

Environmental training and individual skills for environmental sustainability: a study of three Brazilian chemical companies

Treinamento ambiental e competências individuais para sustentabilidade ambiental: um estudo em três empresas químicas brasileiras

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Abstract

This paper aims to analyze how the environmental training process can contribute to the development of individual competencies associated with the environmental dimension of sustainability in large companies in the Brazilian chemical sector. The need to fill theoretical and methodological gaps on the role of the environmental training process, targeted at the environmental dimension of sustainability in the context of companies in the Brazilian chemical sector justifies this study. A qualitative research approach with multiple case studies based on triangulation of evidence sources addressed the theme. The results confirmed that the systematization of the environmental training process can potentiate the development of individual competencies, essential to the sustainability of the companies of the Brazilian chemical sector, considering that the environmental training process is directed at stimulating and developing the competencies aligned with the organizational strategy, based on identified competence gaps.

Keywords: environmental training; skills development, sustainability, chemical sector.

Resumo

O objetivo geral deste trabalho é analisar como o treinamento ambiental pode contribuir para o desenvolvimento de competências individuais associadas à dimensão ambiental da sustentabilidade em grandes empresas do setor químico brasileiro. Tal estudo justifica-se pela necessidade de se preencher *gaps* teóricos e metodológicos sobre o papel do processo de treinamento ambiental, visando à dimensão ambiental da sustentabilidade no contexto das empresas do setor químico brasileiro. O tema foi tratado utilizando-se abordagem de pesquisa qualitativa com estudo de caso múltiplo baseada em triangulação de fontes de evidências. Os resultados apontam para a confirmação de que a sistematização do processo de treinamento ambiental pode potencializar o desenvolvimento de competências individuais, essenciais à sustentabilidade das empresas do setor químico brasileiro, considerando-se que o processo de treinamento ambiental é voltado para estimular e desenvolver as competências individuais alinhadas à estratégia organizacional, a partir dos *gaps* de competência identificados.

Palavras-chave: treinamento ambiental; desenvolvimento de competências; sustentabilidade. setor químico.

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1 INTRODUCTION

Society, governments, and organizations' interest in the sustainability theme is growing. The chemical industry in Brazil plays an important role, occupying third place, in 2018, in the development of the Brazilian industrial Gross Domestic Product (GDP) and, in 2018, sixth place in terms of net sales in the world (ABIQUIM, 2020). Although this sector develops essential products for humanity, chemical production has generated discussions regarding its role regarding sustainability. This is mainly due to the inconveniences caused, such as the formation of toxic by-products, environmental contamination, and risks presented by products and processes that generate volumes of toxic effluents.

Soto (2012) states that despite the improvement in the numbers regarding the reduction in the rate of accidents with lost time, emissions, and water consumption, the production volume grew more than the improvement achieved. Specifically, there was an increase in environmental and social, in terms of absolute values, presenting challenges and dilemmas specific to the chemical industry, such as hazardous chemicals, climate change, greenhouse gases and energy, water consumption, use of non-renewable raw material, post-consumption, and strengthening of relationships. Given these challenges, the adoption of sustainability by chemical industries can be a great opportunity for the development of the sector (Soto, 2012).

Environmental training presents as one of these organizational dimensions with an important role for companies that "embrace the philosophy of sustainability" (Jackson, Schuler, & Jiang, 2014, p. 40; Jabbour & Santos, 2008b).

Among the gaps in studies on environmental training, Jabbour (2013) highlights that the studies performed did not explore the stages of the training process.

Thus, the author emphasizes the value of developing studies that seek to contribute to the knowledge of the stages of the environmental training process.

From the gaps presented concerning the theme of environmental training, the general objective is to analyze how environmental training can contribute to the development of individual skills associated with the environmental dimension of sustainability in companies in the Brazilian chemical sector. To contribute to the achievement of this objective, we defined the following specific objectives: a) to characterize the environmental training process developed by the chemical companies studied; and b) to identify in these companies the individual competencies considered relevant to environmental sustainability.

2 THEORETICAL FRAMEWORK

2.1 Environmental Training

Environmental training is defined as a process of on-the-job training and continuing education that seeks to achieve corporate environmental management's objectives and purposes of corporate, enabling all organizational levels to integrate the organization's performance with environmental issues (Teixeira *et al*, 2016). This choice is warranted by the fact that the concept highlights the strategic dimension of environmental training, as it is not only characterized as a technical dimension, covering those who work in environmental management positions, but extends to all organizational levels. It is also not only associated with an instructional activity, but with a continuous process of education, with the objective of organizational performance in the environmental dimension.

Dermol and Cater (2013) defined training as a process of updating, reviewing, and systematizing employees' knowledge, skills, habits, and competencies, not only in specific situations attributed to the current

job but also seeking to anticipate and satisfy the organization's future needs, based on real needs of employees and organizations, to identify potential environmental changes. Such thinking is in line with the characterization of environmental training in its three sub-processes: needs analysis (diagnosis); development (planning and execution); and evaluation.

2.1.1 Training Needs Analysis

Training needs analysis covers both descriptions of gaps in knowledge, skills, and attitudes, which are basic components of work-oriented competencies, and gaps in competencies related to the various spheres required by society (Abbad & Mourão, 2012; Silva & Menezes, 2012).

The analysis of the gap between the competencies that people in the organization have and those necessary to achieve organizational goals should be the route followed by the analysis of training needs, considering three levels of analysis: organizational (involving the needs arising from the mission and the organization's strategies); operational (analyzes the requirements of the skills that contribute to achieving the objectives of each job), and individual level (assesses the performance gap of each individual according to established standards). These need to focus on the process of deciding who and what should be trained (Narashimhan & Ramanarayanan, 2014; Salas & Cannon-Bowers, 2001).

