

**Science for everyone and everywhere,
an experience on social appropriation of science and technology in Mexico**

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Abstract

How can you get science closer to socially-excluded and isolated communities? How can we foster the process of social appropriation of science and technology? How can we improve the common citizen's perception of these topics in Mexico? These issues were addressed by "National strategy for diffusion and broadcast of science, technology and innovation: Social appropriation of Science, Technology and Innovation in Federal Entities with special emphasis on socially excluded areas" organized by the National Council for Science and Technology (CONACYT). This program is known as "*Ciencia para todos y en todos los Rincones*" (Science for everyone and everywhere). Its purpose was to promote the process of social appropriation of knowledge by means of developing collaborative projects for spreading knowledge about science, technology and innovation with a specially-focused broadcast in socially excluded, rural or isolated areas, in coordination with the 32 states of the Mexican Republic. This approach was innovative in so far as its main aim was to benefit communities through a diversity of interactive actions and resources. The research for this paper is based on a study for the implementation of the 2012 initiative, as well as the review of the established actions in 2013. The paper proposes an integral view for the public communication of science: the practice, from the experience of the federal program; the adaptation of actions according to regions; the policy of involving different actors; and from the theoretical viewpoint, a focus on the reception and importance of making the process of social appropriation available to the overall citizenship.

The authors suggest that the conceptual basis of the social appropriation of science and technology is under construction. We argue it is a complex and dynamic framework focused on interactions and social participation linked to scientific and technological knowledge, where components such as public outreach and communication become key elements for the appropriation process.

The promotion of scientific culture is an active process with a bidirectional character where trust, attitudes and cognitive reception play a decisive role. Additionally, the construction of scientific public communication depends, to a large extent on recognizing that citizens are active organisms contributing to the formation of human culture.

Introduction

The social appropriation of science, technology and innovation is a concept that is developed in recent times, within the field of the relationships between Science, Technology and Society. Raigoso (2011) argues it has multiplicity of representations, meanings and definitions that vary according to the agents, interests and contexts in which it may be presented. Thus, the concept may refer mainly to three tendencies: in the first place that which alludes to social processes from which the nature of scientific knowledge is understood and inserted in a social and cultural context. Secondly, there is the tendency to generate associations between science, technology and society as the engine driving development and growth. And one last point of view suggests the understanding of science as a public common good, and an opportunity for social participation. (Lozano Borda & Pérez Bustos, 2010).

This article relates to the first two lines of thought and it analyses a public program that underscores appropriation, taking the third one as a challenge and a goal for public policy. According to this consideration it is understood that a true public appropriation for scientific knowledge is a powerful tool for the development of solutions to problems and needs of citizens, taking into account the possibility of its linkage with other types of knowledge (local, traditional) in a context of epistemic equality.

The object of analysis in this work is the public program called “*Apropiación Social de la Ciencia, Tecnología e Innovación*” (ASCTI) (Social Appropriation of Science, Technology and Innovation) implemented since 2009 by the National Council for Science and Technology (CONACYT), Mexico's public body in charge of scientific and technological policies. In particular, it focuses on the initiative “*Ciencia para Todos y en Todos los Rincones*”, that took place in various geographical areas in Mexico between 2012 and 2013 and which stands out as the first attempt to carry out scientific outreach in an itinerant way, throughout isolated rural zones in Mexico.

The theoretical and conceptual framework on the notion of the *Social Appropriation of Science and Technology*, emphasizes its relationship with the processes of reception in the communications area. The main characteristics and operation mechanisms of the program will be described later, so the aspects that relate with the implementation of the program may be analyzed qualitatively.

The work finishes with a set of thoughts and recommendations with regards to the need to define different action plans aimed at the design of public policies on the appropriation and outreach of science, thus highlighting the urgent need of making these processes an essential part of social inclusion programs in countries still marked by poverty and inequality, such as Mexico.

Conceptual discussion: Trends in understanding Social Appropriation

The notion of Social Appropriation of Science, Technology and Innovation (SASTI) is relatively recent and its conceptual framework is still under construction¹. In this paper we define it as a complex and dynamic framework focused on interaction and social participation linked to scientific and technological knowledge, with components such as outreach, public communication and broadcasting as basic promotional actions but not the only ones. In this sense, if appropriation means using these communication actions to expand and enrich the representations that citizens have of science and technology -which would be equal to the notion of "weak appropriation" proposed by Olivé (2011)- it also implies citizen's participation and involvement in these subjects, including them as co-producers of knowledge when tackling problems that affect welfare and quality of life. This is what Olivé defines as "strong appropriation" (Olivé, 2011).

