Students' knowledge of sustainability issues in higher education

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Abstract: The paper examines the knowledge level of sustainability issues in a Brazilian Federal University. PRME sustainability literacy test (SULITEST) provided a validated questionnaire for the research execution. We applied an online survey with 360 respondents with undergraduate students from different knowledge areas of higher education. We submitted data through factorial and cluster analysis. The results show that students have some knowledge about world issues but present higher levels of knowledge about local sustainable issues. The cluster analysis elucidated that students know more about organisational governance while environmental issues proved to be the least understood subject.

Keywords: sustainability; knowledge; higher education; Latin America; principles for responsible management education; PRME.

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1 Introduction

Universities should develop knowledge. Knowledge can be compared to a living system, which grows and changes as interacts with the environment [Davenport and Prusak, (1998), p.6]. Knowledge, unlike information, refers to beliefs and commitment [Nonaka and Takeushi, (1995), p.63].

The definition of knowledge provides a problem to higher education. Environments change constantly and organisations, mainly the ones in charge of forming professionals, try to adapt themselves (Friga et al., 2003). In the past only technical, scientific and a small part of behaviour compose a competitive academic course. Time has changes and today the revising the knowledge in period basis in one more challenge to higher education (Wiśniewska and Grudowski, 2017). Joel Poldony, Director of the Yale School of Management in 2007, claimed that in the last 30 years business changes have occurred in significant ways, yet the schools have not. Nevertheless, the schools have begun to understand that 'present business' is no longer an option and that critical decisions should be made (Lorange, 2005; Pfeffer and Fong, 2004). Schools which seek to innovate for management practices (Khurana, 2010) that are appropriate to current economic, social and technological context (Brown, 1999; Watling et al., 2003).

In the other hand, global community is being studying this complex context and providing sustainable agendas. Sustainability emerges like something that can update the curriculum of business schools helping them to deal with this recent phenomenon. Following several environmental, social and financial crises in recent years, which revealed the significant social and environmental effects of businesses' and other organisations' practices, an increasing number of academics have begun considering that sustainability issues are imperative to the survival of business and society (Godemann et al., 2011).

However, despite a clear consensus that higher education programs require change towards better preparation of students for the complexity they will face as professionals (Atwater et al., 2008), with praxis in mind, there is still uncertainty about how embedding sustainability in the curriculum can be achieved. Sustainability knowledge has several characteristics including social robustness, recognition of system complexity and uncertainty, acknowledgement of multiple ways of knowing and the incorporation of

normative and ethical premises. In order to produce sustainability knowledge, the knowledge production process itself must be changed to be more adaptive and engaged with society (Miller et al., 2011).

According to Miller et al. (2011), the definition of knowledge in sustainability involves the production of this knowledge from the academy, that is, universities must assume the responsibility of being a preponderant factor for the promotion of this knowledge and the necessary conditions for professionals learning. The way that educational institutions organise student research and teaching in terms of sustainability and relate this to the com-munity is vital for the construction of knowledge.

Brazilian Federal Universities have made efforts to conduct programs that encourage sustainability, but these initiatives are still fragmented, isolated and few. We often see similar initiatives in different parts within the same university, without communication between them.

Principles for responsible management education (PRME) from the United Nations is an international network which schools can associate and follow the proposed principles. PRME is also an initiative to change ideas, present best practices projects and connect deans and professors around the world (Borges et al., 2017).

But before thinking about the sustainable management practices it is prudent to verify how students are being taught. One preponderant issue is a base of the knowledge that students have about the content related to sustainability; before prescribing an adaptation formula of this content to existing curriculum, it is necessary to explore student's knowledge in vigour. So, it becomes clear that there is a necessity for investigation into how much students of federal schools know about sustainability, so that these new or management practices can be developed.

For that, the paper examines the knowledge level of higher education students about sustainability dynamics in a Federal Education University in Brazil based on the sustainability literacy test (SULITEST) from the Foundation for Sustainable Leadership, Kedge Business School in France.

