

Future transnational knowledge networks through novel global academic rankings indicators

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Abstract– *Global academic rankings (GAR) are used to measure educational quality and internationalization through indicators designed to meet the interests of universities. However, they neglect relevant types of Higher Education Institutions (HEIs) worldwide, especially the Polytechnic Institutes and the like. This study highlights the vocational HEIs niche, their role, and contributions to this level of education and to the expansion of transnational knowledge networks. Analyses through exploratory and documentary research methodology of the main existing GAR and their indicators revealed gaps, which could be filled in with internationalization activities currently carried out in vocational HEIs. So, its main contribution is the proposal of six new indicators and their inclusion to the existing GAR. In addition, a discussion on implementing them is carried out as a case study.*

Keywords– *Transnational cooperation, University rankings, Ranking indicators, Polytechnic sector, Vocational education and training sector.*

I. INTRODUCTION

Global academic rankings (GAR) have been used as instruments to assess higher education institutions (HEIs), particularly universities, linked to the kind of educational programs they offer [1]-[4]. GAR also function to showcase the internationalization achievements of HEIs and confer a comparable reputation on both domestic and international scenarios on them [5], [6]. The process fosters competitiveness and, thus, a race to be on the top positions of GAR, for the closer to the top of a ranking an HEIs is, the greater its international reputation will be.

According to Jöns and Hoyler [3], GAR began in 2003 and have been increasing in number ever since. Currently, we can find at least 25 of them, such as The World University Rankings [7], Academic Rankings of World Universities [8], QS World University Rankings [9], Center for World University Rankings [10], U-Multirank [11], SCImago Institutions Rankings [12] and Ranking Universitário Folha [13]. As measurement tools, GAR use a set of indicators elaborated and run by the ranking agencies, most of which are related to scientific research.

We must keep in mind that GAR only make sense if faculty, students, HEIs managers and other stakeholders take them into account in the decision-making process for transnational cooperation between the different actors involved in the process. Only then might this assessment favor the articulation of transnational knowledge networks (TKNs) to coordinate initiatives to solve problems on a global scale for the 21st

century [14]-[16]. Such initiatives can be implemented in the form of internationalization opportunities, including:

- short-, medium- or long-term international mobility programs;
- blended mobility (Op De Beeck & Van Petegem, 2013);
- joint research projects in international cooperation;
- internationalization at home (Beelen & Jones, 2018);
- international academic and scientific events, among many other.

Nevertheless, GAR have raised debates regarding their importance and application in the context of transnational cooperation. From the practical standpoint, GAR can be useful to a researcher trying to find experienced HEIs in international cooperation projects. Even though recent works have suggested indicators for ranking systems [19]-[22], the mentioned limitations persist and remain a challenge to expanding the transnational cooperation.

In this scenario, the research question raised in this study was: how can GAR showcase HEIs regarding expanded transnational knowledge network formation? It must be noted that this study goes beyond the state of the art as it presents the following two scientific contributions:

- 1) the proposal of six GAR indicators not found in the examined GAR; and
- 2) practical initiatives to implement and test the proposed indicators in the Brazilian Federal Network of VET institutions, as a case study.

The remainder of this paper is structured as follows. The next section provides the background on GAR. Then, we describe the methodology used for this investigation and the description of the case study. Next, we discuss our contributions and main findings to answer the research question. Finally, we conclude the paper and present future research directions.

II. GLOBAL ACADEMIC RANKINGS

Transnational knowledge networks (TKNs) aim to handle relevant, complex global problems by supporting exchanging knowledge [16]. Such networks typically comprise collaborative trans-governmental agencies and non-governmental actors, such as non-profit and super-national organizations. TKNs may support exchanging the same type of

content, e.g., scientific knowledge or even different types of content.

