

# *Extensión universitaria en Cuba y su rol en la formación de ingenieros químicos*

## *University extension in Cuba and his role in chemical engineers' formation*

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**Resumen:** El objetivo del trabajo fue analizar la evolución de la extensión universitaria en Cuba desde perspectivas asociadas al desarrollo de la responsabilidad social de los futuros profesionales, incluyendo su rol particular en la formación de ingenieros químicos. Se aplicó el análisis documental de fuentes pertinentes, y se realizaron entrevistas a informantes clave. Se determinaron indicadores, hitos, etapas y tendencias del proceso investigado. Los resultados revelaron insuficiencias en los fundamentos epistemológicos de la dimensión pedagógica de la extensión, así como en su curricularización que deben eliminarse en aras de desarrollar la responsabilidad social de futuros profesionales como los ingenieros químicos.

**Palabras clave:** Extensión universitaria; Epistemología; Ingeniería Química; Curricularización

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**Abstract:** With the aim of presenting some reflections on the problems presented by the training of the agronomist, an analysis is made of some manifestations that constitute insufficiencies, referring to animal management, the tendencies and approaches that guide their formation, their evolution, as well as the reflection of these problems from the postgraduate level for their performance in the productive practice, it is concluded that it is necessary to deepen the professional pedagogical process, with the intention of eliminating the intermaterial barriers, approaching it from a holistic perspective, so that Engineers can take the current approaches to sustainable agriculture

**Keywords:** College extension; Epistemology; Chemical engineering; Curriculum

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## **Introduction**

The university extension is recognized as one of the essential or substantive processes that every modern university needs to develop in order to fulfill its global mission of responding to the educational, scientific and social demands of the society of which it is a part (Horruitiner, 2012).

According to a document of a guiding nature for the execution of the extension work that was issued in 2004 and known as the National Program of University Extension, the university extension for Cuban higher education can be understood as: "process that aims to promote culture in the intrauniversity and extrauniversity community, to contribute to their cultural development "(Ministry of Higher Education, 2004b, p.5).

Due to the strong university-society relationship involved in the university extension, this process has the particularity of being a channel especially conducive to promoting characteristics in students such as values, attitudes and performances linked to the fulfillment of social responsibility that as professionals play in the society in which they live. On this conception, personalities from the Cuban university sphere have pointed out: "The university must be understood as a political and intellectual environment of crucial importance for the consolidation and strengthening of human values and civic responsibility ..." (Díaz-Canel, 2012, p.10), "In particular university extension, as a substantive process, is a very important vehicle for developing certain values in students" (Horrutiner, 2012, p.21), "the university extension must have a more organic impact on the fulfillment of the social order of the university, and in particular in the integral formation of the future professional "(Alarcón, 2015, p.6).

On the importance of perfecting the formation of a social responsibility of university students that integrate qualities such as: professional commitment to the common good, environmental care, active citizenship, etc., have also reported outstanding Cuban and foreign research (Navarro, 2012; & González, 2014; Vallaey, 2016).

With regard to the substantive process of university extension, valuable scientific investigations have been documented in Cuba that have addressed several of its key facets such as: its conceptualization, procedural and functional nature (González, 1996), the way of institutionally directing said process (Del Valle, 2009, González, 2002, González, 2016), its potential to promote university scientific research (González, 2006), its influence on the initial formation and the exercise of community environmental education of teachers in training (Guibert & Sánchez, 2016; Hernández, 2011; Turro, Relaño & Silva, 2017), the way of its management in conditions of universalization of higher education (Gainza, 2012, González, 2012), its contribution to the elevation of the aesthetic culture of the students university students (Pérez, 2013), the specificity of their address in university training of doctors (Veliz, 2013), and their contribution to the emotion of health from races of biological profile (Batista, 2016).

However, as revealed in these previously cited works and in other background studies, attention has been very limited to the pedagogical dimension of university extension, to the curricularization or inclusion of such work as an integral part of the official curriculum of careers and, to the treatment of extensionism in careers belonging to the sphere of Technical Sciences (Albarenque, 2014, Gamboa, Mena, Gutiérrez & Barquero, 2016, Menéndez, 2013).

It should also be emphasized that if it is agreed that the university extension is an essential process to develop in students axiological qualities such as social responsibility of the professional, and that within the fundamental areas of exercise of such responsibility is the one referred to the care of the environment (both natural and artificial); then it is not difficult to understand that a career like Chemical Engineering, because of the nature of the object of that profession, is of singular interest in research such as the one addressed in this paper.