2 Objectives and method

According to PRME (2014) SULITEST is an online multiple choice question assessment. It assesses, in 30 minutes, the minimum level of knowledge in economic, social and environmental responsibility, applicable all over the world, in any kind of higher education institution (HEI), in any country, for students from any kind of tertiary-level course (bachelors, masters, MBAs, PhD).

Despite SULITEST has the initial idea to measure the level of knowledge from business students we extend the approach by the argument that all careers should know about the topic. The focus on the PRME project is due to methodological choices, since the survey used as a research tool was developed by the PRME organisation.

We used a non-representative sample as long as the questionnaire was sent by the institutional email to all students from the university, in a mailing list provided by the university with 5,000 emails. 1,283 emails have returned to our mailbox, which means that 3,717 was our original population.

The correctness scores four points; it takes between 30 and 40 minutes to answer the 30 multiple-choice questions. The instrument adopted presents eight variables of the study:

1 founding principles of sustainable development

2 environmental trends and key figures of global local issues

3 social trends and key figures of global local issues

4 economy trends and key figures of global local issues

5 organisational governance

6 human rights and community involvement and development

7 environment

8 fair operating and labour practices and consumer issues.

Obtained data contains 352 valid answers. We used both factorial and cluster analysis. The factorial analysis is in charge of grouping the variables into factors, in this work, in an exploratory way. The goal is to analyse in a combined way the intensity of the knowledge absorbed by theme. On the other hand, the cluster analysis was conducted using the variables as the object of agglomeration, in an intentional way. To Anderberg (1973), cluster analysis is a statistical technique that aims to delineate groups from data sets. It was used here to demonstrate which variable has presented higher quotes. The software used was SPSS and the technique was Euclidean distance by hierarchical cluster.

3 Background theory

3.1 Higher education for sustainability

In our current society, there is a growing awareness of the need to build a sustainable future. The meaning of sustainability and its implied characteristics has been widely discussed; however there is no agreement among scholars concerning its meaning, although the indispensable practices are supported by a more informed action and concerned with the balance between environmental, economical and social systems, on a planetary level (Freire, 2007).

During the meeting of Rio 92, according to Jacobi (2003), the Treaty on Environmental Education for Sustainable Societies and Global Responsibility, which sets principles and an action plan for environmental educators, establishing a relationship between public policy of environmental education (EE) and sustainability was implemented. The author explains that the treaty highlights participatory processes in promoting the environment toward their recuperation, conservation and improvement, as well as towards the improvement of quality of life.

In order to reach environmental sustainability, Sachs [Araujo and Bizzo, (2005), p.2], points out that it is necessary to consider some aspects simultaneously, such as: social, aiming to reduce distances between life patterns of social groups; economical, enabled by the allocation and efficient management of resources, evaluated much more through macro social criteria than micro managerial criteria and through the regular flow of public and private investments; ecological, involving measures to reduce the consummation of resources and production of residues, measures to intensify research, to introduce clean technologies and save resources and to define rules that allow for proper

environmental protection; spatial, contemplating a more balanced setting of rural-urban issues; cultural, seeking endogenous conceptions of involvement that respect the peculiarities of each ecosystem, of each culture and each place.

In this manner, Freire (2007, p.145) explains sustainability requires that, "The individualism should be replaced by more solidary practices, implying, for that reason, an education for the values." Act number 9.795/99, 2nd article, brings up that EE is an "essential and permanent component and it should be present, in an articulated way, in all levels and modalities of the educational process, in formal and informal categories" (BRASIL, 1999).

However, it is believed that a university is a privileged place and that it can cooperate with the creation of a culture that stimulates practices, attitudes and positive behaviour related to the environment (Guimarães and Tomazello, 2003).

There is concern about the environmental dimension and this is clear in Act no. 9.795/99, article 11,

> "Environmental dimension should appear on curriculums of teachers' formation, in all levels and all subjects."
>
> "Only paragraph – Teachers in activity should have complementary formation on their acting areas, aiming to attend properly to fulfillment of principles and objectives National Policy of Environmental Education (BRASIL, 1999)."

Teachers' formation aims not to require working with ideas, concepts, values, skills and attitudes that collaborate to an environmentally responsible society, without any previous formation or continuing education (Guimarães and Tomazello, 2003).

