

Clustering Between Universities In Top10 Of QS World University Rankings® Latin America Region 2020

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Abstract

QS World University Rankings® Latin America Region classifies and reviews the academic performance of University Education Institutions from Latin-America according to eight indicators: Academic Reputation, Employer Reputation, Faculty Student, Citations per Paper, Papers per Faculty, Staff with PhD, Web Impact e International Research Network. Results may also be analysed by country. This paper aims to distinguish, through clusters, the universities in Top10 of QS World University Rankings® Latin America Region 2020, in order to relate and compare their indicators through a descriptive analysis. They highlight the clusters formed between Overall Score indicators and the others in the ranking. As a result, highlights the high competitiveness between institutions. In clusters 1 are located between six and seven universities with the best points. Despite UC (Chile) and USP (Brazil) have the highest values; ITESM (Mexico) and UNAM (Mexico) are also positioned in relation to FS. UNIANDES (Colombia) highlights in AR, ER, PF, CP, SP and WI indicators.

Keywords: Clusters, University, QS World University Rankings® Latin America Region, Latin-American countries

1. Introduction

QS World University Rankings® [1] [2] and QS World University Rankings® Latin America Region [3] [4] produce an annual university classification, through a numerical to evaluate and compare the university performance. The first one uses six metrics [2] and, the second one, eight indicators [4], of which three agree in name and definition. Both use expert judgment in the higher education sector, the information supplied by employers and the university itself and, also, Elsevier's Scopus Database [2] [4] [5].

In respect to Latin-American regional ranking, reports are general given in the region and also per country, according to the value for the rank and the results of Overall Score indicator [3] [4]. Similarly, as in both rankings happen, any of the indicators can be selected and, then, universities hierarchy based on the same [6] [7] [8] [9] [10].

This paper aims characterize, through clusters, universities in Top10 of QS World University Rankings® Latin America Region 2020, in order to relate and compare their indicators through a descriptive analysis. Firstly, information is presented over the indicators of ranking and, then, show that clusters formed between Overall Score indicator and the results of indicators: AR, ER, FS, PF, CP, SP, IRN and WI.

Nomenclature

QS	Quacquarelli Symonds
OS	Overall Score
AR	Academic Reputation
ER	Employer Reputation
FS	Faculty Student
CP	Citations per Paper
PF	Papers per Faculty
SP	Staff with PhD
WI	Web Impact
IRN	International Research Network

2. QS World University Rankings® Latin America Region 2020

Since 2011, British consulting Quacquarelli Symonds (QS) publishes annually the ranking of universities of QS World University Rankings® Latin America Region [4], comprising a set of performance indicators adapted to region and, between them, maintain three metrics that match in name and definition with QS World University Rankings® [2] [4]: AR, ER y FS. However, weightings and values of those indicators are different in the two rankings and, therefore, the ranking of Latin-American universities does not coincide in both reports.

QS World University Ranking® Latin America Region considers eight indicators [4]: Academic Reputation (AR), Employer Reputation (ER), Faculty/ Student Ratio (FS), Citations per Paper (CP), Papers per Faculty (PF), Staff with PhD (SPH), Web Impact (WI) and International Research Network (IRN). The ranking of Latin-American universities reports is realized from an Overall Score indicator and the measurement results are reflected as rankings indicators, in this consecutive order in 2020 edition [3]: IRN, WI, SP, PF, CP, FS, ER and AR. In 2018 [11] and 2019 [12] appear in inverse order and, in 2017 [13], are presented in this sequence: AR, ER, FS, CP, PF, IRN, SP and WI. 2021 results are not yet published, while the QS World University Rankings® results are published [7].

Table 1 presents the results of indicators of universities in Top10 of QS World University Rankings® Latin America Region [4], which has been used for the descriptive analysis. Top10 of the ranking covers universities from five Latin-American countries: UC and UCHILE from Chile; USP, UNICAMP and UFRJ from Brazil; ITESM UNAM from Mexico; UNIANDES and UNAL from Colombia and, finally, UBA from Argentina.

Table 1. List of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3].