GAR play a role in the context of TKNs. They can be useful to a researcher trying to find experienced HEIs in international cooperation projects. Students can use GAR to find good HEIs abroad that are connected to the local productive sector, that offer research grants or that provide school-community engagement. For stakeholders, GAR can be used for transnational cooperation with HEIs within their strategic planning.

It must be noted that at least two aspects of GAR have raised debates regarding their importance and application in the context of transnational cooperation. The first one is that GAR are not unanimous and, moreover, they are controversial within the scope of HEIs [1], [5], [23], [24]. Some criticize the engagement of universities to implement neoliberal policy in academia [25], [26]. Others argue that the ratings do not indicate educational quality and may consider data to be inaccurate [27].

The second aspect is that GAR have historically focused on universities, hence neglecting other relevant education networks. This is the case of vocational education and training (VET) institutions [28], the polytechnic sector [29] and the Brazilian Federal Network for Professional, Scientific and Technological Education (RFEPCT) [30], which develop several internationalization activities at different levels of education, e.g., higher education, vocational secondary and post-secondary non-higher education. International mobility of students, professors and staff, joint projects in international cooperation, TKN formation, partnerships with the productive sector, and intercultural activities in collaboration with local/traditional communities are some examples of the internationalization developed there.

These two aspects emerge because of the GAR's indicators and limit their reach. On the one hand, it tends to consolidate the problem of global academic hegemony, mainly focusing on research from Anglo-American universities [3], [31]. On the other hand, teachers, students, managers, and stakeholders can be unaware of the other pertinent HEIs. Even though recent works have suggested indicators for ranking systems [19]-[22], the mentioned limitations persist and remain a challenge to expanding the transnational cooperation.

III. METHODOLOGY

A. GAR selection and data collection

This paper is part of a broader investigation in the field of GAR. More specifically, a study conducted as part of an applied research project developed at one of the Federal Institutes of Education, Science and Technology in Brazil. Exploratory research was conducted to gain familiarity with the open issues in the research domain and to make them more explicit [32]. Then, an applied qualitative approach emerged to generate scientific knowledge to solve real problems, as taught by Gerhardt and Silveira [33].

Bibliographical and documentary research procedures were carried out under two approaches. The first one was based on searching, selecting, reading, and gathering information from recent (2019-2025) peer-reviewed articles on the internationalization of HEIs in online scientific repositories and government documents. The second approach was to raise and analyze the existing GAR and institutional websites. Based on this, we defined a database composed of the following 25 well-recognized GAR with the details of their respective indicators: ARWU (Academic Ranking of World Universities), QS World University Rankings, THE (Times Higher Education), CWTS Leiden Ranking, SCImago Institutions Ranking (SIR), Ranking Universitário Folha (RUF), IGC (Índice Geral de Cursos), CPC (Conceito Preliminar de Curso), Webometrics (Ranking Web of Universities), US News America's Best College Review, NTU Ranking (National Taiwan University), U-Multirank, MINAS ParisTech, CHE Excellence Ranking, HEEACT Performance Ranking, Asia's Best Universities Ranking, Guia do Estudante (GE), Excellence French and German universities, Canadian Education Report Series (EPI), AVCC Ranking das universidades da Austrália, Spanish I-UGR Rankings, Portuguese Ranking, Ranking das Universidades de Pesquisa da América (Lombardi Program), International Champions League of Research Institutions, Scopus Elsevier (SIR).

The systematization methodology for each GAR is structured around three analytical dimensions. The first dimension (intentionality) assesses the core purposes through the lenses of globalization, status, and reputation of the HEIs. The second dimension (educational level) distinguishes the HEI's impact across secondary, undergraduate, and postgraduate levels. Finally, the third dimension (geographic area) defines the scope of the GAR's reach, categorized into national, intra-national, or international scales.

