

Integrating sustainability into teaching and research practice at a higher education institution: A holistic approach

Integración de la sustentabilidad en la práctica docente y de investigación en una institución de educación superior: Un enfoque holístico

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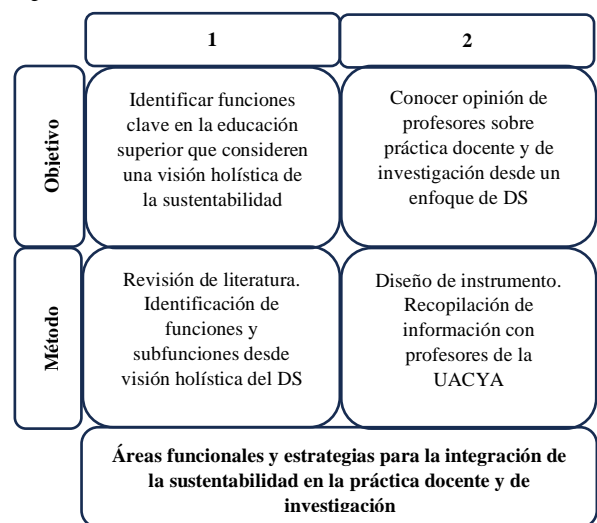
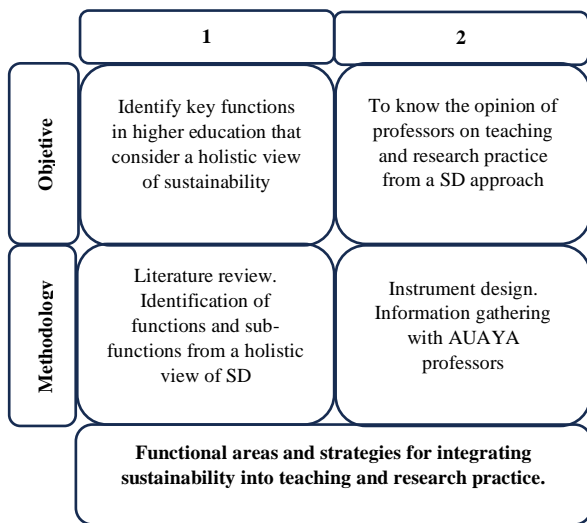
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Abstract

Higher education institutions play a fundamental role in training for sustainable development, recognized as key actors since 1990. Higher education institutions can contribute to the Sustainable Development Goals through teaching, research, outreach and institutional management, but face challenges for a holistic integration, requiring a systemic approach. This research sought to identify areas and strategies for the integration of sustainability in the teaching and research practice of a higher education institution. Using a field methodology and quantitative approach, first key functional areas and sub-functions were defined, assessing their coherence with sustainability. Then, the opinion of professors was gathered, who pointed out main problems in teaching, especially in curriculum development and evaluation, evidencing the need for a comprehensive approach.

Resumen

Las instituciones de educación superior juegan un papel fundamental en la formación para el desarrollo sustentable, reconocidas como actores clave desde 1990. Las instituciones de educación superior pueden contribuir a los Objetivos de Desarrollo Sostenible a través de la docencia, investigación, vinculación y gestión institucional, pero enfrentan desafíos para una integración holística, requiriendo un enfoque sistémico. Esta investigación buscó identificar áreas y estrategias para la integración de la sustentabilidad en la práctica docente y de investigación de una institución de educación superior. Usando una metodología de campo y enfoque cuantitativo, primero se definieron áreas funcionales y subfunciones clave, evaluando su coherencia con la sustentabilidad. Luego, se recopiló la opinión de profesores, quienes señalaron principales problemas en docencia, especialmente en desarrollo curricular y evaluación, evidenciando la necesidad de un abordaje integral.



