

Science for everyone?**Ciencia, ¿para todos?**

CASTAÑEDA, Rafael*†, RODRÍGUEZ, Perla, SALAZAR, Rodrigo and PÉREZ, Alfredo

*Universidad Autónoma Metropolitana.*ID 1st Author: *Rafael, Castañeda*ID 1st Co-author: *Perla, Rodríguez*ID 2nd Co-author: *Rodrigo, Salazar*ID 3rd Co-author: *Alfredo, Pérez*

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Abstract

The objective of this research is to analyze what is the role of science in modern societies, based on the reflection on how science plays a vital role in the economic system that both globalization and the modernization process currently configured. To do this, some socioeconomic and educational indicators on the context in which science develops in Latin America and what are the social consequences that it has brought are analyzed. To do this, we rescued the findings from different scientific fields, they have been made about this issue and focus to our context. Thus, it seeks to contribute to the debate about the role of science in situations like ours and the links to be established between the scientific, economic and social spheres. It also seeks to contribute to the reflection on the role of research and its impact on the classroom and in its immediate context.

Knowledge societies, Latin American Science, Technological Revolution, Scientific Paradigms

Resumen

El objetivo de esta investigación es analizar el papel de la ciencia en las sociedades contemporáneas, partiendo de la reflexión sobre cómo la ciencia juega un papel fundamental dentro del sistema económico que tanto la globalización como el proceso de modernización han configurado actualmente. Para ello, se analizan algunos indicadores socioeconómicos y educativos sobre el contexto en el que se desarrolla la ciencia latinoamericana y cuáles han sido las consecuencias sociales que ha traído consigo. Para ello, se rescatan las conclusiones que, desde distintos ámbitos científicos, se han realizado en torno a este tema y se focaliza en nuestro contexto. Así, se busca contribuir al debate sobre el papel de la ciencia en realidades como la nuestra y los vínculos que deben establecerse entre las esferas científica, económica y social.

Sociedades del conocimiento, Ciencia Latinoamericana, Revolución Tecnológica, Paradigmas Científicos

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* Correspondence to the Author (email: rafaelcastaneda10@yahoo.com.mx)

† Researcher contributing as first author

Introduction

Modern man has placed his trust in both science and technological development.

It is the techno-scientific knowledge where he has found the answers to how the world and the universe around us works.

In fact, since modernity was established in contemporary societies, they have been structured according to progress and technological development. That is why we are interested in analyzing what the role of science is in societies like ours, where techno-scientific development and science in general do not enjoy government support and find limits to their development.

In Latin American societies, techno-scientific progress and development are not characterized by reaching the majority of the population; It is not the majority of society who enjoys the benefits that this progress should bring, nor the bonanzas that, on paper, technology should bring to man's life.

It seems that in our context new ways must be found to link the knowledge that is developed in universities and research centers with the real, palpable impacts that they may have in their closest contexts.

For this, we divided the research into four sections.

In the first section, called Science in modern societies, reference is made to the current debate on how science influences and determines social configuration, emphasizing how it is promoted in various contexts and not in others.

In a second section, called Criticism of the role of science, those arguments put forward from different scientific fields about the trust that humanity has placed in scientific knowledge and technological development are recovered, a trust that, however, has found detractors and critics from science itself. Special mention is made of the concept of Knowledge Societies, proposed by Manuel Castells, a notion that puts on the table for discussion the role that knowledge, knowledge, differentiates societies and has generated social gaps between those who have access to said knowledge and those who do not enjoy this privilege.

Finally, in the third section called Science in Latin America, some indicators on the techno-scientific reality in our continent are presented and a reflection is made around them.

Scientific knowledge is a pillar of contemporary societies and of the globalization process itself. Hence the relevance of constantly reflecting on its social role and its impact on academic sectors.

Science in modern societies

In modern societies, one of the elements that determines an important distinction between nations and between individuals is the access they have both to consumer goods and to knowledge itself. It is the application of the rules of the global market both to the consumption and to the production of knowledge, rules that are formulated to exclude and differentiate.

In the contemporary world, there are entire populations excluded from the production of scientific and technological knowledge, as well as from the benefits produced by this knowledge.

The World Conference on "*Science for the 21st century: a new commitment*", held in Budapest in June 1999, made it clear that these benefits produced by scientific and technological development are unequally distributed around the world; this fact has generated structural asymmetries between the first world countries and those that are not, between the North and the South, marking differences between entire regions and, therefore, between the social groups themselves within any nation.

Therefore, although it is true that scientific knowledge has become a decisive factor for the production of well-being in a globalized context, this well-being is not distributed equally around the world.

This is especially true for a context such as Latin America. Following the order of ideas that said Conference gave rise to, it is clear that Latin American countries generally face an unfavorable and disadvantageous situation in the face of state-of-the-art scientific knowledge, since while its benefits are distributed unequally around the world and are primarily located in first world countries, the risks that the extraction of materials has brought with it.