University	Country	Overall Score	International Research Network	Web Impact	Staff with PhD	Papers per Faculty	Citations per Paper	Faculty Student	Employer Reputation	Academic Reputation	
			10%	5%	10%	5%	10%	10%	20%	30%	
Pontifical Catholic University of Chile	UC	Chile	100	99,6	94,2	95,2	99,3	95,8	58,8	100	100
University of São Paulo	USP	Brazil	99,4	100	100	100	100	87,4	53,3	99,7	100
Monterrey Institute of Technology and F	ITESM	Mexico	98,4	98,6	73,2	93,5	54,5	95,1	99,6	99,9	93,6
University of the Andes	UNIANDES	Colombia	97,2	98,1	97,5	89,1	92,2	88,5	51,7	99,9	99,3
University of Campinas	UNICAMP	Brazil	96,4	99,3	100	100	100	90,9	46,3	88,1	99,9
National Autonomous University of Mex	UNAM	Mexico	96,3	100	100	72,3	57,1	71,2	89	100	100
University of Chile	UCHILE	Chile	96,1	99,8	100	79,5	99,8	93,1	37,1	100	100
University of Buenos Aires	UBA	Argentina	93,4	99,5	99,8	55,1	28	71,1	94,1	100	100
Federal University of Rio de Janeiro	UFRJ	Brazil	90	99,8	100	99,8	99,4	84,3	46,6	61,4	99,4
National University of Colombia	UNAL	Colombia	89,4	97,9	99,8	88	94,9	42,9	20,7	99,9	99,8

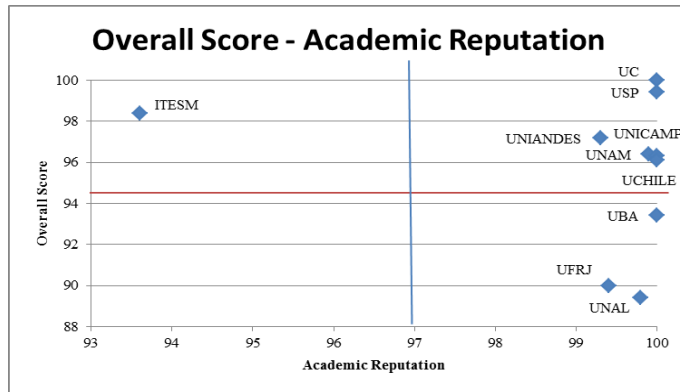
3. QS World University Rankings® Latin America Region 2020 and Top10 of universities

Below are presented the clusters formed in relating the Overall Score indicator with the others: AR, ER, FS, PF, CP, SPH, IRN and WI of the universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4] [14] [15].

3.1. Relationship between Overall Score and Academic Reputation indicators (AR)

Results of AR indicator are obtained by a QS Academic Survey applied to academic experts who give their appreciation about the best universities in the world in terms of research and, it also carries the highest weighting of 30% [3] [4], while in QS World University Rankings® its

Fig. 1 presents the cluster formed with the universities in Top10 of QS World University Rankings® Latin America Region 2020, in relating the Overall Score and AR indicators. Table 2 indicates the cluster characteristics [3] [4]. Six are the best positioned universities (cluster 1): UC



(Chile), USP (Brazil), UNICAM (Brazil), UNIANDES (Colombia), UNAM (Mexico) and UCHILE (Chile).

Fig. 1. Cluster of Overall Score and Academic Reputation indicators (AR) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4].

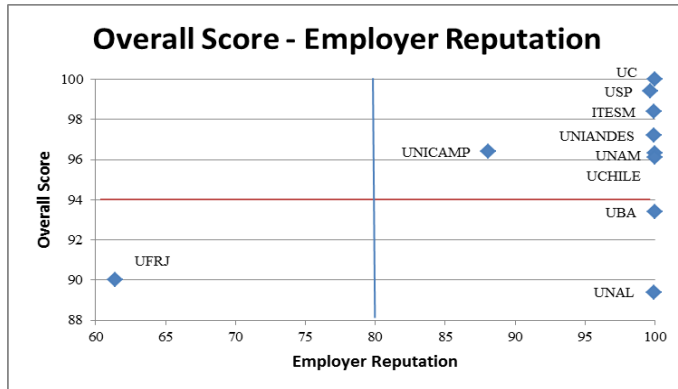
Table 2. Cluster characteristics of Overall Score and Academic Reputation indicators (AR) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4].

