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ENVIRONMENTAL TRAINING AND COMPETENCES FOR ENVIRONMENTAL SUSTAINABILITY IN BRAZILIAN CHEMICAL COMPANIES

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Abstract

In this article, the aim was to analyze how environmental training can help generate individual and organizational competences in companies in the Brazilian chemical sector. This study is justified by the need to conduct more in-depth studies on the role of environmental training to generate competences in the Brazilian chemical sector's environmental dimension. This is important because, in 2016, this sector was third place in the development of Brazilian Gross Domestic Product (GDP) and its production has led to debates over the environmental risks caused by its products and processes. The qualitative research approach was used, with multiple case studies based on the triangulation of sources of evidence. The results confirmed that: 1) systematized environmental training potentiates the development of individual competences required for the sustainability of Brazilian chemical sector companies, considering that the focus of environmental training is to stimulate and develop individual competences aligned with organizational strategy by identifying competence gaps; 2) recognizing core individual competences helps identify important organizational competences for the sustainability of Brazilian chemical sector companies; and 3) developing core individual competences helps create important organizational competences for the sustainability of chemical sector companies. The value of the paper is given by proposing of a model describing the role of environmental training supported by a formal and informal context to develop individual competences for environmental sustainability, mutually related to organizational eco-innovation, eco-efficiency, environmental justice and social justice competences, thus characterizing the development of sustainability in organizations and chemical industries.

Keywords: Environmental Training; Sustainability; Individual Competences; Organizational Competences.

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Introduction

Sustainability strategy formulation requires the involvement of organizational areas. Therefore, environmental training as an organizational dimension plays an important role for companies that "embrace the philosophy of environmental sustainability" (JACKSON *et al*, 2014, p. 40; JABBOUR; SANTOS, 2008).

Sustainability can be achieved through the logic of competences. An organization's competences development can mean benefits in the dimensions of the Triple Bottom Line (TBL), as organizations in the debate on sustainability seek to develop new managerial methods and practices to aid systemic sustainable development (MUNCK; BORIM-DE-SOUZA, 2012).

The Brazilian chemical industry plays an important role. In 2016, it was third place in the development of industrial GDP in Brazil and, in 2015, eighth in the world in net revenues (ABIQUM, 2016). However, according to Law 10.165 of 2000, it has enormous potential for high pollution levels and use of natural resources. Thus, it faces specific challenges to develop sustainability strategies and minimize its negative impacts, handling great complexity in the business world and the economic, social and environmental dimensions. Adopting sustainability strategies could be a great opportunity for its development (SOTO, 2012).

This study sought to analyze how environmental training helps create individual and organizational competences in the environmental dimension of sustainability for companies in the Brazilian chemical sector.

The Brazilian Association of Training and Development (ABTD, 2016) conducted a study that found that despite a 24% increase in yearly investments in Training and Development (T&D), the Brazilian average remains below that of the Americans. Despite the growing indicators in 2016, showing continuing gains in maturity and importance of T&D in organizations, there is room for growth concerning the area's actions in developed countries. This context could be applied to the gaps in studies that associate training and sustainability and, according to Munck and Borim-de-Souza (2012a), interaction between sustainability and competence management, with further studies required in this respect.

Theoretical foundation

Human Resources Management plays an important role in involving workers in the control of environmental management, with training as success factor for environmental management (JABBOUR, 2011; MANDIP, 2012). It develops specialized and customized environmental training programs to adapt to organizational needs (CHERIAN; JACOB, 2012), providing tools, techniques and methods to help develop strategies to minimize environmental, social and economic impacts, including the interests of local communities (UNNIKRISHANN; HEDGE, 2007). It also conforms to regulations and employees' responsibilities, developing a positive image or motivating employees to participate proactively in environmental management (DAILY; HUANG, 2001; DAILY et al, 2007) as a tool to change the attitudes and behavior of employees and organizational culture, with environmental standards associated with changing practices and processes in the business and industrial sector. This is done to anticipate and satisfy future needs (ARDICHVILI, 2012; UNNIKRISHNAN; HEGDE, 2007; SAMMALISTO; BRORSON, 2008) and improve environmental management maturity (Jabbour, 2015), involving all organizational levels (JABBOOUR et al, 2010; AGUINIS; KRAIGER, 2009; ABBAD; MOURÃO, 2012; NARASHIMHAN; RAMANARAYANAM, 2014).

