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ARTICLE

Teaching for sustainability in Brazilian higher education from the perspective of the Sustainable Development Goals

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ABSTRACT

The study verified how teaching for sustainability has been applied in the learning of Brazilian higher education students. From the perspective of the Second Best Theory, the presence of themes related to the United Nations Sustainable Development Goals in Exame Nacional de Desempenho dos Estudantes was analyzed. It presents a qualitative and quantitative approach using content analysis techniques. The documentary research method helped in the collection of ordinances and guidelines of the Ministry of Education, as well as the tests applied in the period from 2004 to 2018. It is concluded that there was already a concern with the topic in the Exame Nacional de Desempenho dos Estudantes tests and that students should have an ethical profile committed to social, cultural, and environmental issues. Although it is difficult to measure the consolidation of student thinking and skills acquired in the years of study, the research contributed to reinforce that the actions of educational institutions are relevant in expanding the commitment to the Sustainable Development Goals.

KEYWORDS

higher education; sustainability; sustainable development; SDG; ENADE.

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ENSINO PARA A SUSTENTABILIDADE NA EDUCAÇÃO SUPERIOR BRASILEIRA NA PERSPECTIVA DOS OBJETIVOS DE DESENVOLVIMENTO SUSTENTÁVEL

RESUMO
O estudo verificou como o ensino para a sustentabilidade tem sido aplicado na aprendizagem de alunos brasileiros do ensino superior. Na perspectiva da Teoria do Segundo Melhor, foi analisada a presença de temas relacionados aos Objetivos de Desenvolvimento Sustentável das Nações Unidas no Exame Nacional de Desempenho dos Estudantes. Apresenta uma abordagem qualitativa e quantitativa utilizando técnicas de análise de conteúdo. O método de pesquisa documental auxiliou na coleta das portarias e diretrizes do Ministério da Educação, bem como das provas aplicadas no período de 2004 a 2018. Conclui-se que já havia uma preocupação com o tema nas provas do Exame Nacional de Desempenho dos Estudantes e que os alunos deveriam ter um perfil ético e comprometido com as questões sociais, culturais e ambientais. Embora seja difícil mensurar a consolidação do pensamento do aluno e das competências adquiridas nos anos de estudo, a pesquisa contribuiu para reforçar que as ações das instituições de ensino são relevantes na ampliação do compromisso com os Objetivos de Desenvolvimento Sustentável.

PALAVRAS-CHAVE
ensino superior; sustentabilidade; desenvolvimento sustentável; ODS; ENADE.

ENSEÑAR PARA LA SOSTENIBILIDAD EN LA EDUCACIÓN SUPERIOR BRASILEÑA DESDE LA PERSPECTIVA DE LOS OBJETIVOS DE DESARROLLO SOSTENIBLE

RESUMEN
El estudio verificó cómo la enseñanza para la sostenibilidad se ha aplicado en el aprendizaje de los estudiantes brasileños de educación superior. Desde la perspectiva de la Segunda Mejor Teoría, se analizó la presencia de temas relacionados con los Objetivos de Desarrollo Sostenible de Naciones Unidas en Exame Nacional de Desempenho dos Estudantes. Presenta un enfoque cualitativo y cuantitativo utilizando técnicas de análisis de contenido. El método de investigación documental ayudó en la recolección de ordenanzas y lineamientos del Ministerio de Educación, así como las pruebas aplicadas en el período de 2004 a 2018. Se concluye que ya existía una preocupación por el tema en las pruebas de Exame Nacional de Desempenho dos Estudantes y que Los estudiantes deben tener un perfil ético comprometido con los temas sociales, culturales y ambientales. Si bien es difícil medir la consolidación del pensamiento y las habilidades de los estudiantes adquiridas en los años de estudio, la investigación contribuyó a reforzar que las acciones de las instituciones educativas son relevantes para ampliar el compromiso con los Objetivos de Desarrollo Sostenible.

PALABRAS-CLAVE
educación superior; sustentabilidad; desarrollo sustentable; ODS; ENADE.

INTRODUCTION

Although society is aware of the planet's environmental situation, education for sustainability is still a problem. There is a divergence that should be presented, especially in higher education, since there is a duality in concept and practical objective. Universities that have technical knowledge abandon sustainability teaching even though it is a subject that is still capable of creating discussions (Christie *et al.*, 2013).

The Theory of the Second Best (TSB), which originally developed the welfare economy (Lipsey and Lancaster, 1956), addresses the choice between the various options, with the second (variable) being the likely best situation, since the first is often impossible to achieve in its total functioning. The second best serves to develop strategies that meet the needs, in a way that does not drift far from the "ideal state". In the context of education, the achievement of this ideal includes institutional changes, revisions of pedagogical policies and practices (Cotton *et al.*, 2009; Baughan, 2015).

In the specific case of education on economic, social, and environmental sustainability, the ideal environment would be to offer the knowledge to a broad group of people who could understand that system can be in full operation with balance and efficiency. Thus, the inclusion of public policies aimed at teaching sustainability should reach a large number of students in both primary and higher education (Almeida, Scatena, and Luz, 2017). This is practically impossible due to the lack of financial resources for education in Brazil, the time offered for extracurricular teaching and the inappropriate environment for theoretical and practical understanding of sustainability concepts. For Wamsler (2020), another difficulty may be the neglect of facilitating a more holistic reflection on the emotional processes that support learning and minimize the integration of the choices of everyday life with the current challenges for sustainable development.

Sustainable development issues are likely to be taught as a second option by educational institutions (Purcell, Henriksen, and Spengler, 2019) because other subjects are considered to be more fundamental to the learning process of humanity, such as physics, mathematics, chemistry, biology, and languages. However, there are other factors that may affect the efficient inclusion of education for sustainability in the academic community. In a New Zealand survey, Shephard and Furnari (2013) identified the difference of four groups of teachers as to the commitment of education to sustainability, but the results showed a dichotomy between those who interdisciplinary way balance education for sustainability and those who do not.

