ALTERIDAD
REVISTA DE EDUCACIÓN
p-ISSN:1390-325X / e-ISSN:1390-8642
http://alteridad.ups.edu.ec

January-June 2025
Vol. 20, No. 1, 60-70
https://doi.org/10.17163/alt.v20n1.2025.05

Educational policies of civil engineering in Mexico: a historical stratigraphy

Las políticas educativas de la ingeniería civil en México: una estratigrafía histórica

Dr. José Augusto Ramón González is a professor at Universidad Nacional Autónoma de Mexico, (jose.ramon@ingenieria.unam.edu) (https://orcid.org/0000-0002-1455-8887)

Received on: 2024-09-24 / **Revised on:** 2024-12-12 / **Accepted on:** 2024-12-16 / **Published on:** 2025-01-01

Abstract

As a result of the social approach adopted in recent years by the Mexican Federal Government, a new strategy has emerged to promote higher education, focusing on the most marginalized individuals and communities, with the goal of fostering their inclusion in professional training at this level. This research presents the philosophical foundations of this initiative, based on the concept of "episteme"; it includes a review of the evolution of higher education in Mexico from the perspective of civil engineering, utilizing a stratigraphic model of knowledge. In particular, the creation of the Benito Juárez García System of Universities for Welfare and the Civil Engineering School in Texcoco, State of Mexico, is described. The latter serves as an alternative to address the consequences of educational policies implemented under the so-called neoliberal framework, representing a potential option for improved social participation in the development of specialized technical capacities. The results and conclusions demonstrate that the educational reforms implemented do not follow a continuous discursive line but rather emerge in response to the episteme or discursive stratum of the moment. As a case study, the current higher education model in civil engineering is presented. In the same way, the results of the new model of the University of Civil Engineering are presented.

Keywords: neoliberal, stratigraphy, politics, education, university, civil engineering.

Resumen

Como resultado del enfoque social adoptado en los últimos años por el gobierno federal mexicano, ha surgido una nueva estrategia para promover la educación superior, dirigida a personas y comunidades en situación de marginación, con el objetivo de favorecer su inclusión en este nivel de formación profesional. En esta investigación se presentan los fundamentos filosóficos de esta iniciativa, basados en el concepto "episteme", la reseña de la evolución de la educación superior en México desde la perspectiva de la ingeniería civil, mediante un modelo estratigráfico del saber; y, particularmente, la descripción de la creación del Sistema de Universidades para el Bienestar Benito Juárez García y de la Escuela de Ingeniería Civil en Texcoco, Estado de México. Esta última constituye una alternativa para superar las consecuencias derivadas de la aplicación de las políticas educativas del llamado esquema neoliberal y que puede representar una opción para que la participación social ocupe un mejor lugar en la creación de capacidades técnicas especializadas para el desarrollo. Como resultados y conclusiones se muestra que, las reformas educativas implementadas, no obedecen a una línea discursiva continua, sino por el contrario, son emergencias que siguen a la episteme o estrato discursivo del momento, y como referencia demostrativa, se presenta el actual modelo de educación superior desde la ingeniería civil. De la misma forma, se presentan los resultados del nuevo modelo de Universidad de Ingeniería Civil.

Palabras clave: neoliberal, estratigrafía, política, educación, universidad, ingeniería civil.

Suggested citation (APA): Ramón, J. (2025). Educational policies of civil engineering in Mexico: a historical stratigraphy. *Alteridad, 20*(1), 60-70. https://doi.org/10.17163/alt.v20n1.2025.05

1. Introduction

Scientific research is a process whose purpose is to understand and explain a natural or social phenomenon and whose development is framed by one or more methods of analysis proposed by the researcher (Garza, 1996). However, such research must be systematic and controlled so that the facts under study are not simply the product of chance (Hernández et al., 1997). In this way, social problems or phenomena have been approached with different methodologies and from different approaches. The most outstanding are those supported by experiences, while, as a counterpart, are those based on taking samples of reality to analyze later, i.e., there are qualitative and quantitative methodologies (Monk, 2011). In addition, a mixed-type investigation can be carried out by combining both (Sánchez & Murillo, 2021).

The argument between education and pedagogy cannot be placed through a continuous discursive line of distance or rapprochement between them, since education was not always linked to pedagogy, as Romero (2008) states, "it is until eighteenth century, when education leaves aside praxis and pedagogy claims for itself all the problems of it" (p. 138).

Likewise, the history of education policies can not only be understood as that of individualistic exercises; thus, one of the objectives of this work is to propose that educational policies far from being shown as continuities are, on the contrary, discontinuous stratigraphic discourses. It can be distinguished that, from the 19th century, education became a matter of state, directed, at least, through two aspects: one, as a project of population reform and another as a pedagogical strategy (Romero, 2008, pp. 139-140). Consequently, it can be said that it was then that something, such as a kind of policy aimed at the care of life, was shown in the two ways described above. The first, which had its origin since the late eighteenth century and Michael Foucault called anatomopolitics of the human body, concentrated directly towards the individual being and, the second, already in the following century, called population biopolitics, as a new technique directed towards man/species, (see Foucault, 2002 and 2017), and it is in this position, in which the axis of the exercise of the educational device is considered through pedagogy and the control of the subject/species from school (see Rodríguez-Revelo, 2016 and 2017).

