

The SDGs and the perspective of education for sustainability in the educational program of undergraduate biology courses in the Amazon region of Pará

Os ODS e a perspectiva de educação para a sustentabilidade nos projetos pedagógicos de cursos de licenciatura em biologia da região amazônica paraense

Natanael Charles da Silva ¹

Magnólia Fernandes Florêncio de Araújo ²

¹ MSc. in Biology Education, Professor, Federal Institute of Pará (IFPA), Abaetetuba, PA, Brazil
E-mail: natanaelcharles@gmail.com

² PhD in Sciences (Ecology and Natural Resources) from the Federal University of São Carlos.
Full Professor at the Federal University of Rio Grande do Norte, Natal, RN, Brazil
E-mail: magffaraujo@gmail.com

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ABSTRACT

The objective of this research was to identify the presence of Sustainable Development Goals (SDGs) in the Educational Programs (EPs) of undergraduate biology courses in the Amazon region of Pará, as well as to characterise the approach these documents take to education for sustainability. Both quantitative and qualitative document analyses were carried out, which identified that five of the 17 SDGs are present in all EPs, two were not found in any of them, and another three were present in 80% of the documents. Although they do not explicitly explore the SDGs and the concept of education for sustainability, some documents carry similarities with this perspective, as they point to the need for training professionals with socio-environmental responsibility. The research presents practical contributions, both from scientific and social points of view, which can be used in documents' guidelines and necessary actions for executing undergraduate courses coherently with the principles of education for sustainability.

Keywords: Guiding documents. Education. Amazon ecosystems. Initial education.

RESUMO

O objetivo desta pesquisa foi identificar a presença dos Objetivos de Desenvolvimento Sustentável (ODS) nos Projetos Pedagógicos de Cursos (PPCs) de licenciatura em biologia da região amazônica paraense, bem como caracterizar a abordagem que esses documentos fazem sobre a educação para a sustentabilidade. De natureza quantitativa e qualitativa, foi realizada uma análise documental, a qual identificou que cinco dos 17 ODS estão presentes em todos os PPCs, sendo que dois não foram

encontrados em nenhum deles e outros três se fizeram presentes em 80% dos documentos. Embora não explorem os ODS e o conceito de educação para a sustentabilidade de forma explícita, observam-se aproximações com essa perspectiva em alguns documentos, uma vez que eles apontam para a necessidade da formação de um profissional com responsabilidade socioambiental. A pesquisa apresenta contribuições práticas, tanto do ponto de vista científico quanto social, as quais poderão ser usadas no direcionamento de documentos e atuações essenciais para a execução de cursos superiores, preocupados e condizentes com os princípios da educação para a sustentabilidade.

Palavras-chave: Documentos norteadores. Educação. Ecossistemas amazônicos. Formação inicial.

1 INTRODUCTION

In today's world, the act of teaching goes beyond objectives and assignments related to topics, contents, descriptors, and the achievement of internal and/or external indicators for the educational institution. Education must be present from the very first moment in actions aimed at today and tomorrow, in a contextualised manner and concerned with the environment where its subjects are located, in addition to enabling both current and future practical applications.

Thus, educating for sustainability implies envisaging a new guideline for teaching practice, emphasising active learning situations and collaborative experiences to solve local, regional, and global problems. This guiding activity requires a new way of thinking about teaching and learning (FREIRE, 2007).

Petrovich *et al.* (2016), however, emphasise that guaranteeing education for sustainability means being vigilant in training future teachers. It is imperative, therefore, to train professionals not to reproduce old knowledge transmission models, thus avoiding spreading science and culture that cause environmental degradation.

With this perspective, the initial education of science and biology teachers represents an ideal space for discussions and learning about science and its nature since it is based on the initial insight of the functioning and contextualisation of science that future teachers will teach their students (BACCIN; DUTRA; COUTINHO, 2020).

In order to train teachers to commit to sustainability education, the personnel and documental bases that support and establish the initial education of these professionals need to be engaged in the topic. In addition, faculty members, management, institution, and community should all be guided by the legal and documental principles that ensure professionals in training develop ideas, changes, and actions committed to local, regional, and global sustainability.

One of these principles is the Educational Program (EP), a guiding document that describes objectives, guidelines, actions, and planning of the educational process, to form a social, critical, supportive, committed, creative, and participative subject (FREITAS, 2018). The document thus needs to follow dimensions that ensure perspectives of education for sustainability to the subjects in training.

Therefore, this research has the following guiding questions: How is education for sustainability addressed in the EPs of undergraduate biology courses in the Amazon region of Pará? Do these documents comprise the training of professionals concerned with the local reality and following the Sustainable Development Goals (SDGs)?

