The social function of citizen science:

developing researchers, developing citizens

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ABSTRACT

Citizen science is not a panacea. In social environments different from those in the European or English-speaking world where this approach has been evolving, citizen science is subject to error. To avoid incurring in type III errors (right answer to the wrong question) it will be necessary to train the citizens who will participate in these studies as well as researchers. If not, we may encounter new forms of scientific dependence that benefit knowledge accumulation and policy decisions in advanced regions of the world without contributing to the well-being of those who carry out the studies. This article analyzes the relationship between civic development, civic research and ways of implementing research results within public policies, given the characteristics of political and citizen participation in Latin America. Within this context, the introduction of citizen science is seen as an opportunity to construct a more inclusive and participatory society, and to reduce the risk of returning to paternalistic, passivity-inducing and purely instrumental approaches to development.

Keywords: Latin America, Panacea, Gaventa J., Ostrom E., Dunn W.N., Citizenship, Empowerment, Community, Development, Culture, Democracy, Education, Civic competencies, University Social Responsibility

INTRODUCTION

It is ironic indeed that the UK Government is credited with providing 'good quality, accessible and accurate health information on Ebola' for its own UK population, while making no mention of what is much more important: the chaotic situation of information and education in countries affected by Ebola.
Neil Pakenham-Walsh (2016)

Latin America is not only a scientficallc interesting region, it is also a poverty ridden region, where even Venezuela with all its oil-derived richness has fall into deep poverty in the recent past. (Ugalde et al, 2007). It is no surprise that the Latin American world suffers from endemic forms of a series of social problems. From poverty, authoritarianism, lack of education to the difficulty to form citizens, there are a range of situations requiring more and more research if we intend to generate sufficient information that can be used in defining public policies to solve them. It haunts us on a personal level since 1978 when one of us started a campaign for the creation in the Venezuelan Parliament of a Committee for Science and Technology in order to help mobilize needed knowledge at the heart of the parliamentary institution in order to monitor and generate public policies for the Venezuelan State (Ordonez, 2015a). But by its very nature, complex problems can only be analyzed in complex forms. It is here where collaborative research enters to play an important role (Ordoñez et al, in press). And because of the knowledge generated through research and its implementation in the social environment through sound public policies, is that initiatives like the one of citizen science are being held as positive, even more when sometimes they are presented with the promise of added value due to the possibility of incremented social capital and engagement in the communities where it is deployed.

Any intervention in a "developing region" must take into consideration the "development discourse": ... *set of techniques and power-knowledge relationships (that) has been operating through different mechanisms on the Third World since Development was defined as "a response to the problematization of poverty that took place in the years following World War II, and not a natural process of knowledge that gradually uncovered problems and dealt with them, as such, it must be seen as a historical construct that provides a space in which poor countries are known, specified and intervened upon" (Escobar, 1995:44-45).* Mentioned by Aguilar (2010).

From this perspective, the problem we would like to address in this chapter is that of how to develop citizen science in our region in such a way as to help develop citizenship, not an easy task since it seems that we really face a double problem: to develop collaborative scientists on the one hand and to develop collaborative citizens in the other, since we lack, due among other things to that authoritarian past mentioned before, a fluid relation between the scientists or university teachers (perceived as part of the powerful) and the very communities where the "citizens" are to be recruited in order to tackle the duties imposed by citizen science. In what we show in this work, we intend to address the complex problem presented, structure it, and try to generate solutions to solve it.

BACKGROUND

The idea behind this book, Citizen Science in Modern Research, looks as very straight forward. Basically, with an open discussion we could formalize the new discipline of citizen science in its early stages, allowing in the process for a greater cooperation among citizen-science initiatives and,furthermore, addressing topics which are not often explored; specifically, how citizen science relates with other sciences; *It will provide inspiration to researchers who designed a tool with one specific use in mind, to generalize it to other uses and to realize* ***the social innovation potential*** *when this tool is used in citizen observatories.* (bold type ours).

From the start, within the many available definitions for Citizen Science, a general idea seems to permeate the initiative, that of the social innovation potential of these efforts, for example:

Citizen science is sometimes described as "public participation in scientific research",

Projects in which volunteers partner with scientists to answer real-world questions.

Citizen Scientist: Researcher who participates in the systematic collection and analysis of data; development of technology; testing of natural phenomena; and the dissemination of these activities on an avocational basis, and Citizen Science: The systematic collection and analysis of data; development of technology; testing of natural phenomena; and the dissemination of these activities by researchers on a primarily avocational basis.

Citizen science is the practice of public participation and collaboration in scientific research to increase scientific knowledge. Through citizen science, people share and contribute to data monitoring and collection programs. Usually this participation is done as an unpaid volunteer.

As well as increasing the body of environmental data available to statutory bodies, community based Citizen Science can contribute to collaborative local environmental management, build community capacity, develop scientific literacy and increase citizen stewardship. Or

Citizen science creates a nexus between science and education that, when coupled with emerging technologies, expands the frontiers of ecological research and public engagement.

The truth is that citizen participation in volunteer activities, and its consequences in community development, should not be taking for granted (Hyatt, 2001). We must increase our understanding of the motivation citizen scientists have, since even factors as basic as quantity and quality of participation vary from a project to another: i*t has been shown that quantity and quality are different in citizen science projects… "factors that enhance participation frequency may not necessarily lead to enhanced contribution quality" calling for a more careful investigation of the effects of motivation* (Nov, Arazy & Anderson, (2014). Because we are talking of Knowledge Mobilization (KMb): *a two-way process that makes use of the existing stock of knowledge and co creates new knowledge to help foster change. The term KMb is most used by the Canadian network Research Impact, which helps translate/transfer university-based knowledge to help citizen groups.* (Shaxson, 2012)

Furthermore, from our point of view, citizen science is being perceived as a panacea to solve certain problems of data-gathering in isolated, impoverished or isolated environments with the added contribution of, in the process,helping in the development of the involucrated populations. Opposite to this, we must remember views as that of Ostrom: *In the context of governance of human-environment interactions, a panacea refers to a blueprint for a single type of governance system (e.g., government ownership, privatization, community property) that is applied to all environmental problems… Practitioners and scholars who fall into panacea traps falsely assume that all problems of resource*

governance can be represented by a small set of simple models, because they falsely perceive that the preferences and perceptions of most resource users are the same. (Ostrom, Janssen and Anderies, 2007) Therefore we ought to ask whether citizen science as proposed in many studies is a panacea in Ostrom's sense (Ostrom, 2007 and Ostrom et al, 2007) and if not, what steps should be taken in order to get the mutual benefits that ought to be expected from the interaction between scientists and citizens.

Incurring in type III errors

Type III errors occur when researchers provide the right answer to the wrong question.
Wikipedia

A critical issue of problem structuring is how well substantive and formal problems actually correspond to the original problem situation. If most problem situations in fact contain whole systems of problems (messes), then a central requirement of policy analysis is the formulation of substantive and formal problems that adequately represent that complexity (Dunn, W. N., 2015). With this in mind, and interested as we are in developing, for multiple reasons, citizen science in our region, we need to consider when and how to introduce that citizen science in our communities and, in order to do it, we need to analyze two separate worlds that coexist culturally in our nations, that of the **people** on the one hand, and the world of the **masters** (the rich, the educated, the powerful,... the university teachers and the politicians). We are talking about social inequality, and therefore we must study and solve a double question when looking for citizen science to fulfill its potential as a "community capacity and citizen stewardship builder"; we need to learn to develop collaborative scientists and collaborative citizens.in the process of introducing citizen science in a given context, as depicted in figure 1, Citizen science and development factors to be considered.

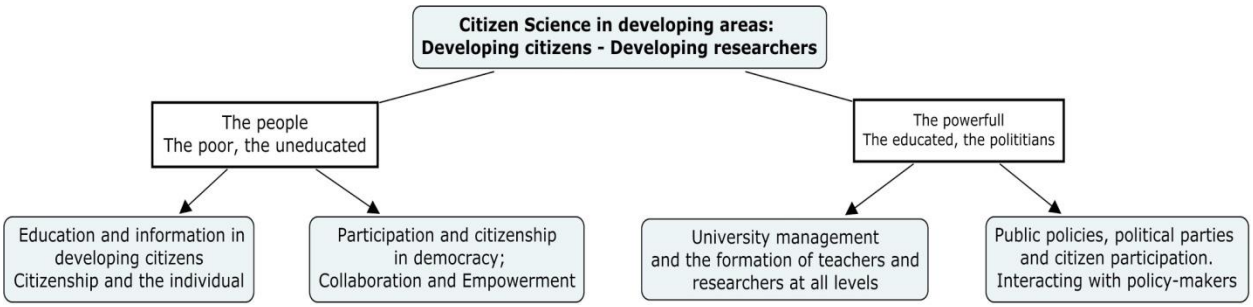

Figure 1.- Citizen science and development: Factors to be considered

But before going into that analysis we think it is needed to picture citizen science in a proper perspective as another approach to performing science in communities.

Citizen science and “different approaches to research”

Various aspects of scientific research - mainly data collection and analysis - are labor-intensive, time-consuming, and consequently costly. Online citizen science reduces the costs of scientific research, increases the resources available to research teams, fosters a partnership between citizens and scientists, and enhances public understanding of science.
Nov, Arazy, & Anderson. (2014)

As we can see from the previous paragraph, beyond Citizen Science being perceived as a panacea for development in underdeveloped or poor communities (*scholars can make simple, predictive models of social-ecological systems (SESs) and deduce universal solutions, panaceas, to problems of overuse and destruction of resources,* Ostrom (2007) , citizen science may also be considered an efficient way of accomplishing the needs of the researcher. However this is not the only approach that may be used for doing research in communities, as can be seen from Figure 2. Approaches to research from the point of view of the community, developed from an interview to John Gaventa for the AURA research program (AURA, African University Research Approaches) which considers different approaches to community research, and why is research in general considered important in “developmental policies”.