Thus, the relevance of the reflection on the origin of civil engineering in Mexico is useful to show that it did not manifest itself as an educational chain of the 19th century, but as an emergency or break from a colonial regime to another liberal, and as part of the stratigraphic discourse line of education, civil engineering emerges as a device to manage the life of the population, i.e., as an educational technology that will have the task of training professionals to manage the resources of a territory with the purpose of making the population live, as a massifying and non-individualistic project, whose "object of government will be the productivity of the population. Without a doubt, we can speak with the property of a biopolitical leadership that intensifies from strategies of control over the population, making productivity visible as a reason of State" (Olave & Vélez, 2017, p. 47). Therefore, and as a proposed methodology, the evolution of higher education policies in Mexico, from the perspective of civil engineering, is approached through a genealogical scheme divided into three moments: first, education under peninsular control (Saldaña, 2005, p.13); second, the irruption of Mexican engineering and its exercise as a profession at the service of the State and third, current Mexican engineering with the project of the Universities for Welfare Benito Juárez as a particular case.

2. Methodology

The methodology chosen for this research is based on a perspective that Michel De Certeau calls social praxis of discontinuities (De Certeau, 1993), which makes sense in Michel Foucault, through his concept of discursive formations or epistemes (Foucault, 2010, p. 55). Its application can be shown from different aspects of social phenomena, and education is one of them, as it is also, "the interference of politics and power over the bio, of individuals and school crowds" (Illicachi, 2017, p. 109). Epistemes are geological strata that function as social discontinuities, which remain. Everything is a discontinuity, so education is no longer seen only as a sequence of events but can be approached as a process.

> […] despite the landslides of the subsurface, it keeps words, concepts or symbolic themes identical. A simple example: we talk about the "crazy" in the 16th century, in the 18th century and in the 19th century, but in reality, here and there, "it is not the same disease. (De Certeau 1995, pp. 20–21)

For Michel Foucault and Gilles Deleuze, the statement or episteme "is a discursive formation generated at a certain moment and that engulfs the collectivity; in another sense, it is like a blanket that covers the whole society and that determines it" (Ramón, 2018, p. 122). In the words of Deleuze (2014, p. 23), "a statement is a regularity and what does it mean, what does it regularize? it regularizes some points", or, in other words, effects, points that converge and determine the subject holding it by means of the network or stratigraphic diagram of the moment.

The diagram, according to Gilles Deleuze (2016), "It is the exposure of the relations of force that constitute power" it is also, "the map of these relations, of density, of intensity, that proceeds by non-localizable primary unions, and that in every instant passes through any point, or rather in every relation from one point to another"; (p. 63), "in other words, everything that is schematized through agencies or devices" (Ramón, 2018, p. 122) and:

> As can be deduced, it is the statement or episteme of the moment, in the current case, for example, neoliberalism, which emits singularities and these are manifested through institutionalized, normative and control devices or agencies, for example, the school, the factory, the police, the shopping center, etc., so that the population, the subject, the species, become subjectivized, the student, the worker, the delinquent, the consumer, etc. (Ramón 2018, p. 122)

Thus, the teaching of civil engineering in Mexico can be understood as a historical process marked by different statements or epistemes, for example, the sovereign episteme, the modern and the contemporary. As a parallel discursive line, the epistemological ideas raised by Karl Popper and Thomas Kuhn stand out. Although they are not identical, they are complementary. Popperian epistemic truth, understood as a process of falsification and construction of new knowledge, is linked to Kuhn's paradigmatic discourse, based on relations of force, i.e., a new scientific paradigm entails, to some extent, an intrinsic dispute that justifies it and allows it to endure (Popper, 1962; Kuhn, 2013). The same applies to stratigraphies, as emergency processes that break out as territoriality and deterritoriality (Haesbaert, 2011; Herner, 2009).

On the other hand, we also speak of the long duration as a historical methodological proposal, which, due to its characteristics, has led to its being used to interpret different social phenomena; among them, education, taking into account time as a main element. Thus, in treating historical time or social events as slow or immobile, the phenomenon of rupture is set aside, i.e., everything is a discontinuity (see Braudel, 2002, pp. 17-18; Roman, 1997, p. 73).

Epistemes function as long-lasting devices, such as multi-line skeins. One of them, higher education from the discipline of civil engineering, appeared *in the world and in Mexico in the nineteenth century*. However, it was as a discontinuous model, so an analysis is presented from three strata or epistemes; the *old*, as a model under the Spanish sovereign domain, the *modern* that becomes from the transformation of the College of Mining of the sovereign regime in the School of Engineering of liberal court and, finally, the *contemporary*, which goes from the neoliberal model to the new welfare scheme implemented by the authorities in office. And it this last point which will show a quantitative approach of the origin and results of the, until now, only school of Civil Engineering of the Universities for Welfare Benito Juárez García, as a product of the humanist renovating scheme of the federal government called the Fourth Mexican Transformation.