Furthermore, the indicators for each GAR are clustered into four primary institutional pillars: management, teaching, research, and outreach. The management group evaluates HEI efficiency and status, often aligning with the analytical framework's intentionality and status categories. The teaching pillar focuses on pedagogical impact across different educational levels, from secondary to postgraduate programs. Research remains a dominant cluster, measuring scientific productivity and global reputation, while the outreach group assesses the institution's engagement with society and its ability to respond to local and international demands through practical initiatives. Consequently, all indicators across the investigated GAR have been mapped and grouped into those four pillars to establish a comprehensive baseline.

B. Case study method

The case study method was used, through which discussions about the practical uses of the proposed GAR indicators were led. This method allows qualitative analysis by organizing social data, thereby preserving the individual character of the social object under investigation. In this case study, different ways of implementing and measuring each GAR indicator are highlighted to meet the current activities led at the HEIs of the World Federation of Colleges and Polytechnics (WFCP) [34].

As a member of the WFCP, the National Council of the Federal Network of Vocational, Scientific & Technological Education Institutions (CONIF) [35] represents the Federal Network of Vocational, Scientific and Technological Education (RFEPCT) in Brazil. The RFEPCT comprises the Brazilian federal vocational education system. Currently, it has 38 Federal Institutes, 2 Federal Technological Education Centers (CEFET), the Federal Technological University of Parana (UTFPR), 22 vocational schools linked to federal universities, and Colégio Pedro II in Rio de Janeiro.

RFEPCT is in strategic municipalities spread over the 26 Brazilian states and the Federal District, currently comprising 656 campuses. Regarding the Federal Institutes, they are multi-curricular educational institutions that offer higher and basic vocational education programs, deliver technical and technological knowledge, and develop pedagogical practices. The aim is the integral education of citizens in the region where they live and work.

IV. RESULTS AND DISCUSSION

In this section, we present six GAR indicators not found in or covered by the investigated GAR. This proposal considers the levels of rationales for the internationalization of HEIs presented in Knight's study [36]. In her study, the author categorizes internationalization purposes in four spheres: individual, institutional, national, and regional. Based on this, for each proposed GAR indicator, we highlight its purposes and point out various forms of application and measurement in the case study, hence presenting a complete answer to our research question.

The first GAR indicator proposed is about providing foreign language training for faculty, students, administrative staff, and the international community, aiming at internationalization opportunities. In defining this GAR indicator, we assume that limited linguistic knowledge in foreign languages is one of the main barriers to internationalization worldwide [37], [38] and in Brazil [39]. Furthermore, access to internationalization opportunities, via public calls from governments, institutions, and national/international private companies, requires proficiency in foreign languages certified by national or international proficiency exams.

We advocate that HEIs provide both the internal community (faculty, students, and administration staff) and the external community (population around campus) with language training and that this provision be a GAR indicator, since it is pivotal for international opportunities. Furthermore, a GAR indicator of this kind might encourage HEIs to promote initiatives that foster transnational cooperation. This GAR indicator is in line with the ideas of Knight [36] regarding "Student and staff development" at an institutional level.

Hereinafter, some examples of how to implement it in the RFEPCT institutions are shared as a case study. It is known that the RFEPCT HEIs have all the necessary elements to develop initiatives of the kind, such as offering initial and continuing training courses in foreign languages for internal and/or external communities, offering Portuguese courses as an

additional/foreign language (PLA/EFL) for the international community, and administering language proficiency exams, such as CELPE-BRAS (Portuguese), DELE (Spanish), TOEFL and IELTS (English) etc. Since such initiatives are documented, they can be easily quantified by the GAR.

That said, we advocate for the inclusion of this indicator to GAR for it will encourage HEIs to incorporate the provision of foreign language training as a strategic action within their internationalization processes. Therefore, linguistic improvements in different languages are sought to enable international cooperation programs and projects between HEIs aiming to provide mobility, co-supervisions, joint research, joint production of academic materials, products, processes, technology services etc.