The assumption that education assumes an important role in shifting the thinking of mankind to sustainable development is not ruled out. Caiado *et al.* (2018) emphasize that education, especially higher education, creates a continuous cycle of knowledge capable of presenting collaborative solutions to make the world more sustainable and resilient. These actions seem to converge with the United Nations' 2030 Agenda (UN, 2015) that established the 17 Sustainable Development Goals (SDG). Goals require holistic global partnership of all social actors. In this regard, Martínes-Usarralde, Lorret Català, and Mas Gil (2017) and Shulla *et al.* (2020) emphasize that the role of the university vis-à-vis the SDG is to build a space that allows the integration of people with strategies to reformulate teaching, learning and the social function.

In Brazil, since the occurrence of Rio-92, efforts have been made to add Sustainability Education to the school curriculum, among them the National Environmental Education Program (ProNEA — Brasil, 2018). In 2012, the subject matter became special with the approval of the "National Curricular Guidelines for Environmental Education" (Brasil, 2012). For Leal Filho *et al.* (2018a, p. 1), the considerations brought by the statements at this conference, emphasized education and sustainable development as an "[…] educational response to the ecological crisis […]".

According to the Census of Higher Education, these guidelines reach more than 2,448 institutions of higher education, 296 public, and 2,152 private, respectively, having more than 8 million students enrolled in undergraduate and online courses (INEP, 2017b). Regarding the reality of higher education, a set of guidelines between institutions, teachers, and students focuses education on sustainability in the transcendence of competences, skills, and profiles of students in a conscious way and with transformative social attitudes (Dias *et al.*, 2018).

Although the consolidation of student thinking is difficult to measure, both in public and private institutions, the Brazilian higher education evaluation instruments, such as the Exame Nacional de Desempenho de Estudantes (ENADE) [National Student Performance Test], which began in 2004, seek to verify the degree of competence of the student, in addition to analyzing their ability to present mastery and aptitude in social, cultural, and environmental issues (Brito, 2008). However, Christie *et al.* (2013) show that the number of higher education graduates with an understanding of the role of sustainable development for future generations is still small.

Therefore, the present study sought to verify how teaching for sustainability has been applied in the learning of Brazilian higher education students. To this end, the presence of themes related to the United Nations' SDG in the exams of undergraduate students in the evaluation process of Brazilian higher education was analyzed. The documentary research method was used to collect the decrees and guidelines of the Ministry of Education (MEC), as well as the ENADE tests applied to all areas of higher education knowledge, from 2004 until 2018.

In this way, issues related to the integration of the university with learning for sustainability that serves society must focus on curriculum development strategies that provide students and educators with skills and capabilities connected to the SDG. Thus, it is hoped that this study can contribute to the strengthening of universities in promoting their capacity for transformation, allowing further discussions on the theme and the development of current practices, policies, and projects for sustainability actions.

LITERATURE REVIEW

EDUCATION FOR SUSTAINABLE DEVELOPMENT IN HIGHER EDUCATION

Sustainability issues have generated discourses in society and raised awareness of the importance of a new attitude from humans in relation to the environment. In this context, higher education institutions, perfect places for reflective and

critical thinking, play an important role in this process of social reconfiguration (Morales, 2007). The perception of the increase of sustainable consciousness and the impacts that this new reality brings to the field is the object of studies by the researchers of the diverse areas of knowledge as education, engineering, accounting, and sciences of the technology (Marcomin and Silva, 2009; Christie *et al*., 2013; Yuan and Zuo, 2013; Abdalla, Siti-Nabiha, and Shahbudin, 2014; Beynaghi *et al*., 2016; Leal Filho *et al*., 2018a; Shulla *et al*., 2020).

According to Shephard (2008), higher education institutions take on the specific role of training influential individuals who value their environment and are able to interact responsibly in helping to sustain the entity. For this, universities should seek results and alternatives to sustainability education in a diversified way. Students should be directly related to sustainability studies so that they develop experiences during the construction of knowledge (Machado *et al*., 2016; Martínez-Usarralde *et al*., 2017). These studies must interact with the elements taught, generating values, attitudes, and abilities. Initiatives such as interacting with the institution's sustainability projects allow students to achieve more committed results (Purcell, Henriksen, and Spengler, 2019).

> ESD [education for sustainable development] is far more than teaching knowledge and principles related to sustainability. ESD, in its broadest sense, is education for social transformation with the goal of creating more sustainable societies. ESD touches every aspect of education including planning, policy development, programme implementation, finance, curricula, teaching, learning, assessment, administration. ESD aims to provide a coherent interaction between education, public awareness, and training with a view to creating a more sustainable future. (UNESCO, 2012a, p. 33)

The role of higher education implies broadening the understanding of sustainability and promoting a new education culture that is thought globally. Therefore, the higher institutions take a leading role and prepare the new generations in the scientific knowledge geared to a viable future for society. The importance of education on the topics of sustainability has been addressed by the United Nations since 1972, with the Stockholm Declaration. Gradually, universities took on the responsibility for sustainable development. This led to the insertion of socio-environmental themes in the curriculum, generating a new curricular environment for sustainability (Gomes and Brasileiro, 2018).

According to Tauchen and Brandli (2006), the development of a new social and environmental conscience brought two currents of thought to the university environment. The first relates to the issues of educational practices and the qualification of its students, focusing on the transformation of actors that prioritize environmental needs. The second stands out in the implementation and innovation of sustainable management processes able to control the negative impact on the environment.

As for the first current, it is understood that the proliferation of curricula and sustainable methods for universities aim to introduce a new perspective of

learning. This approach seeks to imprint skills and dispositions that make it possible to contribute to a better world (Hays and Reinders, 2020). Howlett, Ferreira, and Blomfield (2016) argue that changes in higher education school curricula should also drive changes in pedagogical practices and current ways of thinking and teaching.

Holdsworth and Thomas (2021) identify that students in higher education institutions should be led to a maturation of skills and competences. These must be incorporated into the ways in which knowledge was produced and validated, especially in education for sustainability. For Evans (2019), universities, capable of teaching the knowledge of sustainability, tend to offer their students an integrated set of decisions that will allow them to face more serious and complex challenges.