3. Results

3.1 The sovereign stratum. Education under Peninsular control. From the College of Mining in the service of the Crown

The sovereign episteme addresses the time of the King, which, in general, can be considered in the history of Mexico as the viceregal period. This epistemological stratum stands out for an exercise of power from the legitimacy of the sovereign, i.e., "the

theory of sovereignty is the cycle of the legitimacy of the subject to the subject, the cycle of power and powers, cycle of legitimacy and law" (Foucault, 2002, p. 50) that manifests itself in the domain of the territory —the inert—, the material above life. In other words, the discursive statement was directed towards the territorial dominion of the Crown, even over the life of the subjects. "Seen in this way, in the old regime, the one in which, the sovereign power dictated the guidelines of death to make the population live, this, as a man of species, did not gain relevance, because the relationship between sovereign and territory manifested itself without any link between it, its territory and its vassals" (Ramón, 2022, p. 92), "the feudal lord did not care about the population, he has a lot of servants, it is everything that interests him" (Pérez, 2017).

Thus, the Spanish Crown, through the ecclesiastical hierarchy, both regular and secular, was responsible for administering education at all levels and in all the confines of the territory of New Spain (see Ricard, 1986 and, above all, Gonzalbo, 1990). An institution of higher education created in the early years of the Colony was the Colegio de Santa Cruz de Tlatelolco, known as the first College of America founded in 1536 by Fray Juan de Zumárraga, bishop of Mexico and dedicated to the higher education of the indigenous nobility (Ricard, 1986, pp. 334-335).

In that same year, the same Fray Juan de Zumárraga asked the king of Spain for authorization for the establishment of the Royal University of Mexico, but it was until April 30, 1547 when the monarch announced his agreement on this request, on September 21, 1551, the necessary ordinances were issued for its foundation and on January 25, 1553, Viceroy Luis de Velasco executed the Royal Charter for the opening of the Royal and Pontifical University of Mexico (Martín & Ramón, 2007).

During the colonial era, the development of higher education began to flourish with the creation of this institution oriented to the humanities, law and medicine. In contrast, the teachings of the technical areas were still transmitted in a practical way, from teacher to student, even more so in the field of construction, until the creation of the Royal Seminary of Mining.

Miners represent a very significant group due to its close relationship with scientific education. The rapid development of this activity in New Spain was because it was permanently observed by the monarchy. The Spanish miners brought with them an experience accumulated since the times of the Roman Empire, when gold, silver, copper, iron, lead and tin were exploited in Hispania. These experiences were transferred to New Spain, and lasted for a long time, but the need to exploit the mineral riches to the maximum produced that the Royal General Court of Mining was created on July 1, 1776, and the Royal Seminary of Mining, on January 1, 1792 (Martín & Ramón, 2010a).

However, the Mining Seminar or College of Mining did not mean an advance in the scientific institutions of Novohispanic. Although the influence of the Creole elite is rescued, the decree of its creation totally obeyed the Spanish Crown and its interests, "since these institutions little by little fell under the control of the peninsular and were put at the service of the interests of Spain" (Saldaña, 2005, p. 13).

In other words, the Mining Seminary only dealt with the Spanish emergency of obtaining greater silver resources for its sole benefit, so, according to Miranda, (1995), "it was the spoiled child of the crematistic family" (p. 59). Therefore, it cannot be defined as the antecedent of civil engineering in Mexico, as it has traditionally been considered (Rodríguez, 2021; Ramos, 1996) as part of a discursive statement that reflected the sovereign model in which the territory was more relevant than the population, a position that would be modified in the nineteenth century.

3.2 The modern stratum. The emergence of Mexican engineering and its exercise as a profession at the service of the State

In the 19th century, and even a little earlier, the power of sovereign was replaced by a more subtle and docile one, that of the consideration of life by the power (Foucault, 2017). "A new style of governance was formed, in which life is superimposed on death, hence the logic of the new devices aimed to cafe life and pedagogy will be the center of the exercise of that power of life" (Ramón, 2022, p. 92). The scenario of life promoted the conditions for the appearance of an actor that would make a difference, a character that although he already had a presence,

emerges in the 19th century: civil engineering, which appears as a device from practice for the care of life.

> The first element to be highlighted concerns the fact that civil engineering became a productive practice. It did not remain isolated—as in most other cases of science and technology—in mere theoretical consideration and in academic redoubts, but transcended into practical applications located outside academia and within the productive terrain. It became, so to speak, a necessary activity in the social and economic life of the Nation, and—in addition—profitable. (Domínguez, 2013, p. 12)

Worldwide, the most direct antecedent of the civil engineer is found in the military engineer, who, concerned with safeguarding the interest of the kingdom, manufactured weapons and built fortifications to defend the sovereign from his enemies. In the century of the Lights and in that of the Industrial Revolution, the epistemological rupture marks the course of engineering. At that time, the 18th century and, little by little, the stratigraphic mark of the change in thinking from "military" to "civilian" gave impetus to the Englishman John Smeaton, calling himself the first "civil engineer" (Derry & Trevor, 1990, p. 587).