Cluster	University	Overall Score	Academic Reputation
1	UC, USP, UNIANDES, UNICAMP, UNAM, UCHILE	OS>94	AR>97
2	ITESM	OS>94	AR<97
3	UBA, UFRJ, UNAL	OS<94	AR<90

3.2. Relationship between Overall Score and Employer Reputation indicators (ER)

Results of ER indicators are obtained through a QS Employer Survey applied to employers who supply their opinion about universities, in their opinion, graduate the most competent, innovative and effective professionals. It also carries a weighting of 20% [3] [4], while in QS World University Rankings® its valuations are 10% [2].

Fig. 2 presents the cluster formed with universities in Top10 of QS World University Rankings® Latin America Region 2020, in relating the Overall Score and ER indicators and. Table 3 2 indicates the cluster characteristics [3] [4]: The universities UC (Chile), USP (Brazil), ITESM (Mexico), UNIANDES (Colombia), UNAM (Mexico), UCHILE (Chile) and UNICAMP (Brazil) highlight with the highest values of Overall Score and ER indicators.



(Mexico), UNIANDES (Colombia), UNAM (Mexico), UCHILE (Chile) and UNICAMP (Brazil) highlight with the highest values of Overall Score and ER indicators.

Fig. 2. Cluster of Overall Score and Employer Reputation indicators (ER) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4].

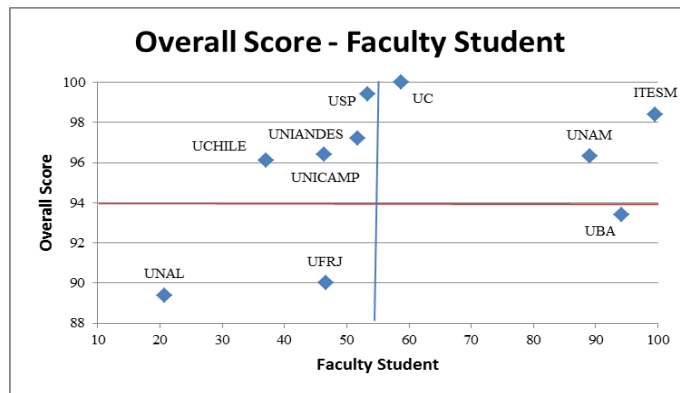
Table 3. Cluster characteristics of Overall Score and Employer Reputation indicators (ER) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4].

Cluster	University	Overall Score	Employer Reputation
1	UC, USP, ITESM, UNIANDES, UNICAMP, UNAM, UCHILE	OS>94	ER>80
2	UFRJ	OS<94	ER<80
3	UBA, UNAL	OS<94	ER>80

3.3. Relationship between Overall Score and Faculty Student indicators (FS)

The FS indicator’s data, with a weighting of 10% [3] [4], while in QS World University Rankings® its valuation is 20% [2], are supplied by universities. The indicator refers to the proportion between the number of academic staff with the number of enrolled students. It is a measure of quality in teaching, in assessing the capacity of institutions to supply professors to their students.

Fig. 3 presents the cluster formed with universities in Top10 of QS World University Rankings® Latin America Region 2020, in relating the Overall Score and FS indicators [3] [4]. Cluster



characteristics are presented in Table 4, where are highlighted ITESM (Mexico), UC (Chile) and UNAM (Mexico) as the best universities (cluster 1).

Fig. 3. Cluster of Overall Score and Faculty Student indicators (FS) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4].