Arshad, Yusof, Mahmood, Ahmed, and Akthar (2015) described the two approaches, reactive and proactive, in the development of training needs assessment. In a reactive perspective, the assessment of needs is based on the difference between the performance in the expected and performed work, not focusing on the competencies

necessary for the organization's strategic objectives. In the proactive approach, there is an expansion of the area of analysis, seeking to assess the business environment in which senior management is included in the assessment, striving to determine the skills necessary for the important changes that occur in the organization, to respond to the fundamental demands for the competitiveness of this organization.

2.1.2 Training Development

Strategies for the development of training activities can be defined as tools, contents, and methods that must be combined by the training program to achieve the proposed objectives, based on four basic principles: presenting relevant information or concepts to be learned; demonstrate the knowledge, skills, and attitudes that must be developed; create opportunities for practical application of skills and, finally, provide feedback during and after training (Salas & Cannon-Bowers, 2001).

The development of training strategies includes the planning and execution of actions that consist of "writing the instructional objectives, choosing the mode of delivery of the instruction, establishing the sequence of objectives and content, selecting or creating instructional procedures, defining educational criteria learning assessment, and test of instructional design" (Silva, Moura & Zanelli, 2005, p. 232).

Among the steps presented by Abbad, Zerbini, Carvalho and Meneses (2006), when dealing with the instructional design that makes up the process of instructional planning, it is possible to verify the steps that will be analyzed in this work, as displayed in Figure 1: Steps in the development of training strategies.

Figure 1 - Steps in the development of training strategies.

Steps	Description
Choice of modality	The characteristics of those who will receive the educational training must be considered, such as demographic, professional, and functional profile; learners' competency discrepancies; complexity and nature of instructional objectives; and available financial, technological, and material resources. The modalities can be face-to-face, distance, or blended.
Establishment of sequence	From a less complex domain to a more complex one, based on the sequence of requirements needed to be learned.
Creation/Choice of procedures	Instructional procedures are dependent on the means or tools and specific environmental conditions. The procedures must fit the objectives and characteristics of the clientele. The resources to be used must be based on the skills to be developed and the modality to be used.

Source: adapted from Abbad, Zerbini, Carvalho and Meneses (2006).

2.1.3 Training Evaluation

Assessing what happens after training, developing methods and processes that assess training, and events that ensure the transfer and application of new knowledge, skills, and attitudes, are as essential in what happens before and during training. However, it is difficult to carry out these activities, as it is intense and expensive work, difficult to execute, and that often does not present good news (Salas & Cannon-Bowers, 2001). To contribute to this training evaluation process, some authors have developed training evaluation models, as well as analyzed training evaluation considering

the transfer of training understood as the degree to which the trained individuals apply and maintain to their work context, for a period, the knowledge, skills, and attitudes acquired in training (Baldwin & Ford, 1988).

The training assessment models that underlie this work present the complexity of the assessment process. Several factors influence this process and can compromise its result. Both elements of the training itself and external to it characterize the complexity of training evaluation. Figure 2: Synthesis theoretical basis for training evaluation presents a synthesis of the theoretical basis with its authors, regarding the training evaluation.

Figure 2 - Synthesis theoretical basis for training evaluation.

Dimension	Features	Description	Authors
Transference	Horizontal or impassable	Dissemination of learning at the same level, whether individual, group, or organizational	Abbad, Pilati and Pantoja (2003)
	Vertical or interlevel	It concerns the transmission of acquired or developed skills from one level to another, both in a top-down and a bottom-up sense.	
	Generalization	Transferring what was learned in the training to the work environment.	Baldwin and Ford (1988)
	Maintenance	Application of what has been learned to work over a long period.	
Evaluation level	Reaction	Measure that indicates customer satisfaction with training involving various criteria such as content, resources employed, and material	Kirkpatrick (2010); Borges-Andrade (2006);
	Learning	It seeks to identify acquired knowledge, skills developed or improved, and modified attitudes. Assessment of learning is a more difficult level than the assessment of reaction.	Kirkpatrick (2010) Holton (1996); Baldwin and Ford (1988); Borges-Andrade (2006).

Assessment level	Behavior	Regarding the extent to which participants change their behavior at work as a result of training, also called transfer of training. Such a change requires consideration of many factors and a more scientific approach.	Kirkpatrick (2010); Borges-Andrade (2006).
	Individual performance	The learning results achieved by the intervention of the area of people management will change the individual's performance and, consequently, will result in a better level of organizational results.	Holton (1996)
	Results	It includes growth in sales, improvement in the quality of products and/or services, increased productivity, increased profits, reduction of work accidents, employee turnover and absenteeism, reduction in the rate of rejected products, improvement in interpersonal communication and human relations, and improved time management.	Kirkpatrick (2010); Holton (1996); Borges-Andrade (2006).

Source: adapted from the cited authors.

2.2 Environmental Sustainability

There is a rich debate in academia, with theoretical diversity on the concept of sustainability. However, Brundtland's report (1987) presented one of the most adopted concepts: humanity can meet its present needs, without compromising the ability of future generations to meet their own needs (Claro, Claro, & Amâncio, 2008).

A common element in the theoretical discussion on sustainability is that it is composed of three interrelated dimensions: economic, environmental, and social. Regarding the environmental dimension of sustainability, the principles are to make rational use of natural resources; properly treat, and make available the generated waste (Severo, Dorion, & Guimarães, 2017). The adoption of environmental practices contributes to minimizing damage to the environment through environmental management planning by organizations (Severo, De Guimarães & Morais, 2020). The development or modification of products, services, or processes without neglecting environmental demands contributes to companies acquiring a competitive advantage (Santos *et al.*, 2019).