Institutions, Sustainability, Holistic

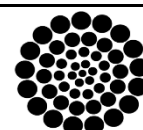
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Introduction

Higher education institutions (HEIs) play a fundamental role in training professionals prepared to face the challenges of sustainable development. Since the 1990 Talloires Declaration, HEIs have been recognized as key players in promoting sustainability at the global level (Colding, 2017; Cardozo et al., 2020).

It was from the 1992 Rio Summit that a call was made to all global organizations to contribute to this goal by promoting a balance between environmental, economic and social dimensions (UNCED, 1992). More recently, the Sustainable Development Goals (SDGs) ratified by the United Nations in 2015 have reaffirmed the need to integrate sustainability comprehensively into the strategies and operations of all types of organizations, including HEIs (United Nations, 2015).

HEIs possess a wide range of essential tools and capacities to drive the transition towards sustainability within societies. These institutions are positioned as crucial actors in the pursuit of the SDGs (De Amorim et al., 2020) and play a fundamental role in this process (Sustainable Development Solutions, 2020). To promote sustainability in HEIs, it is essential to link theory with practice, articulating cultural, social and educational aspects (Cebrián et al., 2013). This implies taking advantage of the three substantive functions of HEIs: teaching, research and linkage with society.

Through teaching, HEIs can train new generations of leaders, professionals and citizens, imparting knowledge and developing skills oriented towards sustainability. On the other hand, the research they carry out allows them to generate new knowledge, technologies and innovations that contribute to address environmental, social and economic challenges.

Likewise, outreach and community outreach activities allow them to disseminate good practices and encourage citizen participation in sustainability initiatives. In this way, HEIs can make a significant contribution to the transition towards sustainable development, taking advantage of their privileged position and multiple capacities to have a positive impact on the environmental, social and economic dimensions.

Linking the theory and practice of sustainability in HEIs faces important challenges. According to an analysis of 331 HEIs in 11 Latin American countries, sustainable practices encounter administrative, financial and cultural obstacles, which highlights the importance of learning, training and efficient institutional protocols (Bezerra et al., 2023).

In the same sense, Yarritu, et al.(2024) conducted a study of 403 teachers at the University of the Basque Country and concluded from their findings that knowledge of the 2030 Agenda leads teachers to have a comprehensive description and a deep understanding of it. Consequently, there is a need for higher education institutions to provide more training to teachers to promote a holistic understanding of sustainability and facilitate its integration into education.

Another study mentions that at the University of Bern in Switzerland, the three levels, macro, meso and micro, of action to include sustainable development in education are involved. The macro level incorporates the entire university, the meso level refers to a Sustainable Development Commission and finally the micro level involves collaboration between teachers from all programs of study of a faculty and the sustainable development team to provide materials, support and financial resources and thereby strengthen the faculty members (Lewis, et al., 2024).

In the case of Mexico, a survey of 569 university professors reveals two approaches to education for sustainable development: a proactive one (79%) that proposes comprehensive curricular and pedagogical changes, and a reactive one (60%) that considers it only as an additional subject without significant transformations (Zúñiga et al., 2022).

It is also common to find that, although HEIs have sustainability models, their effective implementation presents great challenges. For example, at the Autonomous University of Guerrero, although sustainability is highlighted in its educational model, it is not reflected concretely in the curriculum or academic programs, with a disciplinary approach prevailing over environmental elements (Piza-Flores et al., 2018).

For its part, regarding the Autonomous University of Nayarit (AUN), it achieved in 2023 an outstanding recognition by participating for the first time in the UI Green Metric ranking, being positioned as a sustainable institution globally and ranking 26th nationally ([Universidad Autónoma de Nayarit, 2023](#)).

This ranking comprehensively evaluates university policies, commitments and actions in key areas such as infrastructure, energy, waste, water, transportation and education. Although this achievement demonstrates the university's efforts to consolidate itself as a leader in sustainable practices, the segmentation of its substantive functions of teaching, research, outreach and institutional management is notorious.