The foregoing allows us to appreciate the relevance of continuing to investigate the university extension process in general, while revealing the particular problem of pointing the trends that are revealed in the historical evolution in Cuba of the aforementioned process when the analysis of such process is carried out, especially taking into account aspects such as: their theoretical-methodological support, their level of recognition through some components of their own personality that occupy certain places between the formative results required by the curriculum and, their role in a career whose object of the profession is locate in the area of technical sciences, as is the case of Chemical Engineering.

It is for the foregoing that the present work was aimed at analyzing the historical evolution of the process of university extension in Cuba, with attention to the role that it has played in the training of chemical engineers.

## **Development**

### **Determination of indicators, milestones and stages of historical analysis**

The historical analysis included the execution of a group of tasks such as: documentary review of relevant sources such as doctoral theses, scientific articles, national regulations and institutional work documents; as well as carrying out interviews with key informants as professors with a long career in Cuban higher education, and in many cases also with particular experience in university extension work and in the career of Chemical Engineering.

Applying analysis and synthesis procedures to the collected information, it was possible to define that a set of three indicators was adequate for the required historical analysis. The first of them with a fundamentally epistemic character and therefore more general, while the other two with a more specific character depending on the pedagogical dimension of the extension and the role of this process within the training of chemical engineers. The established indicators were the following:

- Epistemological foundations of extension
- Curricularization of the extension
- Extension activities in the Chemical Engineering career.

Coinciding with important investigations antecedents (Díaz 1998, González, 1996, González, 2002, González, 2012, Veliz, 2013) in this work, it is accepted that the historical evolution of university extension in Cuba, as a subsystem of the global system of university education in the country, it is clearly divisible into two broad periods: the prerevolutionary, and the revolutionary. However, the main historical milestones used here do not coincide with those of previous investigations.

In the works referred to in the previous paragraph, due to the importance that is generally granted to the management or administrative direction of the essential processes in Cuban higher education institutions, the events more repeatedly identified as the milestones that define the different stages historical analyzes have been the following: foundation of the Royal and Pontifical University of San Geronimo de la Habana (1728), triumph of the Cuban Revolution (1959), First Congress of the Communist Party of Cuba (1975), beginning of the so-called Special Period (1990) and the beginning of the expansion of the Universalization of Cuban higher education up to the municipal authorities (2000).

However, in the present study, taking into account the research objective and the indicators of determined analysis, the events identified as historical milestones for the delimitation of the different stages of analysis were the following: appearance in 1918 of the Cordoba Reform (National University de Rosario, S / F), proclamation in 1962 of the University Reform of Cuban Higher Education (Higher Council of Universities, 1962), approval in 1988 of the Program for the Development of University Extension in Cuban Higher Education (Ministry of Higher Education , 1988) and, the appearance in 2009 of the agreements emanating from the World Conference on Higher Education held in Paris (UNESCO, 2009). About the significance for the university extension of each of these historical facts is argued in the subsequent section.

Based on the above, the delimited stages on which the historical analysis of the extension process of interest was carried out were the following:

- 1) Of incipient support to the education of the humble sectors (1918-1962).
- 2) University-town integration (1962-1988).
- 3) Promotion of a multifaceted culture (1988-2009).
- 4) Orientation towards university social responsibility (2009- )

### **Analysis of the delimited stages**

First stage: Of incipient support to the education of the humble sectors (1918-1962).

From the neocolonial period in Cuba, the interest of university professors and students, and of artists and intellectuals, began to emerge to carry out certain actions that linked the University with the educational improvement of the most disadvantaged social sectors. At this time the conceptions coming from the Argentine student movement of 1918, known as the Reforma de Córdoba, have a particular importance and impact, an event that defined for the first time the meaning of university extension as a fundamental university task, marked by its social function. This ideology influenced notoriously throughout the Latin American region and Cuba was no exception, especially between the student and teacher vanguard of the existing University of Havana. Among the most important extension activities executed at that time is the foundation by the outstanding university student leader Julio Antonio Mella of the so-called Popular University José Martí, on November 3, 1923. This organization was conceived with the function of improving education of the most humble popular sectors and to promote alliances among workers, students and intellectuals of the country.