The model of Jabbour and Santos (2008) characterizes the alignment between the environmental dimension of the TBL and environmental management, the economic dimension and innovation and the social dimension and diversity. Although studies have shown significant effects of training on innovation capability and its contribution to improving knowledge and innovative skills, further studies are needed to analyze the relationship between training and innovation (MANAFI; SUBRAMANIAM, 2015; AL-BAHUSSIN; EL-GARAIHI, 2013; LING; NASURDIN, 2010; ROSSEL, 2008). Like the alignment of the social dimension of the TBL with diversity, training challenges how the world is viewed (BEZRUKOVA, et al, 2012). Therefore, although environmental training is essential for human development and a sustainable society, gaps can be glimpsed in studies on the theme (NETO et al, 2014; JABBOUR, 2013), leading to the following proposition:

P_{01}: Systematized environmental training potentiates the development of key individual competences for the sustainability of Brazilian chemical companies.

A challenge for industrial organizations is to demonstrate how they reduce environmental and social impacts without compromising their economic sustainability (DEMAJOROVIC, 2003). Six levels of ambition lead organizations to seek sustainability (VAN MARREWIJK; WERRE, 2003). They seek new managerial methods and practices to aid systemic sustainable development, resulting in benefits in the TBL dimensions (MUNCK; BORIM-DE-SOUZA, 2012a). Organizational competences are characterized by their capacity to collaborate and innovate to achieve sustainability, integrating the economic, social and environmental dimensions while remaining competitive and delivering value to customers and stakeholders (VAN KLEEF; ROOME, 2007), classified as eco-efficiency, environmental justice and social justice (ELKINGTON, 2001; MUNCK; BORIM-DE-SOUZA, 2012A; MUNCK; GALLELI; BORIM-DE-SOUZA, 2012; MUNCK, et al, 2012; CELLA-DE-OLIVEIRA; MUNCK; 2014)

Besides competences aligned with the TBL, in the literature, eco-innovation competence stands out. This is the production, assimilation and exploitation of a product, process, service, management or method of conducting business that can be developed or adopted. Throughout the lifecycle, it can result in fewer environmental risks, less pollution and use of resources, including energy (KEMP; PEARSON, 2007).

Van-Kleef and Roome (2007) also claim that combined employee skills in a team, connected by structures and routines, form blocks of competences to identify the managerial capabilities that form organizational competence aligned with innovation. This enables sustainable development, integrating the impact of production and consumption patterns in the economic, social and environmental dimensions. As the organizational competence required for sustainability is the ability to collaborate and innovate for sustainability, integrating the social, economic and environmental dimensions to create value for individuals and organization to create a competitive advantage through individual contributions (MUNCK; BORIM-DE-SOUZA, 2012A; VAN-KLEEF; ROOME, 2007), the following proposition can be made:

P_{02}: Recognizing key individual competences can help identify important organizational competences for the sustainability of Brazilian chemical sector companies.

Sustainability competence is understood as a functionality related to complex knowledge, skills and attitudes in developing of tasks and solutions to problems regarding sustainability challenges and opportunities in the real world (WIEK et al, 2011). It involves psychological requirements, including cognitive and non-cognitive aspects (LAMBRECHTS et al, 2012), with their learning characterized in formal and informal dimensions (BARTH et al, 2007).

With the relationship between individual and organizational competences, the meanings that individuals give to work, mobilization of skills and resources, commitment between people and organizations to respond better to the complex social, economic and environmental problems they face to guarantee a competitive advantage (DUTRA, 2004; AGUINIS; GLAVAS, 2013; MEISTER, 1999), the following proposition can be made:

P_{03}: The development of key individual competences helps create organizational competences important to the sustainability of Brazilian chemical sector companies.

Methodology

The qualitative research approach was used in this work (MASON, 1996) and the multiple case study (YIN, 2010). The selection criteria were: belonging to the chemical sector as a member of the Brazilian Chemical Industry Association (ABIQUIM); using the Responsible Action Management Program System of the ABIQUIM; and being a signatory of the Global pact, a UN initiative to mobilize the international business community to adopt in its business practices fundamental internationally accepted values concerning human rights, labor relations, the environment and combatting corruption, established by ten principles of the Global Pact. Companies that met these criteria were Braskem, Solvay and Beta (fictitious name, as the company wished to remain anonymous). The social subjects of the study and the sources accessed at each company are shown in Table 1.

Table 1: Characterization of sources of evidence of the companies in question.

