Education for Sustainable Development: An exploratory survey of a sample of Latin American higher education institutions

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Abstract
Education for sustainable development (ESD) is defined as the knowledge and skills 'needed to work and live in a way that safeguards environmental, social and economic wellbeing, both in the present and for future generations'. Skills for sustainable development include critical thinking, creative thinking, systems thinking and leadership.

Over the last decades, there has been efforts across the world to embed ESD into the curriculum. In European Union (EU) countries, some higher education have made efforts to align education strategies with international and national ESD frameworks. A cursory review of the literature seems to indicate that dissemination and implementation of the international ESD frameworks in Latin America has been slow and sporadic. Although there are some signs to implement ESD into curricula of countries such as Brazil and Colombia, these practices have not been substantial or have not permeated higher education sustainable development strategies.

This paper aims to explore the developments of ESD in Latin America. As a first step to explore these developments, it intends to survey and map the current ESD processes in eight higher education institutions of four Latin American Countries: Chile, Colombia, Mexico and Peru. The paper also aims to compare ESD developments with some leading EU higher education institutions in ESD with the view to develop a dialogue between the two regions. These will lead to strategies in which ESD processes can be adopted/adapted with benefits in both directions; it will also create, foster and develop mechanisms that will ensure a sustainable culture of ESD in higher education in both regions. Results of the exploratory survey of a sample of higher education institutions in Latin America are reported

1. Introduction

In order to help addressing the global challenges that the world is facing, the United Nations have called for the integration of sustainable development at all levels of education in the Agenda 21Chapter 36 (UN, 1992). To support this, the concept of education for sustainable development was refined at the International Conference on Environment and Society held in Thessaloniki – Greece in 1997 (UN, 1997). The main message of both of these events was that education should be reoriented towards sustainable development as the means to change the manner society thinks and behave (UNESCO, s.f.). UNESCO has highlighted this by suggesting that current knowledge fails to provide solutions for global challenges. Therefore, they advocated that education must enhance student competences such as critical thinking, imagining future scenarios and work in collaborative ways in order to develop the appropriate responses (UNESCO, 2016). Therefore, and for the purposes of this paper, education for sustainable development will be defined as the knowledge and skills 'needed to work and live in a way that safeguards environmental, social and economic wellbeing, both in the present and for future generations' (QAA, 2014)[1].

Universities around the world have supported this process by signing declarations of intent since 1988 with the Magna Charta of European Universities followed by the Talloires Declaration in 1990, committing to integrate sustainable development within their activities (Lozano, Lukman, Lozano, Huisingh, & Lambrechts, 2013). Whilst declarations provide frameworks for advancing sustainable development at universities, they do not suffice to drive organisational change deeply into processes and disciplinary areas (Bekessy, Samson, & Clarkson, 2007). One of the initial efforts in this process was the integration of environmental education for which there is evidence at higher education courses since 1970 (Alonso M, 2010) even before the concept of sustainable development was established in the Brundland report in 1987 (UN, 1987).

Although the process of integrating sustainable development in universities' activities has included operational issues as well as teaching and learning (Leal Filho, Manolas, & Pace, 2009), the former has been, to some extent, more emphasised and developed in practice (Lozano, 2006). However, in recent years the operational element of sustainable development has been accentuated because of financial support for environmental aspects (Barber, Wilson, & Venkatachalam, 2014), especially in North America. Moreover, there is evidence that there is growing interest in curriculum development issues related to sustainable development from national organisations. Some organisations and agencies that have been active pursuing this aim include the Association for the Advancement of Sustainability in Higher Education – AASHE; the Sustainable Development Solutions Network -SDSN in USA; the Environmental Association of Universities and Colleges-EAUC; and the Higher Education Academy in the UK (HEA, 2015 ;Tilbury, 2011).

The process of embedding education for sustainable development in teaching and learning is complex and may include staff development, curriculum review and networking opportunities (Ryan & Tilbury, 2016). Although there is a growing amount of literature focusing on learning and teaching aspects of sustainable development at universities, there is a limited number of publications concerning the design and review of curricula (Wals, 2014). Methods of assessment have been created and trialled to ascertain the level of integration of

[1] The concept of education for sustainable development has several meanings and interpretations. UNESCO defines its pillars, but the authors found the concept of QAA clearer for the purposes of this paper.

sustainable development within universities' activities such as STARS (Sustainability Tracking, Assessment and Rating System), LiFE' (Learning in Future Environments), GASU (Graphical Assessment of Sustainability in Universities) and SAQ (Sustainability Assessment Questionnaire) studied by Ceulemans, Molderez, & Van Liedekerke (2015). Additionally, there are models and tools to assess and better embed education for sustainable development into the curriculum.