In this way, if teachers want to develop, with their students, environmental formation, they need to […] have in their initial formation and continuing learning situations that enable them to discuss and introduce environmental issues, in conformity with the sustainability discourse [Araujo and Bizzo, (2005), p.3]. Guimarães and Tomazello (2003) affirm that no matter the area of concentration, teachers must have a wide contact with environmental issues, allowing a reflection about the subject and the possibility of bringing about proposals of action on their practices at school.

However, to reach this purpose, something needs to be changed, "either on a curricular level, or on a practices level, it is necessary to see a transformation in our way of thinking and acting in school daily" [Freire, (2007), p.143]. Thus, EE is defined by Act no. 9.795/99, article 1 as the processes whereby individuals and collectives build social values, knowledge, skills, attitudes and competences toward environmental conservation and common use property of the people, essential to a healthy quality of life and its sustainability (BRASIL, 1999).

For that reason, it is necessary that EE, especially higher education, highlights the environmental problems that come from the disorder and degradation of the quality of life in the cities and regions (Jacobi, 2003). Guimarães and Tomazello (2003) believe that, initially, to break the inertia of college structure, the subject EE, as a guiding axis to the different subjects of the curriculum – transversal theme – or as an autonomous subject, could involve the elaboration/cooperation of inter/multi disciplinary projects, with the participation of many professors, working in a cooperative way.

Because of the complexity and dynamism of environmental issues, Araujo and Bizzo (2005) claim that in order to insert a sustainability discourse on the higher educational process it is fundamental that the model of a teacher's formation be supported by the reflection of his/her own practice, aiming to resolve any problems, including conceptual

ones and ensuring that the teacher's curriculum is inseparable from the students' curriculum, as well as their own formation.

Guimarães and Tomazello (2003) believe that there are no short term solutions to totally detain the degradation of the environmental quality and quality of life on the planet, but there is not much time to act on these areas and the contribution of education is the most highly anticipated and the most effective, according to the authors.

Velazquez et al. (2005), Lidgren et al. (2006) and Lozano (2006) argue about the barriers and obstacles to implementation of sustainability in higher education. Resistance to adoption of new paradigms, attitudes and behaviours from a new approach on the sustainable use of resources is one of the elements considered as an obstacle to the inclusion of sustainability. The absence of true meaning, understanding and interest in the subject, followed by distancing the responsibility of educators as to ethics education in sustainability are other aspects mentioned. Moreover, the lack of a suitable framework for the practice of sustainable actions is notably more conservative feature of educational organisation, as suggested by Velazquez et al. (2005).

In this manner, Freire (2007) corroborates declaring that education for sustainability and the necessity of thinking in a different way demand the effort of all those people that are worried about the future of our youth. According to the author, social changes demand the adoption of measures on an educational system level preparing the future generation for future challenges.

According to Nejati and Nejati (2013, p.105)

> "A sustainable university is one which apart from seeking academic excellence, tries to embed human values into the fabric of people's lives; a university that promotes and implements sustainability practices in teaching, research, community outreach, waste and energy management and land use and planning through continuous sustainability commitment and monitoring."

It is experienced that the way people understand sustainability, more specifically environmental issues, is a reflection of higher education. Because the roots of this education are usually derived from diverse backgrounds, understanding the various definitions of sustainability becomes quite important (Fisher and McAdams, 2015).

3.2 Sustainability in higher education

The sustainable development is a multi-disciplinary theme that involves several characteristics that hinder the understanding and applicability of actions that can be considered sustainable indeed, which means that professionals from different areas need to learn many different skills so that they can implement practices that allow one sustainable development. This discussion on the theme of multidisciplinary and its implications is treated in evident way by Hailey (1998), Reid et al. (2009) and Audebrand (2010). At the end of the 90s, Hailey (1998) pointed out the many facets of sustainable development, questioning about the way the issue could be included in the educational curricula of undergraduate and more, under which aspect each course should address the issue, as the focus of an exact course is different from that given to a course in the humanities. An important aspect is the ethical training and citizenship of undergraduate students considering the different perspectives, values, motivation and ideology of the institutions and individuals involved.