Another very important fact in this stage was the appearance of the rectoral resolution that, by requirement of the University Student Federation (FEU), approved in 1950 the so-called University Extension Commission (González, 1996), which gave it a more institutional character to the extension actions and activities that were being carried out. This conception of improving the institutionalization of the extension activities carried out was consequently spread to the other two existing universities in the country at that time, the Eastern University and the Central University of Las Villas founded respectively in 1947 and 1952, so it can be said that the social influence of the University through extension activities was not exclusive to the capital university, but also occurred in other regions of the country, although in a

more limited way. The extension activities used in this stage consisted of talks, lectures, exhibitions, artistic and literary presentations, as well as the publication of some materials.

It is worth noting that the aforementioned extensionist actions failed to go beyond the character of relatively spatially isolated and non-systematic temporary events, since most of them were frustrated by the socio-political situation existing in the country at the time. This socio-political situation is further aggravated as of 1952, which leads to a significant decrease in the quantity and quality of the extension actions that were being carried out until the national leadership of this action disappeared in 1956 when the University closed of Havana.

In this stage it is not possible to produce a theoretical-methodological development of the university extension in Cuba that can be highlighted since precision is not reached either in its concept or in its fundamental method of execution, distinguishing only certain types of activities with very diverse characteristics linked to the attempt to raise the education of the most humble sectors. There is no important link between extension work and the process formally recognized as academic for the training of university students, so that the curricularization of the extension work carried out during these years can be considered null. Neither have been located evidence that the university extension has played a recognizable role in the training of chemical engineers in the country during the years analyzed.

Second stage: University-town integration (1962-1988)

With the triumph of the Cuban revolution and from the early years of its development, under the leadership of Commander in Chief Fidel Castro Ruz and other leaders of the country, a series of important educational transformations began to take place and therefore in the sphere of higher education. Thus, on January 10, 1962, the University Reform in Cuba was proclaimed (Superior Council of Universities, 1962), an event that was a decisive milestone in the projection and revolutionary establishment of Cuban higher education. Immediately there are transformations in the three existing universities to respond to the needs of the people, with emphasis on educational and social.

The University Reform highlighted that the University had to be at the service of the people and that in addition to the traditional academic functions should conduct scientific research and disseminate culture, so that consequently conceived the so-called University Extension Commission, which stated that: " ... will be fundamentally an organ of integration of the university and the people" (Higher Council of Universities, 1962, p.10). This Commission had the function of ensuring that the university culture

reached the popular masses and also because the latter could participate in decisions and university programs.

The main extension activities used to spread the university culture throughout the country consisted of: improvement courses aimed at broad sectors of the population, specialized study circles, lectures on scientific dissemination, artistic, sports and recreational activities, postgraduate courses for the update of university graduates.

However, it should be noted as a limitation of this stage that university research was practically absent in the extension work, leading to the fact that in the 70s in general the extension activities were limited to the artistic and sports fields.

In this stage, although the extension manages to constitute a very important channel of university work where the aspirations of integration with the people that are assumed as principles of the process initiated with the Cuban Revolution materialize, and in the organizational aspects important steps are taken such as the creation of the University Extension Commission aimed at guiding and supervising this work in the higher education institutions of the country, still the theoretical-methodological development of the university extension is very limited. It remains almost totally absent to conceive of extension as a task that contributes significantly to the process of training future university graduates, so it is not evident in these years a significant intention to curricularize somehow the extension work of the learners

In the chemical engineering careers, the extension work rested fundamentally for these years in the realization of sports and artistic activities of contest among student collectives, as well as of voluntary overcoming in disciplines such as: dance, painting, photography, cinema, etc.

Third stage: Promotion of a multifaceted culture (1988-2009) In 1988, the Program for the Development of University Extension in Higher Education was approved, in which the text states that university extension has the purpose of "promoting and disseminating culture in its broadest sense, that is, scientific culture, technique, politics, patriotic-military and internationalist, artistic and literary, physics, etc. "(Ministry of Higher Education, 1988, p.1).

As a result of the aforementioned Program in the decade of the 90s, the university extension became one of the fundamental aspects of university work, which in turn made clear the need to deepen in its epistemological sustenance, that is, in the system categorical, legal and methodological that from the

scientific point of view would allow its proper execution, following the guiding principles established after the University Reform of 1962.