	COMPANIES THAT PARTICIPATED IN THE STUDY		
	BRASKEM (C1)	SOLVAY (C2)	BETA (Fictitious) (C3)
Nature of capital	Brazilian public company	Foreign public company	Foreign public company
Size	Large	Large	Large
Year founded	2002, with the integration of six companies from the Odebrecht Organization and Mariani Group.	1863 by Ernest Solvay	Late 19th century
Area and markets	Adhesives, agribusiness, rubber, construction, automotive industry, lubricants, paint and retail	Automotive and aerospace, consumer and healthcare products, energy and environment, appliances, building and construction and industrial applications.	Transport, infrastructure, environment and final consumer.
Interviewees (I) (Total pages transcribed and analyzed: 187)	- Director of Sustainable Development (I1) - Person in charge of environmental area at all Braskem sites (I2) - Safety and environment coordinator of the UNIPOL business units – SP (I3) - Environmental coordinator at UNI2 – RS (I4)	- Corporate safety and environment manager for Latin America (I1) - HR manager and person in charge of South America by area of learning and corporate university (I2)	- HSE Manager (I1) - Management System Coordinator (I2) - Environmental Safety Engineer (I3) - HR Analyst – in charge of training (I4)
Documents (D) (Total pages systematized and analyzed: 1,396)	- Presentation on Environmental Management 2015 (D1) - Model of environmental education lesson plan (D2) - Presentation used at Leaders' Sustainable Development Workshop (D3) - Annual Report 2015 (D4) - Data from company website (D5)	- Global Report 2015 (D1) -Complementary Annual Report 2015 (D2) - Global Report 2013 (D3) - Competence Maps (D4) - Data from company website (D5)	- Sustainability Report 2014/5 (D1) - Update of Sustainability Report 2015 (D2) - Health, Safety and Environmental Policy (D3) - Environment Week Program 2016 (D4) - List of Environmental Training Programs (D5) - Data from company website (D6)
Videos (V) (Total pages transcribed and analyzed: 40)	- Video interview with Braskem's director of sustainable development at the IV Atlas Publishing Business Soiree (V1) - Video of Braskem's vice president of institutional relations and sustainable development's statement (V2) - Video of "Braskem Environmental Education Seminar" (V3)	- Video of presentation of Solvay Way program (V1) -Video interview of Solvay CEO and company executive on sustainable management program tools. (V2) - Video of Solvay CEO on carbon emission and credits (V3)	- Video of statements by three top executives on sustainable development (V1) - Video of company president on the environment (V2)

Source: Prepared by the authors

The analysis of the results was guided by the constructs 'environmental training', 'organizational competence' and 'individual competence', from a theoretical reorganization in categories and dimensions in the literature, as demonstrated by the evidence described and analyzed in the following section.

Results

The data show the need for training at three levels: individual, group and organizational, in accordance with Aguinis and Kraiger (2009), Abbad and Mourão (2012) and Narashimhan and Ramanarayanam (2014). The companies analyze the need for training by identifying gaps between expectations and outcomes, based on strategic organizational goals, corroborating the theoretical framework of Arshad *et al*. (2015), evaluating needs for reactive and proactive training.

In the 'training development and execution' category, the modalities identified were partially aligned with the theoretical basis developed by Abbad *et al* (2006) for the application of regular, semi-regular and distance modalities as methodologies applicable to environmental training, as the semi-regular modality was not identified in the companies surveyed. Regarding the sequence of training based on a hierarchy, ranging from the lowest to the highest complexity level, as defined by Abbad *et al*. (2006), this was identified at the companies. Finally, the companies' efforts towards training procedures aligned with the specific characteristics of the trainees, for instance, and the content taught in training and competences developed were analyzed. The companies heeded the theoretical basis of this study developed by authors like Ramus (2002), Unnikrishann and Hedge (2007), Jabbour (2013) and Abbad *et al*. (2006).

The 'evaluation of training' category, regarding transfer and generalization, was found in the three companies, with a broadening of the concept of Baldwin and Ford (1998), applying what is learned in the work environment for: application across businesses (Beta), to suppliers (Solvay) and to the industrial sector (Braskem).

Of the horizontal and vertical transfer properties established by Abbad *et al.* (2003), horizontal transfer was not identified at Beta, but was found at Braskem, regarding transfer at strategic and tactical organizational levels, and Solvay, with transfer in functional areas, but also broadening to a sector dimension through membership of the ABIQUIM. Thus, learning is transferred across companies in the sector, corroborating the development of the societal competence (BRUNSTEIN, *et al.* 2012). Vertical transfer was found in all three companies, being considered top-down knowledge transfer. This corroborates Arnaut, *et al.* (2012) and Burke and Hutchins (2007), highlighting the importance of leadership and support from superiors for the development of proactive environmental management.