Institutions from the Latin American and Caribbean (LAC) region have made attempts to join international forums dealing with ESD. In fact, some universities as Fundacao Universidade Federal de Mato Grosso and Universidad Autonoma de Centro America-Costa Rica and the Colegio de Mexico are original signatories of the Talloires declaration. On the other hand, universities in the Latin American region have been committed and leaders in environmental education (Sáenz & Benayas, 2015; Sáenz, 2015; 2014); for instance the first conservation courses was offered in 1950 in Colombia. (Sáenz, 2014). However, there is little information in terms of embedding holistically the aspects of education for sustainable development.

Other organizations working for the promotion, research and implementation of education for sustainable development in LAC include: the Mexican Consortium of University Environmental Programmes for Sustainable Development-COMPLEXUS; the Environmental Committee of the Association of Universities in the Montevideo Group-CA-AUGM; the Argentinian University Network for Sustainability and the Environment-RAUSA; and the Alliance of Iberoamerican Networks of Universities for Sustainability and the Environment-ARIUSA (Sáenz & Benayas, 2015).

On the other hand when inspecting ESD strategies deployed by higher education institutions in Latin America, only few models, specifically aim to implement these strategies, have been developed. For example, Geli de Ciurana and Leal Filho (2006) developed the ACES model that includes the complexities to incorporate environmental and sustainable development aspect into the curriculum in higher education. In 2008, the Regional Conference about Higher Education in Latin America and Caribbean Area - CRES signed a declaration where higher education was considered as strategic instrument for sustainable development and inter-institutional and international cooperation, and higher education in Latin America must reaffirm and strengthen the multi-cultural, multi-ethnic and multilingual character of the countries and the region (UNESCO-IESLAC, 2008). The latest declaration signed in Latin America was the "Declaration of the Americas for Sustainability for and from Universities" signed in Loja- Ecuador in 2011 by 53 universities of 15 countries. Its aims was to organise from the Latin American universities the cultural change necessary to contribute in the mitigations of the social and environmental crisis which is in close relation with poverty and environmental damages, as result of economic growth policies (Mora P, 2012)

As regards the situation in the EU, research suggests that higher education institutions in Europe have been leading on this area possibly because of more understanding or interest on the topic. (Disterheft et al., 2012; Karatzoglou, 2013; Matten and Moon, 2004; Lozano et al, 2015). Furthermore, compared to the literature regarding studies in Europe, the research of Latin American cases remains limited.

The main aim of this study is to map curricula in Latin American Universities for their content in terms of education for sustainable development. We plan to continue the study surveying more universities in more detail to then compare these developments with some leading universities based in Europe with the view to develop a dialogue between the two

regions. The overall study seeks to support strategies in which education for sustainable processes can be adapted and adopted to benefit both regions.

The paper is organised as follows: after this introduction, in section 2, the methodology used and the survey strategy justifying the convenience sample of four countries is outlined; the limitations of the study are included in this section. In section 3, the initial results of the survey and on-line search is presented. Afterwards Section 4 discusses the initial results, and finally, in section 5 conclusions and suggestions for future lines of research to enrich the findings are presented.

2. Methodology

2.1 Survey research strategy

2.1.1 Countries and higher education institutions sampled

Since higher education institutions have different orientations and characteristics to give commonalty to the sample, our sampling strategy was to select countries of the Asia-Pacific Alliance: Mexico, Colombia, Chile and Peru. For each country, the two top universities in the QS ranking (2016) were selected. Eight universities in total including one public and one private were surveyed.

At this exploratory stage, only undergraduate programmes were surveyed. The search done in December 2016, looked at the curricula for all faculties and the survey was made using the universities' web pages. To collect the data, a spreadsheet was made using excel. Each undergraduate programme was checked to find the study plan. From the detailed study plan each semester was reviewed and the subjects that fulfilled the parameters below was incorporated to the matrix.