In other words, the leap from the sovereign's interest in safeguarding its territory to that of citizenship, as a fundamental part of the territory, led to the military issue being overshadowed by the citizen (Heyman, 2001). It was in this context that the execution of public works was increased, such as roads, bridges, ports, hydraulic works and, above all, constructions focused on the development of cities, particularly in the health field. As a result, the term civil engineer began to be used more frequently, highlighting a new figure: the civil engineer, the "soldier of peace," who replaced the works for war with an engineering in the service of the life and well-being of the population. This is how this profession emerged.

Seen before, and as part of a combined policy between the old regime and the liberal regime, we can realize that the Royal Court of Mining, and later the Royal Seminary of Mining, appeared as part of the Bourbon reforms implemented in New Spain. However, and as a fundamental part to be able to discern between two completely different institutions, it is necessary to clarify that the Mining Seminary or College of Mining, as it is best known, at the end of the 18th century is an institution of the king and for the kingdom, i.e., that everything that was generated in that house of Novohispanic science was, in general terms, for the benefit of the Spanish kingdom.

On the other hand, the National School of Engineers, the name with which the College of Mining was transformed 75 years later, was an institution that would focus its work totally on behalf of the population of the nascent Mexican nation.

In addition to defense, the infrastructure required for the development of the country required the participation of more and more engineers, for which some centers of technical education were formed such as the School of Arts and Crafts, established in 1856 by President Ignacio Comonfort, and the National School of Agriculture and Veterinary founded in 1857. In the first, the education to be offered covered religious principles, linear drawing, arithmetic and practical geometry (Ramos & Saldaña, 2005).

The latter as a background explains the emergence of the career of civil engineering, thanks to the reforms of 1867, with the expedition, by President Benito Juárez through his secretary Gabino Barreda, of the Organic Law of Public Instruction in the Federal District, which in its article 6 of chapter II indicated which were the schools of higher education that would be located in the Federal District. This law established the studies of jurisprudence, medicine, agriculture and veterinary and created the career of civil engineer (León, 1974, pp. 150-151).

After the issuance of the aforementioned Organic Law, the College of Mining became the Special School of Engineers, as the heir institution of the teaching work of the Royal Seminary of Mining. Subsequently, as an annex of the School of Engineers, the Practical School of Metallurgy and Mining Works of Pachuca was established.

Two decades later, in 1883, the Special School of Engineers was transformed into the National School of Engineers and studied in it the future telegraphers and essayers; in addition, there were already the careers of surveyor engineer, hydrographer engineer, industrial engineer, mining engineer and metallurgist, geographer engineer and engineer of roads, canals and ports.

This new specialty of engineer of roads, canals, and ports obeyed decidedly to the impulse to con-

duct works of infrastructure. From 1897 he became a civil engineer, due to the enormous influence of English engineers who worked in Mexico during the regime of Porfirio Díaz (Bazant, 1984; Martín and Ramón, 2010b).

As it could be noted, one of the most important breakthroughs in the history of education:

> It was the appearance or staging of the actor called population, and with it a whole system for its control; but individual, for which a security apparatus was implemented as a whole, formed by the triplet: territory-population-security. (Ramón 2022, p. 81)

3.3 The contemporary stratum. Current Mexican Civil Engineering

The "market", as classical liberal thought, as a natural way of letting go – and its self-regulation, were modified by neoliberalism that with the same liberal flag – letting go – placed the participation of the State as a promoter of competition and spectator of the market. Thus, this economic model displaced the Keynesian scheme where the protagonist State had to take care of public spending, so the individual as a free subject must participate in the market game, where the important is the "competition" seen, of course, as something natural (see, Delgadillo, 2014, p. 19). However, from the Foucaultian hypothesis, competition is not something natural, but something that must be produced and stimulated, therefore, neoliberalism stubbornly creates conditions for it to occur.

Then, the state, far from what is believed, intervenes to generate competition through privatization. Wealth redistribution and inequality also generate competition. In that case, the individual is considered as a business subject and as simple human capital, consumption for life, his family, his education, his partner, until his retirement, everything is a constant company, but all this under the rules of biopolitics or neoliberal governmentality (for a better panorama see Fortanet, 2015, pp. 119-125).

During the 20th century, the Western world was divided, from economics, into two forms or styles of governance. The first, which as a maxim handled the let do, let go, and the second whose axis is manifested in the purpose of directing the means of production. These two forms, liberalism and planning, were, in Foucault's words (2023), the forms of governing to the maximum and to the minimum that predominated throughout the 20th century. Both the teaching of engineering and its practice were submerged between these two styles.