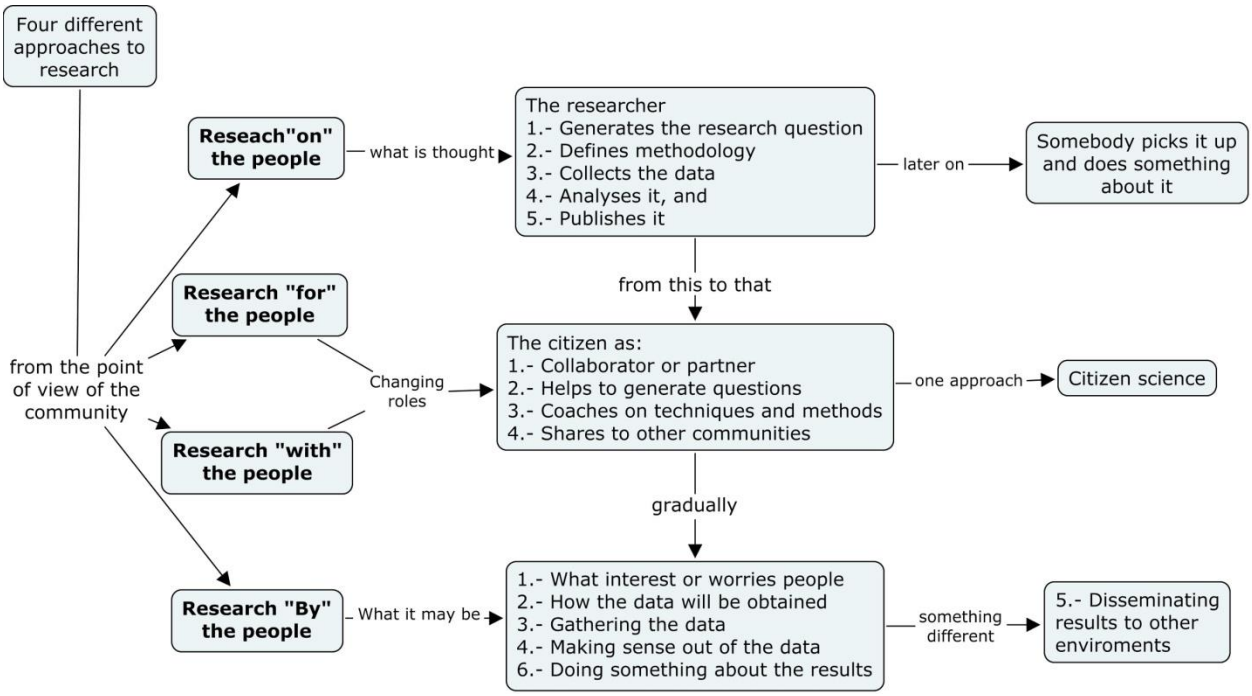

Figure 2.- Approaches to research from the point of view of the community.

Regarding Research from the community point of view, we may conclude that Citizen Science is but one of the many possible ways of approaching the problem. One kind of Research “with” the people.

Another aspect to take into consideration is the kind of “community development” you want to attain when introducing citizen science within a community. The main argument from the developmental point of view to undertake citizen research is to achieve some kind of community development, very helpful in poor and underdeveloped regions, but even that is full of problems, as mentioned by Aguilar (2010). *Let’s place ourselves in the categories we, as researchers, use for “others”: we can describe this essay as written in Argentina a “poor”, “Latin American” “emergent” (IMF, PNUD) “undeveloped” (WB) “middle income” and “sustained partner of US” (USAID) country by a “lower middle class” PhD Student who is above the “poverty line”. Due to the “modernization” process which occurred in the country during the 1960´s her family was able to migrate and escape from unemployment in “vulnerable” countryside areas to the urban and industrialized (i.e. “modern”) suburbs of Buenos Aires. Such a personal description is enough to understand that we are all immersed in concepts and categories, and the extent to which we need them to make the world in which we live legible. (The acronyms used in the paragraph stand for: IMF (International Monetary Fund) WB (World Bank) UNDP (United Nations Development Programme) USAID (United States Agency for International Development).*

This kind of analysis, in almost any combination, can be drawn from the development discourse as read in academic papers or public agencies, as shown in a somewhat different version in Figure 3 Achieving development through citizen science:

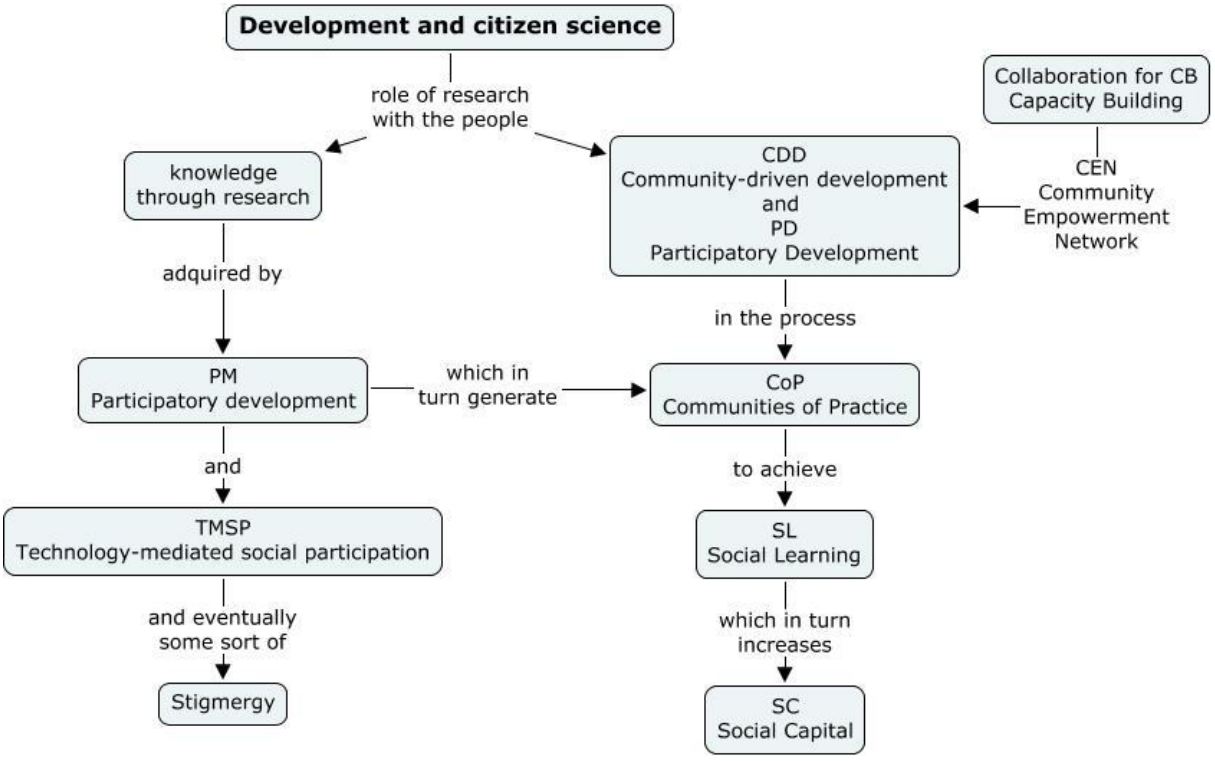

Figure 3.- Achieving development through citizen science

(I have stressed the acronyms because they depend upon the agency interested in development and not such a thing as "Standards Committee" has been created to provide the researcher or the decision taker with a general view of the "jargon" being used in the development field.)

Our main preoccupation at this point is that we cannot conclude in a linear way that "social development" (whatever that is) is going to derive or be stimulated from citizen science or other kinds of research undertaken in the communities. As can be seen from Figure 3, social capital is not automatically the result of generating knowledge from research in a given community.

To help the interested researcher we have compiled the following list of definitions that convey the idea of the magnitude of the hurdle to be surmounted. We invite the reader to generate their very own structured tree for relating research with development at this point.

Communities of practice (CoP): is a group of people who share a craft and/or a profession. The concept was first proposed by cognitive anthropologists Jean Lave and Etienne Wenger in 1991. A CoP can evolve naturally because of the members' common interest in a particular domain or area, or it can be created deliberately with the goal of gaining knowledge related to a specific field. It is through the process of sharing information and experiences with the group that the members learn from each other, and have an opportunity to develop themselves personally and professionally. (Wenger, 1998)

Capacity building (CB): Capacity building is the dedication directed to the strengthening of economies, governments, institutions and individuals through education, training, mentoring, and the infusion of resources. Capacity building aims at developing secure, stable, and sustainable structures, systems and organizations, with a particular emphasis on using motivation and inspiration for people to improve their lives. (taken from a presentation by Russel C. Jones, Ph.D., P.E., President, WFEO Committee on Capacity Building)

Community Empowerment Network (CEN-WB): intended to build the capacity of communities and their development partners to design and deliver more effective CDD projects that respond to the poor. This goal included efforts to: increase understanding of what makes CDD projects succeed or fail; enhance access to relevant capacity development materials; and enhance coordination among development partners on capacity development activities. (Caldwell Johnson, E., 2005)

Community-driven development (CDD - WB): is a term used to describe projects that encourage local communities to control the direction of their own development from project conception through implementation and evaluation. A kind of community of practice.(Caldwell Johnson, E., 2005). A sub-form of social capital that can have a positive effect on citizen empowerment and development. (Esman, M. J., 2003)

Collaborative or participatory monitoring (CM): Involves multiple individuals or organizations with different interests and forms of expertise in the design and implementation of monitoring. Fernandez-Gimenez, M. E., Ballard, H. L., & Sturtevant, V. E. (2008) an opportunity to develop themselves personally and professionally. (https://en.wikipedia.org/wiki/Community_of_practice and Wenger, 1998)

Development: can be conceptualised as an arena, meaning a socially constructed and bounded field, or space, within which actors negotiate, and struggle for, the wide spectrum of resources ranging from

material (e.g. salaries of development workers or infrastructural outputs of a project) to political and symbolic ones (e.g.prestige and authority). (adapted from Cima, O., 2015).