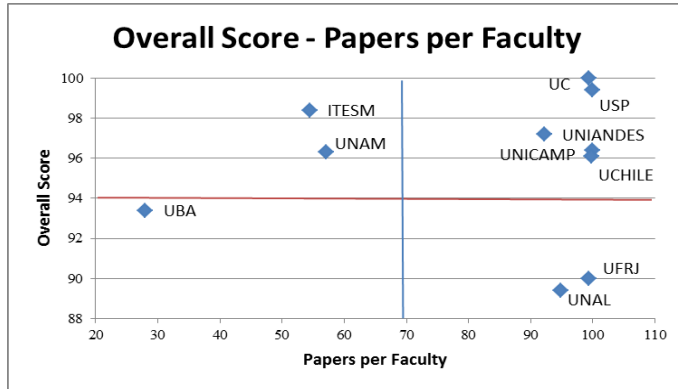
Table 4. Cluster characteristics of Overall Score and Faculty Student indicators (FS) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4].

Cluster	University	Overall Score	Faculty Student
1	UC, ITESM, UNAM	OS>94	FS>55
2	USP, UNIANDES, UCHILE, UNICAMP	OS>94	FS<55
3	UNAL, UFRJ	OS<94	FS<55
4	UBA	OS<94	FS>55

3.4. Relationship between Overall Score and Papers per Faculty indicators (PF)

The PF indicator’s data, with a weighting of 5%, are extracted from Elsevier’s Scopus Database [3] [4]. It refers to average number of scientific papers produced and published by faculty indexed in the last five years [5] (from 2012 to 2016 to 2019 edition). It measures the productivity of research of the universities.

Fig. 4 presents the cluster formed with universities in Top10 of QS World University Rankings® Latin America Region 2020, in relating the Overall Score and PF indicators [3] [4]. Table 5 presents the cluster characteristics: in this case, UC (Chile), USP (Brazil), UNIANDES



(Colombia), UNICAMP (Brazil) and UCHILE are the best institutions (cluster 1).

Fig. 4. Cluster of Overall Score and Papers per Faculty indicators (PF) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4].

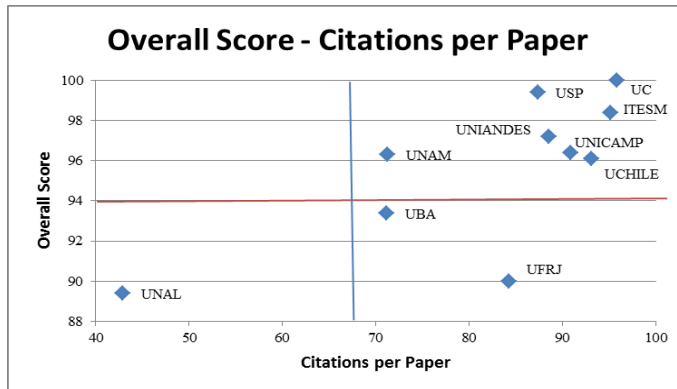
Table 5. Cluster characteristics of Overall Score and Papers per Faculty indicators (PF) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4].

Cluster	University	Overall Score	Papers per Faculty
1	UC, USP, UNIANDES, UNICAMP, UCHILE	OS > 94	PF > 70
2	ITESM, UNAM	OS > 94	PF < 70
3	UBA	OS < 94	PF < 70
4	UNAL, UFRJ	OS < 94	PF > 70

3.5. Relationship between Overall Score and Citations per Paper indicators (CP)

The CP indicator’s data [3] [4], with a weighting of 10%, are also extracted from Elsevier’s Scopus Database [5]. It refers to average number of citations obtained by publication as measure of quality and impact of investigative papers published by universities.

Fig. 5 presents the cluster formed with universities in Top10 of QS World University Rankings® Latin America Region 2020, in relating the Overall Score and CP indicators [3] [4]. Table 6 comprises in cluster 1, seven universities: UC (Chile), ITESM (Mexico), USP (Brazil),



UNIANDDES (Colombia), UNICAMP (Brazil), UCHILE (Chile) and UNAM (Mexico) as the best universities with results of Overall Score over 94 and CP more than 70.

Fig. 5. Cluster of Overall Score and Citations per Paper indicators (CP) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4].