The subjects selected for the matrix where those related with sustainable development concepts as defined for ESD and sustainable development as: *environment* (e); *social development* (s); *culture* (c); and *sustainable development* (sd) as a holistic concept. Those categories were selected from the UNESCO topic of ESD (UNESCO, 2016). All programs that had a publicly access to the syllabus were analysed to guarantee a correct classification. Unfortunately, not all faculties have this information with opened access.

Following the above classification, the subject name of each undergraduate programme was classified into one of the four UNESCO categories. For example, subjects related with biodiversity, climate change, disaster risk, water, pollution, recycling, ecology, or energy were classified as related to the category *environment*. Subjects such as urban planning, social geography, peace, human security, food security, health promotion, gender equity, ethics, peace, and human rights were associated with the category *social development*. Cultural diversity, ancestral knowledge, indigenous knowledge, traditional history, native languages or arts were associated with the c*ultural* aspect of sustainable development. Finally, those subjects with the term sustainable or sustainability (i.e. sustainable building) were classified as related to the category of *sustainable development*. Those subjects named or related with ESD skills as systemic thinking were classified as *sustainable development*. Then, university, faculty, undergraduate program subject name, and ESD classification were organized in the spreadsheet.

A total of 422 undergraduate programmes with their respective detailed study plans was classified. The undergraduate programs inspected contained 2868 subjects that were selected and reviewed. The review and classification was done manually: every study plan (i.e. title or content of the unit) was inspected to classify and count subjects related to one of the four sustainable development categories. Table 1 shows the summary of the counting performed. The full spreadsheet with details of the program, subject title and classification assigned is available from the authors by request.

Country	University	Status	QS Latin America	Total faculties	Total Undergraduate Programs	Total ESD subjects-undergraduate programs
Chile	Pontificia Universidad Católica de Chile (UCC)	Private	3	18	52	508
	Universidad de Chile	Public	6	14	69	178
Colombia	Universidad de los Andes	Private	8	10	38	217
	Universidad Nacional de Colombia	Public	10	10	51	289
Mexico	Universidad Nacional Autónoma de México (UNAM)	Public	4	15	77	686
	Instituto Tecnológico y de Estudios Superiores de Monterrey (TEC)	Private	7	8	50	274
Perú	Pontificia Universidad Católica del Perú	Private	21	9	52	307
	Universidad Nacional Mayor de San Marcos	Public	70	5	67	406

Table 1. Universities sampled according with their position in the QS ranking 2016. (QS, 2016)

2.1.2 Education Sustainable development categories in higher education institutions undergraduate programs sampled

To determine which faculties amongst the sampled universities were more involved with ESD in curricula, similar faculties among the eight universities were identified. The number of occurrence of the categories: *social, environmental, cultural or sustainable development* was counted to establish the total of subjects related with ESD in these four aspects, per faculty and per university. It was considered that this would provide a first overview of the faculties that have integrated ESD into the curriculum to then move to a more detail study in the future. .

Additionally, the general structure of the faculties and universities was surveyed to validate if the findings per faculty correspond to an institutional agreement in sustainable development or other of its aspects. Those structures included environmental management, university social responsibility, culture and sustainable development statements.

2.2 Limitations of the survey and classification procedure

This is an exploratory study and based on a small sample. This poses obvious limitations to the study. In addition to that, the following limitations to the classification procedure carried out are worth noticing:

- The programmes analysed are only outline documents and they do not represent the complete course aspects
- The title and general content may or may not describe the programme intentions in relationship to ESD.
- The name of the subject or unit (as appear in the curriculum or course program) is not warranty that is related with the ESD categories used to classify them.
- To review the syllabus of the subject is a proxy to ascertain the content and structure of the subject. However, not all universities have open access to this information.
- When reviewing some subjects (without a syllabus), the classification was relied on the name. But even a fancy name with the word sustainable does not mean that the content or the way is taught is effectively a case of ESD.

3. Initial Results

In this section, results obtained from the search are presented. First, the results of the sustainable development categories in the curriculum of the universities sampled are presented; Secondly, the results by faculty per university associated to the ESD categories proposed by UNESCO are presented. We complement this set of results by presenting a view as to how institutions in the sample have displayed their commitment to environmental and sustainable issues.