In 'evaluation of environmental training', the reaction level was identified at Solvay and Beta, attributed to the outcomes of this evaluation, contribution to the planning and execution of new environmental training events and improvements to existing actions. The learning level is partially aligned with the literature. The improvement or development of skills or changing attitudes of workers following training was not identified. These aspects are found in the literature (KIRKPATRICK, 2010; HOLTON, 1996; KIRKPATRICK; KIRKPATRICK, 2010). In behavioral terms, no link was found between the results of this evaluation and the investigation of possible causes of no changes in behavior, such as organizational support, support from the leadership, and the lack of an intrinsic or extrinsic reward scheme (KIRKPATRICK, 2010; HOLTON, 1996; KIRKPATRICK; KIRKPATRICK, 2010).

Evaluation of training at the performance level, in accordance with Holton (1996), was found in all three companies, associated with annual internal audits at Braskem, performance evaluation at Solvay and a training assessment system at Beta. However, each company has difficulties with this evaluation. Based on the companies' processes, they appear to be aligned with the base theory regarding evaluation of training results that might have long-term effects, as established at each company (Braskem 2020, Solvay and Beta 2025), as defined by Kirkpatrick (2010), Holton (1996), Kirkpatrick and Kirkpatrick (2010) and Borges-Andrade (2006).

'Evaluation of training' was found in all three companies, although not in the format of all the analysis levels of the aforementioned authors. Thus, it can be said that evaluation of environmental training cannot develop in line with the dimensions of the theoretical base.

The mapped environmental sustainability training programs are shown in Table 2.

Table 2: Mapped environmental training for environmental sustainability of the surveyed cases

Environmental training for environmental sustainability	Cases investigated		
	C1	C2	C3
Environmental management training, Leaders' Workshop for Sustainable Development of Technical Competences (SDTC) in Industrial equipment and processes, Training in lifecycle management	X		
Regulatory awareness training, Behavioral Competency Workshop, Transformational Leadership Program, general health, safety and environmental training, training in residue treatment procedures		X	
Environmental aspects and impacts – Storage in tanks, tubes and transfer areas, exposure to carbon monoxide, chemical product management, residue management, product labeling, Environment Week program			X

Source: Prepared by the authors

Analyzing the organizational competence characteristics regarding classification, the data for the three companies show that environmental sustainability can be classified in all of them as a core competence, in accordance with Mills *et al*. (2002). In the three companies, sustainability is understood as a strategic factor for competitive advantage, recognized by the market and developed in an integrated manner by all companies. In this respect, the classification is aligned with the concept of core competence of Prahalad and Hamel (1990).

Nevertheless, of the three elements that constitute the competitive advantage of core competence described by Prahalad and Hamel (1990) (access to different markets, perceived customer benefits and difficult to imitate), only two were identified in the companies, recognizing that sustainability develops their markets and helps them remain leaders in their fields. They also believe that the strategic axis of sustainability leads to recognition in the global market. However, there was no evidence of concern over the imitation of their practices regarding the environmental dimension of sustainability. On the contrary, there was a drive for integrated actions and shared practices, especially by members of national or international associations for the development of environmental sustainability in the sector.

Regarding vulnerability, four factors were analyzed: tacitness, robustness, embeddedness and consensus. Aligned with shared practices is the discussion on the results at the three companies concerning the factors that characterize the vulnerability of organizational competences, in accordance with King *et al*. (2002), with the exception of robustness, which was not identified in any of the companies. To the aforementioned authors, these factors are vulnerable points of organizational competences, as they facilitate competence transfer across organizations. However, the empirical approach, which does not consider these factors as elements of vulnerability, does not confirm the theoretical approach, constituting an evolving vision. The encoding, sharing, possibility and drive for transfer across organizations of environmental sustainability competences are encouraged by the companies to develop the competence throughout the sector. This corroborates the previous remarks on imitability, as the companies seek to share their environmental practices.

Regarding interactions of organizational competence between the environmental, economic and social pillars of the TBL, the analysis was based on eco-efficiency, environmental justice and social justice.

Concerning organizational competence for sustainability, concerning competences formed through the interaction of the three pillars of sustainability, the findings at the three companies are shown in Table 3. Regarding eco-efficiency, Munck *et al*. (2012) and Cella-de-Oliveria and Munck (2014) highlighted competences that support eco-efficiency. These competences at the three companies include added economic value, trade of products, optimized consumption of materials, energy and water, lower greenhouse gas emissions, recycling culture, maximization of renewable resources, adaptation to new market demands and effective research and development.

Table 3: Mapped organizational environmental sustainability competences of surveyed cases.

