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## Categorical Interrelationships On The University-Business-State Link With The Quality Of Higher Education

Interrelaciones Categóricas Sobre El Vínculo Universidad-Empresa-Estado Con La Calidad De La Enseñanza Superior

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### RESUMEN

#### Palabras clave:

Vinculación Universidad-Empresa-Estado, Calidad de la educación superior, Desarrollo económico, Brechas educativas, Innovación educativa.

El objetivo principal del estudio fue interpretar las interrelaciones categóricas y conceptuales entre la universidad, la empresa y el Estado y su influencia en la calidad de la educación superior. La investigación se basó en un estudio cualitativo y un diseño bibliográfico de tipo documental que permitió analizar la sinergia en esta tríada asociada a factores como: colaboración institucional, transferencia de conocimiento e innovación educativa, que no sólo facilitan una colaboración efectiva, sino que contribuyen significativamente a mejorar la pertinencia educativa y la empleabilidad de los egresados. Los principales resultados destacan la importancia estratégica de estas colaboraciones tripartitas en la formación académica y el desarrollo socioeconómico, subrayando la urgente necesidad de políticas y prácticas que fortalezcan continuamente la calidad y relevancia de la educación superior, proporcionando una comprensión profunda y contextualizada de las dinámicas involucradas, informando así la toma de decisiones estratégicas y promoviendo iniciativas que permitan, desde un aspecto conceptual, la comprensión de estas relaciones de colaboración en beneficio mutuo de la comunidad académica, la calidad educativa y el sector productivo.

### ABSTRACT

#### Keywords:

University-Business-State Linkage, Quality of higher education, Economic development, educational gaps, educational innovation.

The main purpose of the study was to interpret the categorical and conceptual interrelationships between the university, the company and the State and their influence on the quality of higher education. The research was based on a qualitative study and a documentary-type bibliographic design allowing the analysis of the synergy in this triad associated with factors such as: institutional collaboration, knowledge transfer and educational innovation, which not only facilitate effective collaboration, but which also contribute significantly to improving the educational relevance and employability of graduates. The main results highlight the strategic importance of these tripartite collaborations in academic training and socioeconomic development, underscoring the urgent need for policies and practices that continually strengthen the quality and relevance of higher education, providing a deep and contextualized understanding of the dynamics involved, thus informing strategic decision-making and promoting initiatives that allow, from a conceptual aspect, the understanding of these collaborative relationships for the mutual benefit of the academic community, educational quality and the productive sector.

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## Introduction

The link between the university, the company and the State is fundamental for economic and social development and is crucial to improving the quality of higher education (Lacruhy, 2022). Universities are sources of research and advanced knowledge, and their collaboration with companies allows the application of this knowledge to develop new products and services, promoting innovation and economic competitiveness, relating the alignment of educational programs with market demands and promoting the production of a qualified workforce that meets industry requirements (Manarbek et al., 2020). In addition, universities prepare future professionals and by aligning academic programs with the needs of the labor market through alliances with companies, the employability of graduates is improved, leading to the development of innovative educational approaches and the integration of practical experiences in plans of academic study, enhancing the quality of education (Ricardo Cabrera et al., 2021).

The State, by collaborating with universities and companies, can design and apply more effective public policies that promote economic and social development based on evidence and real needs (Betancur-Bustamante et al., 2024). Moreover, the involvement of the state in processes concerning the regulation of institutions of higher education and the introduction of investments in the educational sector should be aimed at ensuring the autonomy and the ability to modernize universities to improve educational standards and research activities (Tereshchenko et al., 2024). Now, the Triple Helix model, which identifies university-business and government interaction as well as knowledge transfer and innovation to drive economic development, highlights the intertwined relationship between these sectors for the quality of higher education. (DOIN & ROSA, 2019).

Concerning the quality of higher education, partnering with companies allows universities

to periodically revise their academic programs to respond to market needs and prepare students adequately (Medina, 2010). Also, it enables students to engage in professional traineeship and work on real projects, which complements their education and gives practical exposure (Pupo et al., 2024). Such linkages also foster creativity and self-employment through the formation of innovative ecosystems like technology parks, business incubators and innovation centers that enhance the birth and expansion of start-up enterprises. Partnerships redirect academic work to respond to societal needs through the application of research outcomes into practice for the betterment of society (Ferrari, 2022).