This fragmentation has caused the efforts to implement sustainability to have a limited impact, as they lack an integral institutional approach. As [Beltrán and Canales \(2021\)](#) point out, higher education institutions persist with the intention of fulfilling the three substantive functions, but what actually occurs is institutional segmentation aimed at different demanders.

Several authors have pointed out that sustainable development is a multifaceted concept that requires the harmonization of economic, social and environmental aspects, under a holistic approach ([Olawumi and Chan, 2018, 2019](#); [Da Silva-Junior et al., 2018](#)). In this sense, [Caeiro et al. \(2020\)](#) state that HEIs are forced to adopt sustainable development through a systemic approach in their operations.

In the context of the Academic Unit of Accounting and Administration (AUAYA) of the AUN, it is relevant to identify the areas and strategies that can contribute to a more effective integration of sustainability.

This would enable the development of comprehensive and coordinated action plans that address sustainability in a holistic manner. However, there are still no studies with this integral approach in the AUAYA.

From a systemic perspective, the adoption of a holistic approach to sustainability in HEIs is presented as a key challenge to achieve an effective and high impact implementation.

Understanding the dynamics and areas of opportunity of the AUAYA in this regard would allow advancing towards a more coherent and transversal integration of sustainability in its substantive functions of teaching, research and outreach. Under this context, the objective of this study is to identify the areas and functional strategies related to the holistic incorporation of sustainability in the teaching and research practice of the AUAYA, in order to contribute to a more informed decision making and thus strengthen the integration of sustainability in a comprehensive manner in the academic unit. Strengths and weaknesses were identified in the four functions of the HEI: teaching, management, research and linkage. One third of the professors pointed out problems in curriculum development and evaluation. The generation and application of knowledge in research, as well as the relationship with society in outreach, were areas of opportunity.

Methodology

The purpose of the research was to identify the functional areas and strategies related to the holistic integration of sustainability in the teaching and research practice of a HEI. It is a theoretical research with descriptive scope. A field research methodology was used, collecting information through a Google form with teachers and researchers of the AUAYA. The quantitative approach predominated in the analysis and synthesis of the information.

As a first step to achieve the research objective, the key functional areas in higher education and their sub-functions were identified, consulting theoretical references from relevant authors and institutions on the subject. Among them, the documents created by the National Association of Universities and Institutions of Higher Education (NAUIHE) were highlighted. Subsequently, the coherence of the identified sub-functions with a holistic vision of sustainable development was evaluated.

This analysis facilitated the design of an instrument that allowed us to gather relevant information from AUAYA professors and researchers. As a final step, the instrument was applied and the functional areas and strategies for informed decision making were identified.

Functions and sub-functions of higher education

In Mexico, one of the most relevant antecedents on the key functions of higher education that continue to be relevant is found in the documents elaborated by NAUIHE in 1978, entitled "Higher Education in Mexico" and "National Plan for Higher Education" (ANUIES, 1978a, 1978b).

These documents establish the existence of substantive and adjective functions. The substantive functions of higher education are teaching, research and dissemination of culture, while the adjective functions refer to complementary and support services.

In order to identify the sub-functions of Teaching, Research, Cultural Dissemination and Complementary and Support Services, an analysis and classification of each of the strategies and programs (activities) indicated by NAUIHE was carried out. Four sub-functions emerged for each of the aforementioned functions, as follows: Teaching (Curricular development and evaluation; Professional development and teacher training; Teaching and educational and technological innovation; Student support), Research (Generation and application of knowledge; Teaching of extracurricular courses; Training of human resources for research; Liaison with research groups), Dissemination of culture (Mobility, Social service and internships; Follow-up of graduates; Relationship with society in general), Complementary and support services (Administrative management, Academic and research management, Infrastructure and services management; Management of the environment).

Teaching

Objective: Promote a better response of the higher education system to the quantitative and qualitative demands in the training of its students.

Curricular development and evaluation

- To expand and improve attention to the demand for enrollment by strengthening existing professional studies and opening new careers and academic options, in accordance with the requirements and priorities of state, regional and national development.