Based on the questions mentioned, it is worth highlighting that the SDGs proposed by the 2030 Agenda constitute guidelines for social responsibility, working as normative principles of action and as an agenda of concerns that guides different stakeholders with a focus on problem-solving (FERNANDES,

2018). The SDGs are thus a universal call to action to end poverty, protect the environment, reduce climate change and ensure that all people enjoy peace and prosperity.

According to Freire (2007), one cannot think of a sustainable community if it is not concerned with training practices; therefore, such an approach is imperative. Along these lines, the 17 SDGs proposed by the 2030 Agenda are formed by global goals grouped in four dimensions: social, economic, environmental, and institutional. These dimensions are interrelated and point to the need for bringing the global goals closer to the local problems of each city (UN, 2015), which can only be achieved through education.

In light of the approach presented, the objective of this research was to identify the presence of SDGs in the EPs of undergraduate biology courses in the Amazon region of Pará, and to characterise the approach these documents take to education for sustainability.

2 EDUCATION FOR SUSTAINABILITY IN UNDERGRADUATE BIOLOGY COURSES

Initial education as professional training plays a crucial role in enabling teachers to adopt specific knowledge and to experience, in their learning process, the development of the necessary skills to act in this new setting (BACCIN; DUTRA; COUTINHO, 2020). Therefore, for undergraduates in biological sciences, the performance context focusses on aspects such as the responsibility of acting in the study and care of most diverse forms of life on planet or associated with the development of citizens aware of their rights, duties, and responsibilities towards the environment they are located in.

From this perspective, higher education, especially in the area of biology, has the responsibility of strongly contributing to the formation of a plurality of people who might exercise leadership roles in different areas of activity, as well as those who may come to work directly with the education of other people.

Consequently, it is considered extremely important to offer education from an integrated and interdisciplinary perspective, in which sustainability can be transversal in the different areas of knowledge. Moreover, once aware, these students will be able to work to disseminate values and change mentality in society, thus contributing to an ecologically viable future (PETROVICH *et al.*, 2016).

The university in present times must be arranged to educate critical professionals and raise their awareness of the environmental reality (STANQUEVISKI, 2019). Besides, commitment to the environment at local, regional, and global levels is strictly related to the practice of science and biology teachers. Therefore, these professionals must develop the sensitivity to work alongside other individuals in training and awareness processes for the planet's welfare.

With access to the principles and approaches of education for sustainability, these professionals will have more significant subsidies in acting against negligence and disservices caused by the government and/or directors of institutions where they might work. Moreover, such diligence can make a difference in other individuals' teaching and learning processes and will add to the fight for the overall improvement and welfare of the planet.

For Gadotti (2008a), educating for sustainability is, essentially, educating for a sustainable life, which means, among other things, educating for voluntary simplicity and stillness. Accordingly, Antunes, Nascimento, and Queiroz (2018) highlight that education for sustainability arises from the need to design new directions for problems that afflict society, seeking to reflect on the possibilities that education presents for these problems fostering a fairer society for the current and future generations.

It is, therefore, understood that universities have great relevance in the reflection, formation, and dissemination of new concepts of development and sustainability, participating in the construction of another culture, thus meeting the aspirations of more just, solidary, and environmentally sustainable societies (OLIVEIRA, 2017).

Responsible for the initial and continuing education of science and biology teachers, as well as other areas, Higher Education Institutions (HEI), in addition to fulfilling their role as a legal entity within a physical environment, have the mission and duty to build an “environmental awareness” in future professionals. This awareness process will contribute to the human capacity to reverse the increasing degradation of the environment and establish planetary sustainability (SILVA; BASTOS; PINHO, 2021).

It is worth highlighting that the institutional environment, along with its curricular, professional, and attitudinal structure towards society, has a substantial and essential influence on individuals' academic and human development. All this contributes to future actions professionals in training may develop that are linked to the socio-environmental needs of the planet. In addition to possible advances and improvements that future educators will be able to bring as a contribution to society, the environment, and overall welfare.

In this context, Gomes and Ferreira (2018) point out that the SDGs show a combined mechanism of efforts and daily practices aimed at promoting the welfare of the present generations and intergenerational justice without disregarding the welfare of future generations.

Thus, by being present in the educational foundation of new professionals in the area of biological sciences, the SDGs may also be present in the professional path to be followed by these individuals, adding values of education for sustainability that are essential in becoming aware of the needs of the planet. In addition, they can contribute to improving socio-environmental problems and harmony of life in all its aspects.

3 METHODOLOGICAL OUTLINE

3.1 RESEARCH DESIGN

This research has quantitative and qualitative approaches, with a methodological procedure based on document analysis, as this type of method has the objective of understanding a given reality, not in its immediate realisation, but indirectly, through the analysis of documents produced by humans about themselves (MENDES; FARIAS; NÓBREGA-TERRIEN, 2011).