In 1916, Venustiano Carranza transformed the School of Arts and Crafts into the Practical School of Electrical Mechanical Engineers, antecedent of the current School of Mechanical and Electrical Engineering -ESIME-, and created the National School of Industrial Chemistry, ancestor of the School of Chemical Engineering and Extractive Industries -ESIQIE-. In 1922 the Technical School of Master Builders was established, which later became the Higher School of Engineering and Architecture -ESIA-. All these schools were gathered years later, in 1937, from the creation of the National Polytechnic Institute by President Lázaro Cárdenas (Martín & Ramón, 2010b). In 1929, the National University of Mexico received its autonomy and changed its name to the National Autonomous University of Mexico.

Later, as a result of a political strategy to govern to the minimum, the Mexican State reduced its intensity and allowed the generation of private schools, such as the Monterrey Institute of Technology and Higher Studies and the Universidad Iberoamericana, which were founded in 1943.

In the 1950s, the educational facilities of Ciudad Universitaria were built by the UNAM and Zacatenco -Adolfo López Mateos Professional Unit- by the IPN. At the end of 1973, on the initiative of President Luis Echeverría, a university was created whose emergency was the growth of the metropolitan area of Mexico City, the UAM, Metropolitan Autonomous University. The National Council for Science and Technology -CONACYT- and numerous technological centers throughout the country were also founded as the latest signs of a social government.

4. Discussion

4.1 Development and education

In Mexico as in other countries, at different times, development policies have shown different perspectives according to the historical evolution

and the political and ideological conception in which they were built. These policies are framed from the currents of thought in force at any time and it was in this way that the Cardinal planning had socialist influence and the current policies have a benefactor, which has affected the schemes applied in education.

It is assumed that all the actions implemented, derived from any strategy, have as their final objective the national development, at least in the terms established in their plans and programs. However, there is also a perception that the regional approach, as a key instrument for generating economic growth and well-being, is exhausted or in the process of extinction.

4.2 Basic education

As known, the third article of the Political Constitution of the United Mexican States establishes the right of citizens and the guarantee by the State, states and municipalities to receive and impart, respectively, education at all levels (Const., 2024.), Is it achieved? With what quality? How is it done? These questions have already had several answers from many points of view.

The Organization for Economic Co-operation and Development - OCDE - notes that:

> […] from primary to higher education, it has experienced exponential growth since 1950, growing from one to 36 million students, achieving virtually universal schooling up to secondary education. However, a large number of students drop out the upper secondary education, and currently only 56.3% of Mexicans are expected to complete this level of education. (OCDE, 2019)

These data show that although the coverage is adequate in basic education, the other side, that of quality, will have to be questioned, since this stage is the basis on which the processes of higher education are based. We have almost 100% coverage up to secondary education, but from then on it is reducing to 50% of the young population who do not study a university degree.

4.3 Higher education

Higher education consists of educational programs "after secondary education, taught by universities or other institutes that are qualified as institutions of higher education by the authorities of the country and/or recognized systems of homologation" (UNESCO, 2019).

Historically, higher education has been out of reach for groups living in poverty, the disabled, racial minorities or ethnicities and the UN International Covenant on Economic, Social and Cultural Rights has spoken out in favor of accessible higher education, noting that it is necessary for the "complete development of the human person and his sense of dignity" (UNESCO, 2019).

One of the main concerns is the percentage of professionals in relation to the country's total population. Increasing this percentage is a necessity. In Mexico, that share is considerably lower than in other countries with similar conditions, and, of course, much lower than in the more advanced countries. The policy of increasing the student population at the professional level faces the contradiction of a higher demand for applicants, but with little possibility of entry due to the insufficient capacity of current universities. In addition to this, the poor quality of education at the upper middle level and other social factors, generated mainly by the capitalist economic, political and cultural system.

> [...] It has been found that the highest failure rates, or non-accreditation as called in some schools, is higher in the first courses of mathematics and physics. It has also been found that students who drop out do so for the most part early in the career. Unfortunately, the main cause has been poor preparation at previous levels. There is no use, then, accepting students who will hardly finish the first semesters or quarters. (González 2009, p. 390)

Currently, the national enrollment at bachelor's level consists of 4 461 986 students, while at master's level drastically reduced to 304 153, and at the doctoral level it decreases even more, remaining in the figure of 60 086 students (ANUIES, 2024). These numbers are clear, while enrollment at a bachelor's level is important and continues to increase, at master's and doctoral degrees it declines significantly. However, although the number of students enrolling in a university degree is high, almost 5 million, it must be said that it is insufficient, because by showing and contrasting, in a general way, the figure of the population between 20 and 25 years, presented by INEGI (2020), there are more than

8 million young people between 20 and 25 years, which is the most common age to study a degree.

In general terms, university education in Mexico is managed by means of competences or, in another sense, by competition. Faced with a global world or framed in the concept of a global village, students must prove that they master a series of skills that will make them competent or competitors in a specific market. An exemplary case is engineering. Under this scheme, associations such as the Accreditation Council of Engineering Teaching, CACEI, in its 2018 frame of reference, listed a series of skills or attributes that engineering students must learn during their stay in an engineering school to be competitive on a continental or global scale (CACEI, 2020).