Curtis *et al.* (2021) presented a relevant list of works that aimed the study of competences in sustainability learning at the level of course offerings. Furthermore, the study by Wiek, Withycombe, and Redman (2011) and Wiek *et al.* (2015) presented a framework on the competences of sustainability that have influenced the training role of undergraduates. The competencies found were:

1. systems-thinking competence;
2. anticipatory competence;
3. normative competence;
4. strategic competence;
5. interpersonal competence;
6. a "meta-competence of meaningfully using and integrating the [other] five key competencies".

On the other hand, the second current can be found in the studies by Butt, More, and Avery (2014), which emphasize that the importance of the university with sustainability goes beyond the scientific field. It focuses on the relationship between higher education institutions, their efforts for sustainability practices, and stakeholders' engagement. Universities are not immune to the challenges of sustainable development. As a resource management organization, its sustainable practices are a driving force in society. However, such practices may suffer from the complexity that universities assume regarding their financial and operational performance.

The reality of education in Brazil assumes a role in which teaching by competences is fundamental for the success of the student. The Basic Education Guidelines Law (LDB — Brasil, 1996) presents a strong inference to the linkage of school education, work, and other social practices. For Dias *et al.* (2018), in the context of higher education, this should transcend in a way that promotes transversal competencies, promotion of ethical and civic values, so that the student combines knowledge and competences with transformative and critical social attitudes.

For Cotton *et al.* (2009), education for sustainable development in higher education is still limited. The existence of some variables has undermined the view that higher education may bring contributions to society regarding sustainability. For the authors, these losses are related to variables such as lack of managerial support to universities, rejection of the incorporation of the subject in the curriculum of some disciplines, a significant distance between the reality taught and the current practice and conflicts in the pedagogy of sustainability.

In this context, the way to educate for sustainability has presented a remarkable conflict, but it is perceived that more effective changes in the campus are, at the same time, feasible only to the curricular changes. For Cotton *et al*. (2009), this pattern reflects a lag between guidelines and institutional practices, such as the difficulty in discussing sustainable development, lack of shared understanding and irrelevance of the subject in disciplines. Given these points, the authors' study presents their results from the TSB.

This theory was originally developed by the social welfare economy (Lipsey and Lancaster, 1956) and suggests that, in the existence of limited variables that provide an ideal state, it is necessary to find the "second best". So, that if it is unattainable the first best, there will be another alternative. Gowdy (2007) reports that the theory applied to the concept of sustainability expresses that changing just one thing (variable) will not bring about more sustainable economic conditions and may even cause an unwanted effect. An example cited is that countries that seek energy efficiency are consequently able to reduce demand for energy and lower prices.

When dealing with the challenges for sustainability education, the higher education institution must be attentive to all the variables involved (they are considered as challenges for implementing a vision of sustainability) and not seek to use only the arguments of the "second best". In this way, the institution will not be absent from its responsibilities in the role of paradigmatic change (Cotton *et al*., 2009). According to Reid and Petocz (2006), for such situations do not occur in the education of sustainability education, it is necessary to first understand how educational managers (government and educational developers) act in this function. Interdisciplinary thinking is needed with innovative educational approaches, integrating ideas related to the academic struggles of sustainability.

Baughan (2015) reports research in the area of sustainability does not have well-theorized bases and that is why theoretical exploration has been based on social practices. In this way, the author used the semi-structured interview method to present, through ideas from university educational developers, the perspectives on the inclusion of sustainability in the curriculum. For Baughan (2015, p. 5), "[…] the absence of a variable for 'first-best' does not imply that a next-best state is secured by the remaining variables, and may call for other variables to be removed, so that second-best may be a distinct state […]". Thus, the author emphasized the results of his study based on this theory and recommended that sustainability policies in education be broader and seek "second-best" strategies promoting interaction between students, educational developers, and the curriculum.

In another perspective, there are researchers who recognize the theoretical foundations of learning theories, as an approach capable of incorporating changes and transformations in the conscious behavior of the actors involved in universities (Sterling, 2011; Blake, Sterling, and Goodson, 2013; Leal Filho *et al*., 2018b). It is worth noting that the work of the educator Mezirow (1978) presented the theory of transformative learning related to qualitative change in the perception and construction of meaning on the part of the student, aiming questions and reformulation of habits arise. In this perspective, Rodríguez Aboytes and Barth (2020) emphasize that this theory becomes an emerging field for the studies of

education for sustainability, as it provides an empirical basis that highlights the role of convergent experience in the development of sustainability competencies.

Undoubtedly, universities are expected nowadays to adopt differential practices of scientific and technical knowledge, as well as proposals for integration in favor of a new and sustainable reality (Rampasso *et al.*, 2019). Guimarães and Bonilla (2018) also add that coherently with the transmission of concepts related to sustainable development awareness, universities must unite discourse with practice and become an example of sustainable communities.

For Caiado *et al.* (2018), higher education institutions are responsible for the mobilization of global knowledge and for the collaborative process of solving sustainability problems. Indeed, universities have a positive relationship between understanding education for sustainability and creating a more sustainable and equitable world (Blake *et al.*, 2013). Consequently, the objectives of promoting students committed to environmental issues converge with the United Nations SDG and Agenda 2030 (Belluzzo, 2018). For Žalėnienė and Pereira (2021, p. 99), higher education institutions are considered as "[…] key agents in the education of future leaders that will contribute to the successful United Nations Sustainable Development Goals.".

According to Wamsler (2020), education becomes both the end and the means for the current challenges of sustainable development to be overcome. The insertion of more holistic pedagogies in teaching is implicitly expressed in the UN SDG, particularly with regard to the global goal of education (SDG4), which aims to ensure quality education for all, promoting learning and opportunity throughout life (UN, 2015). For Wamsler (2020, p. 113) "[…] achieving the SDGs will require more than 'business as usual' pedagogies and approaches to catalyze the necessary change.".

Agenda 2030 represents 17 SDG related to social, ecological, and economic aspects, along with 169 goals for which 193 member states of the United Nations, including Brazil, have committed themselves to a global plan of action that involves society at large (UN, 2015). These objectives were built on the Millennium Development Goals (MDG) that target strategies for the 21st century. For Bebbington and Unerman (2018), SDG are considered the most important environmental and human actions due to their great development ambition. Chart 1 summarizes the SDG.