Participatory development (PD): seeks to engage local populations in development projects. https://en.wikipedia.org/wiki/Participatory_development

Social Capital (SC): is an expression of social organization that enables collective action and thereby citizen empowerment. (Esman, M. J., 2003)

Social Learning (SL): to be considered social learning, a process must: (1) demonstrate that a change in understanding has taken place in the individuals involved; (2) demonstrate that this change goes beyond the individual and becomes situated within wider social units or communities of practice; and (3) occur through social interactions and processes between actors within a social network. (Reed et al., 2010)

Stigmergy : is the phenomenon of indirect communication mediated by modifications of the environment. (Marsh, & Onof, 2008)

Technology-mediated social participation (TMSP): Recent years have seen a substantial growth in the scale and scope of technology-mediated social participation (TMSP) projects [1], such as Wikipedia, Linux and CiteULike, which rely on volunteers who contribute their time, energy and skills for the creation of a public good [2].

Going beyond panaceas in citizen science

It is with all the background considered up to this point that we now must turn our attention to Latin America, its development problems and the role, if any, that we might assign to citizen driven research in order to develop, or at least help to catalyze that process of "cultural community transformation" (our term). It is not an easy task. *Moving beyond panaceas to develop cumulative capacities to diagnose the problems and potentialities of linked SESs requires serious study of complex, multivariable, nonlinear, cross.scale, and changing systems,* (Ostrom 2007). Take for example the use of internet and the web. *Online citizen science is based on two pillars: (1) a technological pillar, which involves developing computer systems to manage large amounts of distributed resources, and (2) a motivational pillar, which involves attracting and retaining volunteers who would contribute their skills, time, and effort to a scientific cause. While the technological dimension has been widely studied, the motivational dimension of citizen science received little attention to date.* (Nov, Arazy, & Anderson. 2014).

As the sustainability of online citizen science projects depends on volunteers who contribute their skills, time, and energy, the objective of this study is to investigate effects of motivational factors on the quantity and quality of citizen scientists' contribution. Building on the social movement participation model, findings from a longitudinal empirical study in three different citizen science projects reveal that quantity of contribution is determined by collective motives, norm-oriented motives, reputation, and intrinsic motives. Contribution quality, on the other hand, is positively affected only by collective motives and reputation. (Nov, Arazy, & Anderson. 2014.) Obviously, this kind of study may only be performed in very confined areas, more akin to the developed world, and the conclusions drawn may not be extrapolated to other communities.

From another point of view, in Table 1 Wikipedia number of speakers by article in a set of selected languages, we compared some wikipedia provided data, previously analyzed for our latin american context. with up-to-date information from the same source. We consider wikipedia to be an almost perfect example of stigmergic achievement and, given its widespread utilization, a good indicator for cultural differences in collaborative participatory efforts

Wikipedia 2013				
Language		**Articles**	**Speakers**	**Speakers/Article**
Chinese		690.000	1.200.000.000	1739,13
Arabic		236.400	221.000.000	934,86
Spanish		1.020.020	406.000.000	398,03
Portuguese		780.000	216.000.000	276,92
Japanese		860.000	127.000.000	147,67
English		4.240.000	335.000.000	79,01
Polish		970.000	56.000.000	57.73
Italian		1.030.000	59.000.000	57,28
French		1.390.000	73.000.000	52,52
Dutch		1.590.000	23.000.000	14,47
Swedish		1.254.800	12.000.000	9,56
Wikipedia 2016				
Language		**Articles**	**Speakers**	**Speakers/Article**
Chinese		872.910	1.197.294.060	1371,6
Arabic		417.487	236.748.330	566,6
Spanish		1.251.188	470.000.000	375,6
Portuguese		917.885	220.000.000	239,7
Japanese		1.011.774	125.000.000	123,5
English		5.125.287	505.000.000	98,5
Polish		1.162.850	38.663.780	33,2
Italian		1.265.535	63.655.047	50,3
French		1.745.312	74.980.460	43
Dutch		1.864.304	21.944.690	11.8
Swedish		2.939.223	9.197.090	3.1

Table 1.- Wikipedia, number of speakers by article in a number of selected countries. Comparative data 2013 - 2016.

When analyzing the Wikipedia data we might appreciate the different results achieved by language (culture?) despite the fact that all of them use the same technology. In our list of countries we included Chinese, Arabic and Japanese because due to its non-alphabetical nature they might show different approaches to computer-mediated enciclopedias. Also, we included latin derived languages according to the definition given by the Inglehart–Welzel Cultural Map (2010) of English Speaking (English), Protestant Europe (Dutch and Swedish) and Catholic Europe (Spanish, Portuguese, Italian, French and Polish) areas of the world.

In the first place it is not surprising that those non-alphabetical languages achieve a higher number of speakers per article due to the difficulties of regular people (citizens) to incorporate data on the computers (the way it has to be done for Wikipedia) and leaving apart languages that do not use the same alphabet as utilized in the original English creation. (i.e. Chinese, Arabic and Japanese) Probably the high results for English, Spanish and Portuguese when compared to other Latin origin languages is the fact that these numbers reflect not only the main countries (Spain, England and Portugal) but the vast numbers of people inhabiting previously dominated territories (colonies) ruled by the colonial empires: in this regard Italy and France have a smaller influence (less inhabitants in their previous colonies?) and Poland, Dutch and Swedish languages have the lowest numbers (notice how Polish is rapidly evolving away from the Catholic Europe averages - Going away from Catholicism or evolving after the soviet phase?). We must conclude, with regards to Latin America, that the numbers for Spanish language are not for Spain and Portugal (European countries) but the consequence of the effects on Latin American cultures of autocratic regimes leading to different ways of handling (managing) information for decision made in real life conditions, which have an spillover effect on their different use of ICT (Information and communication technology).

Citizenship and Participation

A prerequisite for participation, inclusion, and informed citizenship
is the ability to develop knowledge from information
about the social, economic, and community dimensions
through which modern Australian society is constituted.
Lloyd, Lipu, & Kennan (2010).

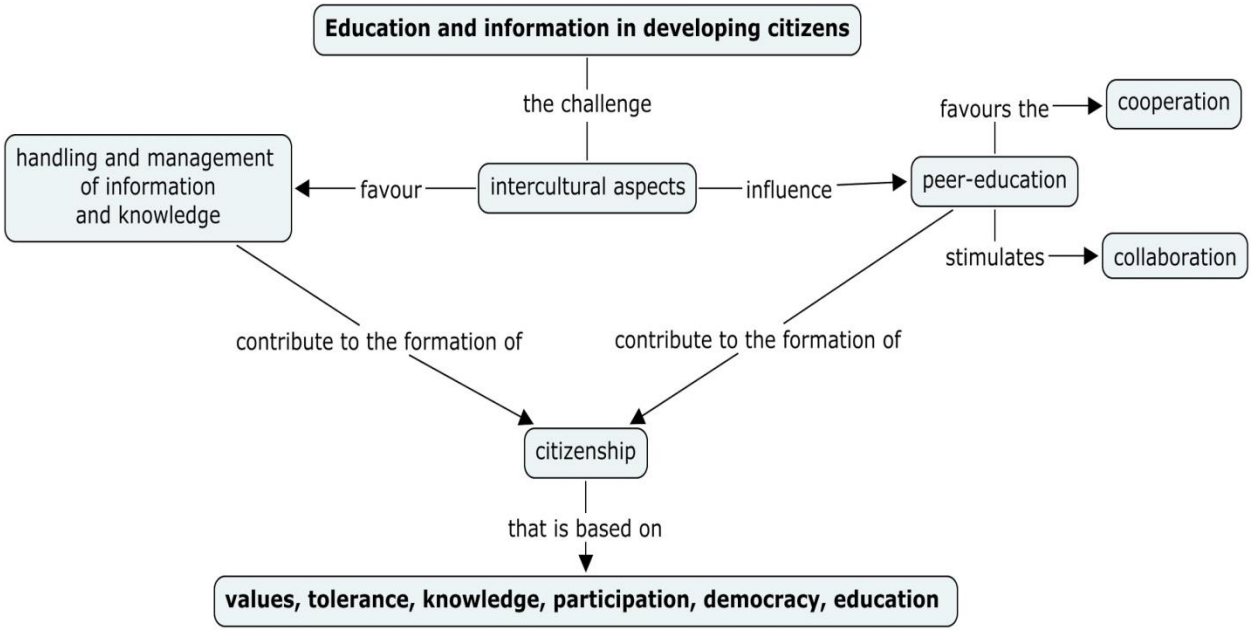

Figure 4. Education and information in developing citizens

Participation and democracy are part of, or at least should be linked to, training, education and teaching. Only with the collaboration of different educational and training factors may development encounter a favorable environment for achieving its full potential. The interest of this chapter focuses on the values of citizenship, participation and democracy and how they may interact in synergy with citizen science when the latter is introduced into a given community. The need to promote a favorable environment for these conditions derives from the need to promote democratic awareness and the expectation that it might be reinforced by citizen science efforts. To these end educational initiatives such as the Freirean methodology (Freire developed an approach to education that links the identification of issues to positive action for change and development.) invites us to rethink the subtle play of communication between society and people, the educational relationship of formal and informal education at all levels, and the way information and knowledge intermingle in a given culture. Practices of adult education, in its specificity, today may not set aside the value and the fundamental interest of the citizen training. And although it is an educational problem, citizen science offers a particular opportunity for the people to become active participants linking knowledge to action. Educational storytelling, another example, is an integral part of the development of people and promotes synchronous and joint improvement of the place of life in many communities.