3.1 Distribution of sustainable development categories in undergraduate curricula for universities sampled

Figure 1 shows that *environment* and s*ocial* issues are the commonest subjects related to ESD (blue and orange bars in Figure 1) followed by cultural ones. Sustainable development or sustainability is explicit in less proportion than subjects related with culture.

The two Mexican universities (TEC and UNAM) lead the programmes with curricula directly related with ESD. It is important, also to highlight that, in terms of environmental programmes provision, public universities have a wider offer than private ones.

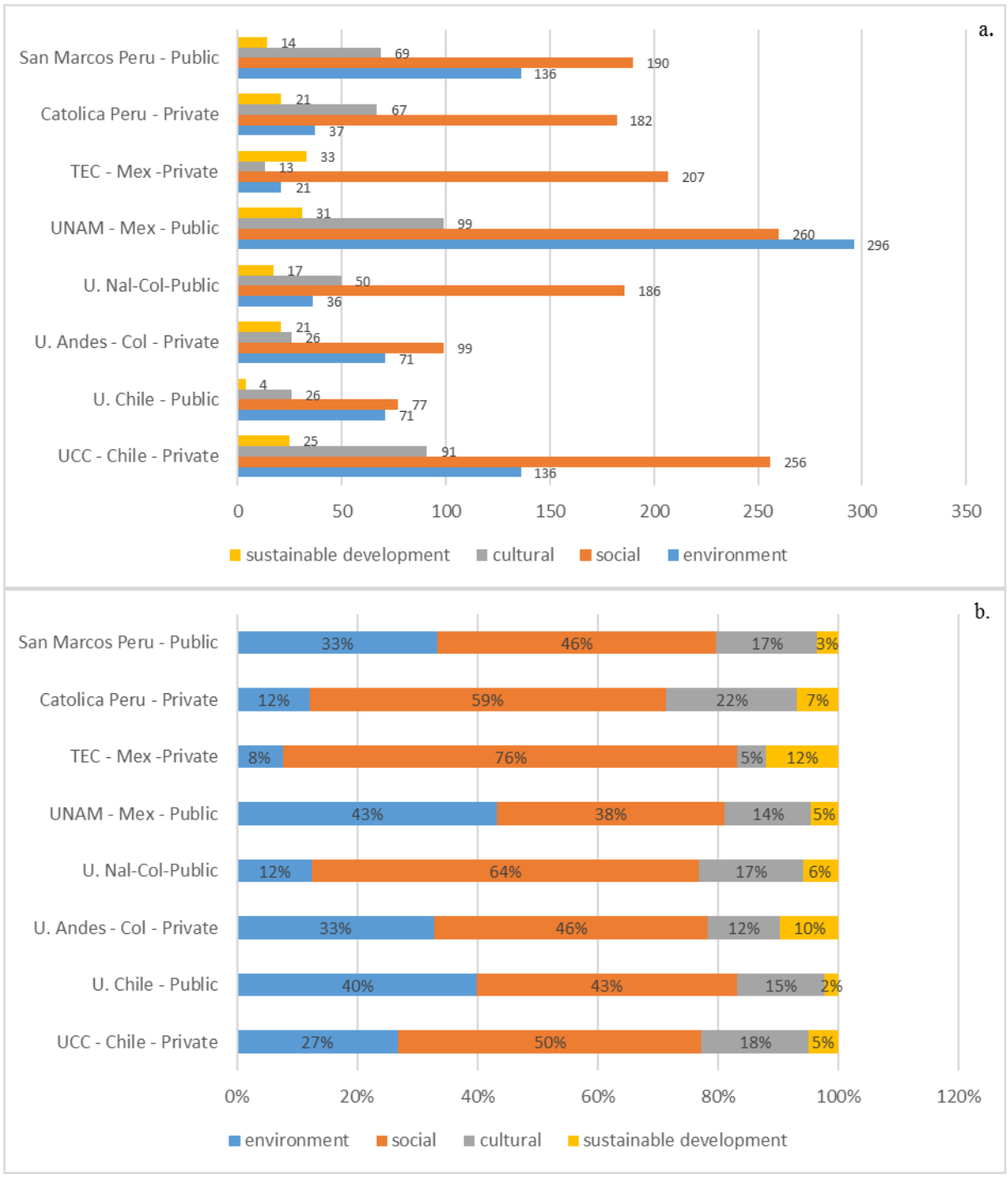
3.2 Subjects by faculty per university associated to the UNESCO ESD categories

As it can be seen in Figure 2, the faculties of engineering, in average, have the highest commitment with environmental aspects and sustainable development. However, the figures seems to suggest that the environmental component is still weak compared with the social aspects of ESD and not being sufficiently addressed.