SDG place education as the strategic center of effectiveness in sustainable development. Its adoption and the contribution of educational institutions has been the object of study for the researchers. Annan-Diab and Molinari (2017) examined the issue of interdisciplinarity in the goal of raising awareness among students and professionals in the performance of SDG and how students are prepared to assess sustainability issues. Seabra *et al.* (2018) sought to understand how the subsystem of Polytechnic Higher Education in Portugal is aligned with the challenges presented by SDG. In Brazil, research such as Collado Ruano (2017) and Guimarães and Bonilla (2018) made reflections based on specific objectives such as the 4th and 11th objectives, respectively. Purcell, Henriksen, and Spengler (2019) explored the university environment in the UK, Bulgaria, and the USA to see how universities can create sustainability strategies for delivering the SDG and be a driver of transformational sustainability.

Chart 1 – The United Nations Sustainable Development Goals summary.

Goal number	Outline description
1.	**No Poverty** End poverty in all its forms everywhere
2.	**Zero Hunger** End hunger, achieve food security and improved nutrition and promote sustainable agriculture
3.	**Good Health and Well-being** Ensure healthy lives and promote wellbeing for all at all ages
4.	**Quality Education** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5.	**Gender Equality** Achieve gender equality and empower all women and girls
6.	**Clean Water and Sanitation** Ensure availability and sustainable management of water and sanitation for all
7.	**Affordable and Clean Energy** Ensure access to affordable, reliable, sustainable and modern energy for all
8.	**Decent Work and Economic Growth** Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9.	**Industry, Innovation and Infrastructure** Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
10.	**Reduced Inequalities** Reduce income inequality within and among countries
11.	**Sustainable Cities and Communities** Make cities and human settlements inclusive, safe, resilient and sustainable
12.	**Responsible Consumption and Production** Ensure sustainable consumption and production patterns
13.	**Climate Action** Take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy
14.	**Life Below Water** Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15.	**Life on Land** Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reversing land degradation and halt biodiversity loss
16.	**Peace, Justice and Strong Institutions** Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable, inclusive institutions at all levels
17.	**Partnerships for the Goals** Strengthen the means of implementation and revitalize the global partnership for sustainable development

Source: Retrieved of "Achieving the United Nations Sustainable Development Goals: An enabling role for accounting research Abstract" (Bebbington and Unerman, 2018).

EVALUATION OF THE BRAZILIAN HIGHER EDUCATION

From a global perspective, the quality of higher education has been the subject of discussion and its development has led to initiatives to evaluate the performance of courses and students (Pereira, Araújo, and Machado-Taylor, 2020). In this context, the institution of a new system of evaluation of Brazilian higher education seeks, in its proposal, to verify how much the teaching institution adds to the student throughout his academic life and how the learning in the course will add to the cultural and professional profile of the student (Limana and Brito, 2005). The Sistema Nacional de Avaliação da Educação Superior (SINAES) [National System for the Evaluation of Higher Education], instituted by Federal Law No. 10.861/04 (Brasil, 2004), presents three dimensions: evaluation of the institution, evaluation of undergraduate courses, and evaluation of student performance. These dimensions allow a broader approach to the institution, a more specific view of each course, and student-focused performance (Primi, Hutz, and Silva, 2011).

The first two dimensions are addressed through an on-site evaluation process of expert committees together with the internal evaluation. ENADE meets the third perspective. It is a mandatory exam and has divided a broader set of courses into three blocks that are evaluated each year. The evaluation presents questions related to the general and specific training of each course, through the sampling of the graduating and the ingresses, completing the evaluation cycle every three years (Bittencourt *et al.,* 2008).

ENADE brings importance to public policies for higher education, as it allows the inference of how much the course contributes to the formation of the student. Based on periodic assessments, the exam focuses on the student's learning process and academic performance in relation to the guidelines of the profession/course, in addition to assessing the skills acquired to understand topics exogenous to the academic environment, that is, topics linked to reality and contemporary problems (Lima *et al*., 2019).

This evaluative cycle comprises the evaluation of the undergraduate courses based on the triennial results of the students' performance. From these data, MEC accredits the educational institution and institutes policies for the expansion and financing of higher education. This is extremely important when verifying the reality of Brazilian higher education. According to the Census of Higher Education in 2017, there were more than 2,448 institutions of higher education, 296 public and 2,152 private, with more than 8 million students enrolled in undergraduate (INEP, 2017b).

For Brito (2008, p. 846, our translation), "ENADE assesses the student's trajectory, based on the learning potential (performance of freshmen), mastery of the area and professional skills (performance of graduates).". For the author, the egress profile of a higher education course can provide an understanding of what was expected along the trajectory in the institution and how the course was successful in building the skills and competencies of the student in the exercise of his profession. ENADE aims at an analysis of change, evaluating the process and not the product and how the student is able to master and fit new situations.

It is known that the implementation of SINAES promoted an improvement in the quality of higher education and aimed at the operationalization of appropriate instruments for an efficient evaluation of courses and institutions. However, Bertolin (2019) emphasizes that the analysis and investigation of the evaluation process of the higher education platform is a challenge to be overcome since the credibility of the evaluative results of the system is directly related to public policies that promote the improvement in the quality of higher education.

It is important to emphasize that ENADE has made a great advance in the control of the statistical results and made the indexes more consistent and with less bias to variables irrelevant to the courses, such as the initial differences between the students. This was a questioning of private institutions since the difficulty of entering public institutions would tend to select more prepared students.

Primi, Hutz, and Silva (2011) emphasize that the implementation of ENADE presented an evolution of previous methods, but it should not be exempted some questions, such as the limitation in an effective interpretation from the cross-sectional analysis of the sample of the egressed and ingressed students in the same year, assuming that the level of both is presented in a similar way. In 2018, The Organization for Economic Co-operation and Development (OECD, 2018) reports ENADE presents weaknesses in the ability to provide reliable information on performance and the program, as the ENADE objectives have a breadth not tested by the scope of the examination and the requirements of general knowledge are not related to the content of the program.