But let us define citizenship. Being a citizen is first of all an act of awareness, to know which are the possibilities that your particular environment offers and the ways to contribute and help others to structure a common living space; only if this process is taking place in a community then activities such as the ones offered by citizens science may achieve their full potential, both in the way of helping science and helping the communities where it is inserted. According to the definition of Marshall (1949) in UNESCO website (2016), citizenship is a complex and difficult result to rights, knowledge and cultures. It can be defined as *the status of having the right to participate in and to be represented in politics." (Baylis & Smith, 2001) It is a collection of rights and obligations that give individuals a formal juridical identity. Marshall, whose work has long dominated the debates about social citizenship, considered citizenship as "a status bestowed on those who are full members of a community. All who possess the status are equal with respect to the rights and duties with which the status is endowed.* (UNESCO, 2016)

Turning our attention to global citizenship, we don't make references only to the fast expansion of the known global village (McLuhan & Powers, 1989), but to a set of changes, transformations, according to the Walter J. Ong theory, passages, among different cultural, educational, scientific, and technological times. Informed citizenship: cultural attitudes towards information in developing countries: We have to develop new educational and social perspectives. Integration, interculturalism, the values, the participation of the citizen is something that needs to be cared for, always and consistently.

This is the main motivation that compels us to take into account the different characteristics and typical of a "fluid", continuous and divisive change variables. According to the proposal of King & McGrawth (2002), it is necessary to speak of *Globalisation, enterprise and knowledge,* according to a complex perspective of globalization of knowledge.

Another important point to be taken into consideration is that of the intercultural nature of citizen science. Researchers from different cultures interact in order to include in their research people from yet another

culture… The value of intercultural aspects: *intercultural interactions have become a constant feature of modern life, even in the most traditional societies, the very manner in which individuals and communities manage encounters with cultural others is under scrutiny. Hence the growing awareness among policy-makers and civil society that intercultural competences may constitute a very relevant resource to help individuals […]* in accord with the *Conceptual and Operational Framework UNESCO* of 2013 (pp.4-5).

It is still very important to take into account the document developed by Delors called *Learning: The Treasure Within* (1996). The same European Commission Past President spoke to us of *[...] "learning to live together". It must be noted that "learning" is first and foremost about considering any matter, object or being as a symbol to be deciphered, or interpreted.* (UNESCO, 2013, p.5) These motives require us an assessment aware of intercultural competences that we must make intercultural values. *Intercultural competences are abilities to adeptly navigate complex environments marked by a growing diversity of peoples, cultures and lifestyles, in other terms, abilities to perform […] (Fantini & Tirmizi, 2006)* Mentioned in UNESCO (2013, p.5) The daily requirement is, then, promote the *Cultural Diversity and Intercultural Dialogue* (UNESCO, 2009).

To conclude this section we must ponder the handling and management of information and knowledge. Today they are necessary for the domain of knowledge, electronic tools and strategies necessary to achieve a favorable social environment and citizenship development. *[…] State legislatures, trustees, administrators, teachers, faculty members, parents, and students have begun to seek better outcomes from education or at least to have better sense of what current outcomes measure, in the case of higher education.* (Petrides & Nodine, 2003, p.13)

In contemporary times, the need of every citizen is to access resources, still needed to get skills. In the 21st century, we speak of society of the information, of complexity (Hannerz, 1992; Taylor, 2001; Doll, Fleener & Julien, 2005; Risager, 2006) and the misinformation, but the only aspect which is being developed with consistency is the doubt dominated knowledge, and create new place to share ideas, learn and especially to create support groups and support for the improvement of all.

The main objective is to make an investigative approach to what has meant the construction of citizenship, from the context of authoritarianism and democracy in Latin America, this within the framework of the research "expressions of inter-subjectivity from the relationship education and digital citizenship" held at the University of San Buenaventura-Bogotá (Cuevas-Silva, 2014). Pluralities of citizens prospects need support for the improvement of the social level, of knowledge, of education for the achievement of a level of knowledge necessary to reduce cultural poverty. Sometimes between the causes of low culture, or better known as literacy, we find different economic, social factors where the primogenital (first?) condition for "access to culture" (Rifkin, 2000) is having the economic resources necessary.

The example that the authors in the essay of 2002, make us its specificity refers to the development of an investigation that took its most successful and concrete sense, only in places development as in the case of Africa, and that helps us to evaluate different and innovative variable, conditions and modes of work and management of information. *In some countries, women with as little as four years of education are more likely to choose to have smaller, healthier families and decide to send their own children to school.*

Education contributes significantly to the improvement of health status by enhancing the capacity of men and women to care for their own health and that of their families, and to make more effective use of preventive and curative services. A good primary education can help to foster agricultural innovation and improve the capacity of the poor to make use of their environment in a sustainable way. (DFID, 2000c, p.2) Mentioned by King & McGrath (2002).

The contribution of the order and the theoretical justification suggested by King and McGrath, allows us to read the education and above all the knowledge of information as content and necessary tool for the improvement of citizenship, the population and the same social and cultural environment. The possibilities offered by the domain of one that should be called basic skills of survival of the person, the awareness and the knowledge management, still does not seem sufficiently developed. This happens because there is confusion about the same definitions and use of the related terms: education, knowledge and information (Bocciolesi & González, 2015).
These motivations, both theoretical and practical allows us to evaluate the contemporaneity under new perspectives, new senses and meanings.

Participation and Empowerment

While social capital may have several positive impacts
as far as the information access is concerned,
there are also a number of less beneficial impacts. ..
social capital might not be beneficial as it makes difficult to obtain novel information;
it might exclude or make new sources of information from outside the company difficult
(as various stories of technological blindness remind us);
and lead to norms of control that turns into resistance to innovation
(as in the case of the famous "not invented here" syndrome).
Mario Benassi (2007)

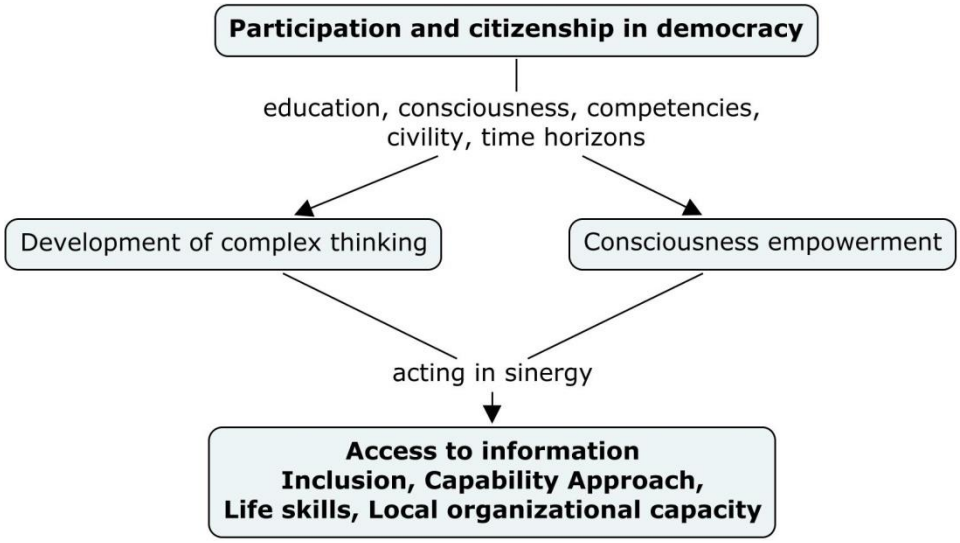

Figure 5. Participation and citizenship empowerment

It is a well- established principle in political sociology that empowerment of the poor and the weak is normally the product of a struggle. Their ability to struggle, to overcome resistance, to achieve some measure of control over their lives, to secure a fairer share of public services and government resources depends on the formation of social capital, usually in the form of organization. Organization enables ordinary men and women to mobilize their collective energies in pursuit of common goals. Thus the principal expression of social capital is through autonomous social organization. Numerous examples can be cited of its contribution to empowerment. (Esman, 2003)

To be a citizen means to be aware of the rights and the duties required by this task; this is not a simple undertaking, and a lot of educational effort must go, both at the family and the school level to achieve it. In the investigation of the IEA (International Association for the Evaluation of Educational Achievement) of 2001, named *Citizenship and Education in Twenty-eight Countries. Civic Knowledge and Engagement at Age Fourteen*, It offers us a new perspective on the State of the art on the relationship of citizenship and education.The framework remains of participation and democracy but it is necessary to pose some questions: *What does democracy mean to young people in different parts of the world? What is their implicit theory regarding what a democracy is and what is likely to strengthen or to weaken it? They are exhorted to be good citizens, but what does that concept imply? If young people read that 'the government' should (or should not) be expected to take certain responsibilities, what do they think that means?* (Torney-Purta, Lehmann, Oswald, & Schulz, 2001, p.72) The answer that the authors give to us is related to the answers you have provided to young people who have replied to the questionnaire they distributed over what is good and what is bad for democracy. This is the only item about the media on which there is consensus across countries. Political theorists also suggest that freedom from government control of newspapers can be important for strong democracy, but in fact young people in many countries believe that some control is a good thing. Likewise, the respondents in some countries express little concern about the situation in which television stations all present the same opinion about politics. If newspapers were forbidden to publish stories that might offend ethnic groups, this would be neither very good nor very bad for democracy, according to the average respondent across countries. It is possible that when two values are counterpoised in a question, as they are here, many students focus on one value and downplay the other value. (Torney-Purta, Lehmann, Oswald, & Schulz, 2001, p.77)

These perspectives allow you to re-read the same sense of democracy and participation, returning in this regard to emphasize the contribution of the same Dewey in his essay *Democracy and Education*: *society not only continues to exist by transmission, by communication, but it may fairly be said to exist in transmission, in communication. (1916, p.8).* And associations are extraordinary mechanism to build citizenship: *These findings strongly support the proposition*

associated with the theory of mass society that the existence of voluntary associations increases the democratic potential of a society. Democracy depends upon citizen participation, and it is clear that organizational membership is directly related to such participation. (Almond and Verba, 2003)

Peer education might turn into an interesting tool to foster collaboration and therefore participation: In this case a critical evaluation of new practices in education will allow us to achieve new goals for the distribution of the information in favor of conscience citizen. One of them could be peer-education: since 1984, William Damon, professor at Clark University, wrote the article that defined the practice "peer". *Two different forms of peer learning, "peer tutoring" and "peer collaboration," are distinguished. Each has its potential use: peer tutoring for transmitting information and drilling special skills; peer collaboration for facilitating intellectual discovery and the acquisition of basic knowledge*. (Damon, 1984, p.331)
It is very interesting to understand how peer-education can influence learning and educational practices. *The recent interest in peer-based learning has arisen from a number of converging trends within psychology and education. Interestingly, several quite distinct (and often opposing) [...]* (Damon, 1984, p.331), and must then recognize the different motivations that allow us to focus on the subject, as the *cognitive-developmental psychologists in the tradition of Piaget* (1984, p.332).