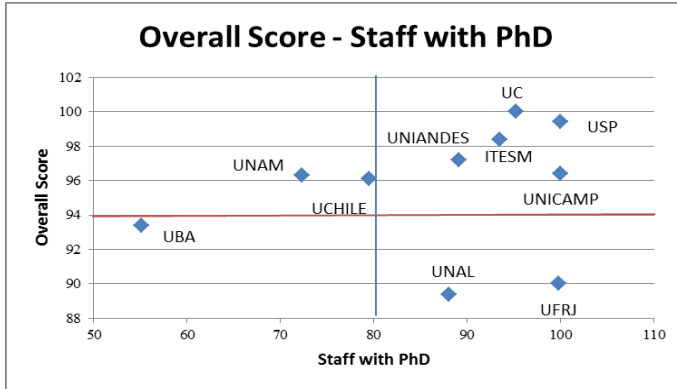
Table 6. Cluster characteristics of Overall Score and Citations per Paper indicators (CP) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4].

Cluster	University	Overall Score	Citations per Paper
1	UC, USP, ITESM, UNIANDDES, UNICAMP, UNAM, UCHILE	OS>94	CP>70
2	UNAL	OS<94	CP<70
3	UBA, UFRJ	OS<94	CP>70

3.6. Relationship between Overall Score and Staff with PhD indicators (SP)

SP indicator is a measure of quality in teaching and institutional research. It measures the proportion of academic staff with doctorate level in their specialty area [3] [4]. It has a weighting of 10% and data supplied by universities.

In Fig. 6, four clusters are defined with universities in Top10 of QS World University Rankings® Latin America Region 2020, in relating the Overall Score and SP indicators [3] [4]. Table 7 shows as cluster characteristics that UC (Chile), USP (Brazil), UNIANDES (Colombia),



ITESM (Mexico) and UNICAMP (Brazil) are the best positioned universities (cluster 1).

Fig. 6. Cluster of Overall Score and Staff with PhD indicators (SP) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4].

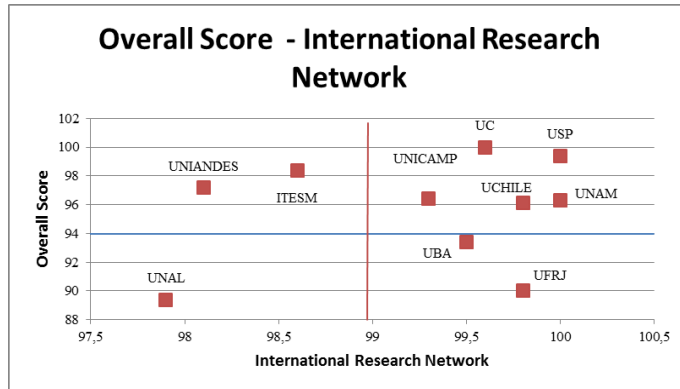
Table 7. Cluster characteristics of Overall Score and Staff with PhD indicators (SP) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4].

Cluster	University	Overall Score	Staff with PhD
1	UC, USP, ITESM, UNIANDES, UNICAMP	OS>94	SP>80
2	UNAM, UCHILE	OS>94	SP<80
3	UBA	OS<94	SP<80
4	UNAL, UFRJ	OS<94	SP>80

3.7. Relationship between Overall Score and International Research Network indicators (IRN)

IRN indicator values the degree of international openness in terms of research collaboration to each university, through the Margalef index, used in environmental sciences [3] [4]. Data are also extracted from Elsevier’s Scopus Database [5], as happen with CP and PF. It has a weighting of 10%.

Fig. 7 presents four clusters with universities in Top10 of QS World University Rankings® Latin America Region 2020, in relating the Overall Score and IRN indicators [3] [4]. As cluster characteristics (table 8), in cluster 1, are located the universities: UC (Chile), USP (Brazil),



UNICAMP (Brazil), UNIANDES (Colombia), ITESM (Mexico), and UNICAMP (Brazil), UCHILE (Chile) and UNAM (Mexico) as the best.

Fig. 7. Cluster of Overall Score and International Research Network indicators (IRN) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [2] [6].