In the case of Rojas Carranco et al. (2024), the author also mentions that collaboration between universities, companies and the State is essential for economic development and innovation. The papers of the organization for economic cooperation and development as well as the World Bank inquire into mechanisms to reinforce the collaboration. Such policies and programs that focus on the transfer of knowledge and technology among these players are reviewed. Moreover, the efficiency of public-private partnerships in relation to innovation and regional advancement is examined as well (Avendaño et al, 2017).

Scholarly articles emanating from the United Nations Educational, Scientific and Cultural Organization as well as the World Bank cite as a critical issue, the standard of higher education (Gautier 2007). The employability of graduates, scientific research, and the teacher training are among the indicators worked on. These reports also deal with the necessity of academic programs as well as the responsiveness of institutions to the needs of the employment arena. Concern is also given to the issue of equity of access to higher education and the representation of the disadvantaged sections of the population. Thus, UNESCO insists on the understanding of the social responsibility of higher education institutions. They are supposed to be engaged not only in the production of knowledge but

also in the promotion of societal welfare as well as sustainable development.

The concern over the quality of higher education is profound in Latin America since higher education institutions (HEIs) must face many challenges in a global and constantly changing context (García-Blanco & Cárdenas Sempértegui, 2018). This result supports the literature denoting the interaction between universities, companies and the State in ability to increase the higher education quality. This tripartite relationship lets universities expand their investment sources beyond public budget, which in turn can have an effective impact at the first-class of education. Likewise, the college-commercial enterprise-State hyperlink can contribute to higher articulation between research, coaching and the reference to the desires of the community. This connection brings blessings that allow universities to be greater in music with the necessities of the exertions market, improving the employability in their graduates and fostering collaboration with the business quarter and the State, facilitating the transfer of know-how and era, as well as the development of initiatives. Of studies and improvement maximum applicable to society (Castro-Montoya et al., 2020).

The affiliation among universities and companies in Colombia is vital to enhance competitiveness and sustainability (Toscano-Hernandez et al., 2021). However, this courting wishes to be drastically improved to gain a wider variety of groups, mainly small and medium-sized organizations, by means of setting up studies laboratories within companies (Herrera Cárdenas et al., 2021a). Additionally, addressing student attrition in better training institutions, specifically in packages together with Business Administration, is essential. Factors such as financial limitations, academic difficulties, and problems with educational methodology contribute to student dropout rates, highlighting the importance of implementing strategies to maximize student retention and graduation rates (Cervantes Muñoz & Narváez Ferrín, 2018). Furthermore, the integration of a dual training system, inspired by the German

model, has shown positive perceptions among graduates and employers, emphasizing the importance of meaningful learning and ensuring the quality of education for the future integration of the workforce and improvement of organizational performance (Rojas Hernández, 2015a). The consolidation of quality in higher education in Colombia is vital to demonstrate institutional management capacity and position the country favorably in the region, emphasizing knowledge management, research and internationalization as key factors (Garzón Daza, 2019).

In Colombia, the link between universities, companies and the State is a relevant issue for the quality of higher education and economic development. The approach to strengthening the college-enterprise link has been formulated via the instructional region with the intention of promoting relevance and competitiveness. The University Business State Committees (CUEE) are local our bodies which might be organized through agreements between universities, research agencies, groups inside the efficient sector and authorities entities.

The CUEE are dedicated to building an in-depth inventory of the investigative abilities to be had within the location. This consists of human resources, research groups, ongoing tasks and specialized laboratories. The objective is to become aware of the strengths and areas of specialization of the colleges and their capacity to collaborate with nearby companies. This stock allows for better alignment among the academic supplying and the actual technological wishes of companies. Likewise, the CUEE analyzes the important monetary sectors in each location, allowing collaboration efforts to be targeted on areas of greatest relevance and growth capacity. Likewise, the CUEE sell conferences between academia and commercial enterprise through commercial enterprise meetings, boards and collaborative occasions (Barrios-Hernández & Olivero-Vega, 2020). The objective is to create solid alliances and foster trust between universities, the State and corporations. These alliances are essential

to power effective collaboration, knowledge switch and innovation inside the location.