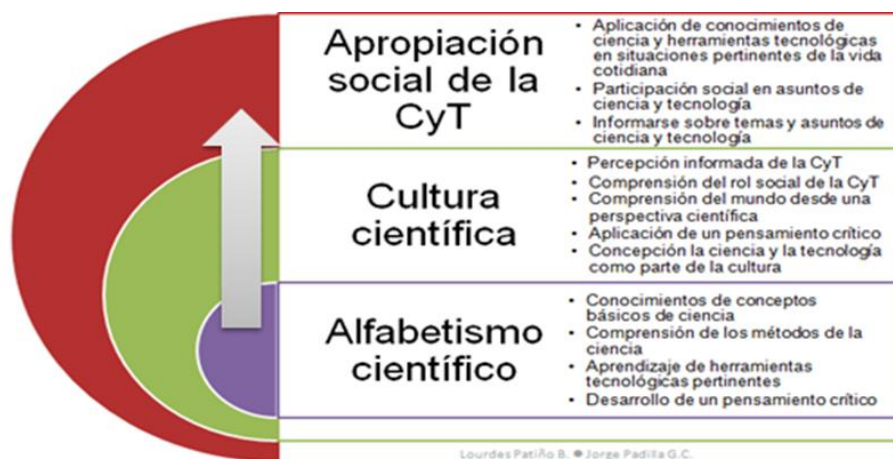
Because of this complexity, the approach to the appropriation, must be multi, inter and trans-disciplinary, with an horizontal and integral perspective.

Another definition underlines that Appropriation is "...a comprehension and intervention process of the relationship between technoscience and society, built upon the active participation of the diverse social groups that generate knowledge. This process has the following characteristics: 1) It is deliberate; 2) Social groups of experts in science and technology participate in the social-technical web that makes it up, i.e. the different sectors that intervene in the constitution of these processes generate mediations; thus, it is a process in which the civil society empowers itself, and 3) Appropriation does not mean alienation; it

¹ For this article we retake exposed appreciations in the article "Science for all and everywhere. An approach to social appropriation of science and technology" from Science and Development Magazine, CONACYT february 2013 and "Notes towards the construction of a conceptual framework of the Social Appropriation of Science, Technology and Innovation, Permanent Regional Seminary on Social Appropriation of Science, Technology and Innovation", Villahermosa, Tabasco, March 3rd, 2011.

involves, even in the most asymmetrical relationships, translation and assembly within the participant groups' frames of reference².

In Mexico there is a reference of the Social Appropriation³, fundamentally linked to two fields of action: scientific teaching and scientific culture which, in progressive or simultaneous actions, aim to generate the dynamics of change to get to the Appropriation (See Figure 1).



Un modelo conceptual sobre Apropiación Social, Cultura y Alfabetismo Científico
(Jorge Padilla y Lourdes Patiño, 2011)

Figura 1. Social Appropriation concept model

However, from our perspective, this is a process that, as an aspiration, must overcome the traditional outreach schemes, linked to the weak notion of appropriation to move towards a notion of stronger character. Namely, towards the construction of a setting in which the citizens not only may be informed on STI topics and subjects, but rather acquire the capacity to participate in the definition of such, and to be able to apply these knowledge, as well as technological tools in their daily lives. In this sense, a fundamental goal would be to consider the possibility to include and integrate citizens into the dynamics

² Definition from: *ColCiencias* Colombia National Social Appropriation of Science and Technology Strategy, 2005.

³ "General guidelines for public politics for the promotion of SASTI recommendations" (Recomendaciones de líneas generales de política pública para la promoción de la ASCTI), a research made for the National Council of Science and Technology, Adjunct Office of Regional Development in collaboration with REDNACECyT, Jorge Padilla y Lourdes Patiño, november 2012.

of knowledge production when this refers to building answers and solutions that have to do with wellbeing.

In this transit towards setting the stage of a "strong" appropriation we could observe at least four dimensions with communicating vessels: 1) social communication, 2) diffusion, 3) divulgation 4) social appropriation. (See Table 1).