4.4 A new model. The creation of the Universities for Wellness Benito Juárez García

In contrast, an educational model emerges based on equality and coverage to anyone who wishes to study a bachelor's degree, which contrasts with that of competition, which is unequal by definition and by nature, because a person must compete for a place in a university, must compete for a qualification, must compete for graduation, and must compete in a labor market, while this model focuses on the exclusion that was generated by the competitive model, exclusion of young people and localities that do not have higher education. This model focuses on the young population and localities, according to the characteristics of the young population and the needs and resources of the excluded localities.

Although Benito Juárez García Universities for Wellness formally emerged in 2019, the truth is that they have their origins several years ago, at least since 2016. In fact, two major periods can be identified. The first is the one that corresponds to "political project", which without official recognition by the educational authorities, began as an initiative of Andrés Manuel López Obrador as head of the National Regeneration Movement (MoReNa) party. The second, can be distinguished as a "State project", which arises from its triumph in the 2018 presidential elections, and which was formalized on July 30, 2019, by means of the decree published in the Official Journal of the Federation -DOF-.

Months before, on December 18, 2018, in El Mexe, Hidalgo, federal and state authorities announced this University Schools program that was taken as a political flag by the Morenista legislators of the Legislative Assembly of Mexico City, who financed its creation and operation; the schools that started the program were the schools of Cuauhtémoc, Xochimilco, Tlalpan and Tláhuac, in Mexico City and the University School of Civil Engineering of Texcoco in the State of Mexico (ALDF, 2016).

The "State project" is the one that is currently in force under the name of Coordinating Body of the Universities for Welfare Benito Juárez García -UBBJ- and is part of the priority programs listed in the National Development Plan in the field of Social Policy in the Right to Education section.

With 100 campuses and coverage in 31 states, the Benito Juárez Welfare Universities began their activities on March 31, 2019:

> Preference was given to areas of high population density in which there were high population density areas in which there is no offer of university studies and with a high degree of social lag, marginalization and violence. The university schools are distributed in Oaxaca (11 schools), Mexico City (10), Veracruz (8), Chiapas and Guanajuato (6). The other entities have between 2 and 5 schools. The Universities for Welfare offer 32,000 places for students, who will receive a scholarship of 2,400 pesos per month.

> The permanent buildings in which the Universities for Welfare will operate will be built with the help of community work and local workers, on land donated or given by peasants, municipalities or municipal commissioners. The careers offered are Civil, Industrial, Forestry, Agri-Food, Environmental, Agroforestry, Electromechanics, Agronomy, Mining, Fish, Aquaculture, Sustainable Regional Development, Chemistry of the Oil Industry, Energy Industry Management and Oil Processes, Renewable Energy; Integral Medicine and Community Health; Nursing and Obstetrics; Veterinary Medicine and Animal Husbandry; Accounting and Public Administration; Law; Historical Heritage and Travel Industry; Integrated Water Management; Normal Basic Education; Social Studies; Historical and Biocultural Heritage; Physical Education; Municipal Administration and Public Policies; Music and Laudership and

Rural and Intercultural Bilingual Norms. (DOF, 2019b)

Its essence is based on the criticism of the educational model of neoliberalism, which is based on competition and therefore inequality. In other words, the educational model of Welfare functions as "a proposal for the inclusion of those who have been denied access to higher education and have been excluded from full participation in social life and in the exercise of their individual and collective rights" (UBBJ, 2023, p. 2).

4.5 The School of Civil Engineering of Texcoco-UBBJ

As mentioned, the Texcoco campus of the UBBJ, where the civil engineering degree is taught, was one of the pioneers in this educational project. It began in 2016, as a civil association called the University School of Civil Engineering, on the initiative of a group of Texaco political actors. This school began to work, under the auspices of Morenista deputies, with about five hundred enrolled in a headquarters that was provided by the H. City of Texcoco (A. Ramírez, personal communication, August 16, 2024).

As of today, it has approximately 600 students who are integrated, in six groups of first semester, four of third semester, two of fifth semester, one of sixth semester, three of seventh semester and two of ninth semester, which is the last. It has a staff of sixteen teachers, most civil engineers and engineers with specialization and teaching experience made at UNAM and IPN, as well as engineers from the Autonomous University of Chapingo.

The school's operating staff is seven people. The facilities have laboratories for hydraulics, computing, structures and geotechnics. With only eight years of operation, it is a relatively young school; yet it has already six generations of civil engineers.

5. Conclusions

The discussion on the evolution of policies on civil engineering education in Mexico has been focused and treated normally as a continuous line in which, at each stage, the current always has to do with the immediately above, when it has been shown that, in reality, it is a discontinuous line that obeys a discursive stratigraphy of the moment and in this way, a critique of the situation is offered.