- To form three higher secondary education subsystems: the first exclusively propaedeutic, the second exclusively terminal and the third with characteristics such that together with the propaedeutic formation it offers training for work. Likewise, efforts will be made to use more flexible curricula for propaedeutic training, so as not to force students to choose a specific baccalaureate prematurely.
- In relation to the admission capacity of each house of studies, apply the principle of academic capacity or competence for higher studies through the rational and objective selection of students, based on their previous knowledge and aptitude for study. In addition, higher education institutions will promote the generation or creation of other educational institutions to meet the expansion of demand as much as possible.
- Linking the productive sector with the professional training system.
- Curricular reforms.
- Development of educational alternatives.
- Unification of the common core of the higher secondary education curriculum, of a propaedeutic nature.
- Post-secondary professional education and short post-baccalaureate careers.

Student support

- Strengthen and broaden vocational guidance activities, with special attention to information services related to the profession, new study options and the conditions of the labor market. Such information should be extended beyond the school environment.
- Vocational orientation.
- Social service for students and interns.
- Scholarship and credit fund and assistance services for students.

Teaching and educational and technological innovation

- Encourage the use of teaching-learning methods and techniques that favor the creative participation of students in their education. This implies, among other things, a thorough strengthening of libraries and teaching equipment and materials.

Article

- Implementation of new undergraduate and graduate programs.
- Manufacture and distribution of didactic material.
- Development of the library and documentary information system.

Professional development and teacher training

- Establishment of regional units for human resources training and educational research.
- Training and updating of teachers.

Research

Objective: Strengthen humanistic, scientific and technological research in its basic and applied modalities; Extend the activities and fruits of research to all regions of the country; Link research to the solution of social, scientific and technological problems of the country.

Generation and application of knowledge

- To awaken the interest of the country's economic sectors in the basic and applied research that can be carried out in higher education institutions.
- Research planning.

Teaching of extracurricular courses

- Take into account the definition of priority areas, the training of human resources, the growth of infrastructure and the establishment of institutional, regional and national frameworks that guarantee the existence of high quality research and the formulation of development programs to strengthen it.

Training of human resources for research

- Take into account the definition of priority areas, the training of human resources, the growth of infrastructure and the establishment of institutional, regional and national frameworks that guarantee the existence of high quality research and the formulation of development programs to strengthen it.

Linkage with research groups

- National network of specialized units.
- Information system for research.
- Support for scientific and humanistic associations.

Dissemination of Culture

Objective: To complement and expand the functions of teaching and research, disseminating the goods and values of national and universal culture to all social sectors of the country and abroad.

Mobility

- Specialization and updating of personnel for the dissemination of knowledge and artistic manifestations.
- Specialization and updating of personnel for the dissemination of knowledge and artistic manifestations.

Social service and internships

- Improve the material infrastructure and train human resources for the social dissemination of culture.
- Identification and diversification of contents and purposes of cultural dissemination.
- Determination of methods, means and materials for cultural diffusion.
- Coordination of programs for the dissemination of knowledge and artistic manifestations.

Follow-up of graduates

- Promote the creative participation of the individual to whom the programs of cultural diffusion are directed, organizing activities that lead them beyond their contemplative attitude.

Relationship with society in general

- Intensify the non-commercial use of the country's mass media.

After analyzing the objectives, strategies and programs related to the function of Dissemination of culture, it was observed that they are closely related to the concept of "Linkage". For this reason, this function is hereinafter referred to in this document by that term.

Complementary and Support Services

Objective: To create conditions and provide economic, political, legal and technical means for the institutions to carry out their substantive functions (teaching, research and cultural dissemination) in a systematic manner, both in terms of each institution and in terms of their interactions as a whole, be they state, regional or national in scope.

These are adjective areas: normative, organizational and coordinating, development, budgeting and financing, and follow-up and evaluation.