Table 1. Dimensions for a strong appropriation of science and technology

Dimensions	Features and hearings
<p>1. Social Communication of STI (to be "on the radar", in peoples and select audiences point of view)</p>	<p>1. Decision makers (public powers) 2. Specific publics (relevant players in the STI system, for example, governors, entrepreneurs, research centers, Universities). 3. Society (their perception on the importance of STI in daily life) 4. Results on the public investment on STI (expenses reports) 5. Relevant successful cases and social valoration on STI scientists and representatives. 6. Positioning and public image of STI (putting the topic in public sight)</p>
<p>2. STI Diffusion (to broadcast in different media in a general way, the topics of science)</p>	<p>1. For expert publics (congresses, seminars, etc.) 2. For non expert publics (dissemination of general information) 3. Short informational TV and radio spots, notes and general information in diverse media.</p>
<p>3. Releases (STI popularization)</p>	<p>1. Actions to make the STI expert topics into a "populace", simple and appropriate language, normally actions for children and teen agers as workshops, experiments, National Science and Technology week, open doors to Research Centers</p>

	<p>and Universitites</p> <p>2. To Promote the parents interest but above all childrens and youngsters, to the topics of STI and scientific careers.</p>
<p>4. STI Social Appropriation (the society has made STI theirs, democratic and participative societies)</p>	<p>1. Appropriation goes through a fase of scientific alphabetism and culture.</p> <p>2. Society takes ownership of the STI topics as part of their daily lives, with elevated consciousness and culturization on the subject.</p> <p>3. Social participation on STI topics.</p> <p>4. Citizens interest to be informed on STI matters.</p> <p>5. Active participation and application of STI knowledge in daily life.</p> <p>6. Citizens participation in the dynamics of knowledge production to tackle social inclusion problems (for example, marginated zones, rural and urban, social groups in disadvantage).</p> <p>7. Integration of the scientific knowledge with the local, traditional knowledge for problem solving.</p> <p>8. Epistemic equality between local and traditional scientific knowledge.</p>

Saldívar y Arancibia, PCST, 2014.

Program Description and Analysis

How to promote the process of social appropriation of science and technology? How can the perception of the citizens of our country improve on these topics? But over all, how to jump-start these processes in poor and isolated rural communities? How to include children that live in poverty and isolation contexts in knowledge production?

To address these questions, CONACYT fostered the iniciative "National strategy of science, technology and innovation difussion and divulgation: Social Appropriation of

Science, Technology and Innovation (SASTI) in 2012 in Federal Entities with emphasis on marginated zones", this program is now known as "Science for everyone and everywhere"⁴, its objective was the promotion of social appropriation of knowledge through the development of collaborative Science, Technology and Innovation (STI) projects, of public interest. The Program was started as a complementary action to other outreach activities.

The main features were:

1. To focus attention on children, teenagers and adults that live in poor or isolated geographical areas, given the fact that other initiatives are concentrated in urban zones and areas of dense population.
2. Involvement from local development actors .
3. The generation of itinerant contents and devices according to the states context or the specific geographical areas.
4. Fair financing mechanisms for each of the 32 States.

⁴ National Council for Science and Technology Public Program, México that began in 2012 and still functioning in 2014 with increasing budget.

Table 2. Goals and reach of the Social Appropriation of Science, Technology and Innovation (SASTI)

2012	2013	2014
<p>Goal: To promote processes of social appropriation of knowledge and the development of collaborative projects of diffusion and divulgation of science, technology and innovation, with public interest characteristics with urban, rural and difficult access zones coverage, of the 32 federal entities. Available resources: 48million pesos (3,6 million USD as of 2013)</p>	<p>Goal: To promote processes of social appropriation of knowledge and the development of collaborative projects of diffusion and divulgation of science, technology and innovation, with public interest characteristics with urban, rural and difficult access zones coverage, of the 32 federal entities. 64 million pesos (4,9 million USD as of 2013)</p>	<p>To promote processes of social appropriation of knowledge and the development of collaborative projects of diffusion and divulgation of science, technology and innovation, with public interest characteristics with urban, rural and difficult access zones coverage, of the 32 federal entities. 120 million pesos (9,2 million USD as of 2013)</p>
<p>a) To consolidate the collaboration between CONACYT and the States, for regional development and decentralization, in the framework of agreements and work diary of the National Science, Technology and</p>	<p>It is included as the "Science for everyone and everywhere" modality. a) To foster development, adquisition or actualization of the divulgation of science mechanisms through intinerant spaces or scientific caravans that allow</p>	<p>It is defined in the modality and sub-project "Science for everyone and everywhere". Support areas are maintained: The proposal has to be aligned towards developing activities that promote, encourage and strengthen the diffusion and</p>