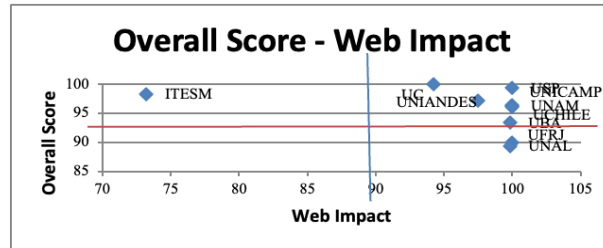
Table 8. Cluster characteristics of Overall Score and International Research Network indicators (IRN of universities in Top10 of QS World University Rankings® Latin America Region 2020 [2] [6].

Cluster	University	Overall Score	International Research Reputation
1	UC, USP, UNICAMP, UNAM, UCHILE	OS>94	IRN>99
2	ITESM, UNIANDES	OS>94	IRN<99
3	UNAL	OS<94	IRN<99
4	UBA, UFRJ	OS<94	IRN>99

3.8. Relationship between Overall Score and Web Impact indicators (WI)

WI indicator, with a weighting of 5%, evaluates the effectively of use new technologies by universities. It is a measure of quality of institutional investigation. The information is extracted from Ranking Web of Universities [3] [4] [16].

In Fig. 8 is presented four clusters with universities in Top10 of QS World University Rankings® Latin America Region 2020, in relating the Overall Score and SPH indicators [3] [4]. Table 9 shows as cluster characteristics that UC (Chile), USP (Brazil), UNIANDES (Colombia),



UNICAMP (Brazil), UNAM (Mexico) and UCHILE (Chile) are which obtain the best valuation.

Fig. 8. Cluster of Overall Score and Web Impact indicators (WI) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4].

Table 9. Cluster characteristics of Overall Score and Web Impact indicators (WI) of universities in Top10 of QS World University Rankings® Latin America Region 2020 [3] [4].

Cluster	University	Overall Score	Web Impact
1	UC, USP, UNIANDES, UNICAMP, UNAM, UCHILE	OS>94	WI>90
2	ITESM	OS>94	WI<90
3	UBA, UFRJ, UNAL	OS<94	WI<90

4. Conclusions

2020 edition of QS World University Rankings® Latin America Region supplies information of University Education Institutions from Latin-American through the measurement of eight indicators adapted to region: Academic Reputation, Employer Reputation, Faculty Student, Papers per Faculty, Citations per Paper, Faculty, Staff with PhD, International Research Network and Web Impact. Top10 of the Ranking covers universities from five Latin-American countries. In this paper had been characterized, through clusters, universities in Top10 of QS World University Rankings® Latin America Region 2020, in order to relate and compare their indicators through a descriptive analysis. They show the clusters formed between Overall Score indicators and the others in the ranking. Stand out as results:

- a) The best positioned universities in respect to Overall Score and AR indicators are: UC (Chile), USP (Brazil), UNICAMP (Brazil), UNIANDES (Colombia), UNAM (Mexico) and UCHILE (Chile).

- b) UC (Chile), USP (Brazil), ITESM (Mexico), UNIANDES (Colombia), UNAM (Mexico), UCHILE (Chile) y UNICAMP (Brazil) universities highlight with the highest values of Overall Score and ER indicators.
- c) ITESM (Mexico), UC (Chile) and UNAM (Mexico) are the best universities in cluster 1 in relating the Overall Score and FS indicators.
- d) UC (Chile), USP (Brazil), UNIANDES (Colombia), UNICAMP (Brazil) and UCHILE are the best positioned in relating Overall Score and PF indicators.
- e) UC (Chile), ITESM (Mexico), USP (Brazil), UNIANDES (Colombia), UNICAMP (Brazil), UCHILE (Chile) and UNAM (Mexico) present the results of Overall Score over 94 and CP more than 70.
- f) UC (Chile), USP (Brazil), UNIANDES (Colombia), ITESM (Mexico) and UNICAMP (Brazil) are the best positioned in relating Overall Score and Staff with PhD indicators.
- g) In respect to Overall Score and IRN indicators, the best universities are: UC (Chile), USP (Brazil), UNICAMP (Brazil), UNIANDES (Colombia), ITESM (Mexico), UNICAMP (Brazil), UCHILE (Chile) and UNAM (Mexico).

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