Administrative management.

- To formally define the rules or norms that will facilitate the relations of the institutions of higher education among themselves, with the State and with the public and private organizations that are considered pertinent.
- Establish structures and mechanisms that favor communication, exchange and concerted action among educational institutions.
- To increase the economic resources destined to higher education, as well as to establish the criteria and procedures to improve the elaboration, financing, management and exercise of the budget.
- To decisively promote institutional planning tasks through the strengthening of existing programs and the creation of planning units where they do not yet exist.
- Expand training and updating programs for personnel dedicated to planning tasks, general administration, academic administration, dissemination and extension, social service, etc.
- Create information units in those institutions that do not yet have them and orient their operation both to support planning and administration tasks, as well as to serve the community.
- Contribution of NAUIHE to elevate university autonomy to constitutional rank.
- NAUIHE' contribution to the legislation on higher education.
- NAUIHE' contribution to labor legislation.

- Inter-institutional agreements of national scope.
- Establishment of institutional planning units for higher education.
- Criteria and procedures for the estimation, allocation and management of federal and state economic resources for higher education institutions.
- National higher education information system.
- National tabulator for academic and administrative personnel of higher education institutions.

Academic and research management

- To formulate the desired future for higher education institutions and the higher education system in a timely and well-founded manner, in accordance with the development model to which the country aspires.
- Apply a rigorous and operative methodology in the permanent follow-up and evaluation of institutional, state, regional and national programs.
- Intensify the provision of recreational services for students and workers of higher education institutions.
- Stimulate the practice of sports among students and workers, giving it the sense of a formative activity.
- Elaboration of diagnoses, plans and programs for higher education institutions.
- Elaboration of monitoring and evaluation programs.
- Recreation and sports.
- Training and updating of academic and administrative personnel.

Management of infrastructure and services

- Support for regional and institutional programs to improve administrative services.

Environmental management

- Linkage with regional development.

It was observed that the objective, strategies and programs analyzed are related to the concept of "Institutional Management". For this reason, this document prefers to use this term to refer to Complementary and Support Services.

Holistic consideration of sustainable development in HEIs and design of the instrument

According to Hernández-Ayón et al. (2022), sustainable development can be analyzed from four areas: environmental, economic, social and cultural. Since this approach considers all natural and anthropogenic aspects of reality (Pascual Trillo, 2013), this vision of sustainable development is considered holistic.

Based on the above statements, we proceeded to review the relationship of the environmental, economic, social and cultural aspects considered holistic, with the functions of higher education.

The functions of Teaching, Research and Liaison encompass sub-functions that are totally related to social and cultural aspects (D1-V4), given that they have an impact on the holistic formation of students, the advancement of knowledge and interaction with society (Table 1).

On the other hand, the Institutional Management function incorporates economic (G1, G3) and environmental (G4) aspects, such as the efficient administration of technology and resources, as well as the natural environment.

These observations suggest that the functions and sub-functions identified in the analysis consider a holistic vision of sustainability in HEIs, by encompassing aspects that go beyond the purely academic, integrating also social, cultural, economic and environmental dimensions in their institutional work.

Based on the functions and sub-functions identified, an instrument was developed that facilitated the collection of information on the strengths and weaknesses in teaching theory and practice, as well as in research, of AUAYA professors, from a sustainability approach. The quantitative analysis of this information allowed the identification of functional areas and strategies that facilitate more informed decision making.

Box 1

Teaching	D1	Curriculum development and evaluation	S, C
	D2	Professional development and teacher training	S, C
	D3	Teaching and educational and technological innovation	S, C
	D4	Student support	S, C
Research	I1	Knowledge generation and application	S, C
	I2	Teaching of extracurricular courses	S, C
	I3	Training of human resources for research	S, C
	I4	Liaison with research groups	S, C
Liaison	V1	Mobility	S, C
	V2	Social service and internships	S, C
	V3	Follow-up of graduates	S, C
	V4	Relationship with society in general	S, C
Institutional Management	G1	Administrative management	S, C, E
	G2	Academic and research management	S, C
	G3	Management of infrastructure and services	E
	G4	Environmental management	A

Table 1

Holistic consideration of sustainability in the functions and sub-functions of HEIs

Symbology: A: environmental aspects, E: economic aspects, S: social aspects, C: cultural aspects. D1-G4: subfunctions

Source: Own elaboration, based on (ANUIES, 1978b, 1978a).