METHODOLOGY

This study is characterized by an exploratory and descriptive nature, as it seeks to know and interpret the reality of sustainability studies in Brazilian universities from a national exam. Studies such as those by Barros *et al*. (2019), Albrecht and Maciel (2020), and Palacios and Fernandes (2022) also presented the theme of SDG related to ENADE. The study presents a qualitative approach with quantitative exposures and used techniques of content analysis, recommended by Bardin (2008), to perform the treatment of results, inference, and interpretation of the contents of the material collected (Silva and Fossá, 2015). Researchers such as O'Byrne, Dripps, and Nicholas (2015), Vaughter *et al*. (2016), Abadia and Carvalho (2018), and Mello and Mello (2018) used the technique of content analysis for similar studies.

The documentary research method was used to collect data that was carried out between the months of January and April 2019. Information about Brazilian education was extracted from the MEC site[1] and Central Planalto website,[2] which resulted in the investigation of laws, opinions, and reports regarding the guidelines for Brazilian education for sustainable development in

1 https://www.mec.gov.br/
2 http://www.planalto.gov.br/

higher education. Similarly, a source of data, the ENADE tests carried out from 2004 to 2018, was collected.

The research method was divided into four parts:

1. the first step was based on the organization of the material and data coding;
2. in the second stage, we sought to analyze the statistics of the objective questions of the general component from the year 2014 to 2017;
3. the third stage allowed the identification of documents, legislation and guidelines that serve as a basis for the establishment of policies for teaching sustainable development; and
4. in the fourth stage, all ENADE tests were analyzed for classification according to the student's profile category. In this stage, starting from a triangulation with the ease indexes and the discrimination index,[3] an attempt was made to understand the students' perception in learning to teach sustainability.

For the process of material organization and data coding, the NVivo 11 software was used. First, the sources that presented the legal guidelines regarding the reality of sustainability education, as well as the information about the evaluations were organized. Additionally, a categorization was made based on the skills and competencies matrices of the reports issued by the Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira (INEP) [National Institute of Educational Studies and Research Anísio Teixeira], the organ responsible for the organization and data of the SINAES of the MEC.

After coding these data, the process of categorizing the questions of the ENADE tests began, based on the general formation components. This component is common to all areas of knowledge and is the only possibility of comparison between students. It contains ten questions (eight objective and two discursive) that aim to verify capacities and competences, such as projection of intervention actions, proposition of solutions to problem situations and conflict management (Brito, 2008). In this way, it becomes easier to find questions related to the SDG perspectives better in this section of the exam. For the time period of the research (2004 to 2018), 150 questions were consulted.

Based on the action plan foreseen by the United Nations global agenda,[4] 2019 topics (keywords) were defined for each SDG. Thus, 64 topics were found that may allow operationalization to identify the presence of SDG in ENADE tests. Figure 1 presents the results of this encoding.

After establishing the central topics, the researchers analyzed the guiding concepts of each SDG, presented in Chart 1. The 2017 ENADE evaluation matrix

3 These indexes were found in the area synthesis report and work as auxiliary variables in the intention of comparing the performance of students who took the ENADE test in each of the knowledge areas. As there is a variability of subscribers in each area and in each region, these variables tend to eliminate the differences (INEP, 2017a).

4 https://sustainabledevelopment.un.org/sdgs

Figure 1 – Central topics developed in the research.
Source: Elaborated by the authors.

was also analyzed, in which we sought to verify the general profile of the student. This document presents important information about the skills and competences for the exercise of the profession, in addition to the desired profile in the understanding of themes of contemporary reality. Studies such as the one by Leite *et al.* (2020) were carried out by categorizing transversal competences, such as critical and reflective analysis/critical thinking, research, organizational and planning capacity, and professional ethics of health science students in Portugal.

With this analysis, connections were established, using cross-references and interpretations. Thus, the coding process allowed the emergence of four new categories that resulted in the final classifications of the research. It is worth mentioning that the process of creation and conformation of each category emerged from the analysis of the data, but it is not absent from the subjectivity of the researchers (Silva and Fossá, 2015). Chart 2 shows the categorization of these data.

INEP publishes annual reports that aim to provide information to institutions aiming to develop actions and improvements in undergraduate courses. As of 2014, the general component received a specific synthesis report. Thus, a mapping of the objective and discursive issues of the general component was done regarding content aligned to the research subject. We also analyzed the evaluation matrix, which presents the matrix of competence and abilities to be developed by the different areas of knowledge.

Chart 2 – Emerging categories of analysis.

SDGs Categories (Initials)	Student profile categories (finals)
• End poverty in all its forms, everywhere (SDG 1)	I - ethical and committed to social, cultural, and environmental issues
• End hunger, achieve food security and improve nutrition, and promote sustainable agriculture (SDG 2)	
• Ensure a healthy life and promote well-being for all, at all ages (SDG 3)	
• Reducing inequality within and between countries (SDG 10)	
• Conservation and sustainable use of oceans, seas and marine resources for sustainable development (SDG 14)	
• Protecting, restoring, and promoting the sustainable use of terrestrial ecosystems, sustainably managing forests, combating desertification, halting, and reversing land degradation and halting the loss of biodiversity (SDG 15)	
• Ensure reliable, sustainable, modern, and affordable access to energy for all (SDG 7)	II - Humanist and critical, supported by scientific, social and cultural knowledge, historically constructed, that transcend the proper environment of its formation
• Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable, and inclusive institutions at all levels (SDG16)	
• Strengthen the means of implementation and revitalize the global partnership for sustainable development (SDG 17)	
• Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (SDG 4)	III - protagonist of knowledge, with a vision of the world in its diversity for literacy practices, aimed at the full exercise of citizenship
• Achieve gender equality and empower all women and girls (SDG 5)	
• Ensure the availability and sustainable management of water and sanitation for all (SDG 6)	
• Build resilient infrastructures, promote inclusive and sustainable industrialization and foster innovation (SDG 9)	
• Ensure sustainable production and consumption patterns (SDG 12)	
• Promote sustainable, inclusive, and sustainable economic growth, full and productive employment, and decent work for all (SDG 8)	IV - Proactive, supportive, autonomous and conscientious in making decisions based on the contextualized analysis of available evidence
• Making cities and human settlements inclusive, safe, resilient, and sustainable (SDG11)	
• Take urgent action to combat climate change and its impacts (SDG13)	

Source: Elaborated by the authors. SDG: Sustainable Development Goals.