The second GAR indicator proposed is about matching students to work in globalized labor markets. Proposing this GAR indicator considers the fact that HEIs represent a relevant player in the training of professionals to act in such markets in countries with more globalized economies [40]. Thus, HEIs should seek to establish continuous interaction with the local, national, and international productive sectors to put students in touch with the labor market in line with the ideas of "Strategic Alliances" at the institutional level, according to Knight [36].

Such an integration can lead HEIs to foster initiatives to provide and/or expand training and job opportunities in small, medium, and large national and international companies, startups, spinoffs etc. These experiences are expected to favor improvements in HEIs' internal processes, since the new knowledge learned from work experiences may raise discussions and foster curricular improvements due to the current demands of the productive sector, to the creation of networks with different stakeholders, and to the recognition from academia and the labor market.

The feasibility of this GAR indicator can be verified in this case study, given that the matching of students with the labor market can take place in different ways within the RFEPCT HEIs. Hiring students as interns or apprentices, offering continuing education courses to employees of partner companies, and arranging technical guided tours of students to companies are examples of initiatives that could be measured by the proposed GAR indicator. Furthermore, specific agreements for dual training [41] can be made, in which students have part-time jobs and attend school in another shift. For the above reasons, we advocate for the inclusion of this indicator in GAR to benefit those HEIs providing their students a closer approach to the productive sector and meeting the perspective of globalized labor markets.

The third GAR indicator recommends the promotion of internationalization actions aiming to train leaders through certain specific teamwork training involving students, faculty, and administrative staff, as well as actors within the larger society. In this regard, leadership is known to involve a relational process, which requires working with other people to achieve a goal or promote positive change according to Brungardt [42]. Teamwork skills enhance the development of soft/interpersonal skills, such as communication, empathy,

honesty, integrity, and a sense of humor [43]. Such skills are considered crucial for the people to integrate the envisioned knowledge society in this century [44].

As for leadership education, it focuses on the soft skills necessary for positive relationships and human interaction, and which have been increasingly valued in globalized labor markets [45], [46]. Therefore, this GAR indicator is intended to score HEIs which promote social actions for both the internal community and society, aimed at developing leadership and soft skills in collective learning situations. Thus, the GAR indicator proposed here is in line with Knight [36], regarding both "Career Enhancement", at the individual's level, and "Student and staff development", at the institutional level.

It must be noted that the RFEPT HEIs are guided by the National Curriculum Guidelines for Basic Education [47]. This document brings about principles, which in turn, lead to opportunities to train leaders, given that the political pedagogical projects of each one of the RFEPT institutions include, in their foundations, training focused on citizenship, human dignity, equality, freedom, plurality, diversity, respect, social justice, solidarity and sustainability, whose conceptual reference links school education, work, and social practices. These guidelines are also found in programs designed for teachers' continuing education, since they will both train and be trained via this leadership perspective.

In the RFEPT institutions, team internationalization takes place through different initiatives. Planning, executing, and evaluating scientific, technological, and cultural events, workshops, and short courses are some of the activities aimed to train leaders. It is recommended that these initiatives involve the international community and/or be the means to train individuals for internationalization opportunities. That said, we advocate for the incorporation of this indicator to the existing GAR.

The fourth GAR indicator proposed here is about promoting intercultural education. The main goal is to publicize internationalization actions carried out by the institutions. In this regard, UNESCO [48] defines intercultural education as a dynamic concept involving relationships and learning between cultural groups to achieve a sustainable way of living in harmony in multicultural societies. This concept is in line with the Universal Declaration of Cultural Diversity [49], which states that anyone has the right to quality education and training that fully respects their cultural identity.

It should be noted that HEIs are allowed to adapt internationalization for intercultural education initiatives to their school-year calendar, as well as other conditions unrelated to them, e.g., geographic location, time zone, climate etc. Considering RFEPT's characteristics, offering seasonal courses during vacations, summer, and winter will foster internationalization through international student mobility and digital platforms. This, in turn, will favor both visiting and local communities to develop interculturality through cultural exchange.