The main objective is to make an investigative approach to what has meant the construction of citizenship, from the context of authoritarianism and democracy in Latin America, this within the framework of the research "expressions of intersubjectivity from the relationship education and digital citizenship" held at the University of San Buenaventura-Bogotá. In accord to Cuevas Silva, (2014), in *Authoritarianism and democracy in Latin America: Two extremes of social, political and cultural hegemonic rationalities.*

In this type of environment, technologies influence in different ways, and offer alternatives and possibilities. *Computer networks are having a major impact of enhancing and transforming teaching and learning relationships, opportunities, and outcomes. Traditional educational structures are being dramatically altered by new communication and information technologies* (Harrison & Stephen, 1996, p.205). How and why do we participate in public life? How do we get drawn into community and political affairs? The associations and networks that connect us to one another and structure our social and political interactions. Civil society and social capital in the functioning os democracy and in stability and change in political regimes. An interesting approach is put forward in the book Connected (Christakis and Fowler, 2009) where the possibilities and consequences of being connected are explored, and topics like the relationships between e-government and participatory culture come to be natural areas for exploration. We must wait for results loke those of the World Bank: Municipal governments are beginning to create websites that enable citizens to interact with governments… In Latin America, the World

Bank is interconnecting the municipal websites of 10 capital cities to encourage exchange of experiences as well as public engagement. (Narayan-Parker, D., 2002).

Only when these matters are better understood in our environment we will be able to undertake studies such as follows: *The present study contributes to theory in two ways. First, it increases our understanding of what motivates citizen scientists. The second contribution goes beyond the unique citizen science context to the study of TMSP in general, and concerns the differences between contribution quantity and quality in their motivational underpinnings. Our findings from one citizen science projects provide preliminary evidence that factors that enhance participation frequency may not necessarily lead to enhanced contribution quality, and in some case actually detract from quality,* (Nov, Arazy and Anderson, 2014)

Developing teachers and researchers: the socially responsible university

Hart and Wolff (2006) stated in their work on CoP: *To illustrate what they believe these 'new forms of engagement' to be producing, Gibbons and colleagues set out a distinction between Mode 1 knowledge and Mode 2. Mode 1 knowledge is pure, disciplinary, homogenous, expert-led, supply driven, hierarchical, peer-reviewed and almost exclusively university-based… Mode 2 is applied, problem-centered, transdisciplinary, heterogeneous, hybrid, demand-driven, entrepreneurial, network-embedded and often (increasingly) handled outside of higher education institutions (Gibbons et al., 1994).* The first type seems to prevail almost exclusively in our part of the world, perhaps being responsible for society's sensation of lack of involvement from the university with the changes that must be undertaken in our societies, in contrast with its origins when the university was perceived as protagonist of social change. Partly due to the insularity permeating the different actions of the university's traditional paradigm (generating, transferring, and applying knowledge), partly for socio-historical reasons, the university is perceived as part of the problem as well as part of the solution of the social inequities in Latin America (Vallaeys, 2007). These facts interfere with any effort to introduce citizen science in our communities.

It should be pointed from the start that we do not criticize the generation of knowledge Mode 1, on the other hand, we express the need to recognize and value the importance that universities and communities establish collaborative projects (Mode 2) as part of the constant quest to strengthen teaching and research, and as a way to comply with the university's social responsibility (one of the reasons for our interest in citizen science). But in order to do that our universities must break the vicious circle of teachers formed in an authoritarian culture, which in turn form authoritarian "elite citizens" in the universities, incapable of becoming researchers that will attempt to undertake the research needed and being requested by the world, as requested in: "Towards the European Higher Education Area: responding to challenges in a globalized world" which explicitly establishes: *Higher education should play a strong role in fostering social cohesion, reducing inequalities and raising the level of knowledge, skills and competences in society. Policy should therefore aim to maximize the potential of individuals in terms of their personal*

development and their contribution to a sustainable and democratic knowledge-based society (Bologna Process, Declarations London Communiqué, 2007, 2.18, p.5)

We ask ourselves why despite diagnosis and a clear vision of the challenges to be tackled there are no institutional changes allowing for the expected results to occur. We propose as a hypothesis the fact that given the present University paradigm (teaching, research and extension) they are managed in watertight compartments, much more in Latin America with its tendency to practice "insularity" among bureaucratic instances (Waissbluth, 2003) which leads to trying to tackle the problem with ad hoc overlapping subjects (students), or mandatory courses (teachers). This approach contributes to accentuate a dichotomy between researchers and citizenship, science and ethics. *This sense of separation and opposition between morality and efficiency will always be fatal for the consolidation of the skills and attitudes of students, since its basic training urged them to be in "efficient and effective professionals". The theoretical challenge and practical is then show students that the ethical is effective, and that immoral strategies end up always being very inefficient and harmful...* (Vallaeys, 2003, p.4). This problem is a old as society's acknowledgement of the importance of education to transmit the values of the established systems, we may cite Napoleon: *Of all political questions that is perhaps the most important. There will be no stability in the state until there is a body of teachers with fixed principles. Till children are taught whether they ought to be Republicans or Monarchists, Catholic or Unbelievers, and so on, there may indeed be a state, but it cannot be a nation (*Napoleon in Note outlining an Order of Teachers? Quoted in J.M. Thompson, Napoleon Bonaparte: His Rise and Fall (Oxford: Blackwell, 1953), p.206 citado por Derek Heater in Citizenship: The civic ideal in world history, politics and education, 3rd. edition 2004)

One possible approach to understand what is being asked from the universities and how to achieve it may be appreciated in Fig. 6: University Social Responsibility. What is required from the institution? (After Vallaeys, 2007)

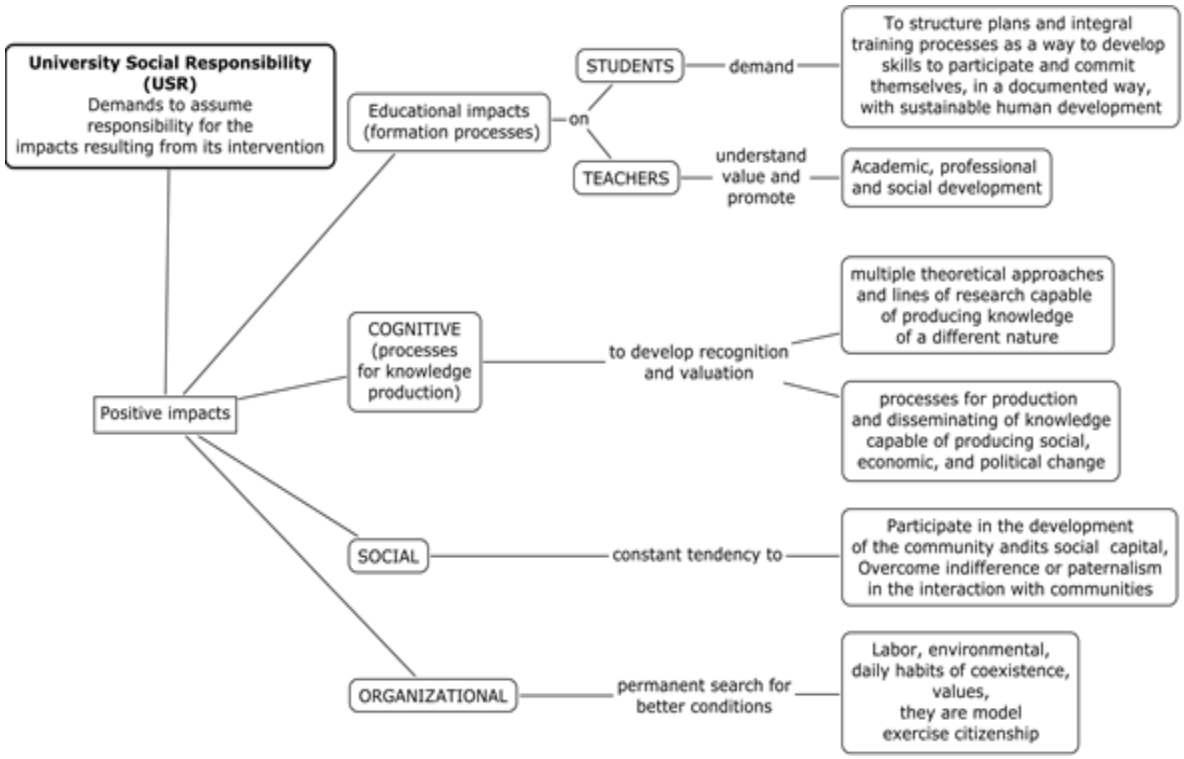

Figure 6: University Social Responsibility. What is required from the Institution?