Environmental sustainability at the organizational level is defined as a series of policies connected with activities and

decision-making in a way that ensures the organization's existence and maximizes the positive impacts on society, understanding natural capital in two main ways: critical natural capital, that it is essential for ecosystem life and integrity; and renewable natural capital that can be recovered or replaced. The environmental pillar of sustainability is characterized by prioritizing the prevention of negative environmental impact generated by the organization. To accomplish this, they must seek compliance with government regulations; develop recycling initiatives, have efficient use of energy, water, and natural resources; by minimizing practices that may affect future generations' access to resources; as well as for considering the impact of the life cycle of the products (Elkington, 2001; Munck & Borim-de-Souza, 2012). Thus, the aspects of environmental sustainability performance are related to the use of materials; energy consumption; water use; biodiversity; effluents and waste; pollutant emissions; recycling programs; environmental impact complaints mechanisms; participation in a voluntary environmental program; being a member of an environmental group; supplier assessment with an environmental focus; have an environmental management system; measurable goals for employee training (Elkington, 2001; Demajorovic, 2003; Collins *et al.*, 2006).

The environmental dimension of sustainability, which is the focus of study in this work, in interaction with the other two dimensions, develops eco-efficiency and environmental justice. The eco-efficient logic involves the economic and environmental pillars, being characterized by the supply, at competitive prices, of products and services that satisfy human needs, reducing negative ecological impacts and resource intensity during the life cycle to a level close to bearable, without compromising future generations. It seeks economic prosperity through the more efficient use of natural resources, generating less harmful emissions to the environment, and contributes to economic and environmental sustainability. The structure of environmental justice arises from the balanced relationship between the environmental and social pillars and is associated with intra- and intergenerational equity, which considers both equity between living people and between the balance of advantages between different generations, even those who are still unborn (Elkington, 2001; Munck & Borim-de-Douza, 2012).

2.3 Individual Skills aligned with Environmental Sustainability

Wiek, Withycombe, and Redman (2011) defined competence for sustainability as a functionality related to complex knowledge, skills, and attitudes that enable success in developing tasks and problem solving that relate to the challenges and opportunities of sustainability in the real world.

Lambrechts, *et al.* (2012) referred to the individual's key competencies as those skills that are relevant and useful to address challenges from different contexts of modern society. Among these challenges is sustainable development. Such skills involve psychological prerequisites that include cognitive and non-cognitive aspects.

Barth, *et al.* (2007), present two approaches that can be used to understand the acquisition of competencies: one based on the development of a deep stage of consciousness through a complex cognitive process that considers the construction of mental models; and the other is based on the internalization of values, through a process of learning, production, reproduction, and communication of values. (Barth *et al.*, 2007).

When considering all the theoretical approaches highlighted for this work, the model established by Jabbour and Santos (2008a), in which the environmental pillar is considered from the perspective of environmental management, was considered for the systematization of individual competencies aligned with environmental sustainability, the economic pillar from the perspective of innovation, and the social pillar associated with diversity. Based on this model, we present a synthesis of the main competencies mapped, regarding the development of individual competencies aiming at environmental sustainability. Figure 3: Individual competencies aligned with environmental management shows the competencies aligned with environmental management.

Figure 3 - Individual competencies aligned with environmental management.

Dimension	Competences	Authors
Environmental management	Health, safety, and environment guidance; Ability to collectively design and implement interventions towards sustainability; Ability to take responsibility for their work; Ability to think and work with a systemic view; Thinking and working with a future-oriented perspective; Get personally involved in sustainable development; Ability to integrate business and social and environmental issues; Integrate the traditional criteria of efficiency with eco and socio-efficiency, as well as with effectiveness; Dealing with differences between focus and degree of desire to maximize results; Living in communion with the environment; Environmental, social, and economic awareness; Efficiency.	Van-Kleef and Roome (2007); Wiek <i>et al.</i> (2011); Roorda (2010); Lambrechts <i>et al.</i> (2012); Barth <i>et al.</i> (2007); Eboli and Mancini (2012).

Source: adapted from cited authors

When analyzing the competencies aligned with environmental management, there is an alignment with the conceptual basis of the environmental pillar of sustainability, as well as with the eco-efficiency integration model, with the interaction of the environmental and economic pillar, and environmental justice that encompasses the environmental and social dimension of TBL.

From the theoretical context in which the environmental training process is characterized as a project targeted at developing and stimulating skills in people, in line with the organization's strategic intentions, so that skills are made viable in a context in which environmental sustainability has increasingly had more expression in the search for the development of competitive advantage for organizations (Fischer, 2002; Moraes & Eboli, 2010; Salas & Cannon-Bowers, 2001; Aguinis & Kraiger, 2009; Silva & Meneses, 2012), the following proposition is expressed in the research: environmental training can enhance the development of individual skills essential to the sustainability of companies in the Brazilian chemical sector.

After a synthesis of the main national and international theoretical approaches that discuss the stages of the training process, both in a general scope and for environmental training, the methodological aspects of the research are described.

3 METHODOLOGICAL PROCEDURES

We utilized a qualitative research approach, offering the possibility of studying the phenomenon through different research strategies, as well as allowing flexibility in decision making with the advancement of the research process (Mason, 1996).

We adopted the research strategy of the study of multiple cases, characterized by an in-depth empirical investigation of a contemporary phenomenon (Yin, 2010), useful when “you want to understand the social processes and interactions that develop in organizations” (Godoy, 2006, p. 127).