Another way to do it is by having HEIs foster community engagement actions [50]. This can be done through programs and projects, involving both national and foreign faculty, administration, and students in collaboration with neighboring communities. That way, those communities can benefit from interculturality via curricular activities and by exchanging their cultural backgrounds with the international community.

It should be noted that the promotion of intercultural education is in line with the purpose of individual "Intercultural understanding and skills" in the study by Knight [36]. Therefore, we advocate for its inclusion to the existing GAR, given that it favors the education of national and international faculty, students, and administration staff through dialogue between different cultures.

The fifth GAR indicator proposed requires the promotion of sports and exercise incentive programs, projects, events, and actions, all aimed at leisure and life quality. This is based on the "Social cultural development" category defined by Knight [36]. Moreover, both the intercultural and international dimensions are internationalization at home initiatives [18]. These include community service, extracurricular activities, and relationships with local cultural and ethnic groups to integrate local and international students, professionals and faculty members into campus life and develop joint activities. In defining this GAR indicator, we considered that sports practice oriented and developed by a multidisciplinary team can play multiple roles and bring countless benefits.

From a leadership perspective, sports practice can function as a teaching-learning environment, where important values and principles, such as discipline, trust, tolerance, and cooperation are shared and learned. This educational process of individuals through sports can help bring about changes in the foundations of human society. Regarding physical and mental health, sports can provide individuals with opportunities to raise awareness of the need for self-care, especially by elevating self-esteem through sports activities prescribed, monitored, and assessed by health professionals. Finally, this practice may foster individuals' insertion into social groups, as well as promote their socialization for the development of their psychosocial skills. This reinforces willingness and self-assurance to play different roles in the family and society.

For the United Nations (UN), the right to access and participate in sports is recognized in several international conventions and, since 1978, it has been a fundamental right for all [51]. In the 2030 Agenda for Sustainable Development [52] Goal 10.2 recommends that signatory countries should by 2030, empower and promote the social, economic and political inclusion of all, regardless of age, gender, disability, race, ethnicity, origin, religion, economic or another situation. Furthermore, sports, play, and exercises have a key role in life to keep individuals physically and mentally active.

Worldwide, programs and projects of this type seek to foster individual and social well-being, through sports practice in an intentional and structured way. Coalter [53] comments that, in the 1990s, sports emerged as an increasingly important aspect of national and international social policy. Furthermore, it can

provide communities around HEIs with solutions to social problems. As a result, teachers, students, administrative staff, and the local external community can live together and share problems, concerns and needs, as well as seek for solutions together. Thus, sports can contribute to a better performance of communities in four main indicators - health, crime, employment, and education [54].

This case study presents several activities to encourage sports practice involving the international community in the RFEPCT HEIs, e.g., campus indoor games, extracurricular sports activities in collaboration with local ethnical-cultural groups, sports-related initiatives etc. Therefore, for all we have discussed and presented above, we recommend that a GAR indicator related to the promotion of sports programs, projects, and events be added to the existing GAR, given that they promote interaction between people, thus mitigating, if not completely breaking social, political, ethnic, and gender barriers.

The sixth GAR indicator requires the promotion of sustainable practices aimed at global citizenship education (GCE). This may lead HEIs to respond to the demands for opportunities to engage in relevant, meaningful activities, enhance students' global perspectives, and help them contribute to a more peaceful, environmentally secure, and fair world [55]. This indicator aims to foster HEIs' responsibility and commitment to implement environmentally sustainable policies, based on goal 13.3 of the 2030 Agenda for Sustainable Development. It envisions, thus, a broader environmental perspective in line with the ideas of Sachs [56], who proposes five sustainability dimensions, namely ecological, cultural, social, economic, and political. It is necessary to place social relevance, ecological prudence, and economic viability as necessary steps to reach a modern and ecologically correct civilization. That said, we seek to promote GCE through comprehensive human training. So, we recommend HEIs provide their students and community with meaningful activities guided by the GCE to respond to local demands with solutions in tune with global problems.