Innovation Conference.	girls, boys, teenagers and adults to have	outreach of actions in whichever of the
b) To strengthen and/or boost the states and regional capacities in the matter of social appropriation of science.	the opportunity of being in contact with science and technology, in an informal, fun and free way.	4 areas that are enlisted:
c) Maximization of the communication processes by generating contents and devices that contribute to the formation of science and technology culture within the population of isolated rural zones.	b) To Generate and/or upgrade the contents of broadcasting and diffusion programs of Science, Technology and Innovation (STI) appropriate for rural or isolated communities.	<ol style="list-style-type: none"> 1. <i>Applied scientific research and talent education.</i> 2. Promotion of STI callings 3. <i>Strengthening of scientific and technologic infrastructure..</i> 4. <i>Diffusion and divulgation of science.</i>
d) Achievement of an elevated social impact from the coverage of isolated rural zones.	c) To Promote the concept of "mobile-interactive classroom" that travels the boroughs in the federal entities (FE), with the purpose of awakening and encouraging childrens, youngsters and	
e) To contribute on the improvement of the public and social perception of science, technology and	general public interests towards the different scientific and technological disciplines.	
	d) To stimulate the	

<p>innovation (STI).</p> <p>f) To bestow the social appropriation of science, technology and innovation.</p> <p>g) To underline the relationship of the STI with common every day activities.</p> <p>h) Developing and promoting STI divulgation in different modalities and media, as massive information - television, radio, press, conferences, printed & electronic publications.</p>	<p>individual and collective creative potential, as well as to sensibilize the population towards the role that science and technology play in intellectual and social development.</p> <p>Integrated Support Areas:</p> <ol style="list-style-type: none"> 1. <i>Applied scientific research and talent education.</i> 2. Promotion of STI callings 3. <i>Strengthening of scientific and technologic infrastructure.</i> 4. <i>Diffusion and outreach of science.</i> 	
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The first edition of the Program in 2012 can be appreciated as having a relative success, in the virtue that it allowed integrating its particular attributes to intensive action in each local context and in a very short time. It generated an untold effort between the coordination of CONACYT and the Local Councils for Science and Technology to take the contents and devices of science outreach in a sensible way to isolated. However, the foresight and the start of that "strong appropriation" is still one of the main challenges in the continuation of the program.

What stands out is the continuity and interest that the program has had during three consecutive years with a growing budget (232 million pesos in total for the whole period⁵, see Table 2,). In spite of this effort, the budget is still very low in relation to the entire STI budget. Another pending subject is the measurement based on indicators that could allow impact assessment and monitoring of results in the medium and long terms. In 2012 these indicators were established, but in the 2013 and 2014 guidelines, they have not been considered.

On the other hand, there have been advances in the programs adequacy to the local contexts by generating differential actions according to each geographical zone, for example, bilingual contents in indigenous communities. However, these efforts have not been well planned. Meanwhile, the line of work between the traditional actions for science outreach and appropriation are still very weak and there has not been a disruptive change to foster the appropriation and citizenship's processes, as mentioned above. Thus, in 2013 and 2014 the spectrum of areas and actions of the program expanded, but this dilutes the sense of social inclusion, established in the original programs directed to poor and isolated rural areas. When the actions that go from outreach, broadcasting, and infrastructure, encouragement of calls and education of communicators are financed, the focus may be diverted, and the difference in relation to other actions traditionally found in the dimension of science popularization is not perceived. Within this viewpoint, the trend is to consider the program as a support strategy for the Social Appropriation of STI in the different states, with a strong emphasis on vulnerable sectors of the population. Thus, the notion and aspiration of "strong appropriation" or "science for citizenship" would be pushed towards a second level.

⁵ 17,846, 153 million USD as of 2013.

