultados muestran que la enseñanza de EIA está presente en todos cursos evaluados. Entretanto, los perfiles de enseñanza predominantes revelan una visión limitada, que no aborda el mínimo para la comprensión de EIA como herramienta de política ambiental. Las debilidades resaltadas indican que la enseñanza de EIA puede estar influyendo negativamente en la práctica de EIA y viceversa, creando un círculo vicioso. Esto pone de manifiesto la urgente necesidad de mejorar la enseñanza de EIA en Brasil para contribuir con su práctica.

Palabras-clave: Perfil de enseñanza, plan de enseñanza, Ingeniería Ambiental, Licencia Ambiental.