Additionally, in the area of Norte de Santander, Colombia, as a reference for this research, an academic social settlement called the Pact for Education became established, which acts as a primary agent of trade (Pacto por la educación, 2022). This pact involves educational institutions from basic to postgraduate levels, the State and the business sector. Its objective is to address existing educational gaps, such as gender, differences between rural and urban areas, ethnic and epistemic gaps. From the above, a new more inclusive, equitable, diverse and quality educational model was proposed, with a broad perspective projected towards the year 2050 (Guerrero et al., 2022).

This document presents the analysis of the categorical interrelationships on the linkage of the university, the company and the State and its influence on the quality of higher education, taking as a reference, the initial application approaches the region of Norte de Santander in Colombia. This analysis seeks to provide a theoretical and practical basis that informs and provides a precedent as a basis for collaborative policies and practices between these three key actors. The article is structured in three main stages: a contextual review that establishes the theoretical context and bases the research, an analysis of the synergy between university, company and State in relation to educational quality through case and comparative studies, and the development of a conceptual framework that explains the identified interrelationships. Finally, conclusions and practical recommendations are offered to improve and consolidate this tripartite collaboration for the benefit of high-quality higher education.

## Materials and Methods

The research was based on a qualitative approach and a documentary-type bibliographic research design (Martínez, 2006), which, based on an understanding of the theoretical and emerging

categories of the study, managed to understand the categorical interrelationships on the University-Business-Business link. State (UEE) and its influence on the quality of higher education. The methodological process was structured in three stages: the contextual review to recognize the current state and base the research, the identification of the synergy between the University-Business-State and educational quality through comparative analyzes and significant case studies, and the development of a conceptual framework that explains the interrelationships identified. A documentary sample comprising of 50 documentary sources, including research articles, public educational policy, and previous doctoral studies, was adopted. The data changed into prepared right into a documentary evaluation matrix, and interrelationships a few of the categories were revealed through the class saturation approach.

### *Stage 1: Contextual Review*

In this primary level, a contextual assessment is done related to the University-Business-State link and its influence on the quality of better training for the Norte Santander region, Colombia. This overview goals to set up a theoretical context that helps the studies, become aware of the principal theories, fashions and tactics utilized in previous research, and discover the interrelationships and dynamics between the entities worried (Palacios-Moya et al., 2024). Various educational assets and specialized databases are consulted, the use of specific choice standards that consist of relevance, topicality, the technique used, the consequences acquired and the conclusions. This level permits us to establish a theoretical context and discover possibilities for improvement within the University-Business-State relationship with the pleasant of better schooling.

The process of choosing documentary assets for this study was guided through precise standards to ensure the relevance and rigor of the included substances. The choice criteria prioritized sources that without delay addressed the linkages among

universities, enterprises, and authorities, specifically in terms of enhancing the satisfactory of better education. Documents were blanketed if they supplied empirical facts, theoretical perspectives, or case studies applicable to this tripartite collaboration, with an emphasis on those published in reputable instructional journals or by using diagnosed academic institutions inside the last ten years. Exclusion criteria concerned omitting documents lacking a clear methodological foundation or relevance to the focus of the study. The sample of 50 sources turned into justified via both the scope of available literature on University-Industry-Government (UIG) relationships and the need to keep a doable but consultant pattern size, ensuring a complete evaluation without compromising the intensity of examination.

### ***Stage 2: Synergy between educational quality and the relationship between the University, business and government***

For the second stage, the factors that facilitate powerful collaboration between universities, companies and the State are investigated, and the way this synergy contributes to improving the satisfactory of higher education. A comparative evaluation of instances is executed and successful practices in distinct instructional and socioeconomic contexts are reviewed in detail. The objective is to discover the underlying mechanisms that sell knowledge transfer, instructional innovation, graduate employability and the socioeconomic impact of these tripartite collaborations (Céspedes Gallegos et al., 2024). This analysis includes the exploration of public guidelines, collaboration applications and strategic alliances which have been established to be effective in improving instructional first-rate at a better stage. Through this comparative technique, we are seeking for now not simplest understanding inter-institutional dynamics, however, also to recommend concrete guidelines to bolster these relationships for the advantage of extra applicable and first-rate better training.