Leal Filho et al. (2015) and Savelyeva and Douglas (2017) reinforce the idea that higher education is extremely relevant and makes the difference when it comes to sustainability education, as it reveals important researches results on this subject, in order to develop a scientific discourse on sustainability. Savelyeva and Douglas (2017) suggest that the data collected in surveys contribute to understand the perception that undergraduate students have in terms of sustainable awareness, which is a result continuous engagement program in sustainability through compulsory curricular studies.

Thus, it is relevant to discuss the sustainability context in higher education and how this subject is handled in university programs. There is some important research about sustainability in higher education at Brazilian universities, like those developed by Motloch et al. (2007), Lara (2012), Palma et al. (2011) and Jacobi et al. (2011). Sustainability in education is a response to the environmental demands, changes and competitiveness, which require a new proposition for the training of future managers, who need to become more responsible, flexible and aware about the theme (Palma et al., 2011).

After the publication of Hailey (1998) on sustainability in higher education other authors such as Calder and Clugston (2003), Velazquez et al. (2005), Lidgren et al. (2006), Lozano (2006), Junyent and Ciurana (2008) and Rusinko (2010) addressed the issue of inclusion of sustainability in the curriculum of higher education courses, as well as the institutionalisation of this process and the barriers that hinder the teaching of the subject. Jabbour et al. (2013) discuss that HEIs need to develop activities towards society that involve the environmental quality of the planet, which must be accompanied by a program that enables the transformation of activities related to research, teaching, community-oriented actions and operational management into a greening behaviour.

Lara (2012) believes that interdisciplinary would be an alternative to the inclusion of sustainability in higher education in Brazil, as it must be treated in an integrated way in various disciplines in shaping the individual as a citizen. The idea of environmental preservation should be treated in the three dimensions of university education, which include the development of projects in teaching, research and extension.

Also considering the issue of interdisciplinary, Jacobi et al. (2011) reflect that the involvement of several areas of knowledge and their respective subjects in the study of sustainability are the result of several instances of environmental crisis that pushed somewhat academic institutions to adopt the subject in higher education. For the authors, the idea involves the diversity of experiences and opinions, a change in the behaviour and habits of individuals and a critical analysis of the subjects participating in the process. In this integration process of sustainability an interdependence must exist between people and between disciplines.

The study developed by Palma et al. (2011) seeks to identify the subjects related to sustainability in the management courses of Brazilian federal universities. The results showed that only 33% of cases show some subject on sustainability and only 5 of the 40 sample universities have a specific subject in environmental management. The social responsibility theme appears as a subject in just 2 universities. Most research institutions with the inclusion of the topic of sustainability in the subjects of the educational curriculum of the courses are located in the northeast of the country.

The conclusions of Palma et al. (2011) suggest that it is necessary to insert questions regarding sustainability in management courses and for this it is necessary to develop a more effective role for the academy. Lara (2012) indicates that one of the initiatives to

achieve the inclusion of sustainability in education is the development of an environmental management system that considers the participation of all stakeholders and departments at a university in planning the needs of the consumption of water and energy and the conscious use of natural resources.

Rusinko (2010) presents a clearly generic matrix that can be applied for higher education, in any course, for insertion of actions related to sustainable development. The options considered by Rusinko (2010) involve the use of an existing structure, should be considered, for example, the inclusion of a topic or sustainability module in a graduate course (closer approach) or the integration of sustainability as a common basic requirement to various courses at a university (comprehensive approach). In order to consider building a new structure, we recommend the creation of a training course on sustainability and business and the creation of a specific discipline of sustainability (narrow approach); and the creation of a new multi-disciplinary and cross-cutting issue or a fundamental and mandatory program in sustainability (broader approach).

As Freire (2007) and Sims and Falkenberg (2013) point out that one of the problems to be faced lies in reorienting education teacher education towards sustainability. It would be necessary to develop educational skills to sustainable development, so that also propitiated partnerships between educators, students and other organisations that relate to universities, creating intra-and interdisciplinary learning opportunities that are able to solve problems within and outside the university space.