Organizational competences for environmental sustainability	Cases investigated		
	BRASKEM	SOLVAY	BETA
Green product development	X		
Carbon management	X	X	X
Development of sustainable products focusing on environmental issues	X	X	X
Dangerous residue treatment	X	X	
Residue management	X	X	X
Effluent generation management	X	X	X
Ability to influence the chemical sector	X	X	X
HSE management		X	X
Water resource consumption management	X	X	X
Creating solutions for climate change	X	X	
Ability to engage employees in social initiatives		X	
Process management			X
Eco-innovation capability	X	X	X

Source: Prepared by the authors

Regarding environmental justice associated with intra and intergenerational equity, all three companies show concern over impacts on the chain, collaboration to develop the sector, partnerships with organizations interested in recycling plastic in different sectors, voluntary commitments to share information and specialist knowledge, dialogues with stakeholders to develop sustainability, customer involvement in sustainability and financial contributions through sponsorship. These are evidence of environmental justice competence.

Concerning social justice, a common point among the companies was the development of sustainability in the sector. The three companies are members of the ABIQUIM. Other pillars of social competence include transparency and openness in shared practices, incentives to engage employees in social issues and investments in sustainability. These occur in all three companies, showing their alignment with the theoretical basis, with interaction between the three dimensions of the TBL.

Eco-innovation can be characterized by the proactive approach as the companies show characteristics of eco-innovation described by Maçaneiro and Cunha (2014; 2015), Maçaneiro *et al*. (2015) and Jacomissi *et al*. (2016) as requirements for the proactive approach to eco-innovation. The internal factors that influenced eco-innovation in the three companies are the strategic dimensions of eco-innovation, collaboration networks and support from the top management. Environmental formalization was identified only at Solvay. The external factors that influenced eco-innovation were environmental regulations, technological demands for sustainable products and effects of reputation. The three companies aspire to be shining examples of environmental practices.

The mapping of individual competences aligned with environmental sustainability in the companies is shown in Table 4. The fundamental characteristics of individual competence were identified in the level of complexity associated with the function and hierarchical level of individuals and their occupational position regarding attention the need to broaden knowledge.

Table 4: Individual competences aligned with environmental sustainability

MAPPED INDIVIDUAL COMPETENCES	BRASKEM	SOLVAY	BETA
HSE orientation	X	X	X
Teamwork	X	X	X
Systemic vision	X	X	X
Communion with environment	X	X	X
Taking responsibility	X	X	
Maximizing results	X	X	
Resilience	X		
Seeking knowledge	X		
Collaboration attitude	X		
Commitment to sustainability	X		
Anticipating challenges	X		
Critical thinking	X		
Communication abilities	X		
Sensing opportunities	X		
Open mind		X	
Courage		X	
Initiative		X	
Customer orientation		X	
Impacts and influences		X	
Development of others		X	
Work planning			X

Source: Prepared by the authors

Acquisition of individual competence, characterized by Barth *et al*. (2007), was identified in the awareness stage as an important element for the companies, all striving to raise environmental awareness among employees, customers and community, characterizing the construction of a shared mental model. Regarding the internalization of values, the importance of the role of leadership was identified. The following cognitive aspects may be highlighted: the cognitive characteristic of trainees, capacity to understand associated with technical qualification and ignorance, and recognizing individuals' knowledge gaps on environmental issues, environmental information and technical training to align the language used in communication and the function of each individual.

Concerning non-cognitive aspects, the reward or recognition system was highlighted as an element that encourages people to develop competences, corroborating Jabbour (2011) and Jackson *et al.* (2014), emphasizing the importance of Human Resources Management to develop environmental sustainability, and Kirkipatrick (2010), that an intrinsic or extrinsic reward is always expected. The leadership, besides internalizing values, can influence cognitive aspects, as shown in Braskem and Beta, the leadership characterizing a context favoring self-directed and experiential learning, which may influence individual competence acquisition, in accordance with Barth, *et al*. (2007). Further non-cognitive aspects include challenges for individuals to achieve environmental results, sensemaking, engaging and motivating people on environmental issues, organizational culture, discipline and teamwork.

Individual sustainability competences were analyzed through their alignment with environmental management. The individual competences aligned with environmental sustainability described in the literature were identified in the companies. The data also show that the individual competences highlighted by the companies, which do not compose the theoretical basis of competences aligned with environmental sustainability, corroborate the literature regarding alignment with economic competences through innovation and social competences through diversity, as in the model of Jabbour and Santos (2008).

Proposition of the Descriptive Model

The alignment of the empirical evidence with the theoretical discussion, supporting the development of the descriptive model of individual and organizational sustainability competences, is summarized in Table 5.