With this approach, the research is divided into five stages: a) Delimitation of the research locus; b) Research of the EP in its most current publication in the public domain on the institution's website; c) Construction of an analysis tool that can reflect the approach that the documents take to the SDGs; d) Analysis of the EPs selected in stage “a”, using the instruments built in stage “c”; e) Data analysis relating the identification of concepts and actions associated with education for sustainability present in the EPs through the identification of the SDGs in the instrument.

3.2 RESEARCH SETTING

The Amazon is known for housing a significant biological diversity in its ecosystems. However, in recent decades it has suffered the effects of climate change and anthropic action in different ways, presenting profound and perhaps irreversible changes in its biome, which can lead to regional, national, and global impacts (FERREIRA; VENTICINQUE; ALMEIDA, 2005).

Among the Brazilian states that comprise this ecosystem, Pará is the second in territorial extension, having areas of more recent colonisation, such as the southeastern part of the state. However, the oldest colonisation areas, such as Bragantina and Baixo Tocantins, are located in the northeastern mesoregion of the state (ALMEIDA, 2010).

As the setting of the research, five HEIs located in the Amazon region of Pará were chosen according to the selection criteria: a) HEIs that offer an undergraduate course in biology, biological sciences, or natural sciences with a qualification in biology or related topics; b) The biology course offered must be at least five years old; c) The institution's campus must be located in the Amazon region of Pará.

From this criteria, the following undergraduate courses were selected for this study: 1) Biological Sciences offered by the Federal Institute of Pará (IFPA) - Abaetetuba Campus; 2) Biological Sciences offered by the Federal Institute of Pará (IFPA) - Belém Campus; 3) Biological Sciences offered by the Federal University of Pará (UFPA) - Belém Campus; 4) Natural Sciences with a qualification in biology offered by the State University of Pará (UEPA) - Moju Campus; and 5) Biological Sciences offered by the Federal Institute of Pará (IFPA) - Bragança Campus (Figure 1).

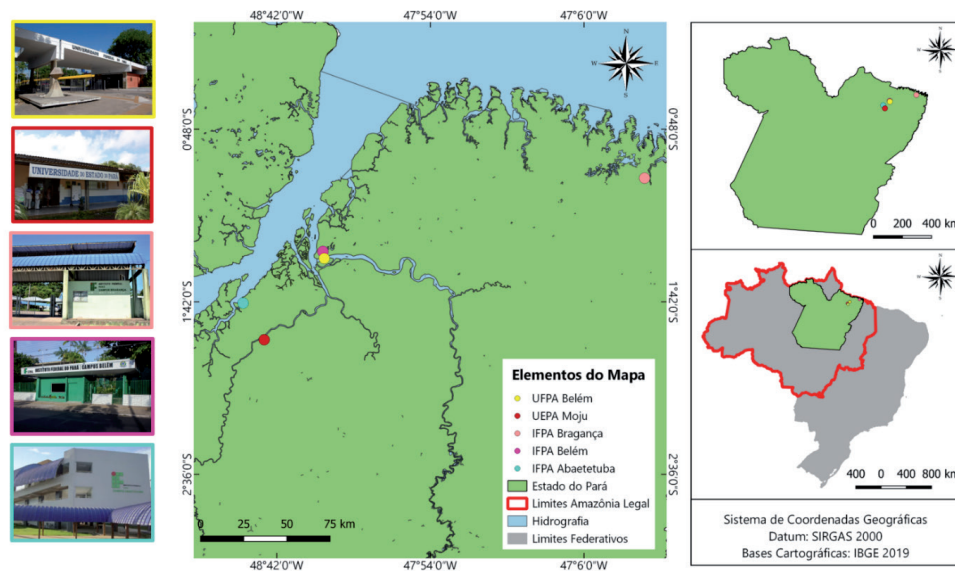


Figure 1 | Location map of the institutions participating in the research.

Source: Produced by the authors (2022).

As a way of preserving the identities of educational institutions in the tabulation, expression, and discussion of the results obtained, names of HEIs were randomly replaced by acronyms: EI1, EI2, EI3, EI4, and EI5.

3.3 RESEARCH INSTRUMENT AND OBJECTS

The instrument used in the document analysis was developed so that the analysis favoured the identification of SDGs in the documents, based on topics that are closely related to education for sustainability. In addition, such instruments were inspired by methodologies previously used by Castilho, Peña and Gil-Pérez (2021) and Lima (2020) in works with similar objectives.

The instrument (Table 1) consisted of the description of the 17 SDGs, followed by three search keywords for each. The word choice is intended to reflect the representativeness of the SDG in the analysed document through keywords related to the goal under analysis. In addition, the instrument presents a description of topics related to the SDGs and the keywords, followed by gaps to be filled in

during analysis to verify the presence, absence, and context in which the analysed word appears in the document (if present).