### ***Stage 3: Analysis of categorical interrelationships***

Finally, inside the closing stage, the interrelationships among the styles of University-Business-State linkage and their impact in the subject of higher education are analyzed. Based on the findings of the literature review and the comparative analysis carried out in the second stage, a conceptual framework is built that integrates the key factors identified. Qualitative analysis methods are used to explore the connections between these variables and to examine how they influence various aspects of the educational system. The goal is to provide a deep understanding of the complex dynamics involved in tripartite collaboration and offer practical recommendations to strengthen these relationships. This analysis categorizes and evaluates the interactions between universities, companies and government entities, highlighting the opportunities and challenges in the continuous improvement of the quality and relevance of higher education for the Norte de Santander region in Colombia.

## **Results and Discussion**

The results are organized based on the proposed methodology. For the contextual review, it is identified that the relationship between universities, companies and the State is a multidisciplinary field of study that encompasses various theories, models and approaches. The interaction between these actors not only promotes the transfer of knowledge, but also influences the training of competent professionals and the generation of a positive social impact. In this sense, we seek to understand how to strengthen the connection and promote high-quality higher education. Based on the main research found, Table I illustrates the applications of the University-Business-State link.

Table I. Applications of the University-Business-State link.

Category	Application	Description
University-Business-State Linkage	Triple Helix Theory(Etzkowitz & Leydesdorff, 2000)	Developed by Etzkowitz and Leydesdorff, this theory proposes that collaboration creates an environment conducive to the generation of knowledge, technological transfer, and economic development.
	Open Innovation Model(Chesbrough, 2003)	Based on the idea that innovation is not limited to the borders of an organization. It suggests that universities should collaborate with companies and the State to share knowledge, resources and capabilities.
	Innovation Ecosystem Approach(Cooke, 2001)	Considers the relationship between universities, companies and the State as part of a broader ecosystem, highlighting the importance of infrastructure, entrepreneurial culture and governance in the quality of higher education and the transfer of knowledge.

In Colombia, the application of models such as the Triple Helix Theory and the Open Innovation Model is relevant in the relationship between universities, companies and the State. These approaches seek to foster collaboration, knowledge transfer and innovation. However, it is important to note that specific implementation may vary depending on government policies, regional characteristics, and local dynamics.

In the same sense, Table II lists the relevant research found in the literature review that was selected considering the criteria indicated in the proposed methodology, which correspond to the relevance, timeliness, the methodology used, the results obtained and conclusions. The above with respect to the link between the University-Business-State with the quality of higher education in Colombia.

Table II. Relevant research on the link between the University-Business-State and the quality of higher education in Colombia

Investigation	Methodology	Contributions	Conclusions
Dual training in Colombia. The case of the University Foundation of the Bogotá Chamber of Commerce Uniemprarial : the current challenges in the perception of graduates and entrepreneurs.(Rojas Hernández, 2015b)	Quantitative and qualitative survey carried out on alumni and businessmen. Review of cutting-edge research on dual training system	Uniemprarial dual training system by graduates and entrepreneurs. The importance of meaningful learning is highlighted in the pedagogical model.	Positive perception of the dual training system by graduates and entrepreneurs. Ensures quality education and future employment relationships.
Relationship of Colombian Higher Education Institutions with the Business Sector: a Reflective Analysis.(Herrera Cárdenas et al., 2021b)	Analysis of scientific publications from universities in Medellín. It highlights the need to improve university-business sector agreements.	Discusses the need to establish stronger connections between Colombian universities and the business sector. He suggests that universities establish their own research laboratories within companies.	Colombian universities need to improve their links with the business sector. Universities must create alliances to strengthen small and medium-sized businesses.
<i>Cause-Related Marketing in Retail E-Commerce as Support for the Sustainability of the University: The Case of Amazon and University of the Andes (Colombia).</i> (Toscano-Hernandez et al., 2021)	Cause-related marketing. Support for the sustainability of the Universidad de los Andes.	Strengthen the university-business relationship for competitiveness and sustainability. Greater interest of companies in higher education for productivity.	Strengthening the university-business relationship is a priority for higher education. It has the potential to improve the competitiveness and sustainability of universities.
An analysis of the impact that the articulation of research processes carried out within universities with innovation in technology-based companies and technology-intensive companies has on the development of a country. (Gutiérrez-Portela et al., 2019)	Descriptive and documentary research Primary sources: Redcluster Colombia, secondary sources: texts and articles	Articulation of research processes between universities and technology-based companies. Impact on development by enhancing collaboration between academia and industry.	The IES positively impacts the development of clusters through the training and knowledge of students. The government supports the necessity to create technology-intensive companies through university collaboration.
Characterization of experiences and strategies of the link between University, Business and State in the Faculty of Sciences of the National University of Colombia. (Patiño Guzmán, 2014)	Literature review on models and strategies for university-industry-state links. Case study method to document experiences and identify strategies.	Research groups in pure sciences are crucial for the transfer of knowledge. Programs must effectively meet science and technology transfer needs.	Pure sciences highly influenced by research groups Programs must meet the needs of science and technology transfer