Also it is worth noticing that the fraction of subjects including *sustainable development* is lower than 30%. The trend in universities, and the composition of programs, is towards the social component of sustainable development. Interestingly, apart from Social Sciences, Design, Architecture and Arts programs are those including social issues in a very significant part of their courses. This may suggest Latin American universities have still much to do in order to guarantee a sustainability culture. However, in universities such as Los Andes, Universidad Nacional Mayor de San Marcos, UNAM and Universidad de Chile (see table 2), they are becoming, by declaration in their strategic plans, an integration of the environmental and sustainable development component into their academic plans. This could mark significant professional achievements in the pursuit of sustainable development goals by 2030. However, as an example the Social Sciences faculty of Universidad de Los Andes, does not include any environmental neither sustainable development subjects in its academic

offer. Social sciences faculties in general have a considerable component of social and cultural subjects as it was expected; however, the environmental component is under 10%.

Although the results (Figure 1, Figure 2) presented give an overview of ESD content in the undergraduate programmes and faculties, they do not give in depth information about how programmes address its components. Then, the next phase of this work will be to use a more detailed approach to map sustainable development.



a. Number of subjects per university in each area. b. total fraction (%) of EDS topics per university

Figure 1. Distribution of sustainable development categories in undergraduate curricula for universities sampled