The problem to solve at this point is how to have university teachers and researchers that practice this kind of social responsibility and therefore may be capable of teaching students beyond the professional basic knowledge, the values and means of citizenship. This kind of teacher is in a position to undertake research within the values of USR as the case mentioned by Lall (2011) in Canada and England, a practice rooted in the community that allows the development of a committed academic practice allowing to learn about social problems such as poverty, education, security, health, among others, problems that affect society as a whole but particularly marginalized populations. Although Vallaeys develops four topics: educational, cognitive, social and organizational, we will only develop here those of education (description of the components of a plan of study whose purpose is the integral formation (comprehensive training) of the student) and cognition regarding knowledge generation. two aspects (the problem that represents the professional overspecialization of teachers).

When analyzing Competency areas (areas of competency for integral formation) in curricular design Villa and Villa (2007) assume three big areas with their intersections: the main areas being Academic, Social and Professional, with the intersection between social and academic generating Personal Development, among social and professional generating Socio-professional responsibilities, and the interaction between professional and academic being responsible for the Applied competences. Integral Formation as result of the interactions among all three areas generating competences. By comprehensive training we understand:... *form to the University, first of all, as a person, secondly, as a professional who will play a work that is being prepared and, thirdly, as a citizen, what could be called civic skills* (Villa & Villa, 2007, p.19). This process occurs at the intersection of three areas of competence: the academic,

professional and social. The instructional design should offer learning experiences in which integration can occur.

When the formation of teachers assigns maximum priority to academic and professional training, prevents incorporating the social component that enables for the exercise of citizenship, so, usually, this aspect is assumed as a learning objective. These unbalance among the three areas approach, when translated in the implementation of training plans for teachers, focused on the development of professional competencies, leads to hyper specialization. Frequently, curricular design shows disconnection between competencies approach and the pedagogical teaching model that is implemented. The pedagogical model assumes a scheme in which education is understood as a process of transfer of knowledge and acquisition of culture accumulated by mankind, while the apprentice is understood as a receiver of information. The consequences of this model lead to conceptualize the teacher as a specialist in a field or discipline. This approach attempts against Mode 2 knowledge as advanced by Gibbons et al. (1994)

Perhaps what is needed is to achieve some sort of capacity building in order to achieve empowerment in university trained students and teachers. *The contemporary view of capacity-building goes beyond the conventional perception of training. The central concerns of environmental management and community building – to manage change, to resolve conflict, to manage institutional pluralism, to enhance coordination, to foster communication, and to ensure that data and information are shared – require a broad and holistic view of capacity development. This definition covers both institutional and community-based capacity-building (from* http://learningforsustainability.net/capacity-building-empowerment/). Therefore it may be that what is needed at the present time in our universities, if they are to contribute to our region's development is to help simultaneously to develop capacity building for empowerment in our students and researchers, perhaps an example could experiences described hereafter.

We would like to share two experiences in which we have been involved. The first resulting from the entry into force of the Act of Community Service (ACS) as a graduation requisite for students of higher education in Venezuela, experience that we will examine from the perspective of production of knowledge with examples of the Central University of Venezuela: the Faculty of Science and the Faculty of Economics and Social Sciences. Secondly, we will describe the formation of an interdisciplinary team of researchers from different countries of Latin America and Europe to generate a Massive Open Online Course (MOOC) style course on "Interdisciplinary Collaborative Research in social sciences in the 21st century", aimed at graduate students and to be offered through a network of graduate programs in our space.

The promulgation of ACS for the students of higher education (LSCEES, LEY DE SERVICIO COMUNITARIO DEL ESTUDIANTE DE EDUCACIÓN SUPERIOR Gaceta Oficial de la República de Venezuela, Nº 38272, 14 de Septiembre 2005) has generated a curricular space that seeks to promote his participation as a citizen in society with a clear vision of the objective to achieve: to develop social capital (article 7). It is a requirement for graduation (article 6), and must be developed in the form of a social project (articles 13,15,16,17,18, 21) linked to vocational training (article 15) and shall be using the learning service methodology (article 7); to be implemented in a community with a minimum duration of 120 hours to be fulfilled in not less than 3 months (article 8).To provide the service the student must have

passed 50(50%) of the credits required in the curriculum (article 16) and should be supervised by both, a community and a academic tutor (article).

In summary, the Act pursues the purpose of developing social capital, understood as: *a tangible public, but not visible, good, which generates symbolic or material benefits to the community, based on social relationships to generate links and collective capital...* (Klisberg, 2001, pp. 14-17). Among the important aspects to consider in this approach are the concrete manifestations of learning and exchanges of knowledge between community and university. Is intended that persons, have knowledge systematized as to learn and become citizens with the aim of not increasing the number of "excluded socio-economic" with the "excluded cognitive", the last without having developed skills to appropriate that information (Froes, 2002). And it should be understood that learning occurs from reflection and synthesis that is performed in order to interrelate the theory and the practice. This conscious interrelationship should produce new knowledge (Correia and Bleicher, 2008) which must be returned to the communities (Mitchell, 2008).

To achieve this objective activities and projects in which the student will participate should be of such a nature so as to constitute a real challenge to research and understanding of the causes that underlie social problems in the community as well as actions that can contribute to change the structural causes that support those problem (Mitchell, 2008). Here is where we may consider to develop such problems as “citizen science projects”, or incorporate citizen science projects already underway in other latitudes into our formative projects. In this approach the student may act as a “coach” in the community and the university teacher as the manager of the coach team distributed among many communities.

One important matter at this point is whether we may generate knowledge from CS activities. The production of knowledge is closely related to the ability to systematize practices, so we ask ourselves how to organize it in a way to produce, disseminate and popularize the knowledge produced. In our examples, the one from Science Faculty is a deductive process: a) defines a project umbrella; (b) define lines of action; (c) proposal of macro-projects; and (d) development and implementation of micro-projects in the communities, as may be appreciated in Figure 7. CS projects in Faculty of Sciences, UCV. On the other hand the Economics Faculty generates an inductive process, the organization is the result of the analysis and synthesis of micro-projects that students started from the initial periods of the LSCEES (September 2007), as may be appreciated in Figure 8. CS projects in Economics and Social Sciences Faculty, UCV

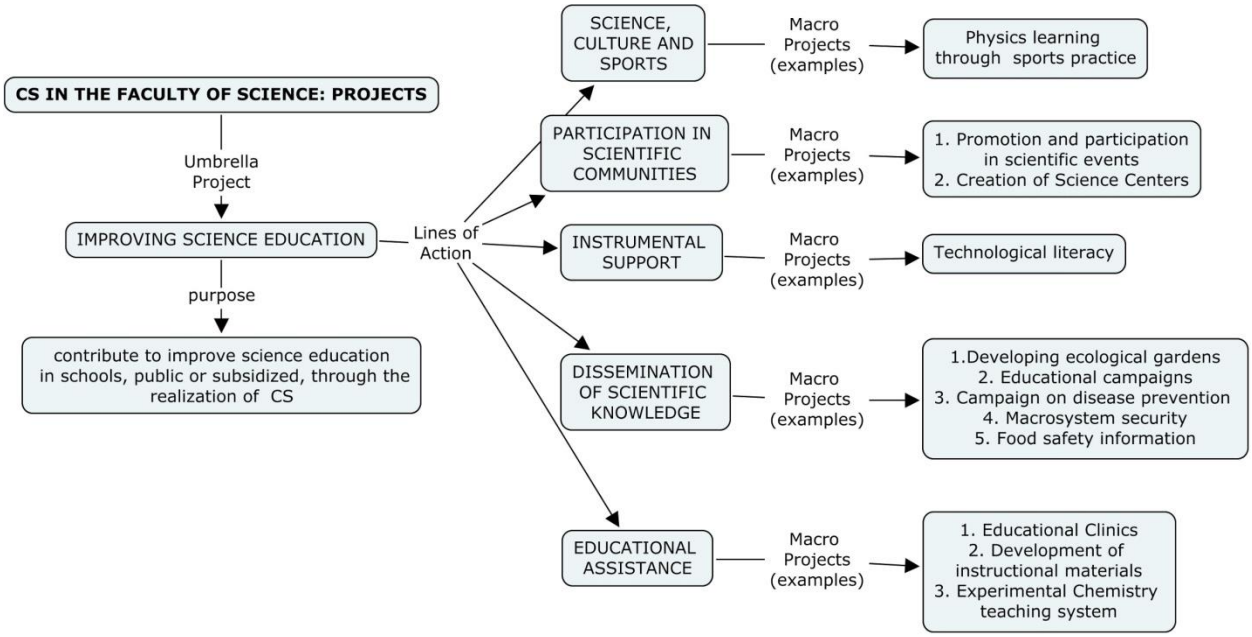

Figure 7. CS projects in Faculty of Sciences, UCV

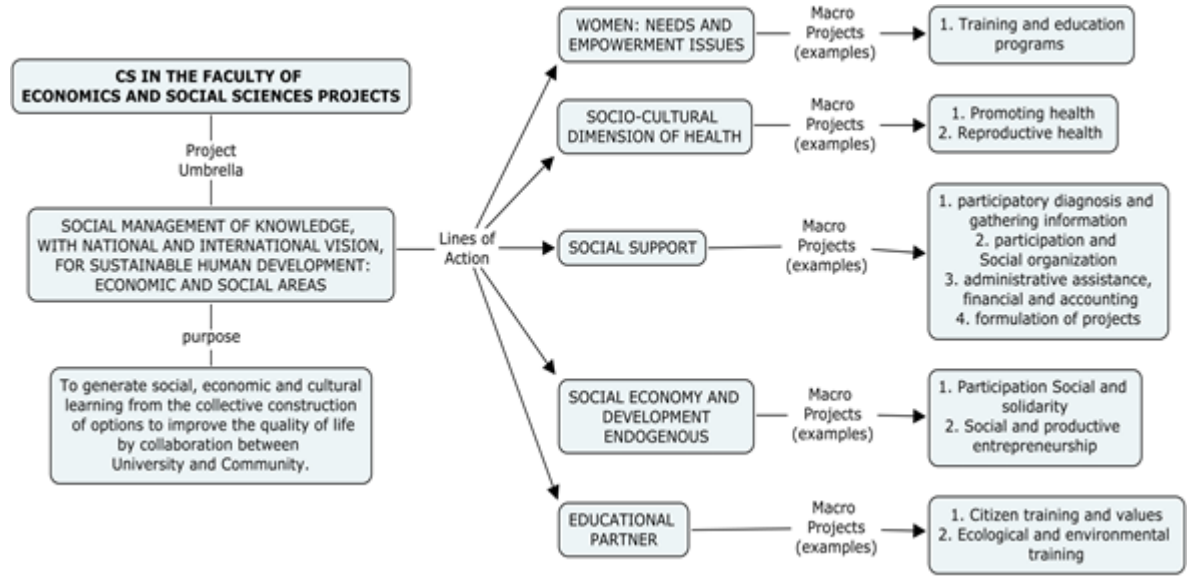

Figure 8. CS projects in Economics and Social Sciences Faculty, UCV

But this process may only be tackled with well motivated and prepared teachers, that is why we have been proposing MOOCs introducing Collaborative Research to graduate students which must look for, among other things, to a) develop capabilities for the generation of efficient collaborative teams, as are to be the ones between students and teachers that will work in communities, and b) develop capabilities to identify and study “real world” problems in communities, working together with the people that inhabit them (Ordóñez et al, in press).