The state of partnership between universities and companies in Colombia is crucial to improving the quality of higher education. The research emphasizes the need for stronger links between universities and the business sector to improve competitiveness and sustainability. The review carried out highlights the importance of universities getting involved with companies to provide support and advice, especially for small and medium-sized companies. Furthermore, the integration of university research processes with technology-based companies is fundamental for the development of the country, emphasizing the need for better coordination between academic institutions and companies. Collaborations between academic institutions and the productive sector are seen as key to driving innovation and contributing to social transformation, underscoring the importance of strategic partnerships for economic success. Based on the above, it can be inferred that fostering closer ties between universities and companies in Colombia is essential to improve the quality of higher education and promote national development.

In the proposal of the National Development Plan (PND) for the period 2022-2026, called “World Power of Life”, it is oriented towards strengthening HEIs with the purpose of guaranteeing the provision of higher education services. The aim is to ensure that there is no tuition cost in public university training institutions, with an emphasis on quality, equity and territorial relevance. This approach is progressively moving towards widespread expansion and the establishment of new educational environments conceived as centers of community coexistence and promoters of peace. The goal is to promote geographic equity and correct historical inequalities in the availability of education, starting from preschool education and ending in higher education. The implementation of the Immediate Transit Program to Higher Education (PTIES) is a specific strategy designed to facilitate and encourage the access of young people from rural and dispersed rural areas to higher education (Ministerio de Educación Nacional, 2018).

The Public Policy on Educational Resources addresses the country's need to unify, synchronize and cohere educational policy in relation to the conditions of access and availability, as well as the relevance and quality of the resources used to strengthen teaching and enrich learning according to the school curricula (Ministerio de Educación Nacional, 2018).

In the research field, in Colombia only 2.5% of researchers work in companies, while 95.7% are in academic environments. In contrast, in the OECD, these percentages are, on average, 48.1% and 38.2%, respectively (de Competitividad, 2021). Recommendations to improve the current state of higher education include the implementation of comprehensive strategies to address the dropout of at-risk youth, the strengthening of non-face-to-face education to increase quality university educational coverage, the reevaluation of the education financing system public, reducing legs in the publication of educational indicators, and promoting the use of national qualification metrics (Observatorio de la Universidad Colombiana, 2021).

On the other hand, according to Edwards (1992), the quality of education is defined as the value assigned to an educational process or product, and this value implies a judgment, since it implies a comparative statement in relation to another. The statement that an education is of quality implies, consequently, that there is a possibility that it is not; The ability to make comparisons is what makes it easier to make a judgment on the matter.

Likewise, Martin Calvo (2018) he argues that educational quality originates in the results model, giving primary importance to social efficiency. Quality is interpreted as performance, which provides a limited explanation of this concept by not adequately considering the current low-quality educational system and the social context. The

need to address aspects of increasing relevance is highlighted by proposing reasoning about the quality of education that goes beyond economic considerations.

Therefore, the interaction between educational actors ensures the development of the educational process, offering support, understanding, incentive and collaboration, working collaboratively. To achieve this effectively, it is essential to have assertive communication between all parties involved, which will facilitate better understanding and allow coordinated action from the respective functions of each participant (Tocora & García, 2018).