The chemical industry in Brazil plays a critical role, in 2018 occupying third place in the development of the Brazilian industrial Gross Domestic Product (GDP) and, sixth place in terms of net sales in the world (ABIQUIM, 2020). Challenges and dilemmas specific to the chemical industry present themselves, regarding the development of a sustainability strategy: hazardous chemicals, climate change, greenhouse gases and energy, water consumption, use of non-renewable raw materials, post-consumption, and strengthening relationships. Given these challenges, the adoption of sustainability by chemical industries can be a great opportunity for the development of the sector (Soto, 2012).

In seeking to align itself with sustainability, the chemical industry has

prioritized the development of products, applications, and processes to reduce or eliminate the use and generation of toxic substances, enhancing positive economic, social, and environmental impacts and controlling and seeking to minimize negative impacts (Prado, 2003; Soto, 2012).

To characterize the relevance of the chosen cases, it is contextualized that in Brazil, in 1992, Abiquim launched the Responsible Care Program to support companies in or associated with the chemical sector, and in 2011 they developed the implementation tool for the Program of Action. Responsible, which is the Management System of Responsible Care, seeks to provide companies with a tool that will help develop a culture of continuous improvement in health, safety, and the environment; conducting ethical and transparent business; protecting people and the environment; the integrity of the property; communication channels with stakeholders; the value chain, and in valuing the image of the chemical industry and its products (ABIQUIM, 2020). The criteria for selecting the cases were: being a member of ABIQUIM; have the

Management System of the Responsible Care Program and participate as an active member of ABIQUIM of the Environment Commission, which seeks to “promote the improvement of the environmental management of the associated Brazilian chemical companies and the value chain, to ensure the environmental sustainability of the processes and products, as well as contributing to the permanent improvement of society’s quality of life” (ABIQUIM, 2020). Seeking to verify the relevance in the international dimension of the cases, it was adopted as a criterion of choice that the company is also a signatory of the Global Compact, which is an initiative developed by the UN that aims to mobilize the international business community for adopting the dimensions of human rights, labor relations, environment, and anti-corruption, based on ten principles established by the Global Compact. Based on these criteria, the companies studied were: Braskem, Solvay, and Beta (fictitious name, as the company did not authorize its identification) (Figure 4: Business characterization of the companies surveyed).

Figure 4 - Business characterization of the companies surveyed.

Business characteristics	Braskem	Solvay	Beta
Nature of capital	Brazilian company publicly traded by CDP Brazil (Carbon Disclosure Project) in the transparency category.	Publicly traded foreign company	Publicly traded foreign company
Size	Large	Large	Large
Foundation	Created in August 2002 through the integration of six companies from the Odebrecht Group and the Mariani Group.	1863 by Ernest Solvay	End of century XIX
Location	With administrative headquarters in São Paulo, Braskem operates 29 industrial units in São Paulo, Rio de Janeiro, Rio Grande do Sul, Bahia and Alagoas. There are also two of its three Innovation and Technology Centers in Brazil. Braskem is also present in countries: Argentina, Chile, Peru, Colombia, Venezuela, Mexico, USA, Netherlands, Germany, and Singapore.	The group has a global presence with 47 industrial sites and 6 research and innovation centers in North America; 59 industrial sites and 10 research and innovation centers in Europe; 30 production units and 4 research and innovation centers in Asia; and 9 productive sites, and 1 research and innovation center in Latin America	The company has global and regional headquarters, research center, and manufacturing facilities in North American countries, from Asia-Pacific, Europe, Middle East, and Africa; as well as global headquarters (located in Brazil) and manufacturing units in South America.

Area and market	Adhesives, agribusiness, rubber, construction, automotive industry, lubricants, paints, and retail markets.	Automotive and aerospace, consumer products and healthcare, energy and the environment, electronics, building and construction, and industrial applications.	Transport, infrastructure, environment, and final consumer.
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Source: the authors.

The authors collected data from document research, file records, and in-depth semi-structured interviews (Yin, 2010; Godoy, 2006; Flick, 2004). Such data collection techniques are fundamental for the triangulation of collected data, which, according to Yin (2010), helps address potential problems of construct validity, as the same phenomenon occurs with multiple assessments through multiple sources of evidence.

Yin (2010), Godoy (2006) and Gil (2009) considered that the examination of documents can produce significant contributions to the case study.

Complementarily, the analysis of documents prepared by the organization starts to have information that helps in data collection through observation or interview (Gil, 2009). According to Yin (2010), documents are useful, and their most important use is to corroborate and increase evidence from other sources.

In Figure 5: Characterization of the sources of evidence of the companies surveyed.

Source: the authors, we list the social subjects of the research the sources of evidence accessed in each analyzed unit (BRASKEM; SOLVAY; BETA).

Figure 5 - Characterization of the sources of evidence of the companies surveyed.

	BRASKEM	SOLVAY	BETA
	Description	Description	Description
INTERVIEWED	<ul style="list-style-type: none"> -- Sustainable Development Director -- Responsible for the environmental aspect at all Braskem sites -- Safety and environment coordinator of the UNIPOL - SP business units -- Environment Coordinator at UNI2 - RS 	<ul style="list-style-type: none"> - Corporate security and environment manager for the Latin America region. - HR Manager responsible for the South America learning area and Corporate University 	<ul style="list-style-type: none"> - HSE Manager - Management System Coordinator - Environmental and Safety Engineer - HR Analyst in charge of training
DOCUMENTS	<ul style="list-style-type: none"> - Presentation on Environmental Management 2015 - 2017 environmental education lesson plan template - Presentation used in the Sustainable Development Leaders Workshop - Annual Report 2015 - Data available on the company's institutional website 	<ul style="list-style-type: none"> - Global Report 2015 - Complementary Annual Report 2015 - Global Report 2013 - Competence maps for the figure of leadership 2017 - Data available on the company's institutional website 	<ul style="list-style-type: none"> - 2014-2015 Sustainability Report - Update of the 2015 Sustainability Report - Health, Safety, and Environment Policy - 2016 Environment Week Program - List of Environment training 2017 - Data available on the company's institutional website

Source: the authors.