Table 1 | Instrument for the analysis of Educational Programs (EPs) in Biological Sciences in the Amazon region of Pará.

<i>Sustainable Development Goals</i>	<i>Search keyword</i>	<i>Related topics</i>	<i>PR*</i>	<i>AB**</i>	<i>Context</i>
01- No Poverty	Poverty	- Unequal income distribution, wealth, and extreme poverty; - Public policies for the poor and vulnerable and against inequality.			
	Vulnerability				
	Eradication				
02- Zero Hunger	Hunger	- Food waste; - Monoculture, transgenics, pesticides and insecticides.			
	Food security				
	Sustainable agriculture				
03- Good Health and Well-Being	Health	- Contagious diseases, sexually transmitted infections, mental disorders, and drug addiction; - Health promotion.			
	Well-being				
	Life expectancy				
04- Quality Education	Inclusive education	- Illiteracy and related factors; - Discrimination related to cultural diversity and disregard for historical and natural heritage.			
	Equal education				
	Teaching-learning				
05- Gender Equality	Gender equality	- Gender inequality and access to rights; - Workplace democracy, economic rights, equity.			
	Women's empowerment				
	Discrimination against women				
06- Clean Water and Sanitation	Clean water	- Water wastage and contamination; - Drinking water, water reuse, and basic sanitation.			
	Sanitation				
	Water resources				
07- Affordable and Clean Energy	Renewable energy	- Wind energy, solar energy, tidal energy, geothermal energy, hydropower energy, etc.; - Saving energy and energy resources.			
	Affordable energy				
	Energy efficiency				
08- Decent Work and Economic Growth	Economy	- Slave labour, economic crisis (unemployment, low wages, inflation); - Subsistence agriculture, handicraft work, fishing, tourism.			
	Sustainable development				
	Employability				
09- Industry, Innovation, and Infrastructure	Industrialisation	- Sustainable construction (energy efficiency, water saving, and reuse, technologies and materials that do not harm the environment); - Waste management, passive use of natural resources, reuse.			
	Sustainable infrastructure				
	Industrial innovation				

Sustainable Development Goals	Search keyword	Related topics	PR*	AB**	Context
10- Reduced Inequalities	Social inclusion	- Unequal income distribution, wealth and extreme poverty, public policies for the poor and vulnerable; - Prejudices (racism, misogyny, LGBT-phobia, xenophobia, etc.			
	Social inequality				
	Social policies				
11- Sustainable Cities and Communities	Urban sustainability	- City planning; - Sustainable construction, water saving and reuse, waste management, and passive use of natural resources.			
	Cultural heritage				
	Urban resilience				
12- Responsible Consumption and Production	Sustainable management	- Waste disposal and treatment, recycling, reuse, reduction, and restoration; - Emission of greenhouse gases from burning fossil fuels and cars.			
	Natural resources				
	Waste reduction				
13- Climate Action	Climate change	- Drought and global water shortage, floods; - Natural disasters (wildfires, tsunamis, storms, hurricanes, tornadoes).			
	Natural disasters				
	Environmental policies				
14- Life Below Water	Aquatic ecosystems	- Increase in ocean temperature and level, marine pollution; - Loss of marine biodiversity.			
	Conservation of aquatic biodiversity				
	Water pollution				
15- Life on Land	Terrestrial ecosystems	- Loss of marine and terrestrial biodiversity, extinction, and trafficking of fauna and flora species; - Degradation of ecosystems and biomes, ecological relationships, ecosystem services, actions for protecting and preserving the environment, and rehabilitation of species.			
	Biodiversity				
	Environmental preservation				
16- Peace, Justice, and Strong Institutions	Social justice	- Citizen action and social responsibility; - Armed conflicts, insecurity (robberies, burglaries, murders), and violence.			
	Peaceful societies				
	Social equality				
17- Partnerships	Globalisation	- Relationship and partnership within and between countries; - Advances in science, technology, economy, etc.			
	Transparency in public policies				
	Social responsibility				

*Presence of the word in the analysed document. **Absence of the word in the analysed document.
Source: Produced by the authors (2022).

3.4 DATA COLLECTION AND ANALYSIS

The most recent EP of each course selected for the research was downloaded directly from the institutions' official websites and saved in PDF format. Then, the EPs were digitally analysed through the Adobe Acrobat Reader's search tool (Ctrl + F) to find keywords in the document.

After analysis, the data were tabulated in an Excel 2017 spreadsheet considering the categories “present”, “absent” and “context”, according to how the group of three keywords considered for each SDG appeared in the document.