Conclusions

After reviewing the Program "Science for everyone and everywhere" experience, a moderate optimism is revealed in terms of the future and consolidation of this type of initiatives, especially because of the focus that gave birth to the program: the social and conditions according to a different geographical and social context. However the challenge is that this kind of programs may serve as transformation tools and not only as spontaneous and dispersed actions. The risk and limitations of initiatives of this nature is evident: to make "isolated successes", that point out certain specific deficits in science and technology outreach but fail to be framed in an SASTI national proposal with clear, broad and long term goals.

This national proposal of STI appropriation must have a differential character and agree with the needs of local contexts and various audiences. School age children living under conditions of poverty and isolation should be a top priority.

On the other hand, STI policies in Mexico do not consider Social Appropriation as a major goal, but only as merely secondary in importance. The main outreach actions have been carried out through traditional programs such as the National Science and Technology Week, which will celebrate its 21st anniversary this year. As part of the SASTI initiative, CONACYT issued the first Call of Support for Public Communication of Science Projects in 2012.

In summary, multiple challenges are faced. One of them consists in undertaking a body of work that will coordinate all those who participate in the STI system, namely, the educational institutions and research centers, the three levels of government, the business sectors and, overall, the citizenship, so that the topics of STI can turn into natural and daily conversational topics at home and work. A national crusade would have to be done: to generate learning with the broadcasting media, with the education system, with the actors and promoters of science, which can be encouraged through continuing generation processes and uses of knowledge, organized in such way that will contribute to *social learning* processes. Imagining a society with the capacity to generate knowledge on their reality and surroundings, to be used in the process of envisioning, forging and construction of their future.

How to face this challenge in countries like Mexico that confronts serious equity and severe limitations on the social participation on the benefits of development, especially when STI appear as an incomprehensive subject decoupled from reality? The challenge is complex because scientific knowledge is a low priority in social perception as it is considered a separate field and not as an integral part of culture, where it really belongs.

The real issues are the "how's": How to transit towards this public policy of social appropriation of STI? How to bring STI topics to the forefront of daily life, so that wide acknowledgement is achieved? How to position these topics in public perception?

A starting point would be to conceive STI as a social field that naturally includes scientists and researchers, as builders of knowledge, but also the society as a whole: children, men, women and elders, as direct or indirect beneficiaries of their processes.

From the viewpoint of the four dimensions of public communication of STI, public policy efforts are required to be set in place. In addition to the formal planning in the framework of institutional structures and programs, the approach should be bottom-up, built upon local needs and capacities and geared towards the design of differential programs.

One of the fundamental premises is that the formulation of a public national SASTI policy with a long-term vision requires the involvement of all parties in order to consider the wide variety of impacts. This also means shared responsibility as well as social inclusion.

Along with these ideas, a set of proposals is set forth around a Mexican policy for SASTI:

- For the actors of the national STI system to *own* the concept, socializing the social appropriation among promoters.
- To include the SASTI concept as part of the Science, Technology and Innovation Special Program issued by the Federal Administration. Each state could incorporate the concept in their own programs, or even develop outreach programs. The state of Michoacán is the only case in Mexico where this has occurred.

- At the local level, taking actions to promote initiatives and programs among different sectors and institutions thus energizing and integrating initiatives and budgets, among other items.
- To foster the integration and mobilization of STI agents, including the general public, to actively participate in the SASTI processes as a strategy towards the future.
- To contribute in the democratization of STI, encouraging the processes of collective knowledge construction, in which the scientific community may interact and recognize actors, of related and different disciplines, as the actors of other sectors and other ways of knowledge (i.e. local and traditional knowledge).
- To maximize the social communication and entertainment processes with contents and devices that contributes to the formation of a scientific and technological culture in the Mexican population.
- To learn how to provide and receive good news and spread them towards broader social spaces. To link with mass media in an efficient way to position the topic in the public spectrum.
- To foster the value of the identity of culture, thus evidencing and stimulating the usage of scientific and technologic development inputs.
- Outreach activities to position science, technology and innovation in the public sphere.
- Education of science mediators (social and intercultural mediation)
- Increase citizenship awareness of the subject to elevate participation and conformation of public opinion on science and technology.
- Encouragement of science, technology and innovation culture based in society's interest and needs.
- Advancement of monitoring and assessment of SASTI activities and programs

- Carry out specific studies at the state level regarding public perception, culture and social appropriation of STI.
- Assessment of the cultural impact of STI social communication.

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