Table 5: Theoretical and empirical base to support the descriptive model of individual and organizational competences for environmental sustainability.

ORGANIZATIONAL COMPETENCE						
Organizational competence characteristic		Organizational competence for sustainability				
Classification	Vulnerability factors	Interaction with Triple Bottom Line			Ambition level	
Essential Competence or Core Competence	Embeddedness	Eco-efficiency	Environmental Justice	Social Justice	Holistic	
		Eco-innovation				
INDIVIDUAL COMPETENCE						
Fundamentals of individual competence		Individual competence for sustainability				
Fundamental elements	Acquisition	Alignment with environmental management				
Complexity Occupational space	Stage of awareness Internalization of values Cognitive aspects Non-cognitive aspects	HSE orientation Teamwork Taking responsibility Systemic vision Maximizing outcomes Communion with the environment				
ENVIRONMENTAL TRAINING						
Training needs evaluation		Development and execution		TD&E evaluation		
Competence gaps	Approaches	Modality choice	Procedures	Transfer	Learning level	
Organizational Operational Individual	Reactive Proactive	Regular Distance	Choosing tools and resources	Vertical Generalization	Performance	

Source: Prepared by the authors

The environmental training in the companies to develop environmental sustainability comprised three phases: 'evaluation the need for training', 'development and execution of training' and 'evaluation of training'.

Evaluating the need for training based on analyzing individual, group and organizational competence gaps shows the importance of environmental training for mapping competences and aligning them with strategic, tactical and operational organizational strategies to spread throughout the organization, corroborating Jabbour, *et al.* (2010), Ramus (2002), Unnikrishnam and Hedge (2007), Daily *et al.* (2012), Mandip (2012) and Jabbour (2013).

Analyzing the evaluation of the need for training shows the need to integrate Human Resources Management into this process through performance evaluation and career plans, or individual element, subsystems. This demonstrates the need to integrate these subsystem and align them with strategic intentions regarding sustainability, corroborating Colbert and Kurucz (2007), Jabbour (2011) and Jackson *et al.* (2014), highlighting the role of management strategies and Human Resources Management to support organizational goals for sustainability.

The reactive and proactive approaches used for 'evaluating the need for training' were important for guiding actions, pointing out the need to correct courses if deviations occur. The other points to an evolutionary perspective, as it focuses on developing competences for long-term goals. The use of the proactive approach by the companies means evaluating the need for training to develop competences to respond to core demands for organizational competitiveness with sustainability, in accordance with Arshad *et al.* (2015).

Analysis of the development and execution of training identified the use of regular and distance learning, corroborating Abbad *et al.* (2006), the latter associated with the focus of

overcoming an obstacle to environmental training: shortage of time for individuals to attend training. Distance training was also a way for the companies to reduce the cost of training.

Concern over the development and execution of training is seen in the main obstacle highlighted by all the companies: the unattractiveness of training to motivate participants. To overcome this barrier, the companies use internal and external training, workshops, simulations and theaters, corroborating what Jabbour *et al* (2010) highlight as the need to integrate the best environmental training practices to ensure cooperation from the whole organization. The attractiveness of training should be analyzed carefully to ensure effective programs.

Analysis of the evaluation of training showed that the transfer dimension is broadened in the companies in relation to the theoretical basis of Baldwin e Ford (1998), departing from a perspective of transfer only within the work environment to a perspective across companies, reaching suppliers and customers and the whole sector, including other chemical companies.

'Evaluation of training' was characterized by company data as the most complex and difficult phase, corroborating Salas and Cannon-Bowers (2001). 'Evaluation of training' was not systematically identified in the companies as an environmental training phase. It was mainly associated with performance evaluation, showing again the importance of aligning Human Resources Management sub-systems, corroborating Colbert and Kurucz (2007), Jabbour (2011) and Jackson *et al*. (2014). However, although the companies have no structured environmental training evaluation program, they all associated their organizational advances in this respect with their training programs.

The results confirm P01, that systematized environmental training potentiates the development of core individual competences for the sustainability of companies in the Brazilian chemical sector, as it encourages the development of individual competences aligned with organizational strategy by identifying competence gaps.

Analysis of organizational competence characteristics showed that environmental sustainability is considered essential by the three companies to develop competitive advantages, created through recognition from the market, corroborating Mills *et al*. (2002), associated, according to Munck and Borim-de-Souza (2012b), with a commitment between people and organization to respond better to current and future social, economic and environmental issues.