Results

The opinions of AUAYA professors were gathered from all the academies and academic bodies of the institution. The participants presented 17 themes that reflected strengths in teaching, research and/or professional experience linked to higher education. The topics presented generated a total of 997 comments that addressed both strengths and weaknesses.

These opinions were classified according to the four functions of HEIs: teaching, research, linkage and institutional management (Table 2).

Box 2

Function	Ratio
Teaching	32%
Research	22%
Liaison	22%
Institutional Management	24%

Table 2

Functions of Higher Education Institutions

Source: Own elaboration.

From the point of view and experience of the participating professors, and considering a sustainability approach, the opinions were related to a greater extent to teaching functions (32%), followed by institutional management (24%). Proposals related to research and outreach had the same proportion (22% each).

Teaching

The teaching functions in turn obtained the following percentages (Table 3):

Box 3

Teaching Subfunctions	Ratio
D1. Curriculum development and evaluation	34%
D2. Professional development and teacher training	18%
D3. Teaching and Educational and Technological Innovation	20%
D4. Student support	17%

Table 3

Proposals made to the Teaching sub-functions
Source: Own elaboration.

The largest number of proposals (34%) were related to curricular development, study plans and programs, as well as evaluation in general. Opinions related to teaching at different levels and systems reached 20%, followed by professional development with 18% and tutoring programs with 17%.

Research

Research functions reached the following percentages (Table 4):

Box 4

Research Subfunctions	Ratio
I1. Knowledge generation and application	57%
I2. Delivery of extracurricular courses	1%
I3. Training of human resources for research	17%
I4. Linkage with research groups	25%

Table 4

Proposals made to the Research sub-functions
Source: Own elaboration.

Among all the proposals, those related to the generation and application of knowledge stand out, representing 57%. Likewise, the opinions related to linkage with research groups reached 25%. On the other hand, the low number of observations related to the teaching of extracurricular courses is notorious.

Liaison

The proposals related to the Liaison functions reached the following percentages (Table 5):

Box 5

Liaison sub-functions	Ratio
V1. Mobility	15%
V2. Social service and internships	22%
V3. Follow-up of graduates	12%
V4. Relationship with society in general	51%

Table 5

Proposals made to the Liaison sub-functions
Source: Own elaboration.

Sub-functions related to society in general, including outreach, accounted for 51% of the comments. These were followed by proposals related to social service and professional internships, which accounted for 22%. Mobility and graduate follow-up had a similar participation, with 15% and 12%, respectively.

Institutional management

The proposals related to the institutional management functions obtained the following percentages (Table 6):

Box 6

Institutional management sub-functions	Ratio
G1. Administrative management	34%
G2. Academic and research management	33%
G3. Infrastructure and Services Management	15%
G4. Management of the environment	17%

Table 6

Proposals made to the Institutional management subfunctions
Source: Own elaboration.

The majority of the proposals made by the participating teachers (34%) considered administrative management as a key sub-function for the improvement of higher education at AUAYA. These were followed by comments related to academic and research management, which represented 35%. Finally, suggestions made to the management of the environment represented 17%, while those related to the management of infrastructure and services were 15%.

Conclusions

The research conducted allowed us to evaluate the integration of sustainability in the teaching and research practice of the AUAYA, from a holistic approach. To achieve this, the following steps were carried out: 1) Key functions and sub-functions in higher education that considered a holistic view of sustainability were identified, and an instrument was designed for the collection of information. 2) The opinion of professors on the strengths and weaknesses of AUAYA's teaching and research practice was obtained.