As well as the commercialization and final disposal of the waste that is generated, have a greater impact among the poorest nations and among the most vulnerable social sectors.

We are situated, then, in a framework of techno-scientific injustice generated by globalization and the market rules that have been established.

The clearest example of this assertion is evident with the handling of materials and their final disposal. According to UN figures, about 60% of the most polluting industries (especially textiles, chemicals and transformation) are in third world countries, and among them over 80% have at least one process of ongoing litigation for non-compliance with local or international environmental laws.

As if this were not enough, Greenpeace asserts that 40% of the water resources found in some region of the South of the planet are on the verge of extinction, while the natural reserves of the South have been reduced by 35% in recent 20 years. It is not surprising, therefore, that the data on migrants from these latitudes increase, according to figures from the Inter-American Commission on Human Rights (IACHR), at a rate of 10% per year, since this rate of overexploitation both of natural resources as well as of human resources guarantees that those inhabitants who see their habitats destroyed move to those places where they are industrialized and transformed into consumer goods.

Therefore, the rate of progress that globalization imposes has segregated entire populations that inhabit those places that provide resources to the world market; As if that were not enough, they are the ones who suffer firsthand the collateral effects and unintended consequences of modernization.

Thus, the most vulnerable and most segregated populations not only do not enjoy the benefits that technology has brought with it, but must deal with these products when they are no longer useful and when they have become waste, deposited without control where it population generally inhabits.

Therefore, one of the elements that for Ulrich Beck defines modern societies is precisely this game of distribution of wealth and risks (Beck, 1986). "Wealth accumulates at the top and risks at the bottom", asserts this author, producing new global inequalities between the Third World and the industrialized countries, further widening the gap between North and South. In other words, inequitable distribution has configured an increasingly marked gap between those who have, those who have access, those who benefit from techno-scientific advances and those who systematically fail to do so, or do so only partially. We witness, therefore, *aapharteid* based on knowledge and access to technological advances.

As if this were not enough, only 15% of the world's population enjoys the benefits of exploiting 70% of the planet's natural resources. The distributive injustice that these figures show make us think in terms not only of inequity, but even of environmental racism. In economic terms, we are talking about the creation of an inequitable structure for the distribution of wealth and, in sociological terms, about the social injustice of the prevailing global market system. This system has found in the scientific sphere and in knowledge, those who provide knowledge to the other subsystems, an ally for its perpetuation.

Hence the criticism of the social role of science, a criticism that dates back to the middle of the 20th century, when reflecting on the trust that humanity has placed both in science and in technological progress itself, a trust that for a time to date it has been cracking in some social circles.

Criticism of the role of science

The German philosophers Horkheimer and Adorno (1998), sociologists such as Herbert Marcuse (1964) and, more recently, the Englishman Anthony Giddens (1994) and the Polish Zygmunt Bauman (2008) analyze the role that science has played in the modern societies and the blind trust that humanity has placed in it.

The effect *Boomerang* spoken of by the German Ulrich Beck (1986), for example, has as a backdrop, precisely, scenarios defined by the acceptance/compliance by contemporary societies of high levels of risks and potential dangers around the world.

These, says Beck, are accepted by the way of life that modern Western civilization has set up, accepting them as necessary.

Thus, the presence of nuclear power generation plants, despite the extremely high risk they imply and the catastrophes they have already generated -just remember Chernobyl in 1986 and Fukushima in 2011-, continue to operate; We continue to consume genetically modified foods despite the damage to human health that this generates, and we continue to transform materials despite the fact that environmentally harmful waste is generated in the manufacturing process.

They are the risks assumed by modern Western civilization, risks that are assumed but that, little by little, have been damaging the image of certainty that scientific knowledge enjoyed.

As a consequence, this trust in specialized knowledge is placed in the critical magnifying glass of science itself. Knowledge based on techno-scientific reliability, what Anthony Giddens calls "expert systems" (Giddens, 1994) are analyzed from a critical lens, having generated scenarios of knowledge that are both specialized and diffuse, disembedded and embodied in institutions such as the academies and research centers. That is, institutions represent the points of passage of expert systems where expert knowledge and users interact, generating a complex relationship between risk and trust, between laymen and specialists (Velasco, 2006). The debate is then directed towards the neutrality and impartiality of techno-scientific development.

"...the objects resulting from technological development or use values do not contain a telos, a purpose or an immanent meaning, so their organic forms are objectively teleological (suitable for vital purposes), so that the purpose of the forces social productive activities are immanently human and serve the universal development of humanity insofar as they serve to satisfy needs" (Veraza, 1987: 53-54).