With this information, the context of the searched words was assessed based on content analysis which, according to Santos (2012), is a “deep” reading, determined by the conditions offered by the linguistic system, and it aims to discover the relationships between the content of speech and the external aspects. In addition, this technique allows the understanding, use, and application of certain content, promoting the interpretation of the approach to the topic of education for sustainability in the EPs of the courses under analysis.

It is worth mentioning that the document (EP) was read in its entirety, but with emphasis and greater attention to the parts in which the keywords were located. This reading is part of the content analysis process, analysing the presence and/or absence of the keywords in the text, and their meaning and context, interpreting them in the construction of the EP.

In addition, a quantitative analysis of the data was carried out in the Past software version 4.07b, to present a chart with the frequency of the keywords that represent the SDGs found in the institutions’ EPs.

4 RESULTS AND DISCUSSION

4.1 GENERAL ASSESSMENTS ABOUT THE PRESENCE OF SDGS IN THE EPs OF UNDERGRADUATE BIOLOGY COURSES IN THE AMAZON REGION OF PARÁ

The analysis of the presence and/or absence of words related to the SDGs in EPs of the courses considered in this research showed that of the five educational institutions examined, SDGs 3, 4, 8, 15, and 16 were found in all EPs. In contrast, SDGs 5 and 11 were not found in any documents, and SDGs 10, 12, and 14 appeared in 80% of the documents analysed (Table 2).

Table 2 | Occurrence of SDGs in EPs of the institutions considered in the research.

Sustainable Development Goals	Educational Institutions Considered in the Research				
	EI1	EI2	EI3	EI4	EI5
1		X			
2		X			
3	X	X	X	X	X
4	X	X	X	X	X
5					
6		X	X	X	
7					X
8	X	X	X	X	X
9					X
10	X	X	X		X
11					

Sustainable Development Goals	Educational Institutions Considered in the Research				
	EI1	EI2	EI3	EI4	EI5
12	X	X	X	X	
13		X			X
14		X	X	X	X
15	X	X	X	X	X
16	X	X			X
17		X	X	X	X
Total	7	13	9	8	11

Source: Research data.

By expressing the aims and principles of a particular SDG, the document that guides the course can plan new advances and improvements, as long as they are well oriented and thought out. This is because the SDGs claim efforts for genuinely overcoming the problems that affect humanity and the environment over the years. Therefore, it is relevant to point out that the SDGs' central purposes are similar to the dimensions of sustainability (GOMES; FERREIRA, 2018).

For Corrêa and Ashley (2018), higher education commonly incorporates the agenda of environmental education, sustainability, and sustainable development with different interpretations and approaches in educational programs and curricula, in institutional documents, in everyday speeches, in teacher training, and the contents and practices of teaching and learning. However, there is still not enough dialogue maturity in many cases to understand such issues.

For a more in-depth analysis of how the EPs address the SDGs, Figure 2 shows the frequency of keywords corresponding to the SDGs that were detected in all EPs (SDGs 3, 4, 8, 15, and 16) of the five institutions, and EI3 and EI2 were the ones that most expressed words related to these SDGs in their EPs.

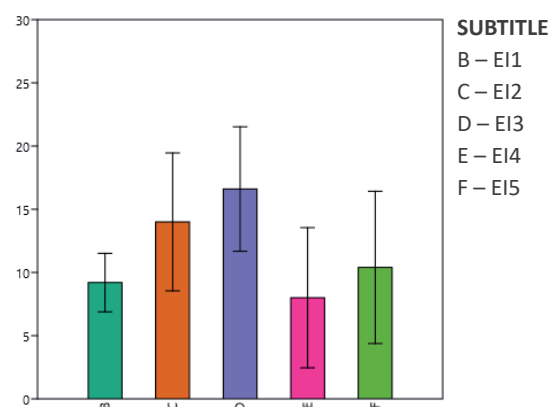


Figure 2 | Frequency of keywords representing the SDGs detected in the five institutions analysed.

Source: Research data.

It is possible to infer from the chart that EI3 and EI2, by showing a significant frequency of keywords related to the SDGs in question, stand out as institutions that are mindful of topics such as health, well-being, social responsibility, and quality education, labour conditions, and terrestrial ecosystems. Such

concern in the initial education of future professionals in biological sciences aligns with the principles of education for sustainability.

This shows, for example, that when EI2 states in its EP "the education of future professionals promotes the understanding of the historical process guiding the construction of knowledge in the area of biology. Besides, it highlights the importance to society through education, of various aspects of its socio-political performance and for the practice of sustainable development in the country", the institution is clearly in compliance with SDG 4 (quality education). Thus, the institution demonstrates that the course is committed to building knowledge in biology, whose importance lies in the sustainable development of the country and the region where it is located.