According to Jacobi et al. (2011), one of the relevant initiatives on sustainability in educational institutions refers to the PRME project, especially in management courses. These initiatives address both the issues related to establishing a structure that enables preservation actions, energy efficiency and recycling, as well as the included concepts and sustainable practices in the programs, research projects and educational curricula of courses.

3.3 About PRME

The discussion about sustainability has been gaining strength since the 1960s. For this reason organisations seek alternative ways to increase their contribution to environmental preservation and to the promotion of a more sustainable world. In this sense, HEIs have also adopted practices aiming to create college *campi* that are socially and environmentally responsible (Lahaise and Pozzebon, 2010).

The first attempt at institutionalisation of these practices, in association with the Management Schools and United Nations, was made by PRME. The program was released in 2007 at the summit meeting *Global Compact Leaders* in Geneva and today there are 571 signers, amongst them 24 Brazilian institutions (PRME, 2014). PRME development marks an important step towards a re-evaluation of the activities developed at business schools (Burchell et al., 2014).

Godemann et al. (2014) and Haertle et al. (2017) mention that the PRME project was established in 2007 and involves the responsibility of institutions to prepare professionals for the challenge of transforming the business environment into a more sustainable context. In this sense, PRME aims to contribute to the curricular enhance of the courses in terms of sustainability, promoting opportunities to review topics, in order to ensure greater involvement of society and the private initiative in sustainable actions.

According to Fiate et al. (2012, p.13), to "stimulate and support, on a global level, education, investigation, innovation and entrepreneurship in the area of responsible management", constitutes the mission of the UN initiative concerning six principles:

1 Purpose: development of students' capacities for them to be future generators of sustainable value for companies and society in general and work on a sustainable and inclusive global economy.

2 Values: incorporation of values of global social responsibility in academic activities and curriculums, as well as those portrayed in international initiatives, such as the Global Pact of the United Nations.

3 Method: creation of educational structures, materials, processes and an environment that allows efficient learning experiences for responsible leadership.

4 Research: general comprehension about organisations' role, dynamic and impact on the creation of sustainable value, in social, environmental and economic dimensions.

5 Partnership: interaction between managers of private organisations in order to extend the general knowledge about their challenges in fulfilment of social environmental responsibilities, in addition to exploring effective approaches for the solution of these challenges.

6 Dialogue: facilitation and support in the debate between educators, students, companies, government, consumers, media, civil society organisations and others interested in sustainability and social responsibility that involves critical global issues.

Business Schools, when they become a volunteer concerning the challenge of incorporating these principles, receive an engagement model offered by PRME to serve as a reference to the necessary systematic changes. Therefore, schools should conform their strategic objectives and mission to the United Nations' values incorporated in the six principles (Fiates et al., 2012). PRME can reduce the distance that exists between academic discourse and sustainability practices in the majority of management schools spread around Brazil and the world. There are many debates and teaching about the importance of sustainable development inside organisations, but few Management schools incorporate those practices in their management and teaching (Lahaise and Pozzebon, 2010; Godemann et al., 2014).

Studies comparing signatory and non-signatory schools of PRME, Burchell et al. (2014) identified that there is little evidence that the former had a significant process on development of responsible management on its curriculums in comparison to the latter. According to the authors, the governance approach adopted by PRME does not produce, by itself, the type of change and development that was expected. However, being a signatory school can be a way in which the institution can engender their organisational change.

4 Results

For the analysis of the results the use of multiple scales of indicators was considered to define each variable, adopting, therefore, the average value of the answers. The total

number of the complete answers of the questionnaire applied resulted in 352 respondents. The statistical analysis was achieved using the statistic software SPSS version 20. The values of the descriptive statistic of research data are disposed on Table 1.

It is possible to observe through Table 1 that the average of the variables is around 5.00 to 4.0 points in scale; in other words, it is below the maximum value of the scale score used on the questionnaire, indicating that the average of correct answers it is not high, especially in the variable 'organisational governance'. The numbers presented in terms of standard deviation of the variables show that the answers changed in a certain way and that the variables 'environment' and 'organisational governance' are the ones that presented the most dispersion in comparison to the average and so the answers were different. Asymmetrical negative values indicate a subtle curve of data distribution on the right side of the normal curve and the negative kurtosis demonstrates an elongated curve of data.