As the data analysis process, we adopted the content analysis procedures described by Bardin (2010), at two levels of analysis: at the level of each interview,

through the deciphering process that seeks to understand from the speech of a person, and, at the level that seeks intercommunication between individuals

through the process of thematic transversality. Thus, the data were interpreted based on categorization and coding.

Among the strategies described by Yin (2010), for data analysis, we enacted the strategy of having theoretical propositions that will shape the data collection plan that reflect a set of research questions, literature reviews, as well as the of rethinking rival explanations that, as said by the author, tries to define and test rival explanations that generally work with the other strategies. Being open to these strategies allows the work to find explanations in the data that will go against theoretical propositions, thus contributing to the inductive approach to work.

To complement the general strategies, we sought to use the analysis sub-strategies, pattern combination, which according to Yin (2010), is one of the most desirable for case study analysis as it can strengthen its internal validity by the analysis results if there is a coincidence between the patterns and the cross-case synthesis, applicable to the analysis of multiple cases.

The choice of the methodology described aspires to meet the general objective of the research, as summarized in the methodological matrix shown in Figure 6: Methodological matrix, in which we highlight the guiding questions that guided both the interview script and the script for document analysis.

Figure 6 - Methodological matrix.

Main objective	Specific objectives	Category of analysis	Dimensions	Guiding questions of the script	Authors
Analyze how the systematization of the environmental training process can contribute to the development of individual skills associated with the environmental dimension of sustainability in companies in the Brazilian chemical sector.	Characterize the environmental training process developed by the chemical companies studied.	Training needs assessment	Competence gaps	How is the analysis of the need for environmental training carried out?	Abbad and Mourão, (2012); Silva and Menezes, (2012); Narashimhan and Ramanarayanan, (2014); Salas and Cannon-Bowers, (2001).
			Approaches	How are new environmental training needs identified?	Arshad, Yusof, Mahmood, Ahmed and Akthar (2015).
		Development and execution of training	Choice modality	How are the environmental training processes created? How are the tools, contents, and methods of environmental training?	Abbad, Zerbini, Carvalho and Menezes (2006).
			Sequence		
			Procedures		
		Training evaluation	Transference	How do you assess the effects of environmental training processes on individuals, in the groups, and the company?	Abbad, Pilati and Pantoja (2003); Baldwin e Ford (1988).
			Learning level	How are the results of the environmental training developed in the company evaluated?	Kirkpatrick (2010); Holton (1996); Baldwin and Ford (1988); Borges-Andrade (2006).

	Identify in these companies the individual skills considered relevant to environmental sustainability.	Individual Competency Characteristics	Environmental management	What are the skills considered essential that people need to have so that their deliveries are aligned with environmental sustainability? How are the competencies aligned with the environmental dimension of the people in the company?	Van-Kleef and Roome (2007); Wiek <i>et al.</i> (2011); Roorda (2010); Lambrechts <i>et al.</i> (2012); Barth, <i>et al.</i> (2007); Eboli and Mancini (2012); Jabbour and Santos (2008a – 2008b).
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Source: the authors.

4 PRESENTATION AND DISCUSSION OF RESULTS

Figure 7 - Environmental training for environmental sustainability mapped in the investigated cases shows the training

relevant to environmental sustainability that was mapped in the investigated cases and that may be the focus of attention by other companies operating in the Brazilian chemical sector.

Figure 7 - Environmental training for environmental sustainability mapped in the investigated cases.

Cases	Environmental training for environmental sustainability
BRASKEM	Environmental Management Training; Sustainable Development Leaders Workshop; Program Skills Development; Techniques (PDCT) in Industrial Equipment and Processes; and Life Cycle Management Training.
SOLVAY	Regulatory awareness training; Behavioral Skills Workshop; Program of Transformational Leadership; General Health, Safety and Environment Training; and Training in waste treatment procedures.
BETA	Environmental Aspects and Impacts; Storage in Tanks, Pipes and Transfer Areas; Exposure to Carbon Monoxide; Chemicals Management; Waste management; GHS - Product Labeling; and the Environment Week Program.

Source: the authors.

4.1 Analysis of Environmental Training Needs

We present the results of the three companies that formed the basis of this research (Braskem, Solvay, & Beta), highlighting the data referring to the studied construct: environmental training.

There was alignment in the three companies studied in the category ‘training needs assessment’, with regard to the levels of analysis of skills gaps, with all levels of analysis: organizational, operational, and individual. The organizational level is identified in each of the companies both by corporate demands and by demands aligned with the particularities of each business.

The ‘training needs assessment’ at the operational level, also called groups

and teams by some authors, was also evidenced in the three companies studied, characterized by a group of functions, by functional area, or even by specific related activities to the environment, emphasizing: the area of environmental management, maintenance, research, and development. The same alignment situation was found in the companies, concerning the assessment of the need for training at the individual level. In all companies, the sources by which training needs in the individual dimension are evidenced are performance evaluation and a personal development plan or career plan. The company Braskem also highlighted, in addition to these two sources, the internal audits performed using the ISO 14001 process.

The data found in the three companies studied corroborate the authors

who indicate the need to assess the need for training in the three levels of coverage, such as Aguinis and Kraiger (2009), Abbad and Mourão (2012), and Narashimhan and Ramanarayanan (2014). They also substantiate the literature in which people management practices play a vital role in the development of organizational sustainability, highlighting the performance evaluation system and the career plan (Daily & Huang, 2001; Jabbour *et al.*, 2010).