It shows that EI2 and EI3, based on the considerable frequency of words related to SDGs 3, 4, 8, 15, and 16, are not only under the perspectives of education for sustainability in the education of their professionals, which would already be of great value. They are also interested in the qualification of their future professionals. Such interest derives from the concern above mentioned HEIs have in educating citizens to respect and contribute to the sustainable development of the Amazon, a region where the courses take place and where most professionals will work after graduation.

In this context, Guerra and Figueiredo (2014) draw attention to the fact that curricular environmentalisation can be defined as a continuous and dynamic process aimed at educating professionals to be committed to the permanent search for the best possible relationships between society and nature. Therefore, seeking to educate professionals involved with the region's social and environmental issues is a first step in the continuous education process and adoption of values to be considered and worked on throughout the life of the human being.

In other passages, for example, EI3 states in its EP that the course aims to "interact with modern approaches and principles of sustainable development, relating educational knowledge with biological knowledge", in addition to "educate holistic, critical, autonomous and humanitarian professionals for the exercise of citizenship and social responsibility".

Consequently, there is a context that approaches SDGs 8 (decent work and economic growth) and 17 (partnerships) since the institution seeks an education focused on society, meeting social and humanistic responsibility principles. It is believed, however, that this type of education leaves something to be desired in the environmental approach, given that both approaches (social and environmental) deserve equal attention and concern in the education of a qualified professional responsible for the well-being of current and future generations.

When seeking education in this manner, institutions agree with Freire (2007), who states that the global crisis that humanity is experiencing is the result of our way of life and our collective values and, therefore, it can be considered a cultural crisis. However, culture plays a central role in the complex notion of sustainability in whatever form it takes in the future, as it depends on our decisions and actions at a local level.

It is also important to point out that all institutions address SDG 4 in their EP to ensure access to inclusive and quality education. However, some institutions stand out, such as EI1. It aims to "minimise the effects of social and regional inequalities on the permanence and completion of higher education". On the other hand, EI3, aims to "be mindful of the reality in which it will operate and the need to become a transforming agent of such reality, aiming to improve the quality of life of the human population, assuming its responsibility in the preservation of biodiversity as a heritage of humanity".

Regarding the curricular components that comprise the courses' EPs and their respective approaches, it can be noted that EI2 and EI3 contemplate the various dimensions considered by the 2030 Agenda regarding the SDGs (social, economic, environmental, and institutional goals).

The different axes of curricular components within the EP are a positive factor, as education for sustainability should not be limited to one subject or module within the course. However, it must be present throughout the course, from teaching to research and community activities. In the documents of the other institutions, it was possible to observe the prevalence of some dimensions, but never all four.

Therefore, the inclusion of topics related to the principles of education for sustainability in the curriculum of initial education becomes essential regarding the process of raising awareness of the academic community about the importance of environmental sustainability, which is a topic that should permeate the diversity of academic subjects and practices in HEIs. It can be combined with adequate management and full cooperation between the various institutional bodies and, under current regulations, involving all who are part of it, such as staff, faculty, and students (SANTOS, 2018).

Individually, it is possible to note that, although it mentions a few keywords from the data collection instrument, EI5 contextualises them vaguely and superficially, thus not allowing an actual definition of their importance to the institution. On the other hand, EI1, EI2, EI3, and EI4 seem more engaged in expressing the concepts related and contextualised with the SDGs, even though they do not directly mention the goals in the documents.

In this research, EI2 is the institution that most addresses the concepts, goals, and principles of education for sustainability through the presence of SDGs in its EP. This occurs not only because it expressed 13 of the 17 SDGs, but also through the homogeneity of approaching these principles. Furthermore, from the introduction to the objectives and description of the curricular components of the course, it was possible to identify elements related to the objectives of the SDGs and are associated with the context pointed out in the analysis instrument developed in this study.

Therefore, rethinking the initial education of science and biology teachers following the SDGs and from the perspective of education for sustainability should be a priority in all HEIs. This action can help these future teachers to re-elaborate and re-signify spaces and learning situations in the school environment. It can also encourage them to participate in forming interdisciplinary teams on the sustainability topic at school (PETROVICH *et al.*, 2016).

Thus, it is understood that this is a measure that actively helps the school community to adopt and prioritise issues related to education principles for sustainability in the educational environment.

4.2 WHAT DO EPS EXPRESS ABOUT EDUCATION FOR SUSTAINABILITY?

It was possible to observe that none of the analysed EPs had, directly and explicitly, the application and contextualisation of the term "education for sustainability". However, based on the context of the SDGs, there were expressions and excerpts in the documents referring to the principles of education for sustainability, which allowed recognising the consonance between the approach to sustainability and the purposes of the course through its EP, albeit in a subtle way.