INEP also provides, on its official website,[5] statistical synopses through which data from the School Census of Higher Education are presented through an annual survey of the main components of Brazilian education. Regarding the synopses for ENADE, its production began in 2014. However, it was not possible

5 http://portal.inep.gov.br/web/guest/sinopses-estatisticas-do-enade

to obtain these data, due to unavailability on the website. As a result, participation data and average student scores were collected from the general synthesis report.

Thus, the 150 questions were included in the system and related to the 64 research topics. This resulted in a final sample of 66 questions for analysis. Cross-references were made between the data (documents, indicators and categories found in the research). Interpretations and inferences will be dealt with in the next section.

PRESENTATION AND DISCUSSION OF RESULTS

It appears that somehow the National Curricular Guidelines and MEC regulations have influenced higher education courses to rethink about the inclusion of the theme sustainable development in the midst of their strategic educational actions. Therefore, the pedagogical projects of the different courses of a Higher Education Institution (HEI) were forced to insert information of socio-environmental responsibility in the curricular formation, resulting in the formation of Brazilian citizens. The main conclusions about the result of this research are presented next.

ALIGNMENT OF EDUCATION IN HIGHER EDUCATION WITH SUSTAINABLE DEVELOPMENT GOALS

From the categories established in the study, it is possible to infer the desired profile for higher education students. It is known that, at the end of the course, students must present skills and competencies that are not only aligned with the labor market issue. The student's profile must interact with social, environmental, and economic issues. To respond together with the action plans presented for the SDG, the results showed which profile is directly related to each objective. For category I, the student's profile represents an ethical commitment to social, environmental, and cultural changes (which we can infer as a primary goal for educational institutions). In this category are the actions aimed at SDG1, SDG2, SDG3, SDG10, SDG14, and SDG15.

Category II is geared to the profile of students who present a humanistic and critical line through which their understanding is based on scientific knowledge. In this category are the actions aimed at SDG7, SDG16, and SDG17. For category III, the student has characteristics of a profile by which he/she becomes the protagonist of knowledge, with full knowledge of his/her role as a citizen and open to diversities. Thus, the student is able to take action aimed at SDG4, SDG5, SDG6, SDG9, and SDG12. And finally, the proactive, autonomous student and aware of his/her decision making are categorized in number IV. Hir/her actions are in line with SDG8, SDG11, and SDG13.

It is worth mentioning that the presence of one profile does not exclude the other. Thus, educational institutions become influencers of more holistic thoughts to their students. Figure 2 shows the formation of the quadrant for the profile of a student focused on teaching for sustainability.

It is possible to see, in Chart 3, the presentation of the analysis of the ENADE questions for the general education component of the different areas of knowledge considering the categorization of the student profile carried out in this research. On average, the exam questions present a frequency of more than 25%

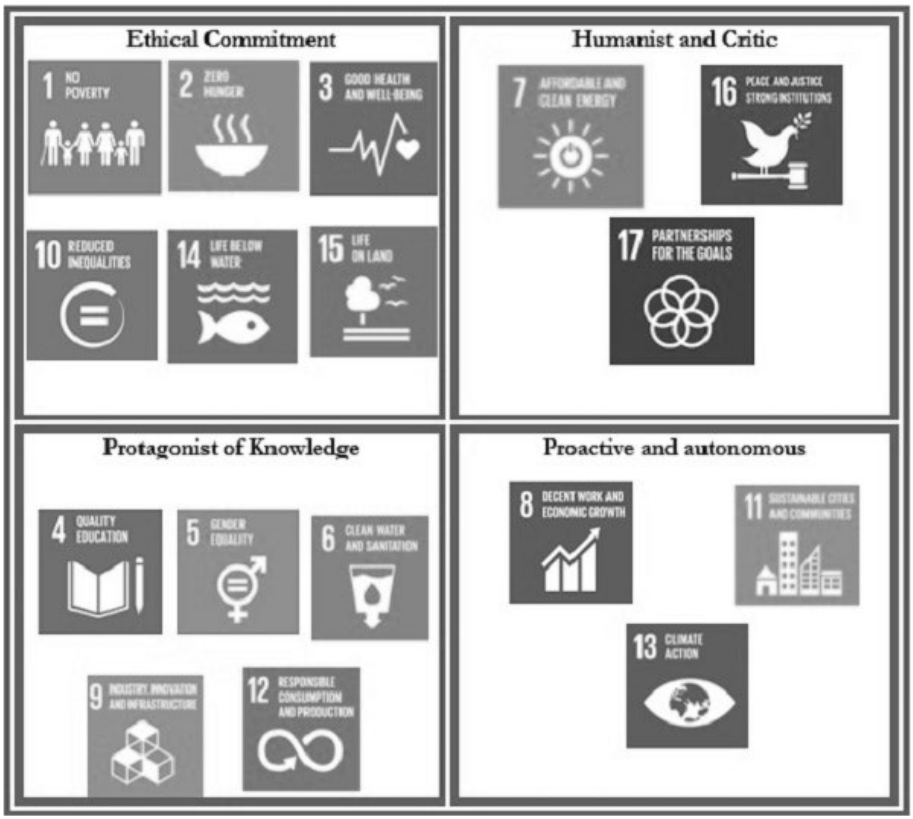

Figure 2 – Profile of a student focused on teaching for sustainability.
Source: Elaborated by the authors.

of subjects related to the matter of sustainability. The 2010 edition was the one that presented the highest frequency (60%) with six questions: two for category 'I' (ethical and committed to social issues), one for category 'II' (humanist and critical), two for category 'III' (protagonist of knowledge with vision of the world) and one for category 'IV' (proactive, solidarity, and autonomous).