In general, regarding the UBBJ program, considering the number of students, the number of teachers and the administrative staff available, the results are positive, compared to other schools whose expenditure is much higher than the one they apply. On the quality of education, so far, only the quality of teaching offered, teachers with masters and doctorates and with extensive experience and that of graduate students, among which there are already successful cases in the labor market, can be taken as a reference.

In the civil engineering career, enrollment follows an upward curve. To date, 1888 students have been received and six generations have graduated, with a record of 690 students, 204 of them with full credits and continues to increase each year.

References

Asociación Nacional de Universidades e Instituciones de Educación Superior. [ANUIES]. (2024). (s.f.). Anuario Estadístico de la Población Escolar en Educación Superior. Consultado del 15 de septiembre de 2024. https://bit.ly/3ZxmSMM

ALDF. (2016, 22 de febrero). *Diputados de morena recorren instalaciones de escuelas universitarias que apoyan económicamente*. Noticias. https://bit.ly/3XC08su

Bazant, M. (1984). La enseñanza y la práctica de la ingeniería durante el porfiriato. *Historia Mexicana*, *33*(3), 254-297. https://bit.ly/3zsHyej

Braudel, F. (2002). *El Mediterráneo y el mundo mediterráneo en la época de Felipe II*. Fondo de Cultura Económica.

Consejo de Acreditación de la Enseñanza de la Ingeniería. [CACEI]. (2020). (s.f.). Marco de Referencia 2018. https://bit.ly/3XH9aEz

Constitución Política de los Estados Unidos Mexicanos [Const.]. (2024). Artículo 25. Diario Oficial de la Federación. https://bit.ly/4ftgJX0

Deleuze, G. (2014). *Michel Foucault y el poder*. Viajes iniciáticos I. Errata naturae editores.

Deleuze, G. (2016). *Foucault*. Paidós.

Delgadillo, J. (2014). Reconfiguración territorial en México ante el proceso de liberación económica. en Guadarrama, Delgadillo y Fonseca (coords.), *Territorios y sociedades en un mundo en cambio: Miradas desde Iberoamérica I*. El Colegio de Tlaxcala-UNAM. https://bit.ly/4fwWac7

De Certeau, M. (1993). *La escritura de la historia*. Universidad Iberoamericana.

De Certeau, M. (1995). *Historia y psicoanálisis*. Universidad Iberoamericana.

Derry, T. & Trevor, I. (1990). *Historia de la tecnología desde 1750 hasta 1900*. 11ª ed. Siglo XXI Editores.

Domínguez, R. (2013). *La ingeniería civil en México, 1900-1940. Análisis histórico de los factores de su desarrollo*. Instituto de Investigaciones sobre la Universidad y la Educación – UNAM. https://bit.ly/4fS1rLf

Diario Oficial de la Federación. [DOF]. (2019a). DECRETO por el que se crea el organismo público descentralizado denominado Organismo Coordinador de las Universidades para el Bienestar Benito Juárez García, México. Secretaría de Gobernación. https://bit.ly/4dlasuP

Diario Oficial de la Federación. [DOF]. (2019b). PLAN Nacional de Desarrollo 2019-2024, México. Secretaría de Gobernación. https://bit.ly/3MVrLI3

Fortanet, J. (2015). *Foucault*. RBA.

Foucault, M. (2002). *Defender la sociedad*. 2ª ed. Fondo de Cultura Económica.

Foucault, M. (2010). *La arqueología del saber*. 2ª ed. Siglo XXI Editores.

Foucault, M. (2017). *Historia de la sexualidad*. La voluntad de saber. 2ª ed. Siglo XXI Editores.

Foucault, M. (2023). *Nacimiento de la biopolítica*. Fondo de Cultura Económica.

Garza, A. (1996). *Manual de técnicas de investigación para estudiantes de ciencias sociales*. 6ª ed. El Colegio de México.

Gonzalbo, P. (1990). *Historia de la educación en la época colonial. El mundo indígena*. El Colegio de México.

González, O. (2009). Temas actuales en la agenda internacional de la educación superior y en ingeniería. En C. Martín y J. Ramón (coords.), *Planeación estratégica de la infraestructura en México 2010-2035*. Universidad Tecnológica del Valle de Chalco, Colegio de Ingenieros Civiles de México. https://bit.ly/3Z8Law2

Haesbaert, R. (2011). *El mito de la desterritorialización: del "fin de los territorios" a la multiterritorialidad*. Siglo XXI Editores.

Herner, M. (2009). Territorio, desterritorialización y reterritorialización: un abordaje teórico desde la perspectiva de Deleuze y Guattari. *Huellas*, (19), 158-171. https://bit.ly/3XzZ20l

Hernández, R., Fernández, C. & Baptista, P. (1997). *Metodología de la Investigación*. McGraw-Hill.

Heyman, J. (2001). *La ciencia de las estructuras*. Instituto Juan de Herrera.