In this perspective, Gadotti (2008a) points out that educating for sustainability implies changes in the system and respect for life, including everyday care for the planet and the entire community of life. To educate for life, EI4, for example, emphasises in its EP that the biologist must be able to solve some obstacles, among which the following is mentioned: "the biology teacher must use biological knowledge to awaken a sense of responsibility in basic education students".

Therefore, one can perceive the great responsibility of trained professionals concerning their functions. This is because, by educating citizens to be aware of their social responsibilities, these professionals will be responsible for the care and maintenance of life on the planet, in addition to being in line with SDG 16 (peace, justice, and strong institutions) and 17 (partnerships).

Moreover, Unesco (2017) points out that education for sustainability fosters the development of better-informed citizens with new values, skills, attitudes, and behaviours, ensuring harmony and balance between social and ecological processes. Along these lines, EI2 demonstrates in its EP, on environmental education policies, that “sustainable development is one of the values that guide the institution’s actions, being essential for it to act in line with current social, environmental and economic issues, and should be widely disseminated in order to support the development of citizens who are critical and aware of their role in society”.

However, it was found through content analysis that although the institution uses the term “sustainable development” in its EP, as shown in the excerpt above, the concept used is more associated with the principles of education for sustainability. This is one of the recurrent cases in which the use of the terminologies “sustainable development” and “education for sustainability” is mistaken.

Effectively, the institution values the development of critical and conscientious citizens before society’s problems, aspiring thus that their actions after graduation may reflect the type of education received during undergraduate studies. This fact aligns with SDG 8 (decent work and economic growth) and with the principles of education for sustainability.

In addition, the EPs are interested in having professionals aware of their responsibility towards the planet’s biological diversity at local and global levels. It is understood, therefore, that since biodiversity is essential for the maintenance of life on earth, promoting professional awareness about interferences in the environment is necessary for disseminating and executing the principles of education for sustainability.

Higher education has a priority role insofar as future professionals are the ones who will have to work with the social, environmental, and economic resources. Such professionals need, therefore, to realise their role in the search for social transformations and improved well-being for current and future generations (LOUREIRO; PEREIRA; PACHECO JUNIOR, 2016).

In this perspective, EI2, in the topic of general competencies to develop in the education of graduates in biological sciences, considers it essential to “conduct educational practices that are consistent with reality and concrete possibilities of education in the process of social transformation, aiming at collective welfare”, which can be related to SDG 10 (reduced inequalities). Therefore, the institution proposes the possibility of behavioural changes and comprehensive social education to its students, presenting practical action perspectives that support the community and the environment.

Considering the social purpose of educational institutions, education for sustainability comprises more participatory learning, which creates ways of building more contextualised and, therefore, more meaningful knowledge. Participation, co-creation, and co-responsibility are thus deemed as central aspects of this approach, focusing on the importance of collective, collaborative, and democratic processes in the search for more sustainable societies (GRANDISOLI *et al.*, 2020).

It is understood that undergraduate biology science courses should offer students teaching and learning practices that encourage them to transform society and participate in its problems. Then, facing such problems, they will be able to think critically about innovative solutions within sustainability principles.

Such actions can be seen in the EP of EI4, on the topic of living beings and the environment: “knowing the main environmental problems, such as pollution, exploitation of natural resources, global changes, conservation, and development”. This aspect is part of the duties of the professional in training, thus elucidating the confrontation that future teachers will experience in their professional life. It is worth mentioning that appropriate training can contribute towards pointing out solutions to the problems experienced.

In this context, Carletto and De Oliveira (2017) draw attention to the fact that the teacher, as a social actor and mediator of students' demands for society, needs to discern the problems of their sector with a view to the educational purpose of their practice and, thus, fulfil their role, contributing to the complete development of citizens.

4.3 PERSPECTIVES AND POSSIBILITIES FOR NEW PATHS AND APPROACHES

Pointing out possibilities for new paths and perspectives that could be adopted by undergraduate biology courses in the Amazon region of Pará does not mean dictating rules or a magic recipe. Instead, it means exposing perceptions based on this study about the guiding documents of a sample of courses in the region, an intersection with the SDGs. The intention is thus to identify possible effects and applications carried out by one institution that, when added together, may present more significant results regarding the principles pointed out.

For Pereira *et al.* (2013), some changes are essential for creating a more sustainable society, as there is no way to maintain the current form of unbridled consumption, which requires a global rethinking in search of a more egalitarian society. Along these lines, the EP of EI2 points out that the course's curriculum framework must "provide the students with a holistic, critical, autonomous and humanitarian education, guiding them to the exercise of citizenship, the respect for human rights and the social responsibility they have as a biology professional". With this approach, it is possible to develop future professionals concerned with social equality and aware of their role in society and the planet, contributing to the improvement and harmony of both.