In the years 1996 and 2002, two key investigations were carried out in the country that produced a notable change in the epistemological livelihoods available for the extension work of Cuban universities (González, 1996, González, 2002). These works, by specifying basal aspects such as the concept of university extension, the process nature of such work, its functions, its fundamental method of work based on cultural promotion, its main organizational forms of execution, as well as the specificities of the administrative management of this process at the institutional level, constituted the epistemic pillars on which, over the subsequent years, the theoretical-methodological body of Cuban university extension has continued to be developed and perfected (Batista, 2016, González, 2006, González, 2012, González, 2016, Hernández, 2011, Pérez, 2013, Veliz, 2013).

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Among the actions and extension activities that are developed in this stage are: community projects, the teaching of courses to students and professionals related to science, technology, art, sports, economic development strategies, political, social and cultural of the country, the history of Cuba and local, the work of the University Honorific Chairs, the development of comprehensive programs on Healthy Living



and Environmental Education, and the dissemination of the life of the university community in society (Socas, del Pozo & Díaz, 2018).

At this stage, despite important advances in the improvement of the epistemological underpinnings of the university extension process in Cuba and of proclaiming the general nature of the culture that extension work should promote inside and outside the university campuses, in general it predominates a traditional or unidirectional conception of extension, in which university agents are the subjects that provide culture, while communities and society in general remain as passive recipients of that culture. Implicit in the above is the conception that the exercise of university extension by students does not lead to an important contribution to the process of their training as professionals, so the curricularization of the extension in this stage is revealed only through the inclusion in the curriculum of the careers of some subjects related to artistic appreciation. It is also worth noting that, in general, the university extension process continued to be identified with artistic, literary, sports and socio-political activities, which meant a reduction in the pedagogical dimension of the extension process (González, González & Socas, 2010).

In the chemical engineering careers in the country begin to develop university extension activities linked to the performance of this type of professional, especially in the environmental sphere and through environmental education activities (Menéndez & Toledano, 2002), community projects (Escudero, del Toro, Ríos, Iglesias & Galindo, 2002) and postgraduate courses (Pire, 2002).

Fourth stage: Orientation towards university social responsibility (as of 2009)

In the final communiqué derived from the World Conference on Higher Education held in Paris in 2009, the social responsibility of Higher Education as the first aspect stands out, that is, to assume and face the economic, scientific and humanistic problems that affect the society. A call is made to train professionals with skills to meet these challenges, thus contributing to sustainable development, with peace, well-being and active citizenship (UNESCO, 2009).

From this communication it is emphasized that the university institutions must advance in the configuration of a more active relationship with their contexts, aware that quality is inseparable from the relevance and sustainable development of society. It is also connoted that the extension should enrich appreciably the training of students, collaborate in the detection of problems for the research agenda and create spaces for joint action with different social actors.

In reference to the methodological aspects, it is considered that extension activities should strengthen their interactive and dialogical character with respect to university knowledge and the knowledge and needs of the other participating communities (Gezmet, 2013).

From the perspective of the present study, it can be seen that in the years following the celebration of the World Conference on Higher Education held in Paris (UNESCO, 2009), it can be identified as advances that are incorporated into the epistemic sphere of university extension the conception of that such work should constitute a particularly important channel for university institutions to reveal, not the traditional link with the environment, which has sometimes been sporadic and understood as voluntary or charitable, but the exercise of social responsibility that is inalienable to them, paying tribute to such essential issues as sustainable development and the promotion of active citizenship.

It also highlights the importance given to the extension in terms of what it can and should specifically contribute to the training of university students, considering also that such a pedagogical dimension of the extension should be reflected in a concrete way in the university study plans. Regarding the insertion of extension work in the professional training curriculum, important results reported by countries such as Uruguay and Argentina have already been managed where it has already been possible to integrate extension activities within the curricula of some careers (Gezmet, 2013; Tommasino & Cano, 2016).

In the stage that analyzes the different university careers in Cuba can be classified into three stages of development according to the type of extension work developed. The first stage races employ extension activities of a socio-political, artistic and sporting nature. Those in the second stage, in addition to using the activities already mentioned, include others that seek to address certain problems in the context (Almaguer, Parrado, & Marques, 2018, García, Barrera, & Días, 2018). In the third, where there are few careers, are located that in addition to having the aforementioned, achieve some degree of curricularization of the extension.