Category 'I' was the one that presented the highest frequency over the years, with 25 questions. This category corresponds to the professional profile of a student committed to social, cultural, and environmental issues, corroborating the literature that emphasizes a profile of social engagement (Reid and Petocz, 2006; Shephard, 2008). It corresponds to a total of approximately 17% when analyzing the total number of questions (150) over the years. The category 'III', which approximates the realities of the inequalities stimulating a protagonist student from their knowledge, corresponded to 12% of the total of questions, followed by category 'IV' and 'II' (10% and 0.06%, respectively).

The synthesis reports from 2014 to 2017 allow analyzing, from a triangulation, the objective questions of the general training component. Chart 4 presents

Chart 3 – ENADE questions of the general component by categories from 2004 to 2018.

Year of Application	Student profile categories according to the survey				
	Category I	Category II	Category III	Category IV	Total
2004	1	-	1	2	4
2005	2	-	-	2	4
2006	2	1	1	-	4
2007	3	-	-	-	3
2008	2	1	2	-	5
2009	1	-	1	3	5
2010	2	1	2	1	6
2011	1	-	2	1	4
2012	1	2	-	2	5
2013	1	-	2	-	3
2014	1	1	1	1	4
2015	-	-	3	1	4
2016	3	1	1	-	5
2017	3	1	1	-	5
2018	2	-	1	2	5
Total questions	25	8	18	15	66

Source: Elaborated by the authors.

Chart 4 – Analysis of the objective issues of the general component 2014 to 2017.

ENADE issues identified with a sustainability theme		Student profile categories	Facility index [a]	Discrimination index [b]
Year of Application	Issue Number			
2014	Issue 3	I	medium	very good
	Issue 6	III	medium	very good
2015	Issue 3	IV	easy	very good
	Issue 7	III	difficult	very good
2016	Issue 1	I	medium	very good
	issue 5	III	very difficult	medium
2017	Issue 2	I	medium	very good
	Issue 5	III	medium	very good
	Issue 8	II	medium	very good

Source: Elaborated by the authors. [a] percentage of correct answers to the question: very easy (≥0.86), easy (0.61 until 0.85), medium (0.41 until 0.40), difficult (0.16 until 0.40) and very difficult (≤0,15). [b] power of discrimination: weak (≤0.19), medium (0.20 until 0.29), good (0.30 until 0.39) and very good (≥ 0.40). Retrieved from http://portal.inep.gov.br/web/guest/relatorios

the results of the student profile category, the facility index and the discrimination index for each objective question identified on the subject in ENADE from 2014 to 2018. The facility index matches the classifications of the questions from the percentage of hits, with ratings ranging from very easy, easy, medium, difficult, and very difficult. The discrimination index allows the question to have the power to evaluate the students. This index makes the questions better judged by students who perform better than the worst performers. It is classified by the power of discrimination in weak, medium, good, and very good (INEP, 2017a).

It is possible to infer that, on average, students can easily answer questions about sustainability. Category 'I' issues (ethical profile and committed to social, cultural, and environmental issues) correspond to an average facility index and a very good discrimination power. In 2016, a question of ENADE belonging to category 'III' (protagonist of knowledge, with a view of the world in its diversity for literacy practices, aimed at the full exercise of citizenship) had an index of ease registered as very difficult. This means that less than 15% of the respondents answered the question correctly, having an average discriminatory power (INEP, 2017a).

THE DEVELOPMENT OF STUDENTS FOCUSED ON SUSTAINABILITY

Chart 5 presents the results of the documentary analysis on the theme of education for sustainability. According to the analyzes carried out, it was possible to verify that the National Curriculum Guidelines and the other norms of each higher education program have strategies for the inclusion of education for sustainable development in higher education. This information allows universities to be attentive to updating the theme in their curriculum formation.

According to Brazilian legislation, this insertion must occur through the transversality of the themes and start from the specific contents of each course so that there is a combination of the curricular treatments with these transversal themes (Brasil, 2018). The undergraduate courses in Brazil are divided by large areas of knowledge, which has an absolutely practical purpose the institutions to streamline and systematize the information. As a practical example of this, when analyzing the curricular guidelines of 11 undergraduate courses (Law, Economics, Administration, Accounting, Tourism, Hospitality, Executive Secretariat, Music, Dance, Theater, and Design), it was possible to verify the few references on the subject matter. The term "social responsibility" appeared only in the course of Accounting. The term "environment" was present for the areas of Tourism and Design. We did not find the presence of the term "sustainability" or other terms correlated in the analysis (Brasil, 2003).

The difficulty of finding themes from the analysis can corroborate the idea of Cotton *et al*. (2009) and Baughan (2015) for whom HEI can deal with relevant issues such as the issue of sustainability from an idea of the "second best". This reality becomes complex when it is realized that such institutions still present limitations on the content of education for sustainability, even though there is an attempt to move away from the idea of competence only focused on the labor market. In this respect Slocum, Dimitrov, and Webb (2019) present that the increasing involvement

Chart 5 – Documentary analysis on sustainability education in Brazil.

Documents	Assumption about education for sustainable development
The Basic Education Guidelines Law - LDB (Lei No. 9394/96 — Brasil, 1996)	Art 43, VI - to stimulate the knowledge of the problems of the present world, in particular the national and regional ones, to render specialized services to the community and to establish with it a relation of reciprocity.
Parecer 776/97 – Conselho Nacional de Educação *It guides the curricular guidelines of the courses of University graduate* (Brasil, 1997)	a) Encourage a solid general education, necessary for the future graduate to overcome the challenges of renewed conditions of professional practice and production of knowledge, allowing different types of training and differentiated qualifications in the same program; b) To induce the creation of different formations and qualifications for each area of knowledge, making it possible to define multiple professional profiles, guaranteeing a greater diversity of careers, promoting the integration of undergraduate and postgraduate education, privileging, in the profile of its graduates, intellectual abilities that reflect the heterogeneity of social demands.
Instruments of Institutional External Evaluation (INEP, 2017c)	• The contextualization of the higher education institution (HEI) should contain the following information ... o) existence of projects and actions to promote social and environmental sustainability in the management of HEI and in teaching, research and extension activities; • Social responsibility refers to the actions of the institution (with or without partnership) that contribute to a more just and sustainable society, considering works, actions, activities, projects, and programs developed towards the community, aiming at social inclusion, economic development and improving the quality of life and local infrastructure; • The socioenvironmental dimension, in teaching, research, extension and management activities, is aimed at the conservation, recovery and improvement of environmental, social and existential conditions, promoting the participation of the entire IHE community, in the design, planning, implementation and evaluation activities and their indicators, which should be included in their Institutional Development Plan.
National Environmental Education Program (ProNEA — Brasil, 2018)	• To stimulate the inclusion of approach and methodological content of environmental education in higher education curriculum; • To integrate environmental education in higher education, in a transversal, inter and transdisciplinary way, in the different areas and courses; • Encourage the creation and strengthening of articulated research and extension groups and groups in higher education that strengthen studies and the field of environmental education at all levels and modalities of education, enabling the integration between formal and non-formal education; • Foster higher education institutions to implement extension projects linked to teaching and research, focusing on environment, environmental education, sustainability, and citizenship; • To stimulate research in environmental education in the spaces of primary education schools, articulating professionals of basic and higher education.