Therefore, the era of capitalism has given a different nuance to what techno-scientific development is and, in any case, to the benefits it generates.

Capitalist technology is not neutral because it provides and surrounds it with its own rationality, a rationality that, as we have mentioned, excludes and differentiates. The logic of the capitalist production system itself is impregnated in the essence of that active human process, that is, scientific and technological progress, biasing it. Thomas Kuhn (1977) refers to it by pointing out that the economic and sociopolitical context in which the scientific community operates deeply affects methodological formulations, and introjects itself into them. Hence, the capitalist system has developed an increasingly reductionist, segmented and simplified science.

The essential feature of today's science is specialization, a specialization that, however, loses its sense of the totality to which it belongs. It is not that each specialized branch of human knowledge lacks complexity; quite the opposite, but it does lose the dimension of unity or, in other words, the complexity of the whole (Delgado, 2003). This is the main legacy of capitalist logic to techno-scientific thought: the atomization of scientific knowledge.

Capitalist logic designs and adjusts the essence of science and technology both in its course, modality and rhythm, at the same time that it has adapted it to its interests and needs. Thus, from the formulation of educational plans at all levels to private support for certain types of research, the truth is that the capitalist design around technological and scientific progress makes it clear what type of education and projects are supported by the class. capitalist, and which are not. It is the logic, says Manuel Castells, of knowledge societies (Castells, 2000).

This new knowledge society has generated a new social ladder made up of those who administer knowledge and those who encapsulate knowledge, who administer and validate it, this fact also becoming a new source of social advancement. Knowledge is power in contemporary societies, and, as in any exercise of power, the justice/injustice dynamic is at stake.

And in societies where the exercise of power in the sociopolitical sphere has neither democratic nor social justice characteristics, it is difficult to think that the sphere of knowledge does.

Therefore, Latin American societies, far from becoming democratized with the advent of this knowledge society, have become meritocratic societies by not guaranteeing equitable access to it; there is an evident absence of adequate public educational policies, a fact that has generated even more polarized societies.

For Emilio Lamo, in contemporary societies the most evident unequal effect is the result of this inequitable distribution of knowledge, where "ignorance is the most direct cause of poverty and knowledge generates wealth" (Lamo, 1994: 43).

Thus, the reflection that Latin American science makes on itself has led it to debate about its role in the modern global economy, a role that must urgently address the risk scenarios in which our societies live daily and where individuals they live in their own flesh -in their habitats, in their way of life, in their individual and family expectations- the ravages of this model.

Science in Latin America

The reflection that science in Latin America makes on its role in the modern global world has a key point to analyze: the relationship it establishes with society.

One of the strong criticisms is that research in different countries generally responds to development models or is focused on prototypes that have little to do with our context and that are related on a smaller scale than what is socially expected of it. .

To corroborate this, we can analyze what the latinobarometro throws up. For example, a minority percentage of Latin Americans believe that scientific knowledge provides answers to their financial situation. Latin Americans, in general, do not trust learning for a better future either; In addition, we do not find, among Latin Americans, a link between techno-scientific development and social welfare.

The results of these three variables clearly show how it is that the certainty that human beings have historically deposited in scientific knowledge has been lost, or is at a critical stage, since ordinary citizens do not find elements in it. that they grant you security and certainty to your life; at least in the Latin American context the data corroborate it.

It is clear that one of the lessons that this analysis yields is that the gap that the Latin American population has in the educational sphere is evident and has yielded figures that are increasingly alarming. For example: the average education in this part of the continent is between 10 and 11 years of age, when, due to socioeconomic conditions, children are forced to leave the classroom; In addition, this distance has brought with it culturally irreversible phenomena that several social studies have promptly demonstrated:

The lack of critical sense among the population, the general absence of job expectations as a result of better educational preparation, a very evident lack of interest in both local and national political affairs, etc.

Conclusions

The role that Latin American science plays on the international scientific scene will not transform this site if it fails to turn its vision towards other types of needs. It will not be able to link its focuses of attention as long as it depends on global academic plans and conditions and fails to generate its own scenarios but in a constant and solid manner. Research schools and academies must be strengthened internally and manage to generate ties and links.

It is a paradigm shift that, of course, must be accompanied by government support. The successful models of models that have managed to consolidate in this way, such as the Finnish one, managed to do so in just two generations, betting on the strengthening of the educational system, the professionalization of the academic career and the union that it achieved with the government plans in the medium and long term.

It is worth asking then: how much does my academic work respond to and focus on this profile? The projects that I carry out, do they have a real impact in our context? Do I know the national context of the subjects I teach? What is the environment that encompasses the knowledge I want to develop? Ultimately, how close is my profile to what education in Mexico requires of a professional?

Complex work that requires a constant and culturally solvent effort. But it is only in this way, through scientific and academic work, that cultural change can operate.

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