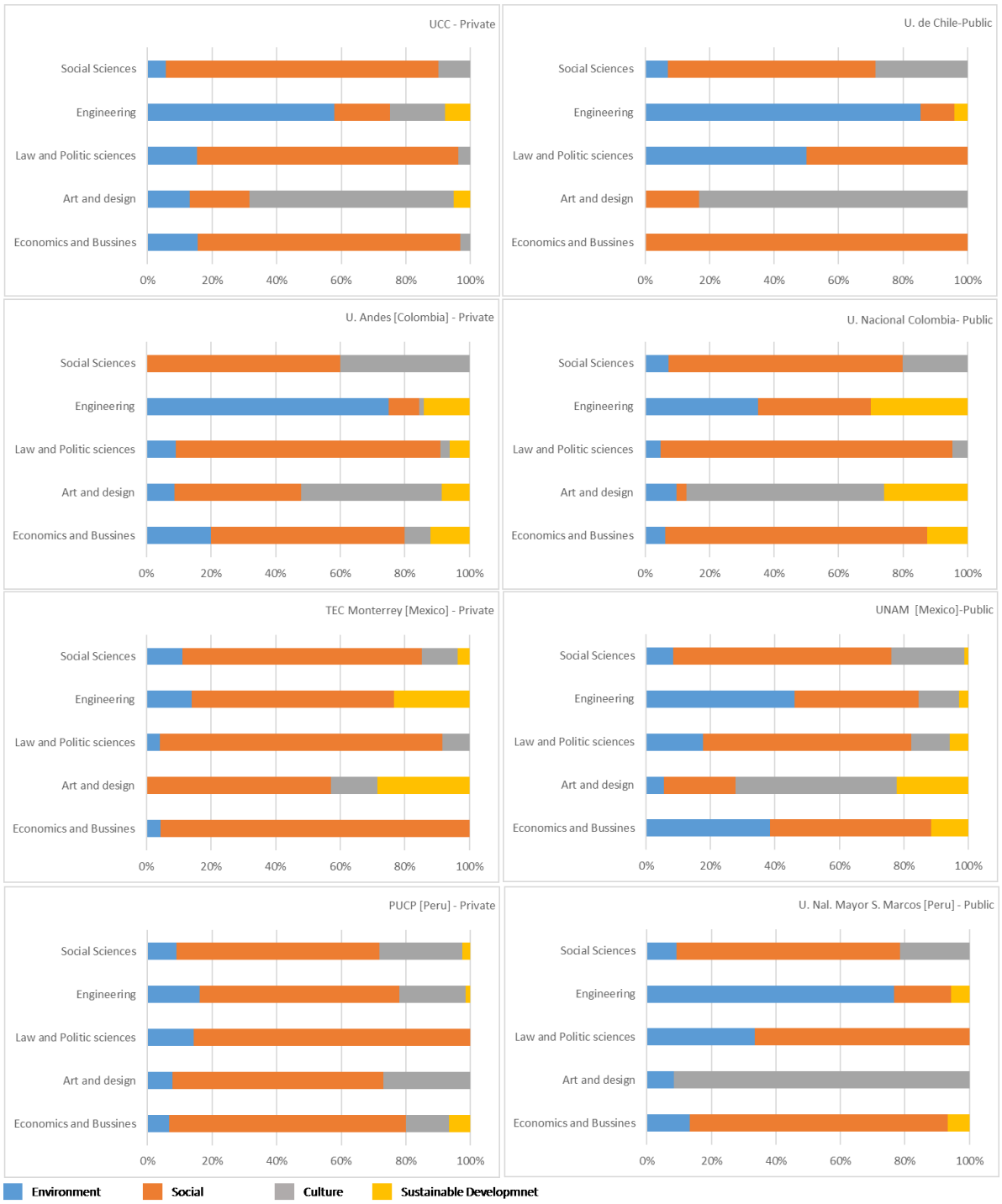


Figure 2. Number of subjects by faculty per university associated to the UNESCO ESD categories: environment, social issues, culture and sustainable development.

To assess higher education institutions commitment to the operational aspects of sustainable development in general. That is to assess how publically they meant to be committed to engage with sustainable development in their day-today operations. To explore this, a search for evidence of elements of environmental management and sustainable development commitments in their using institutional web pages was made. For university social responsibility, culture and sustainable development, the mission and other institutional declarations were analysed.

All universities have a commitment with social responsibility and/or sustainable practices in campus operation (Table 2). It is important to highlight the universities' compromise with the social and culture promotion, which are considered components of sustainable development.

	Environmental Management							Sustainable Development		
University	**solid waste**	**Transport**	**Water**	**Buildings**	**Energy**	**Campus**	**Policy**	**USR**	**Culture**	**Sustainable Human Development**
Pontificia Universidad Católica de Chile (UC)	x	x	x			x			x	x
Universidad de Chile	x	x	x			x			x	
Universidad de los Andes	x	x	x	x	x	x	x	x		x
Universidad Nacional de Colombia	x	x	x	x	x	x		x	x	
Universidad Nacional Autónoma de México (UNAM)						x	x			x
Instituto Tecnológico y de Estudios Superiores de Monterrey	x	x	x	x	x	x		x		x
Pontificia Universidad Católica del Perú					x	x		x	x	x
Universidad Nacional Mayor de San Marcos	x							x	x	x

Table 2. Evidence of Environmental Management and Sustainable Development in universities sampled.

As it can be seen in Table 2, most of the universities sampled had a University Social Responsibility commitment, and look to contribute with culture in aspects such as cultural heritage preservation and national identity. Six universities, from a total of eight, either have explicitly in their mission or as an institutional programme their awareness and commitment with sustainable development.

4. Discussion

To discuss the results about embedding ESD in the eight Latin American universities e the structure proposed by Gale, Davison, Wood, Williams, & Towle (2015) (Figure 3) was used. They found "that different disciplines attract different values" and understandings for sustainable development and it is one impediment to establish ESD in higher education. Their research suggest that business disciplines are more related with the economic dimension of sustainable development because of their view of natural and social capital, while applied life sciences related areas interpret sustainable development as a relation between environment with economic, and ignore the social component. Social disciplines are focused in social justice, equity, poverty among others. Similar trends were found in this exploratory research (see Figure 3). This model allow us to observe the trends of the different faculties where not equilibrium towards sustainable development can be seen apparently.

Engineering faculties are more concerned towards the environment, maybe because the cost-benefit approach own of the profession; social sciences, law and politic sciences are increasing the relation of resource scarcity and availability with social aspects as inequity, health, peace, human rights, cultural heritage, etc.