Therefore, as teacher trainers, universities must provide qualifications consistent with their role as agents of change in the new model of citizenship demanded by today's society. They should include, among other aspects, the dimension of sustainability in the education of its students (ALARCÃO *et al.*, 2018).

Regarding this dimension, EI2 also points out that biology graduates should "be mindful of the reality in which they will work and the need to become a transforming agent of such reality". This approach is under the definition of sustainability presented by Boff (2012), who relates the term to the concern with the existence and maintenance of natural resources with the possibility of an environment suitable for the continuity of future generations. Similarly, it complies with SDGs 14 (life below water) and 15 (life on land).

However, it will not be possible to qualify professionals aware of their role as belonging to the dimensions of sustainability if the educational institutions do not address, in their courses, the guiding principles and goals of education for sustainability beginning in their normative documents. Conversely, demanding such principles and goals should work as a chain of effects, in which faculty members will be able to use the document as a basis for the development of their activities and, in turn, the students will be based on the dynamics, activities, and principles disseminated by their teachers.

In the EP of EI1, for example, the institution aims to "contribute to the promotion of social inclusion through education", showing compliance with SDG 4 (quality education). It emphasises, with this instrument, that education contributes to social inclusion and many other principles necessary for a collective, harmonious and sustainable life.

In this respect, Gadotti (2008b) considers that the reach of sustainability culture should be in agreement with education for thinking globally, for feelings, for teaching earthly identity, for planetary consciousness, understanding, and voluntary simplicity. It is, therefore, a pedagogical practice that goes from diluted responsibility to concrete and shared action, exercising sustainability in all sectors of our lives.

That being said, it is hoped that the guiding principles of education for sustainability will contribute to a change in governance and the mobilisation of society through education (GROHE; DA SILVA, 2022). Therefore, educational institutions and communities must go through a transition that engages them with preserving the environment and people's welfare.

In this process, teachers are a crucial factor whose training has a multiplier effect that must be reproduced in their future professional careers (VARELA-LOSADA; ARIAS-CORREA; VEGA-MARCOTE, 2019). Educating for sustainability means, in this context, recognising the role of education both in raising awareness of the impact of social organisation on the environment and in the development of societies that are concerned with reducing such impacts in order to establish sustainable models of social organisation (JACOBI; SULAIMAN, 2017).

This study, therefore, considers the need for educators to reflect on concrete actions at all levels of education so that a sustainable future can be created. Such praxis should raise the importance of access to knowledge that instigates discussions about environmental vulnerability with the unbridled exploitation of the planet's resources while proposing practical actions aimed at its sustainability (ARAÚJO, 2021). These measures may help students from EIs in the Amazon region of Pará to do the same, making the educational space an active environment concerned with social and environmental welfare.

5 FINAL CONSIDERATIONS

By identifying the limited existence of studies that investigate the approach that EPs of undergraduate biology courses take on the SDGs and education for sustainability, this study makes its contribution insofar as it identifies and points to the existence of an approach that relates to the SDGs agenda. However, sometimes this occurs indirectly, out of context, or without depth.

When addressing sustainable development goals in their conception, development, and execution context, the investigated institutions are mindful of the prospect of new directions for society and the planet. This demonstrates a concern with the education of new professionals and, consequently, with cultivating a planet with humanity concerned with maintaining life and social and environmental rights for current and future generations.

It was also possible to identify that some institutions are only concerned with growth and social perspectives. Consequently, their courses dedicate great effort and attention to solving problems that will improve the quality of life of the human being, without paying attention, for example, to the fact that such improvement depends directly on protecting the environment in which these individuals are included.

The contributions of this research permeate three dimensions: 1) practical, when it indicates one of the institutions as the one that presents a complete approach to the principles of education for sustainability; 2) theoretical, when it details the approach that the guiding documents of the courses take on the SDGs; and 3) social when it contributes with notes and possibilities of paths for institutions that offer higher education.

The first dimension serves as a guide for other institutions in moments of reformulation and/or construction of their EPs, providing guidelines so that these documents present equity between what is expected of a professional in the area and the concepts and principles of education for sustainability. The second dimension provides an overview of actions humans, through EPs, have on their role in the environment where they are included. Moreover, the third one, based on pointing out different possibilities and paths, makes it possible for future professionals to be increasingly engaged and critical of socio-environmental issues.

It was possible to observe, as future perspectives, the need to update the EPs of undergraduate biology courses not only as a temporal necessity, given the fact that some documents are recent, but as a concern related to contents and socio-environmental issues, in addition to the graduates' view about the need to act under the principles of education for sustainability. This premise gives clarity and objectivity to these principles in the production of documents, thus facilitating the understanding and development of the actions proposed by the course's pedagogical components.

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