The aim must be to provide "civic competencies" to both teachers and researchers in universities as well as to the university graduates, in order to initiate a process of generating a civic society capable, on the one side to interact efficiently with the institutions in position to generate public policies, and on the other, with the communities in need of acquiring knowledge about their problems and the way of going through the decision-taking mechanisms to generate the public policies that might help to solve those problems. As may be appreciated in Figure 10. University Social Responsibility and the generation and mobilization of Knowledge with the communities

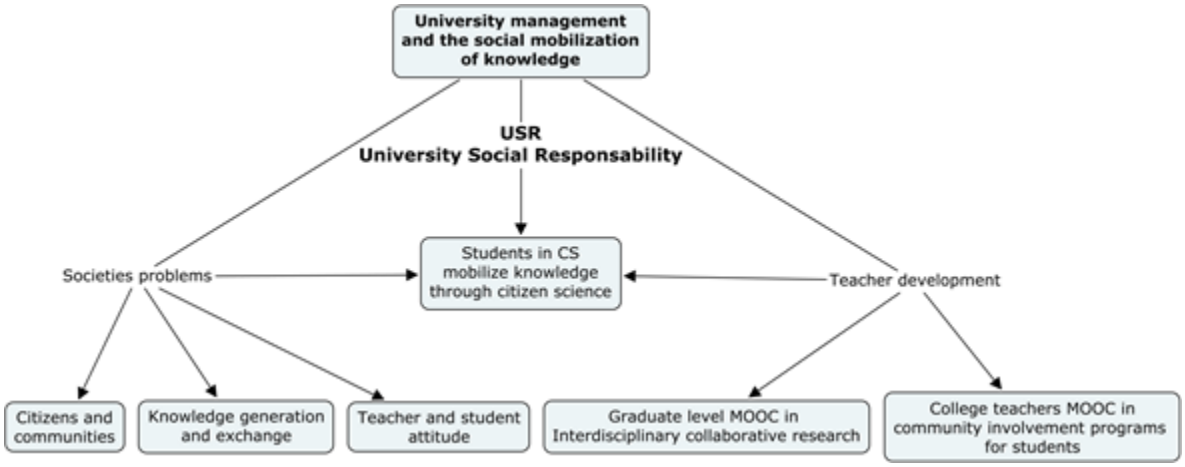

Figure 9. University Social Responsibility and the generation and mobilization of Knowledge with the communities

Perhaps the "driving force" at this point should be to generate "capacity building" among the university teams. *The contemporary view of capacity-building goes beyond the conventional perception of training. The central concerns of environmental management and community building – to manage change, to resolve conflict, to manage institutional pluralism, to enhance coordination, to foster communication, and to ensure that data and information are shared – require a broad and holistic view of capacity developmen*t. This definition covers both institutional and community-based capacity-building. http://learningforsustainability.net/capacity-building-empowerment/

As may be appreciated from the preceding paragraphs, perhaps a way to help introduce these development is the traditional university is by means of interrelating science with citizenship education as put forward by Davies (2004), Figure 11. The overlapping of Science and Citizenship Education

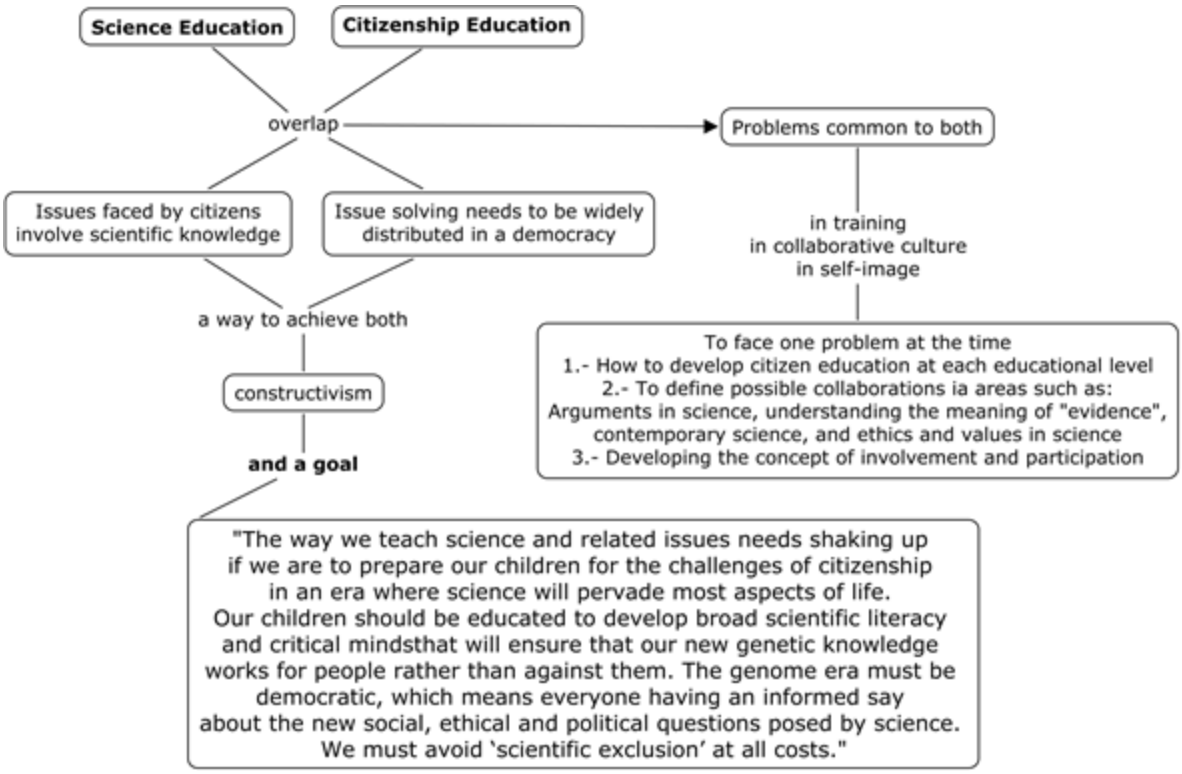

Figure 10. The overlapping of Science and Citizenship Education

A very big task, which involves the whole of society, and one which obliges us to now turn our attention to the political systems and the politicians in our part of the world.

Interacting with politicians and political institutions

...the discourse of Evidence-Based Policy (EBP) offers poor guidance to those who seek to ensure that social policy making is informed by the findings of social science. EBP discourse relies on a technocratic, linear understanding of the policy making process and on a naïve empiricist understanding of the role of evidence. This renders it unable to engage with the role of the underlying discursive frameworks and paradigms that render evidence meaningful and invest it with consequence: EBP discourse does not help u understand either how policy changes, or what is at stake in dialogue across the 'research-policy divide'.
Andries du Toit. (2012)

Much like in an impressionist painting, we are concluding this overview of the problems encountered when attempting to introduce citizen research in Latin America communities, with their own culture, underdeveloped areas, and its main participants: citizens, communities and researchers. We must turn now our attention to the political system, mainly represented by Parliaments and political parties,

Researchers must be able to interact with them so they would be a part of them, and in this way, get community support, as they alone do not decide by themselves but are dependent upon community leaders, bound to decision makers and also critical in the subtle interplay of power relations in our part of the world. We must not forget that from the beginning of our formation as independent states, as indicated by Cesarini and Hite (Bermeo, 2004) when concluding the book "Authoritarian legacies and democracy in Latin America and Southern Europe": *The range of legacies examined here is quite vast, including the discursive frames of the postcolonial period that continue to affect today's political dynamics in Latin America's democracies;* ***the severed bond of trust*** *between the state and its citizens; the traumatic past of human rights violations and its associated impunity; the economic policies, institutions and networks of interest representation left by dictators; the style of policing inherited from authoritarianism; and the military's patterns of authoritarian domination* (bold type ours). It is within this complexity of political processes in Latin America and its impact on the civil society that we must consider how the communities are going to perceive any attempt to introduce citizen science in their environment. Understanding "the severed bond of trust between the state and its citizens" is critical, specifically, if we attempt to have any possibility of convincing the people of the fact the data obtained through this procedure is going to contribute to the communities well-being and act as a leverage for achieving a better society through better decision making. And, as may be expected, the relations between politicians, political parties and public opinion are not the same in our societies as they may be in advanced industrial democracies. (Dalton, 2013).

Culture, individual judgment and decision making are intermingled and impinge on the relations between the citizen, the public administration, the political parties and the politicians that permeate those instances (Weber & Hsee, 2000). Underdeveloped societies are not exempt from this reality, much more when distrust among citizens and politicians is rooted and therefore, must be taken into consideration since it might hamper incorporation of citizen science just for lack of trust in the possibility of those efforts to change things, much more since the regular historical practice has been leading in, too many occasions, to what we depicted in Figure 11, Dunn's phases of policy making: the "plunging in" short circuit, which is nothing but the decision makers choosing public policies to solve"problematic sensations" based upon their previous experiences, prejudices and stereotypes and not on solid evidence-based analysis.