Source: Elaborated by the authors.

of market-oriented universities and the participation of segments of the economy in school curriculum has hampered pedagogical didactics of teaching for sustainability.

In this context, the OECD (2018) prepared a report and drew the attention of the Brazilian educational authorities regarding the existence of broad curricular

guidelines that, when collected in specific exams such as ENADE, can generate a specific judgment of what the student has to learn. This fact can lead to strategies in the teaching institutions with the aim of "teaching content for the exam" by restricting learning. In fact, very broad curricular guidelines tend to allow course content to be influenced by exams.

The perspectives presented by Butt, More, and Avery (2014) should guide Brazilian HEI so that these institutions could provide their students with an engagement in sustainable programs in order to boost their visibility on the problems of the contemporary world. Therefore, it is important to demonstrate that there was no possibility of identification in official reports regarding the effective participation of each educational institution in sustainability programs. MEC issued a technical note that deals with the external evaluation instruments of HEI and presents an indicator on the existence of sustainable programs in each institution (Brasil, 2017). However, these data is not public and is included only in the score of the general concept of each institution.

Although the agenda that defined the SDG was approved only in 2015, the topic regarding challenges for sustainable development already required actions by organizations and society if we consider that, since 1992, the signing of the commitment to the MDG also addressed similar issues. Nonetheless, educational institutions have played important roles in the efficiency of this process in order to contribute to a more just and sustainable world, since it is perceived that SDG, unlike the MDG, play a more democratic and broader participation role (Barreto and Vilaça, 2018).

According to Nascimento (2021), the evaluation of student performance, the evaluation of courses, and the evaluation of educational institutions make up the evaluation cycle of higher education. In the case of student performance, the assessment is the result of a test, called ENADE, intended for students at the beginning of the course and those who graduate. Such an exam results in a concept for gauging the quality of the course. However, as mentioned by Barreyro and Ristoff (2015), the indicator does not measure a course and a university as a whole, such as the difference in new students. Therefore, the results presented here must also be analyzed with caution, since ENADE, involving only a portion of students, does not allow for detailed explanations also in the evaluation of principles, rules, and their awareness of the SDG. Thus, it is impossible to have a more accurate analysis of the learning of the group of students of an HEI, in view of the difficulties of understanding the intrinsic particularities of the indicator.

CONCLUSION

This study analyzed the documents and tests of performance evaluation of Brazilian higher education in order to verify which subjects were required for undergraduate students in relation to the United Nations SDG. HEI are expected to be developing students' competencies and abilities for the new global challenge of raising awareness of sustainable economic, social, cultural, and environmental development.

Environmental issues and the ecological crisis drive a greater commitment to the entire population from a paradigm shift. Individuals are called to a new social engagement and full citizenship. Given those points, educational institutions have a driving force capable of changing the reality of understanding the social role of each one, because it is in the educational environment in which there are transformations of ideas and the scientific-technical development of alternatives of a new sustainable world.

Disagreements over the role of education should not overlap with their social function. In the case of higher education, institutions are called to add in their guidelines and curriculum transversality of teaching for sustainable development, provided that this inclusion is not impaired by the option of the "second best" alternative. Slocum, Dimitrov, and Webb (2009) emphasize that HEI are able to transfer critical thinking to students and stimulate conscious decision making that challenges the vulnerabilities of environmental, cultural, and economic exploitation.

In this context, the paper consisted of an approach to qualitative exploration to try to verify how Brazilian universities are working on sustainable development issues with their students. The research used content analysis techniques to identify the assumptions of the study. The central idea of the research was in the relation of Brazilian higher education with the United Nations SDG.

Data were collected that relate higher education to education for sustainability. As the main source of the research, the tests of ENADE from 2004 to 2018 were verified in the section devoted to the general training component of all knowledge areas, since it is expected that, by essential characteristics, this section would be more related to the subject.

The results presented significant participation of the topics in the questions during the years of application of the student performance exam. As part of the methodology, it was possible to categorize the subject matter into four different categories. These categories present the profile of the student of higher education from the matrix of competencies and abilities. This profile was related to SDG, allowing a better analysis of the research. Thus, it was possible to verify that the ENADE questions require the student to be ethical and committed to social, cultural, and environmental issues. It was also observed that, although the SDG was instituted in 2015, Brazilian higher education was already concerned with sustainability issues.

The main contribution of the present study is in seeking to understand what subjects are required of higher education students on sustainable development. New actions can be carried out by public educational management trainers based on the findings, since Brazil plays an important role in the international theme on the implementation of agendas and maintenance of its natural resources.

The study did not pretend to verify the potential of teaching for sustainable development in HEI. However, it sought to make an exploration of the subject, because of its total importance. It is known that the actions carried out by educational institutions are relevant so that there is a greater commitment not only in teaching but also in the practical actions of sustainability in the world.

As a limitation of the research, it was not possible to analyze the other evaluation components of ENADE and to understand, in a broader way, how Brazilian

courses or universities are aligning their curriculum with teaching for sustainable development. Therefore, it is suggested that other researchers are committed to demonstrate how knowledge areas are teaching sustainability, starting from the assumption that areas more focused on the concept of human and social will tend to have a greater relationship with issues of sustainable development.

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