The second dimension studied about the ‘assessment of training needs’ was the approach used by companies. The data show that the three companies studied use both approaches: reactive and proactive. The first, in which training needs are identified based on the diagnosis of gaps between the expected performance and the employee or team’s actual performance, is made primarily through the performance evaluation and the results of audits associated with the ISO 14001 structure. A proactive approach is present in the companies through the training needs raised from the organizational strategic guidelines, associated with the environmental dimension, which involve programs intended to develop competencies for sustainability, elaborated in a corporate dimension. The empirical data evidenced in the three companies surveyed show that they analyze the need for training both from the identification of gaps between the expected result and the one performed by employees, and based on organizational strategic objectives, corroborating the theoretical basis established by Arshad *et al.* (2015). The authors affirm the existence of two approaches that can be used in the assessment of training needs: reactive and proactive.

The analysis of the training need assessment category also points to the need to integrate the people management area in this process through its performance assessment subsystems and career plan or individual development, showing, as seen

in the literature, the need for integration of these subsystems and their alignment with strategic intent, concerning sustainability, which corroborates Colbert and Kurucz (2007), Jabbour (2011), and Jackson *et al.* (2014), which feature the role of people management strategies and practices in supporting organizational goals in pursuit of sustainability.

4.2 Development and Implementation of Environmental Training

The second category analyzed was the development and execution of training, based on the dimensions: choice of modality, training sequence, and procedures.

In the dimension of the modalities used in the environmental training, in the three companies, we observed the properties of in-person and distance training. Training in Environmental Management at Braskem held in-person modality and content that addresses the various types of waste and impacts. The training “Environmental Aspects and Impacts” by the Solvay company is in the distance mode and addresses the main organizational objectives aimed at reducing the negative environmental impacts caused by the company’s operations. Despite the use of face-to-face and e-learning modalities, the data collected demonstrated the companies favor the distance modality, arguing for its expansion due to the ease of attending and simplification of the training as well as an expansion in availability and, mainly, the cost reduction this modality produces. The modalities found are partially in line with the theoretical basis developed by Abbad *et al.* (2006). This base shows the application of the on-site, blended, and distance modalities as methodologies applicable to environmental training since the use of the blended modality was not identified in the surveyed companies.

The second dimension analyzed was the training sequence based on a training

hierarchy starting from the lowest to the highest level of complexity, as defined by Abbad *et al.* (2006). This dimension was not found in the companies studied. From the evidence collected in the companies, with regard to environmental training, there is no development in sequential dimensions by levels of complexity, thus characterizing a misalignment between theory and practice concerning this dimension.

To complete the analysis of the category “training development and execution”, we investigated the dimension of the procedures used in the environmental training programs. Freedom for each business unit to seek the resources necessary for their needs was apparent as to the tools and resources used in the execution of training. The three companies identified the use of internal and external training, training developed in-house, and training developed by contracted companies, hiring speakers, conducting workshops, simulation events, recreational activities such as games or theaters. As a result, companies are aligned with the theoretical basis developed by authors such as Ramus (2002), Unnikrishann and Hedge (2007), Jabbour (2013), and Abbad *et al.* (2006).

4.3 Environmental Training Assessment

The third category analyzed was the training evaluation through the dimensions: transference and learning levels.

Regarding the transfer dimension, the investigated properties were generalization, maintenance, horizontal transfer, and vertical transfer. Generalization was evidenced in the three companies studied, with an expansion of the concept established by Baldwin and Ford (1998), of the application in the work environment of what was learned: application of one business to another (Beta company); application for suppliers (Solvay company); and the industrial

sector (Braskem). Thus, the data support the development of responsiveness to social and environmental impacts through interaction and dialogue with stakeholders, constituting a societal competence, according to Brunstein *et al.* (2012).

As the maintenance property was not exhibited in the studied companies, from the data analyzed from these companies, the transfer dimension is aligned with the generalization property, partially corroborating Baldwin and Ford (1988), who establish the generalization and maintenance as a transfer perspective.

From the horizontal and vertical transfer properties, established by Abbad *et al.* (2003), we did not identify the first in the Beta company, but they do exist in the Braskem companies, considering a transfer at strategic and tactical organizational levels, and Solvay, which presents a transfer in functional areas, but also expands to a sectorial dimension through participation in ABIQUIM, so that learning is transferred to other companies in the sector, thus supporting the development of societal competence (Brunstein *et al.*, 2012).

The three companies displayed the property of vertical transfer, being considered the transmission of top-down learning, with emphasis on the role of the leadership in this process of transfer of learning. This corroborates Arnaut *et al.* (2012) who affirms the importance of the leadership role for the development of proactive environmental management, as well as corroborates Burke and Hutchin (2007), who highlight the role of superior support in the training transfer process.

In the three companies, the dimension ‘environmental training assessment’ proved to be a complex and difficult phase to carry out, which corroborates the theoretical basis developed by Salas and Cannon-Bowers (2001) when stating that training assessment is about a complex job. The authors did not ascertain all properties of the learning levels dimension of the

training evaluation presented in the literature (reaction, learning, behavior, performance, and result) in the three companies, regarding environmental training.

We identified the property of the reaction level assessment in the Solvay and Beta companies, and we explain the results of this assessment to the contribution to the planning and execution of new environmental training events, as well as to improvements in existing actions. These results are in line with the literature on the importance of evaluating the reaction of those trained to training events (Kirkpatrick, 2010).

The level of learning is confirmed in the Braskem and Beta companies, and the first present this assessment process performed mainly in those associated with regulatory standards, such as ISO 14000, based on an audit process that verifies the level of knowledge of the professional who has participated in environmental training. The Beta company described the process from the application of a verification test of learning the content presented in the training, to diagnose if there was understanding. At Solvay, there was no report of learning assessment in environmental training. Based on these results, it can be stated that the assessment at the level of learning, in companies that apply it to environmental training, is partially in line with the literature (Kirkpatrick, 2010; Holton, 1996; Kirkpatrick & Kirkpatrick, 2010).