From a quantitative approach, functional areas and sub-functions related to the holistic incorporation of sustainability were identified to contribute to more informed decision making.

In this regard, 1 out of 3 AUAYA professors indicated that most of the problems and/or areas of opportunity are found in the teaching functions, above research, outreach and institutional management. The above coincides with what Beltrán and Canales (2021) point out in their study "Teaching at the higher level in the last three decades in Mexico", where they point out that, in higher education institutions it is more frequent that teaching activity is underestimated, that is to say, that it is the function in which it is least fulfilled.

The focus on the teaching function, therefore, is key to achieving the organization's objectives.

Within the teaching functions, curriculum development and evaluation of higher education in general were identified as deficient sub-functions and/or with greater opportunities for improvement. In this also agrees with the study conducted by (Beltrán and Canales, 2021).

Regarding research sub-functions, those linked to the generation and application of knowledge were considered highly relevant and a priority for the quality of higher education at the AUAYA. It is also noteworthy that extracurricular courses for students and teachers are given very infrequently, which may mean that, in general, in the organization, these extracurricular courses satisfactorily meet the requirements of the teaching staff.

This is congruent with what is pointed out by Rodríguez-Varela et al. (2015: 55) in their study *The current challenges of educational institutions in the area of management*, where they state: "Higher Education Institutions have great challenges such as the generation of knowledge, training of comprehensive, competent professionals with values, ...".

A significant proportion of the linkage functions in higher education refer to relevance, and another to the dissemination and diffusion of knowledge. In relation to relevance, Fernández-Fassnacht (2017) points out that, in order to meet the expectations established by society, higher education institutions must establish solid connections with the environments that surround them.

In this sense, within the AUAYA's linkage functions, the sub-function of relationship with society in general is the one that is shown as the area with the greatest need of attention for improvement.

The sub-function that encompasses social service and professional practices is presented as the second area of opportunity for the improvement of higher education in the organization.

Management functions, also called adjective functions, play a key role in higher education.

They provide support to the substantive functions in the normative, organizational and coordination, development, budgeting and financing, monitoring and evaluation fields, among other complementary areas (ANUIES, 1978b). Among these management functions, administrative, academic and research functions are considered essential sub-functions in the improvement of higher education at the AUAYA.

Key to the achievement of AUAYA's organizational objectives is the strengthening and refocusing of leadership in the administrative areas in charge of carrying out these functions. Furthermore, the management of the environment, mainly related to the care of nature, was considered more relevant than the management of infrastructure and support services.

In addition to the above organizational contributions, the functions and sub-functions identified provide an integral vision of higher education, as well as a holistic approach to sustainability.

In other words, they constitute a theoretical proposal of key variables for the holistic study of higher education from a sustainability perspective. This proposal can be used for the evaluation of other aspects of higher education.

Conflict of interest

The authors declare no interest conflict. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

Authors' Contribution

Hernández-Ayón, Francisco Javier: Contributed to the project idea, research method and technique. He supported the design of the field instrument. He carried out the data analysis and systematisation of results, as well as writing the article.

Figueroa-Verde, Brenda: Contributed to the project idea, research method and technique. She supported the design of the field instrument. She carried out the data analysis, as well as writing the article.

Arvizu-Narváez, Ana Carolina: Contributed to the project idea, research method and technique. She supported the design of the field instrument. She also worked on the writing of the paper.

Navarrete-Méndez, Adrián: Contributed to the project idea, research method and technique. He carried out the data analysis and systematisation of results, as well as writing the article.

Availability of data and materials

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Abbreviations

AUAYA	Academic Unit of Accounting and Administration
HEI	Higher Education Institutions
NAUIHE	National Association of Universities and Institutions of Higher Education
SDG	Sustainable Development Goals
AUN	Autonomous University of Nayarit

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