As can be seen from the results reported in this section, even business and economics faculties in Latin America, are getting aware of the importance and impacts of environment in economy and society. This analysis suggests that it is necessary an interdisciplinary dialogue towards ESD in Latin America where the view of the university as a competitive commercial enterprise (Tünnermann, 2003) needs to be challenged and maybe replaced by a more open and inclusive view that seeks the wellbeing of the different stakeholders including the community where the higher education institution operate.

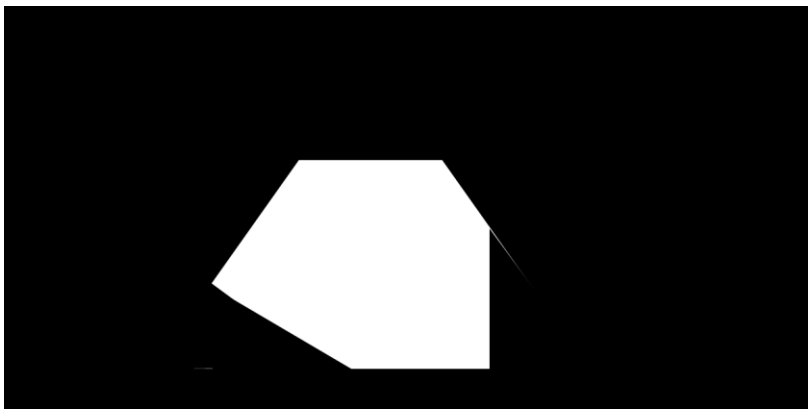


Figure 3. Trends in ESD by disciplines in Latin America.
Adapted from the concept of Conceptions of sustainability in higher education institutions using Connelly´s approach (Gale, Davison, Wood, Williams, & Towle, 2015).

Regarding the distribution of sustainable development categories in undergraduate curricula for universities sampled, it seems clear that the top universities in the Latin America Asia-Pacific countries have the awareness respect ESD either in the social, cultural or environmental aspects of sustainable development. However, the strongest area is the social component. Subjects as ethics, citizenship, rural and social development and cooperation to development are the predominant. It is part of the Latin American universities structure, a combination which evokes the colonial, and religion legacy of the confessional university (Soto A, 2004) and the search for a more humanistic university in the mid-end of the 20th century (Soto A & Forero R, 2016). However the industrial and commercial purposes influenced by North American universities (Tünnermann, 2003), is still prevailing; it can be notice comparing the number of EDS topics and the other subject per undergraduate program. The first ones do not exceed the subjects in professional formation of each program, not even in the social component, and most of them are elective subjects, excepting those programs of the social and human sciences.

Considering that the missions of the eight universities are similar in terms of contributing to social and human development and cultural preservation, it was expected to find more compulsory courses in social development and Latin-American culture. Additionally, the compromise with sustainable development would entail a balance between the social,

environmental and cultural components exposed by UNESCO for the incorporation of ESD in higher education which is not reflected in any faculty.

The Universidad Nacional Mayor de San Marcos, declare in their mission that is "Committed to the sustainable development of the country and the protection of the environment; trainer of leading professionals and competent, responsible, courageous and respectful researchers of cultural diversity; promoter of national identity, culture of quality, excellence and social responsibility" (UNMSM, 2016). It is contradictory that the only university among the studied universities, who explicitly declares its commitment with sustainable development, has one of the lowest number of subjects in it and just above the average for environmental topics. It suggest as the UNESCO (2012) proposed a clear need to include in the curriculum appropriate subjects for these purposes, a clear own definition in their context of sustainable development, and the creation of its own action plan with their particularities and challenges.

In fact, only one university, UNAM have the total of its studied faculties with all four component of EDS, followed by Universidad de Los Andes with three out of four faculties. Even they are not equity distributed; it partially reflects the findings of Saenz (2014) about the leadership of Colombia and Mexico in environmental and sustainable development incorporation in higher education. Both Universities have an structured program for sustainable development, for UNAM is called EcoPUMA-University Program of Strategies for Sustainability- (UNAM, 2016), for Los Andes there is a complete sustainable structure led by Fenicia Plan (UNIANDES, 2016)

Among the subjects found as part of the inclusion of ESD in higher education, it was clear that most of them are part of the elective and flexible curriculum. Although some authors defend the position of including a compulsory subject on sustainable development in the curriculum, the added value of free elective is the interdisciplinary aspect that can emerge in those subjects. Interdisciplinary work is recognised as one of the necessity for champions teachers committed with ESD (Wood, et al., 2016). It promotes the understanding and analysis of natural and human phenomena from diverse dimensions.