Table 1 Descriptive statistics of variables

Variables	*Value min.*	*Value max.*	*Average*	*Standard dev.*	*Asymmetry*	*Kurtosis*
Founding principles	9	9.1	5,125	1,717	0.071	–0.450
Environment trends	0	9.0	4,972	1,946	–0.236	–0.286
Social trends	0	8.3	4,077	1,878	–0.125	–0.289
Economy trends	0	10	5,637	2,030	–0.193	–0.440
Organisational governance	0	10	3,371	3,531	0.558	–0.854
Human rights community involvement development	0	9	4,700	1,939	–0.073	–0.517
Environment	0	10	5,327	2,539	0.048	–0.888
Fair operating practices labour practices consumer issues.	0	10	4,977	2,079	0.153	–0.554

Source: Own elaboration

The Kolmogorov-Smirnov normality test was the resource used to evaluate the distribution of the research data. According to the test, the p-value of all variables generated a value below 5% (0.05), which indicates a rejection of a hypothesis of data normality. A Pearson correlation analysis was carried out among the variables of the research. The results show that most of the values of coefficient R are under 0.7 (with statistic significance from 0.01 to 0.05), which indicates, according to Hair et al. (2005), that the strength of the association among variables is from moderate to little and there is little co-linearity among them.

The factorial exploratory analysis was achieved by using the method of rotation varimax, which resulted in the following coefficients of measures from the main measurement to be considered for this type of evaluation:

Table 2 presents the indexes of factorial cargo resultants of the reduction process of the number of dimensions found, from a total of eight. We notice that, considering the prerequisites of Hair et al. (2009) for factorial analysis, only the variables social trends, organisational governance and human rights comprehend cargo above 0.5 for the second factor. The other variables are grouped in factor 1. The variance explained for both factors was 59.32%, close to the index defined as ideal for Hair et al. (2009), which is

superior to 60%. This allows us to conclude that only two factors should be considered as representative of the data dimension.

Table 2 Factorial exploratory analysis

Variables	*Cargo factorial 1*	*Cargo factorial 2*	H^2	*MSA*	*Factors*
Founding principles	0.802	0.169	0.672	0.851	1
Environment trends	0.560	0.378	0.456	0.891	1
Social trends	0.349	0.780	0.731	0.776	2
Economy trends	0.785	0.063	0.621	0.887	1
Organisational governance	0.087	0.563	0.325	0.882	2
Human rights community involvement development	0.151	0.812	0.683	0.719	2
Environment	0.702	0.293	0.579	0.877	1
Fair operating practices labour practices consumer issues.	0.799	0.200	0.679	0.815	1

Source: Own elaboration

According to Hair et al. (2009) the coefficient of communality of the variables presented in the research should be more than 0.5. In the table this index appears represented by coefficient H^2, where it is possible to perceive that two variables do not present values inside the minimum limit that is necessary. That means that both variables 'organisational governance' and 'environment trends' present a low estimation of variance shared with the other variables represented on the study.

The technique used for measurement of adjustment was the Kaiser-Meyer-Olkin (KMO) test. The coefficient of measurement of adjustment of the sample normally varies from 0 to 1, in conformity with Hair et al. (2009), the biggest index better explained how much a variable can be measured without error by the other variables. It is perceived that most of the variables have values above 0.7 and that they can follow presupposition of adequacy of the sample, revealing that there is no necessity for the elimination of any variables.

The reliability coefficient measured was 0.792; which attributes consistency among the measures of each variable, in an adequacy on scale.

Table 3 Agglomeration schedule

Stage	*Cluster combined*		*Coefficients*	*Stage cluster first appears*		*Next stage*
	Cluster 1	*Cluster 2*		*Cluster 1*	*Cluster 2*	
1	4	8	1,118,016	0	0	3
2	2	6	1,145,543	0	0	5
3	3	4	1,239,326	0	1	4
4	1	3	1,385,393	0	3	5
5	1	2	1,708,708	4	2	6
6	1	7	1,742,348	5	0	7
7	1	5	4,632,201	6	0	0

Source: Own elaboration

The alpha of Cronbach test was used for the reliability analysis, which allows us to identify to which point the scale of the measure adopted is free of error, evaluating its consistency (Hair et al., 2009).