Illicachi, J. (2017). Del castigo corporal al buen encauzamiento de las conductas en la educación. *Alteridad*, *12*(1), 104-114. https://doi.org/10.17163/alt.v12n1.2017.09

Instituto Nacional de Estadística. [INEGI]. (2020). Geografía e Informática. Censo de Población y Vivienda 2020. https://bit.ly/47EagW1

Kuhn, T. (2013). *La estructura de las revoluciones científicas*. 4ª. ed. Fondo de Cultura Económica.

León, E. (1974). *La ingeniería en México*. Secretaría de Educación Pública.

Martín, C. & Ramón, J. (2007). *La construcción de un país. Historia de la ingeniería civil mexicana*. Colegio de Ingenieros Civiles de México-IPN.

Martín, C. & Ramón, J. (2010a). El Colegio de Minería, forjador de ingenieros. *Revista Ingeniería Civil*, (491), 5-9.

Martín, C. & Ramón, J. (2010b). La ingeniería civil y el porfiriato. *Revista Ingeniería Civil*, (494), 5-7.

Miranda, J. (1995). *Humboldt y México*. 2ª ed. UNAM

Monje, C. (2011). *Metodología de la investigación cuantitativa y cualitativa*. Universidad Surcolombiana.

Olave, J. & Vélez, C. (2017). Las familias entre fines educativos y económicos. El caso de Chile. *Alteridad*, *12*(1), 43-54. http://doi.org/10.17163/alt.v12n1.2017.04

Organización para la Cooperación y el Desarrollo. [OCDE]. (2019). (s.f.). Higher Education in Mexico. Consultado el 1 de septiembre de 2024. https://doi.org/10.1787/9789264309432

Pérez, S. (2017, 6 de marzo). *Conversatorio Foucault, el poder y la política*. [video]. YouTube. https://bit.ly/4eelbZf.

Popper, K. (1962). *La lógica de la investigación científica*. Editorial Tecnos.

Ramos, M. (1996). *Estudio de la Física en México en el siglo XIX: los casos del Colegio de Minería y la Escuela Nacional de Ingenieros*. [Tesis de doctorado, UNAM]. https://bit.ly/4dzTYiB

Ramón, J. (2018). La ciudad como dispositivo, la periferia como rizoma. La ciudad de Puebla y su proceso histórico urbanizador. En C. Hoyos et al. (coords.), *Dinámicas urbanas y perspectivas regionales de los estudios culturales y de género*. UNAM-AMECIDER. http://ru.iiec.unam.mx/4407/

Ramón, J. (2022). Posiciones de lugar a lugar en los procesos de agenciamiento en el territorio. La ciudad como dispositivo, la periferia como rizoma. En J. Delgadillo (coord.), *Agenciamiento de desarrollo y territorio. Acción pública y gestión institucional en ambientes rurales y urbanos*. UNA; -CIM-IIE. https://doi.org/10.22201/crim.9786073064972p.2022

Ramos, M. & Saldaña, J. (2005). La enseñanza de la ingeniería y las actividades de los ingenieros egresados del Colegio de Minería. En Saldaña. J. (coord.), *La Casa de Salomón en México. Estudios sobre la institucionalización de la docencia y la investigación científicas* (pp.134-152). Facultad de Filosofía y Letras-UNAM

Ricard, R. (1986). *La conquista espiritual de México: ensayo sobre el apostolado y los métodos misioneros de las órdenes mendicantes en la Nueva España de 1523-1524 a 1575*. 2ª ed. Fondo de Cultura Económica.

Rodríguez, E. (2021). *La construcción de una nación. Historia de la ingeniería civil en México en el siglo XIX*. Facultad de Ingeniería-UNAM. https://bit.ly/3UTmuoE

Rodríguez, E. (2016). El liderazgo directivo en la hermenéutica micropolítica de la escuela. *Alteridad, 11*(2), 231-239. https://doi.org/10.17163/alt.v11n2.2016.08

Rodríguez-Revelo, E. (2017). La estandarización en el currículo educativo: la punta del iceberg de la homogeneización. *Alteridad*, *12*(2), 248-258. https://doi.org/10.17163/alt.v12n1.2017.10

Romano, R. (1997). *Braudel y nosotros. Reflexiones sobre la cultura histórica de nuestro tiempo*. Fondo de Cultura Económica.

Romero, J. (2008). *La vida histórica*. Siglo XXI Editores Argentina.

Saldaña, J. (2005). Introducción. Historia de las instituciones científicas en México. En J. Saldaña. (coord.), *La Casa de Salomón en México. Estudios sobre la institucionalización de la docencia y la investigación científicas*. Facultad de Filosofía y Letras-UNAM.

Sánchez, M. & Murillo G. (2021). Enfoques metodológicos en la investigación histórica: cuantitativa, cualitativa y comparativa. *Debates por la historia*, *9*(2), 147-181. https://doi.org/10.54167/debates-por-la-historia.v9i2.792

Universidades para el Bienestar Benito Juárez. [UBBJ]. (2023). *Estatuto Académico*. https://bit.ly/4hSxpsu