As mentioned in the introduction, ESD in higher education is approached thought campus operation, institutional policies, integration sustainable development in curricula, staff training, research on sustainable development, and assessment and reporting (Disterheft & et al, 2015; Leal, Manolas, & Pace, 2009; Lozano R., 2006). Altought this research was focused in the curricula, as part of the exploratory phase the exploration in campus environmental management, policies and statements was made to have an idea about the institutional awarenes. It is clear, that many universities are getting involved either because of environmental policies in their region or it own conviction about environmental problems as solid waste, water and air pollution, but also concerned about climate change (i.e energy eficinecy, carbon footprint). It is reflected in the eigth Latin American universities surveyed. All of them have some explicitly action about environment. In fact, six of eight universities are participating in GreenMetrics (UI GreenMetric, 2017). Pontificia Universidad Catolica del Peru, Pontificia Universidad Catolica del Peru, UNAM, TEC, Universidad Nacional de Colombia, Universidad de Los Andes. This worldwide Metric has five criteria to evaluate campus operation and one to evaluate education and sustainability (Lauder, Sari, Suwartha, & Tjahjono, 2015). Thus, Latin American Universities that voluntarily apply to environmental management strategies as it was found.

Lozano et al., (2015) whom found that campus operation is focused, primarily, on waste managemen, where recycling is the main activity is similar with the findings of this research. As example are TEC and Universidad Nacional Mayor de San Marcos with their paper recycling programms. Although the same authors stated that water management trends to be the least aspect considered by universities, there are important practices in Latin American universities, such as Universidad de Los Andes and TEC, which have wastewater treatment plant in their campus. The EU higher education institutions are highly committed greening the campus (Disterheft, Caeiro, Ramos, & Azeiteiro, 2012) maybe because all the benefits that can it brings (Leal Filo, 2015); however, there are no evidence if the Latin American Universities are greening their campus with this knowledge. But, it could be another research topic of Latin American higher education institutions.

5. Initial Conclusions and Further Research

In this paper, an initial approach as to how to ascertain the presence of elements of sustainable development into the curricula of higher education institutions in Latin America was presented. the desirable sustainable development elements as the ones recommended by UNESCO were taken (2016).

This exploratory phase included two of the strands of ESD in higher education the campus operation (e.g. green campus initiatives) and the embodiment of sustainable development elements into the curricula of the higher education institution programs. Ideally, a genuine and lasting commitment to sustainable development principles should be seen and taught for future generations to assimilate and applied these principles.

Based on the results of the Latin American universities sampled s, compared to EU, the Latin-American universities seems to have made some progress. Judging from their activity in regional forums, there is evidence of their commitment to operationalize sustainable development principles. As regards embedding sustainable development elements in the curricula, again there seem to be some progress , especially in the social, and environmental area. Engineering faculties in Latin America seem to be concerned in the environmental issues of sustainable development, whereas social sciences and law and politics sciences showed a compromise with both environment and culture issues for sustainable development. Although all universities have courses explicitly called with the word *sustainable*, the amounts of this courses looks still low compared with the total of social related courses. It suggest that could be relevant to know what sustainable development mean for academic actors (i.e. teacher, students, and other staff) to stablish the relevance in their professions and facilitate the interdisciplinary work that sustainable development is challenging in universities today.
This exploratory research seeks to open possibilities for many universities in Latin America to increase and improve their contributions to Sustainable Development. An important pathway for achieving this goal is related to new curricular projects structured around Education of Sustainable Development. A particular emphasis will be given to Systems Thinking due to the holistic sense this way of structuring social issues, way that fosters the understanding and effective practice of ESD and for the specific characteristics of Latin American students.

As stated before, this is an initial quantitative study based on a small sample. To have a better and complete picture it will be necessary both to increase the sample size and to embark in a

qualitative study that is a more in depth study by selecting some representative Latin American universities and extract relevant data about their endeavours to embedded sustainable development in their programs. This can be done maybe by interviewing key staff in each university. Further research also is needed to ascertain other way (this study concentrates on the curriculum content) to see how developments and applications of sustainable development can be seen in the activity of higher education institutions in Latin America.

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