Data from cluster analysis shows that two-step categorisation and high coefficients of dissimilarity form cluster 1 and 2.

Table 4 Cluster membership

Case	*3 clusters*
Environment: trends and key figures of global/local issues	1
Social: trends and key figures of global/local issues	1
Economy: trends and key figures of global/local issues	1
Founding principles of sustainable development	1
Organisational governance	2
Human rights and community involvement and development	1
Environment	3
Fair operating practices and Labour practices and consumer issues	1

Source: Own elaboration

Table 4 represents the division of the study variables into three heterogeneous clusters. The first one, cluster 1, includes the variables 'fair operating practices and labour practices and consumer issues'; 'human rights and community involvement and development'; 'environment: trends and key figures of global/local issues'; 'social: trends and key figures of global/local issues'; 'economy: trends and key figures of global/local issues' and 'founding principles of sustainable development', that have received on average 15 to 25 points (total of the questionnaire). The second cluster, cluster 2 includes 'organisational governance' that has achieved 19 to 25 points. The last cluster includes the variable 'Environment' that has achieved ten points/score on the total questionnaire.

Nejati and Nejati (2013) studying the key factors about students' perceptions on sustainability, identified a four-dimensional structure, including

1 community outreach

2 sustainability commitment and monitoring

3 waste and energy

4 land use and planning.

The first factor is about the university's engagement in planning programs that benefit the local environment. The second one attaches the university's commitment to sustainability in all dimensions. The third factor focus on uses and reuses of waste and energy in university besides the support services. And the last one is about the campus building planning and campus-land use. All these factors are included in cluster 1 and 2 of this study.

4.1 Data analysis

The descriptive statistics allow for the consideration that some respondents did not reach an average value in the answer to certain questions, that is, the answer marked out by the

respondent was wrong, since the minimum value was zero, which does not supply an average score. The scale adopted was based on a multiple scale that is a choice in what is considered an average value of correct answers, by a combination of indicators of the variable evaluation and so a measure for evaluation is established.

The value of ten points was reached for some variables by some respondents, which infers that there exists a higher knowledge related to factors like corporative governance, economical trends, environment and labour operational practices and issues related to consume. However, when investigating the average value and standard deviation a weak point can be seen in relation to the knowledge of most respondents in corporate governance, followed by the issues related to environment.

Results like those presented above are common. Emanuel and Adams (2011) comparing university knowledge in Hawaii and Alabama found out that less than 20% of the respondents had good knowledge about sustainability. Furthermore, a third of them said they had very little knowledge about it. On the other hand, when the universities were asked to differentiate sustainable terms from unsustainable terms, the researchers concluded they had good present/future understanding.

The lowest value of standard deviation found refers to the variable founding principles, which also represents an average above five points, which makes it possible to evaluate that knowledge on fundamental issues in sustainability, is higher than when it is compared to other variables of evaluation of knowledge about the topic. It can also be analysed that the access to information about trends in economy seems to be greater among students, because the average of correct answers for this variable was the largest among all measurable variables.

Palma et al. (2011) developed a study in order to identify the number of courses related to sustainability offered in bachelor degree programs of business administration in Brazilian federal universities. The authors suggested that the lack of specific courses on sustainability may impair the ability of future managers to deal with the complex business world that they will face.

From the various statistic tests carried out in the exploratory factorial analysis it is possible to consider that the sample was adequate for statistic significance purposes and that the scale reached a reliability coefficient. The factorials cargo indicates the presence of two factors, reinforced by octagonal rotation. The variables founding principles, environment trends, economy trends, environment and fair operating practices labour practices consumer issues are grouped in factor 1 and the others are grouped in a second factor, according to the coefficients of their factorial cargo.

Thus, factor one that groups and reduces the four variables previously mentioned in a single factor was defined by fundamental factors in sustainability – operations, environment and economy. And factor 2 that grouped issues related to governance and social action was denominated as social factors, human development and governance. It is notable that basic information and those that gather the content of environment and economy are grouped into another factor, which leads us to comprehend that the understanding of environmental and economical issues is more similar to social issues and human development (humans rights and development). The governance issues were the least known by respondents, followed by social trend issues.