Now, for the synergy between the University-Business-State and the Quality of Higher Education, it is observed that the pact for education (2022) is interrelated with the quality of education, ensuring the closing of educational gaps and, with the innovation and competitiveness of companies emphasizing social commitment. Likewise, companies through development in science, technology and innovation are interrelated with engineering training, teacher training, pedagogical practice and the STEAM approach, in the context of research, for the region of Norte de Santander in Colombia. , the Electronic Engineering program of the Francisco de Paula Santander University (UFPS) is taken as the scenario. In the same way, this academic program, in terms of quality of education, is interrelated through high quality and international accreditation with accrediting agencies in other countries. Figure 1 illustrates the synergy between the University-Business-State and the Quality of Higher Education.

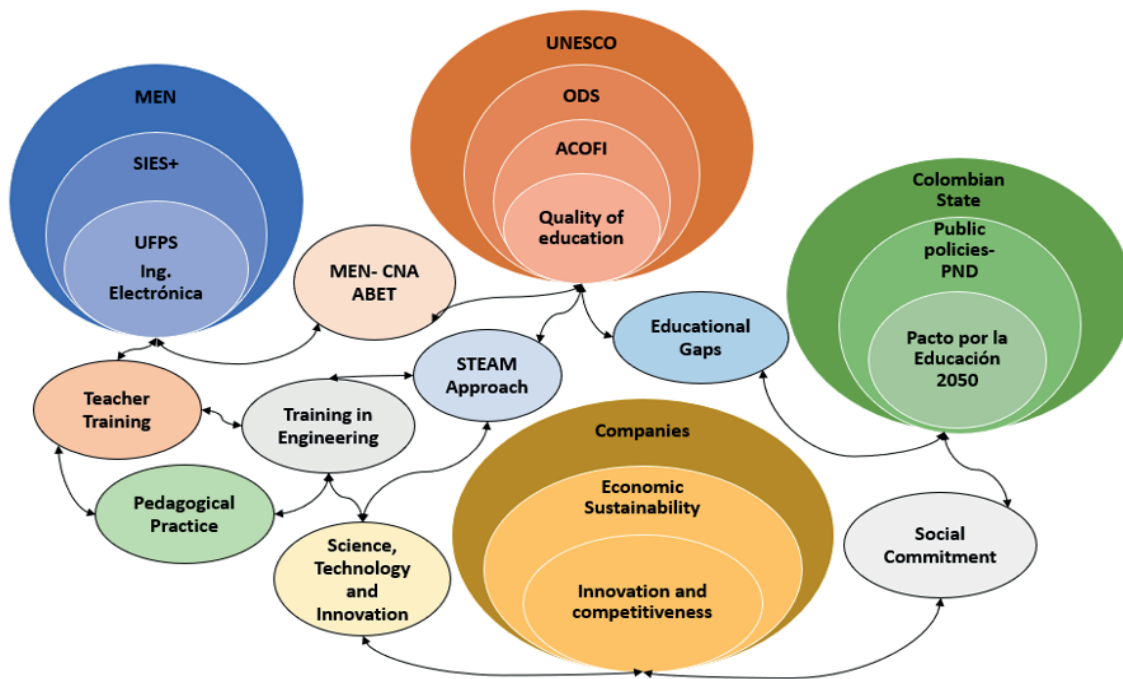


Figure 1. Synergy between the University-Business-State and the Quality of Higher Education

Currently, transformative instances refer to the contributions of governance and governability, science, technology and innovation, and the emerging transformations of pedagogical practice that contribute to closing gaps and sustaining the quality of education. education in the context of engineering training.

Governance and governability play crucial roles in transforming engineering education by closing gaps and sustaining quality. Through effective governance, collaboration between educational institutions, companies and government agencies is facilitated, allowing the strategic alignment of academic programs with the demands of the labor market. Governance, for its part, ensures the efficient implementation of educational policies, constant quality assurance and agile adaptability of programs to address changes in technology and industrial needs. Both entities work together to ensure equity, stakeholder participation, and the continued development of engineering education programs that remain relevant and high quality (Jiménez, 2022).

In the same way, science, technology and innovation (CTI) are essential pillars in the educational transformation in engineering, contributing to closing gaps and sustaining quality. Scientific research provides the basis for the continuous evolution of academic programs, integrating the latest advances and discoveries. Technology and pedagogical innovation offer advanced tools and adaptive pedagogical approaches that not only expand access to education, but also improve the learning experience. Additionally, collaboration with industry, facilitated by CTI, ensures the relevance and applicability of educational programs, closing gaps by providing students with practical experiences aligned with the demands of the world of work. Together, these dynamic instances sustain and elevate the quality of engineering education in response to the changing demands of the educational and professional environment (Quiñónez et al., 2022).