We identified the evaluation at the behavior level in the three companies studied. Braskem performs this assessment through an annual internal audit that verifies, with the leader, the behavior of employees associated with the training they attended. Solvay and Beta companies make this assessment through performance evaluation. These results corroborate the established literature on training evaluation at the behavior level, concerning the verification of behavioral change in the work environment of the trained person.

However, there was no association between the results of this assessment and the investigation of possible causes of non-behavioral change, such as organizational support, leadership support, lack of both intrinsic and extrinsic rewards (Kirkpatrick, 2010; Jolton, 1996; Kirkpatrick & Kirkpatrick, 2010).

The evaluation of training at the performance level, as established by Holton (1996) is present in the three companies, associated with the annual internal audits performed by Braskem; performance assessment by Solvay; and a system for evaluating the training itself by the Beta company. However, the three companies have difficulties regarding this assessment.

Evaluation at the results level for environmental training is conducted at Braskem and Solvay. In both companies, the assessment is associated with improvement in organizational results, including improvement in effluent control, reduction of greenhouse gases, energy efficiency, and post-consumption. Braskem associates the effectiveness of environmental training with improvements in indicators developed based on the strategic objectives in the environmental dimension for 2015. Solvay evaluates the results based on the challenges established by the team of coordinators of the Solvay Way program in the following areas: consumers, employees, planet, investors, suppliers, and communities. These companies are in line with the theoretical basis defined by Kirkpatrick (2010); Holton (1996); Kirkpatrick and Kirkpatrick (2010) and Borges-Andrade (2006), regarding the evaluation of training at the results level that may have long-term effects, according to the goals established by each company with a long-term focus: Braskem objectives for 2020, Solvay and Beta for 2025, according to the companies' annual sustainability reports.

The 'training evaluation' category was present in the three companies, however, not in the format of all levels of

analyses presented in the literature by the aforementioned authors. However, although there is no structured process for evaluating environmental training in the companies studied, they all associate the results achieved from organizational advances, concerning improving the environmental results achieved by each company, to the implemented training programs.

This evidence corroborates Jabbour (2013) when he stresses environmental training as a success factor for environmental management with the provision of tools, methods, and techniques that contribute to the development of organizational strategies to minimize environmental, social, and economic

impacts, in line with pillars of the Triple Bottom Line. At the same time, this assessment was mainly associated with the performance assessment process, showing again the importance of aligning the subsystems in people management, corroborating Colbert and Kurucz (2007) and Jackson *et al.* (2014).

Figure 8: Aggregated discussion of environmental training performed by the investigated companies reorganizes the construct ‘Environmental Training’ into categories and dimensions and its descriptor properties are presented from the confrontation of empirical data (discussion of the Braskem, Solvay, and Beta cases) with the literature.

Figure 8 - Aggregated discussion of environmental training performed by the investigated companies.

	Categories of analysis	Dimensions	DESCRIPT PROPERTIES		
			BRASKEM	SOLVAY	BETA
ENVIRONMENTAL TRAINING	<u>Training needs assessment</u>	Competence gaps	Organizational Operational Individual	Organizational Operational Individual	Organizational Operational Individual
		Approaches	Reactive Proactive	Reactive Proactive	Reactive Proactive
	<u>Development</u>	Choose modality	Presential Remote	Presential Remote	Presential Remote
		Sequence	Less complex More complex	Absence of evidence	Absence of evidence
		Procedures	Definition goals Choose tools and Resources	Definition goals Choose tools and resources	Choose tools and resources
	<u>Evaluation</u>	Transfer	Generalization Horizontal Vertical Influencing Factors	Generalization Horizontal Vertical	Generalization Maintenance Vertical Influencing Factors
		Learning level	Reaction Learning Behavior Performance Result	Behavior Performance Result	Reaction Learning Behavior Performance

Source: the author

4.4 Individual Skills aligned with Environmental Sustainability

The analysis of the category of characteristics of individual competencies for sustainability in the companies studied

seeks to identify such competencies so that they can be taken as a basis for analyzing the environmental training discussed in the previous section. Analysis of individual competencies for sustainability was made from the dimension of their alignment with

environmental management. It was established that the individual competencies aligned with environmental sustainability described in the literature, as

shown in Figure 9: Individual competencies aligned with sustainability mapped in the companies studied, were identified in the companies studied.

Figure 9 - Individual competencies aligned with sustainability mapped in the companies studied.

Properties of individual competencies aligned with sustainability	BRASKEM	SOLVAY	BETA
Guidance Health Safety Environment	X	X	X
Teamwork	X	X	X
Take responsibility	X	X	
Systemic view	X	X	X
Maximizing results	X	X	
Communion with the environment	X	X	X
Resilience	X		
Search for knowledge	X		
Collaborative Attitude	X		
Commitment to sustainability	X		
Anticipating challenges	X		
Critical reasoning	X		
Communication capacity	X		
Sense of opportunity	X		
Open mind		X	
Courage		X	
Initiative		X	
Customer orientation		X	
Impacts and influences		X	
Development of others		X	
Work planning			X