These considerations indicate that the knowledge of economical dimension, referring to sustainability is more known and because of this, may be the most publicised in the academic environment and mainly, in business environments. The questionnaire elaborated by PRME does not deal with cultural issues from Brazil, or the body of

knowledge that is discussed on the undergraduate courses of the target university. There is no program of EE or of sustainability effectively applied on the courses, especially in environmental themes, social trends and corporate governance.

In their study, Emanuel and Adam (2011) showed that students indicate more commitment to campus sustainability in Hawaii than in Alabama. The authors suggest that this may happen because of the wide program of campus initiatives to protect the environment they have in Hawaii University. In this way, it is possible that if the university studied in this paper had developed sustainability programs, the results would have been different. This may happen because 'student's responses are reflecting the state of sustainable practices in the community where their campus is located. This suggests that, when it comes to campus sustainability, students follow where their community leads [Emanuel and Adam, (2011), p.90].

The cluster analysis contributes when it shows that the variable 'environment' received the lowest score. This means that environment issues such as water, soil, sun, forests, rivers and animals are the least understood by students. On the other hand, 'organisational governance' achieved the highest score which reveals that issues related to financial and economic indicators of organisations are the most well-known issues by the students; this may be explained by the percentage of 12% of the sample composed by students from business courses. The cluster that approached six variables is medium scored. It shows that issues related to triple bottom line trends are known by the students in an average score.

Palma et al. (2011, p.256), found out that the business courses in Latin America, especially in Brazil, are not very concerned with sustainability. In this way, 'it is necessary to dedicate great effort to issues related to sustainability in management courses in order to better prepare managers to deal with the challenges of modernity'.

5 Final considerations

In general, the values obtained through the students' answers are low. This indicates that, in general, the level of knowledge about sustainability is below the expected average. Specifically, the areas where there is greater variation in the level of knowledge of the answers are 'environment' and 'organisational governance'. The results of factorial analysis indicate that the eight variables could be grouped into two factors with pertinent factorial cargo: factor 1 representing the fundamental variables in sustainability like operations, environment and economy and factor 2 representing social variables like human rights, human development and governance.

The answers to factor 1 are more homogeneous that the answers presented to factor 2. It also presents a higher level of knowledge by students than factor 2. Therefore, we can consider that students have more knowledge about local factors (related to their parents) and economical factors, being this one of the pillars of sustainability. Students dominate less sustainability issues associated to the social dimension and global matters.

Organisation governance was the other most well-understood issue, while environment was the least. This can be explained by the high percentage of students from the business course. Trends in all three areas of the triple bottom line (economic, social and environmental areas) received an average score which means that students have some knowledge but do not have a deep understanding of those factors.

Data corroborates (Miller et al., 2011) when they say that knowledge in sustainability involves the production of this knowledge from the academy, that is, universities must assume the responsibility of being a preponderant factor for the promotion of this knowledge and the necessary conditions for professionals learning. Students have shown more knowledge in fields which sustainability works as a teaching subject.

Finally, we can say that the knowledge demonstrated is fruit of teaching in other areas, related to its area of formation that relates to sustainability manners. Agronomy students know more about economic aspects and so on successively. There is a clear heterogeneity of knowledge that students have and there is a lack of initiative in teaching and more coherent and extensive research within the university. These results are related to the conclusions of Fisher and McAdams (2015) regarding the differences of understanding of the subjects of the research to which the origins of their graduate courses refer. A sustainability subject in the area of economics and business directs students' knowledge to a more eco-efficient understanding. On the other hand, students of social science courses understand sustainability for a bias less focused on economic efficiency and more on welfare and health conditions of society in general.

Limitations can be described as the absence of a theory model for SULITES questionnaire and the lack of access to all students' email from the university. For future studies, we suggest a deeper investigation on the trends of triple bottom line. This is justified by the need to explore what and how the students differentiate these issues of knowledge. In addition, works that compare undergraduate courses should also complement future studies.

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