Analysis of organizational competence for sustainability aligned with the TBL revealed the presence of eco-efficiency competence, environmental justice and social justice, and the importance of eco-innovation competence in a proactive approach, corroborating Maçaneiro and Cunha (2014, 2015), Maçaneiro *et al*. (2015) and Jacomissi *et al*. (2016).

The competence maps show the elements discussed in the literature regarding environmental awareness, internalization of the environment as a value that governs people's actions and cognitive and non-cognitive factors representing learning in formal and informal contexts, corroborating Barth *et al*. (2007).

This mapping shows recognition of the need for individual competences aligned with organizational competences necessary for sustainable development, as seen in the companies of the Brazilian chemical sector, corroborating Dutra (2004), regarding mutual influence between individual and organizational competences through an ongoing exchange. Thus, P02 is confirmed, that recognition of individual core competences helps identify organizational competences required for the sustainability of companies in the Brazilian chemical sector. This recognition is characterized by the companies' efforts to provide environmental training to develop individual competences required for organizational competences.

As individual competences constitute part of organizational competence, ensuring competitive advantages, according to Meister (1999), sustainability is characterized in the companies as a strategic dimension of businesses that develops competitive advantages. The economic, social and environmental pillars of sustainability were identified through their interactions that form competences: eco-efficiency, environmental justice and social justice. The importance of eco-innovation competence was identified through the development of innovative products or processes that help to develop competitive advantage while seeking to reduce environmental impact, and is associated with the social pillar through governance and transparency, as highlighted by Kemp and Pearson (2007).

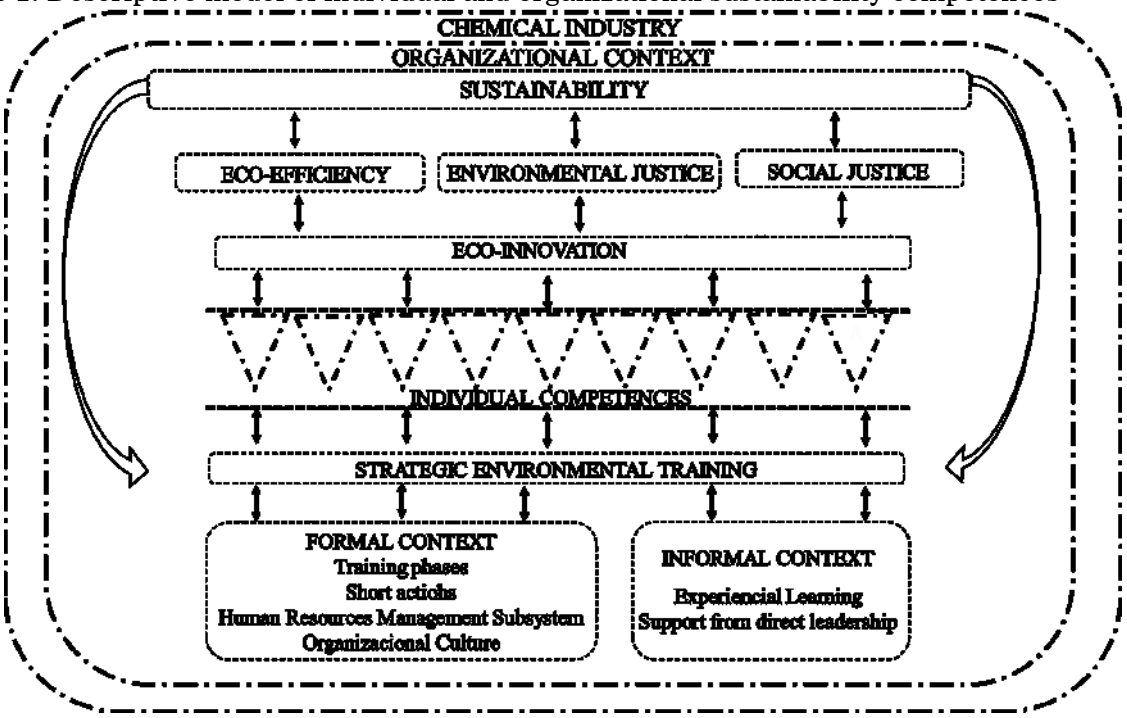
An example of interaction between individual and organizational competences is the development of sustainable environmentally friendly products, highlighted by all three companies, with which individual competences are associated. These include: (1) HSE orientation, focusing on

employees' and customers' health, safety in production, transport and use of a new product, seeking to eliminate or minimize its environmental impact; (2) teamwork to integrate diverse knowledge to develop new sustainable products; (3) systemic visions that represent the ability of people involved in new product development to see its impacts or benefits from a broader environmental perspective; and (4) communion with the environment, with individuals recognizing and appreciating environmental protection to develop environmentally sustainable products.