It must be noted that sustainable practices are likely to awaken students to broader and more critical thinking regarding development and social well-being for present and future generations. In short, the GAR indicator proposed here is in tune with the purpose of "Student and staff development" at the institutional level, as discussed by Knight [36].

In Brazil, the National Council for the Environment (CONAMA) advocates for sustainable practices based on awareness, knowledge, behavior, skills, and participation as one of the functions of educational institutions. Thus, the RFEPCT HEIs can promote GCE by including international participants in their activities, such as courses, events, projects, programs etc. As for measuring the activities, we recommend GAR to incorporate an indicator that values the promotion of sustainable practices aimed at providing students and the community with the GCE and to score HEIs for engaging the academic community in sustainable activities.

Considering the above discussions and propositions, Table I summarizes the GAR indicators proposed in this paper. The left column of the table shows the definition of those indicators. In the right column, they are related to the categories introduced by Knight [36] to bring the academic categorization closer to GAR.

TABLE I
GAR INDICATORS PROPOSED IN THIS PAPER

GAR indicator	Levels of rationales (Knight 2018)
Language training for teachers, students, administration staff, and the international community, aiming at internationalization opportunities	Institutional level (<i>Staff Development</i>)
Student-labor market matching in globalized labor markets	Institutional level (<i>Strategic Alliances</i>)
Promotion of internationalization actions aiming to train leaders, through teamwork between students, professors and administration staff and society	Individual level (<i>Enhance Career</i>); Institutional level (<i>Student and staff development</i>)
Promotion of intercultural education	Individual level (<i>Intercultural understanding and skills</i>)
Promotion of actions, events, projects, and programs to encourage sports for leisure and life quality	National level (<i>Social cultural development</i>)
Promotion of sustainable practices for global citizenship education (GCE)	Institutional level (<i>Staff Development</i>)

A. Limitations and potential challenges for adoption

While the six proposed GAR indicators offer a more holistic approach to internationalization by focusing on areas such as staff development and social impact, their global adoption raises concerns about standardization and socio-economic disparities. A primary concern is the subjectivity inherent in measuring qualitative concepts like intercultural education or leadership training, which are influenced by local cultural norms and lack a universal rubric for comparison. Further, indicators involving language training and sports programs require important financial investment and infrastructure, potentially penalizing HEIs in resource-constrained environments or those that prioritize local social missions over TKNs alignment.

Additionally, implementing these GAR indicators globally imposes a heavy administrative burden on HEIs, as tracking extracurricular activities, community engagement, and sustainable practices requires sophisticated data-collection approaches. There is also likely to be institutional resistance from established elite HEIs that benefit from traditional GAR focused on research output and citations. To be successful, the adoption of these new GAR indicators, which match student skills to global markets and promote global GCE, must involve

a flexible framework that acknowledges regional economic differences and avoids a one-size-fits-all definition of academic excellence.

V. CONCLUSION

In this study, we discussed global academic rankings (GAR) aimed at ranking higher education institutions (HEIs). As a main contribution, we proposed six new ranking indicators not found in the studied GAR accompanied with a discussion and rationale for their inclusion in the existing GAR. In a nutshell, we proposed, as GAR indicators, the promotion of language training for teachers, students, staff and the international community, aiming at internationalization opportunities; the integration of students to globalized labor markets; the promotion of internationalization actions to train leaders, through teamwork between students, faculty/professors and administration staff, as well as society members; the promotion of actions for intercultural education; and the promotion of sustainable practices in the perspective of the global citizenship education.

As another equally relevant contribution, we recommend the implementation of our indicators into the HEIs of the World Federation of Colleges and Polytechnics (WFCP). We also provide guidelines for measurement by the GAR as a case study. In future work, we intend to investigate the use of the proposed GAR indicators in different types of HEIs and analyze their impact on GAR.

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