The incipient curricularization of the university extension in Cuba has been oriented to edges of the extension such as: the promotion of the health (Batista, González & Ortiz, 2016), the environmental education (Leyva, Marichal, Alonso, & Chaos, 2015) and socio-cultural projects (Chaos, López, De la Paz & Falls, 2016). However, the precise expression of the contribution made in these cases by extension activities to the training of the future professional is an aspect that in general is still pending.

In the field of Chemical Engineering, the existence of the Environmental Network of the MES (REDMA) can be cited for this stage, in which the Chemical Engineering departments of the universities participate,

and which is aimed at managing knowledge and innovation in favor of the environment, risk prevention and adaptation to climate change; Therefore, it constitutes a favorable way to contribute to the integral and committed formation of future professionals with the sustainable development of the country (Merino, 2018).

A positive example is the one offered by the Universidad de Oriente where the Chemical Engineering degree is supported by a faculty-level extension strategy that includes actions aimed at the work of honorary chairs and community socio-cultural projects linked to the promotion of health and product management and chemical waste (Universidad de Oriente, 2017), although still not achieving concrete levels of curricularization of the extension activity.

### **Trends determined in the investigated extension process**

The epistemological foundations of the university extension have been systematized, from including a diffuse understanding of the extension that understood it as something voluntary, a systemic and based on extrauniversity activities fundamentally oriented to the educational elevation of disadvantaged social sectors; up to a scientific conception of the extension that understands it as a function and substantive university process that must exist in integration with the other key processes of training and research, and that is based on non-unidirectional but dialogical activities that play an important role within community projects oriented to the solution of problems of these contexts, all this as an expression of exercising social responsibility that is currently inseparable from higher education institutions. However, it has not yet been possible to specify the theoretical-methodological aspects that are necessary to develop, at the learners' level, the basal qualities of performance as the social responsibility inherent in the object of the given profession.

The curricularization of the university extension has varied from a practically null level, given by the management of the activities and extension activities with an absolutely extracurricular character or in no measure demanded by the university study plans, until the recognition of a pedagogical dimension of the extension work that must reach specific expressions within the curricula of careers. However, the degree of achievement of such extension curricularization is still incipient, which has not been able to delimit with sufficient clarity the specific contribution made by the extension activities planned to the integral formation and, especially to the development in the future professionals, of a social responsibility oriented to sustainable development.

Regarding the extension activities in the Chemical Engineering career, there has been a slight change, produced between extremely sporadic activities, of a fundamentally unidirectional nature and totally independent of the particularities of such a career, up to the use of methods of cultural promotion through of community projects; Although the latter only rarely, have been addressed to address problems of communities that can receive significant mitigation or solutions taking advantage of the culture of the profession that is typical of these students, as may be the case of environmental preservation. It is also worth noting that the aforementioned modest variation in the extension activities present in the context of the analyzed career was not accompanied by an appreciable improvement in the curricularization of the same.

### **Conclusions**

The research presented reached the objective pursued, while the analysis made it possible to determine important trends in the historical evolution of university extension in Cuba that are unveiled as a result of having made the analysis from perspectives related to the purpose of developing students' social responsibility like those of Chemical Engineering.

The university extension in Cuba, from 1918 to the present, has enriched its epistemological body appreciably, but theoretical-methodological shortcomings still exist, related to the pedagogical tribute that this process can and should do, especially in the formation of learners of axiological qualities such as social responsibility inherent in the object of their profession.

The curricularization of the university extension reveals that it is currently in the country in a primary phase, so it is necessary to perfect the theory and practice of this important aspect in order to achieve the academic recognition that deserves the pedagogical extension work.

In the career of Chemical Engineering that has been developed in different institutions of the country, there has been a modest increase in extension activity, but still suffers from negligible levels of curricularization, and not being sufficiently related to the exercise by learners of actions linked to social responsibility inherent in the object of their profession, such as community projects related to an adequate environmental management of pollutants derived from industry, or waste generated by daily life in communities.

The results obtained in the present research, while also specifying the main theoretical-methodological shortcomings that still exist in the studied extension process, guide the improvement path to be followed

in order to achieve that the substantive university process achieves a more complete overall compliance of its functions, and in particular more effective in terms of contributing to the development in students of an axiological quality as important as the social responsibility inherent in the object of their profession, especially for chemical engineers.

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