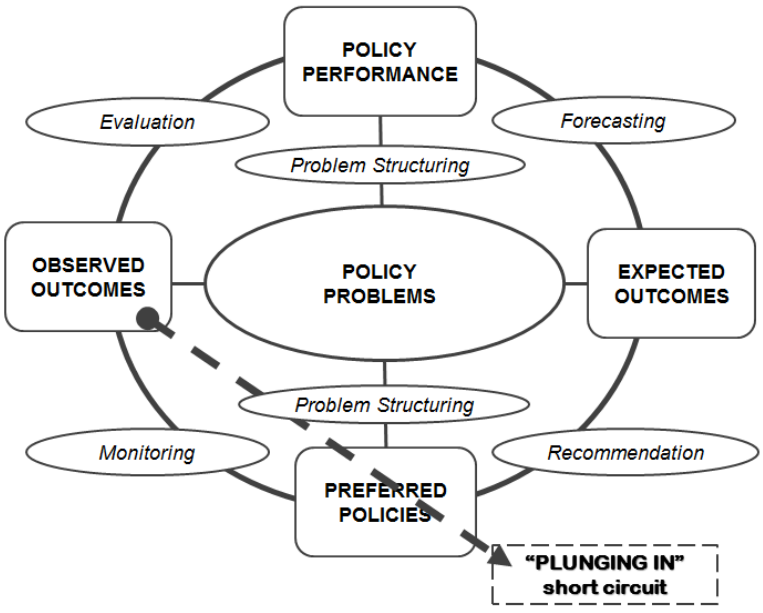

Figure 11. Dunn's phases of policy making: the "plunging in" short circuit (after Russo, Schomaker & Russo, 1990)

The situation is very similar to the one found in the problem of trust in police, since politicians, like police, are not part of the community but somehow represent "the power": *Police reform is widely undertaken in developing and post-authoritarian countries. The starting point for analysis of this phenomenon, it is suggested, is the absence of public trust in police that characterizes police-community relations in these countries. Without public trust in police, 'policing by consent' is difficult or impossible and public safety suffers. The nature of trust is examined in general terms and related to the problem of trust in governance. Then, the problematic nature of trust of the police is considered; structural features as well as performance aspects are invoked to explain distrust of police. In the penultimate section, the question of how to build trustworthy police forces is examined in the light of what has been learnt about the difficulties of maintaining or establishing trust in police. Process as well as substantive improvements each play a role here. In addition to building trust, ways of institutionalizing distrust are needed. The article concludes by pointing to some inherent limits or constraints upon trust-building, including the impact of the wider environment in which policing occurs, and the need to trust the tools we use for building trust. (*Goldsmith, 2005). In a similar way *enhanced collaboration and partnership among governance and public administration agencies, citizens, and other social players such as the media, academia, and the private and third sectors… despite the fact that citizens are formal "owners" of the state, ownership will remain a symbolic banner for the governance and public administration–citizen relationship in a representative democracy. The alternative interaction of movement between responsiveness and collaboration is more realistic for the years ahead.* (Vigoda, 2002).

The main point to be considered here, by the research team interested in introducing citizen science in a given community, is to have clear conscience of its role as gatekeepers between the research team (students, field workers and so on), the communities and the local, regional or national authorities involved in one way or another in the accomplishment of the project objectives. Furthermore, if citizen science is going to have a positive impact among decision makers, proper consideration must be paid to intervention of the media, and therefore, it may be advisable to incorporate journalistic know-how in the coordination team. The research team may be well advised to perceive itself as a negotiating team and implement a shared strategy when negotiating with all the involved actors.All these elements are considered in Figure 12, Topics to be considered in public policies, political parties and citizen participation when considering to introduce citizen research in a given community.

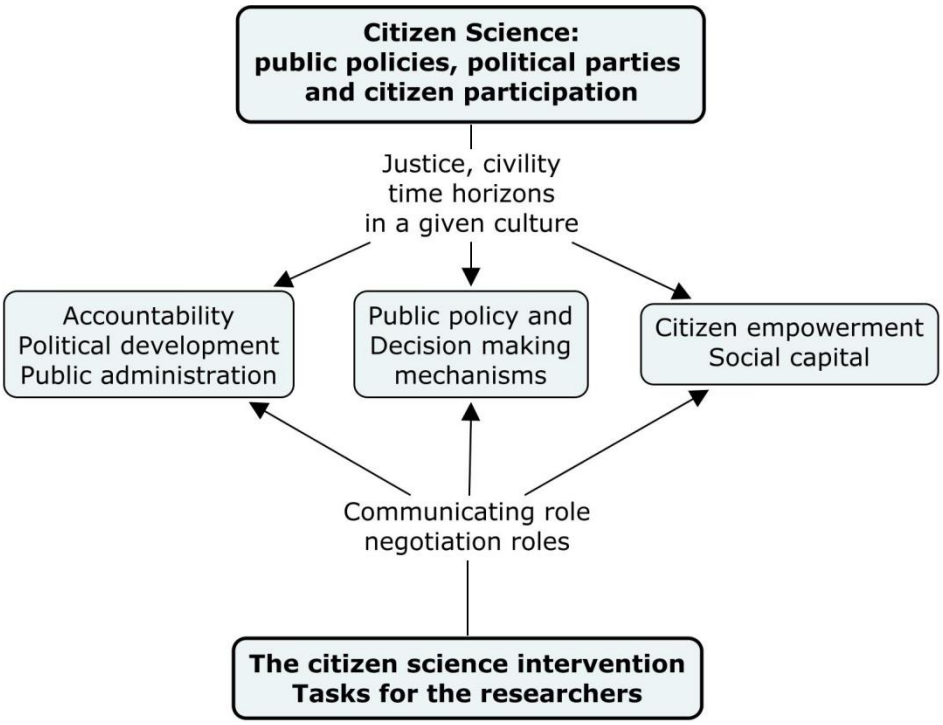

Figure 12. Topics to be considered in public policies, political parties and citizen participation

What is the desirable outcome for the citizen science intervention? As the figure on the different approaches to research shows (Figure 2) there are many possibilities to socialize the results of research once the data has been obtained and processed. In citizen science we do not want the results to be exclusively published in research journals, since this approach does not help to build citizenship as we envision it, or motivate further collaboration from the citizens involved, what we would rather like is to encounter an array of uses of the results as may be seen in the mentioned figure, sort of "Doing something about the results" and "Disseminating the results to other environments", through a combination of publication, sharing to other communities, media involvement, so that citizens and decision makers come to know about the problem, the findings, and the possibilities opened by the knowledge generated. Information of the public is needed to approve the public policies needed to "fix" the problematic situation being studied. Perhaps the emphasis to our region at this point in time, as stated in the previous paragraph, should be to get media collaboration in order to introduce citizen research to the people and to the political community simultaneously, even though, another problem is to overcome the hurdles outlined by Habermas (2006): *2 critical conditions: mediated political communication in the public sphere can facilitate deliberative legitimation processes in complex societies only if a self-regulating media system gains independence from its social environments and if anonymous audiences grant a feedback between an informed elite discourse and a responsive civil society*. We may not guarantee that both of these conditions are present in today's Latin America. But whatever citizen science process is to be undertaken must consider it. Scientific journalism initiatives may be a good ally in these processes.

SOLUTIONS AND RECOMMENDATIONS

In their Guide for transboundary research partnerships (Stöcli et al, 2012) the Swiss Academy of Sciences mentions 11 principles that may help to guide researchers considering or planning to engage in fair and equal partnership:
1.- Set the Agenda together
2.- Interact with stakeholders
3.- Clarify responsibilities
4.- Account to beneficiaries
5.- Promote mutual learning
6.- Enhance capacities
7.- Share data and networks
8.- Disseminate results
9.- Pool profits and merits
10.- Apply results
11.- Secure outcomes

Within that background the Swiss Academy goes further to mention other actors that have to be involved, or links and bridges established with: The scientific communities active in the field of the research; the agencies commissioning the research and/or using the results; the users and beneficiaries of the research outcomes; and the general public interested in the field of the research.

It is obvious to us that, from the point of view of the research community in the developing area where Citizen Science initiatives are going to be implemented, the responsibilities are even larger than those addressed by the Swiss Academy since there is ethical need to contribute to solve the social question of the communities involved, due to the ***social innovation potential*** of citizen science. But citizen science in not a panacea, if we define social question as *the breach (main component of capitalist social order) between the legal order (all citizens are equal under law) and the inequalities of existence (poverty, unemployment, hunger)* (Aguilar, 2010), we must conclude that the impact for native research teams involved in citizen science in Latin America must be analyzed beyond the data acquired for a particular research purpose, but by its contribution to answer the social question, and these has to be considered before the research is implemented in any particular setting, and their consequences evaluated *ex post*.

Although it might be expected that the original research team, if based in a developed country, should take into consideration many of the aspects referred to in this chapter, truth is that the main responsibility falls in the research-academic systems of the developing region. Furthermore, all analysis must, of necessity, consider that ultimately in our culture the problem has to do with the generation, management and transfer of knowledge between University and society. In our authoritarian and traditionalist academic environments, as well as in the decision-makers, it is not proper to recognize that something is not known (and if accepted, it is on the base that the matter does not correspond to "important issues"), all of which makes the process of recognizing problems, finding information about them, advancing explanatory hypotheses that allow for exploration of solutions and... accept the errors that they detect in the subsequent monitoring and evaluation of interventions in order to try to correct them in subsequent approaches, in that perennial search for the best solutions to the problems facing us at all levels, but mainly on the social level.

"...virtually all human learning occurs in a culturally influenced, if not culturally created environment."