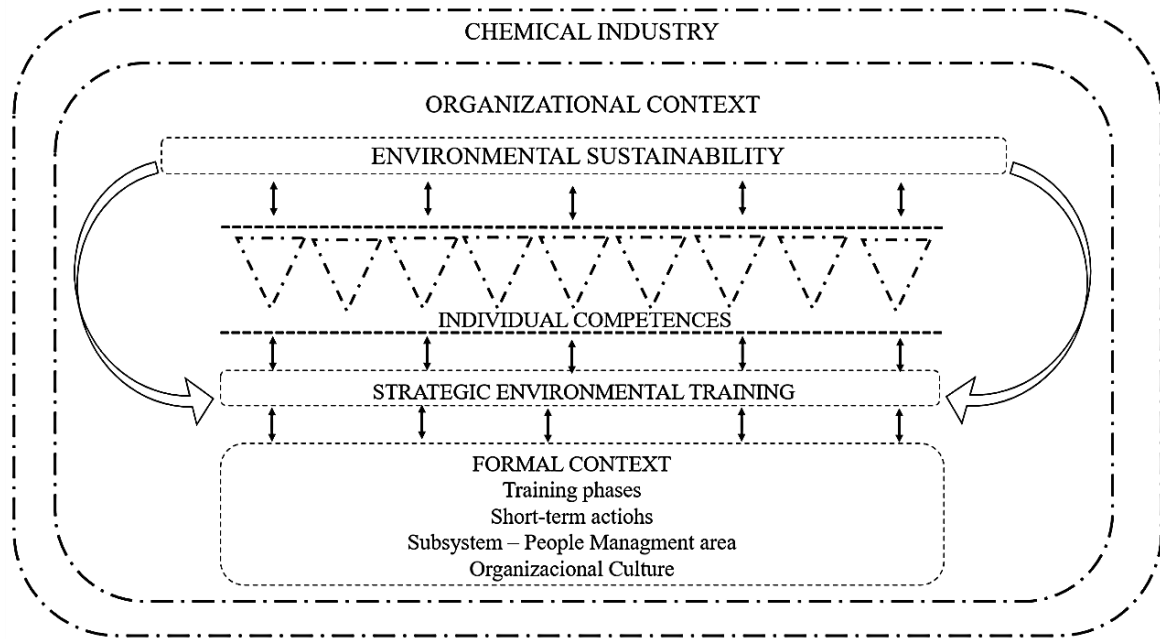
Source: the authors.

The data presented in Figure 9 also show that some properties of individual competencies identified in companies are not provided for in the literature (initially raised in Figure 3), namely: initiative; open-minded, teamwork, and collaborative attitude. Therefore, these new properties corroborate the literature, concerning the economic dimension of environmental training for sustainability, from the perspective of innovation, such as the initiative and open-minded properties, and in the social dimension of sustainability, from the perspective of diversity, as the

properties teamwork and collaborative attitude.

From the results analyzed on the environmental training process and the characterization of individual competencies for environmental sustainability, it is possible to propose a descriptive model of strategic environmental training for the development of individual competencies for the environmental sustainability of companies in the Brazilian chemical sector. This model is shown in Figure 10: Descriptive Model of Strategic Environmental Training.

Figure 10 - Descriptive Model of Strategic Environmental Training –



Source: the authors.

The model describes the process of generating individual competencies that are characterized in an increasing position of support to environmental sustainability development.

The concept of environmental training takes on a strategic dimension, considered as a continuing education process, seeking to meet the objectives and purposes of corporate environmental management, developing all organizational levels to integrate the organization's performance with environmental issues. The formal context is characterized by the training phases: the assessment of the need for training, covering the strategic, tactical, and operational levels, with a proactive approach; the development and execution of training with a choice of modalities, methods, content, and communication process aligned with the trainees' characteristics; and evaluation of training results at each of the three organizational levels.

The formal context encompasses short-term educational actions, such as quick lectures, frequent dialogues about the environment, environmental newsletters; systematic communication of environmental issues; the formation of heterogeneous groups or committees that

allow the exchange of experiences, and information regarding environmental issues.

Considering the formal context, the role of subsystems in people management is evident, as a career plan system and performance evaluation, as strategies in the area that contribute to the development of environmental training. Likewise, the support of senior leadership, as well as direct leaders, are elements of a formal context established by the organizational culture that cooperates for the success of environmental training, as well as the development of individual competencies for environmental sustainability.

5 Final Considerations

By analyzing the environmental training process developed by the three large companies in the Brazilian chemical sector that we studied, it was possible to descriptively characterize the phases of the environmental training process developed, thus meeting the first specific objective. Likewise, we established the individual competencies considered relevant to environmental sustainability, thus reaching the second specific objective.

Based on these objectives, the general objective of environmental training can be achieved by structuring its phases in line with the organizational objectives, regarding the strategic intent about sustainability, and how it contributes to the development of individual skills essential to environmental sustainability. The authors also identified the importance of integrating performance assessment and career plans or individual development subsystems into environmental training programs concerning sustainability. From these results, it is possible to propose a descriptive model and confirm the proposition that the environmental training process can enhance the development of individual skills essential to the sustainability of companies in the Brazilian chemical sector, considering that the environmental training process is aimed at stimulating and developing individual competencies aligned with the organizational strategy, based on the recognized competence gaps.

The contributions that may come from this study, for the organizational context, are related to the description of the phases of the environmental training process developed by the companies studied, which may serve as a benchmark for other companies in the sector. Furthermore, presenting to the companies studied the possibility of improving its process from the descriptive model presented. In addition, we grouped individual competencies for environmental sustainability that were mapped in the investigated cases and that may be a focus of attention by other companies operating in the Brazilian chemical sector. In the academic context and for the scientific community, this study may contribute to the investigation of the relationship between the constructs of environmental training and sustainability, deepening the investigation on the themes.

The limitations of this research are based, essentially, on the research strategy itself, which could not be generalized, as

well as on the need to deepen the study itself involving other organizational areas or the expansion for investigation of units of companies located outside Brazil, which opens the possibility for further study.

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