The teaching and learning dynamic involve a communicative exchange, since the teacher structures, communicates, shares and transmits scientific, historical and social content to the students. These, in turn, not only build their own knowledge, but also interact with the teacher, among themselves, with their families and with the surrounding community. This interaction is manifested through

the application, debate, verification and contrast of the contents taught (Abreu et al., 2018).

Taking into account the contextual review and the synergy between the University-Business-State link and the quality of higher education, the categorical interrelationships are proposed in Figure 2, which illustrates the representation of the subcategories of the main categories; From the transformative instances, the subcategories of governance and governability, science, technology and innovation and emerging transformations of pedagogical practice emerge; Of the educational gaps according to the context, the categories of inclusion, gender equity and rural access are presented; For the quality of education, the subcategories of sustainable development, training in engineering and science, technology and innovation are broken down, but for the quality of education, public policies and teacher training base the conceptualization and pedagogical interrelation of the research.

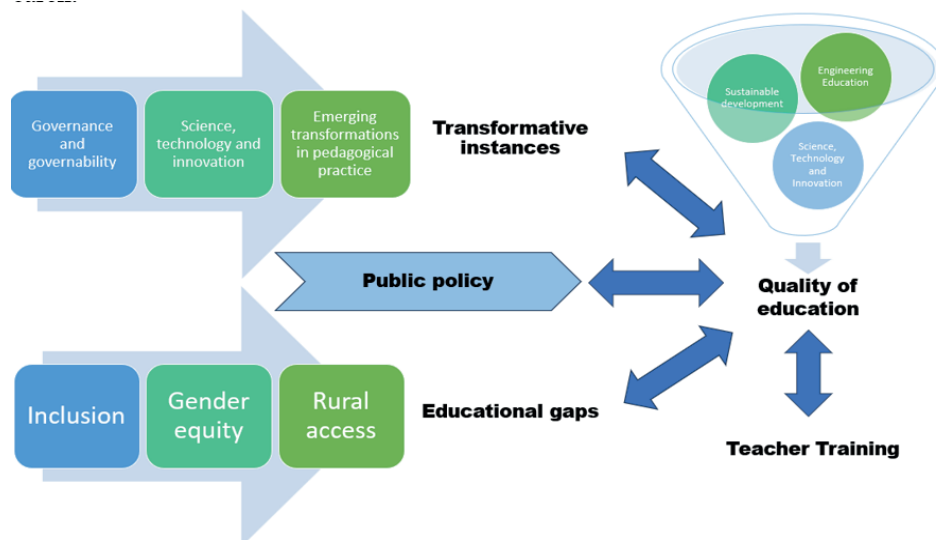


Figure 2. Categorical interrelationships between the University-Business-State link with the quality of higher education

The University-Industry-Government linkage is crucial for improving the quality of higher education in Colombia, as recent studies indicate that effective collaboration among these actors can facilitate knowledge and technology transfer, benefiting society. Also, Etzkowitz and Leydesdorff (2000) propose the triple linkage model as a way of fostering innovation and economic development. However, in this model there are challenges, such as lack of incentives and cultural differences. To solve these challenges, it is essential to implement public policies that promote joint research with continuing education programs that align the skills of graduates with the needs of the labor market and that implement evaluation mechanisms to measure the impact on educational quality.

## Conclusions

The interrelationships between universities, organizations and the State could seriously enhance the first-rate of better training and near instructional gaps. It is important that training regulations sell and support those collaborations to maximize their effect on monetary and social improvement.

Educational innovation pushed by means of University-Business-State linkages can remodel teaching and learning strategies, higher prepare

students for the exertions marketplace and foster dynamic and adaptive mastering surroundings in higher training establishments.

Despite the advantages recognized, sizeable demanding situations continue to be, consisting of the need for greater equitable and sustainable collaboration between the parties worried. Addressing those challenges will require modern regulations and techniques that reinforce tripartite collaborations for the gain of more inclusive and first-rate better training.

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