Thus, individual competences aligned with environmental sustainability aid the development of organizational competences, thereby confirming P03, that developing core individual competences can help create organizational competences important to the sustainability of Brazilian chemical companies.

By confirming the above propositions, a descriptive model of individual and organizational competences for the environmental sustainability of companies in the Brazilian chemical sector can be proposed, using strategic environmental training, as shown in Figure 1.

Figure 1: Descriptive model of individual and organizational sustainability competences



Source: Prepared by the authors

The model describes the organizational competence creation process aligned with sustainability from organizational competences of eco-efficiency, environmental justice and social justice, supported by eco-innovation competences that encompass the three pillars of sustainability. Eco-innovation competence development is described from the development of individual competences aligned with sustainability, with environmental training as a learning process embedded in formal and informal social contexts, guided by organizational sustainability. Individual competences are characterized as increasingly supporting organizational competence development.

Environmental training assumes a strategic dimension as a continuous education process, fulfilling the goals and purposes of corporate environmental management, developing all organizational levels to integrate organizational performance with environmental issues, broadened by including formal and informal learning. The formal context is characterized by the phases of training: evaluating the need for training, encompassing the strategic, tactical and operational levels, with a proactive approach; development and execution of training with a choice of modalities, methods, content and communication process aligned with trainees' characteristics; and evaluating the outcomes of training at the three organizational levels.

The formal context includes short educational actions like lectures, frequent dialogues on the environment, bulletins, systematic communication of environmental issues and forming heterogeneous groups or committees to exchange experiences and information.

The formal context also includes Human Resources Management subsystems like payment and reward schemes, career plans and performance assessment as strategies to aid the development of environmental training. Likewise, support from the top management and direct leaders are elements of a formal context established by organizational cultures, cooperating for successful environmental training and individual competence development.

The formal context is presented in a perspective of experiential learning, daily organizational experience, interaction and sharing information for learning. This context should be considered learning and competence development mechanisms, albeit unconscious and involuntary, an ally in environmental training, aiding individual competence development in the workplace, for example with support, recognition and praise from direct leaders regarding their subordinates' environmental achievements.

This model shows that the dynamic development of individual competences through environmental training potentiates the sustainability of Brazilian chemical companies. With articulated interaction between companies in the sector, organizational sustainability competences developed in an organizational context can expand to develop competences aligned with sustainability in chemical industries.

Conclusions

This study described the environmental training provided by companies in the Brazilian chemical sector to develop environmental sustainability, characterizing the individual and organizational competences required for this purpose. Thus, the development of individual competences proved essential at the technical and behavioral level due to the need to develop specific knowledge and awareness, involvement and appreciation of environmental issues. This revealed the contribution of environmental training to create individual and organizational sustainability competences and the support individual competences provide in developing organizational competences to achieve the organization's environmental strategic goals.

A model was proposed describing the role of environmental training supported by a formal and informal context to develop individual competences for environmental sustainability, mutually related to organizational eco-innovation, eco-efficiency, environmental justice and social justice competences, thus characterizing the development of sustainability in organizations and chemical industries. Therefore, the research question was answered and the general aim of the work fulfilled. Consequently, the contributions to academia, the market, the surveyed companies and society can be outlined.

The academic contribution is greater focus on Human Resources Management, in this case, the training subsystem, to develop environmental sustainability. A new paradox was also discussed regarding the characterization of core competence concerning sustainability. A competitive perspective was found concerning products, but a collaborative attitude regarding the development of sustainability competence, which all considered strategic.

For the market, the proposed model can be analyzed by people and environmental management professionals to help develop training focusing on the formal and informal context to improve performance. Mapping individual sustainability competences from the literature and companies can help organizations develop their competence maps. For the ABIQUIM, which has specific environmental and Human Resources Management committees and develops training for various chemical industries, this study provides knowledge to develop sustainability competences and structure the phases of environmental training, especially training evaluation.

As for the companies, they highlighted the study itself as a contribution. The interviewees noted that simply reflecting on the theme was important. The results can help identify points for improvement in their environmental training, focusing on developing competences aligned with sustainability.

The limitations of this study should be highlighted. The results cannot be generalized due to the approach used. However, the study opens an agenda for future research: extending the cases studied to units in other countries to compare results in different cultural contexts. Another possibility is analyzing the informal context in forming sustainability competences and investigating the theoretical bases in communities of practice as elements to develop competences for the Brazilian chemical sector based on associations such as the ABIQUIM.

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