Education and Scientific Culture: The Contribution from National Science, Technology and Innovation Weeks[1]

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Abstract

One of the most successful and widespread scientific popularization policies in the world is the national science and technology week. Since the 80s, they are organized with the intention of democratize knowledge and improve education and scientific culture of the public, especially children and youth. Called "Day of Science" Coffee with Science "," Science Fair "," Party of Science "and" National Weeks of CT & I ", these events intend also to encourage young people to develop interest in technical and scientific careers. The event weeks rely largely on government funding, with further help from private companies. This article provides an overview of the international initiatives weeks from CT & I, emphasizing the National Week of Science and Technology of Brazil, started in 2004, focusing on direct observation of activities in SNCT-2012, "Green Economy, Sustainability and Eradication poverty ", in São Paulo. The methodology of the study is descriptive, the nature exploratory and qualitative. The results present the cultural differences in the performance of these weeks in each country and its features. In the specific case of Brazil, emphasize the importance of the Week for the formation of scientific culture in non-formal education spaces, their growth (1.848 activities in 252

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municipalities in 2004, increasing to 28.148 activities in 722 municipalities in 2012). On the other hand, it also brings to surface important structure and organization problems.

Key Words: Communication, Science, Education, Public Politics of CT&I, International weeks of CT&I and SNCT in Brazil.

Introduction

The importance of Science, Technology and Innovation (CT&I) in the political, economic and global cultural development, its increasing production and social impacts beyond its inclusiveness, has mobilized leaders from different countries to improve the scientific culture of the general population.

One of the strategies that has been adopted by different countries to become the science popular is the creation of a National Week of Science and Technology (SNCT) or Science Fairs. The goal is common in different countries: generate interest in CT&I and improve public understanding of the area. This article provides a brief historical overview of these international events, with its multiple formats.

On the international scenery, we can see that are different formats and models. Their methods of disclosure on the Internet offer little information to the detriment of a more comprehensive understanding of the trajectory of each Week. The activities are adapted to the socio-cultural, geographical context and the needs of each audience. The length of Weeks and the dates of their fulfillment are also flexible. In Brazil, the schedule is set in October of each year. The Weeks depend on government and private company resources. Some of them are already performed annually for at least for two decades.

The activities are organized by ONGs, universities, schools, government agencies and research institutes, with the autonomy to choose the dates and formats. In Brazil, there is a national coordination, carried out by the Department of Popularization and Propagation of C&T from MCTI. According to the European Science Events Association (Eusea)[2], the number of European countries that holds events to promote public understanding of science is great. The site reports that there are 95 registered[3] members.

[2] http://www.eusea.info/ accessed in 16/5/2013, at 17:03

[3] http://www.eusea.info/Members, accessed in 16/5/2013, at 17:18

Other European countries and cities that also have a Week of Science and Technology (science festival) are: New York (USA), Australia, Paris (France); Poland, Bern (Switzerland), Gothenburg (Sweden); Canada; Edinburgh (Scotland), Norway, Luxembourg, Dublin (Ireland), Madrid (Spain), Spain, Ireland, Belgium, Genoa, Italy and Czech Republic. The activities are mostly free. However, the activities records show the sites are precarious.

Methodology

This is a monographic descriptive and exploratory research. This is about a Multiple Case Study (Yin, 1989), qualitative nature. In a complimentary way, the quantitative feature was used to evaluate the path of Weeks.

The countries were selected intentionally, based on ease of access and availability of information: France, United Kingdom (inspirations for Brazilian), Portugal, USA, Canada, Mexico, Peru, Colombia, Argentina, Chile and Brazil.

Data were collected from Internet research seeking the keywords "National Week of Science and Technology", in Portuguese, Spanish and English language. It is, therefore, a sample of how to contextualize the Portuguese, Spanish, English and French speaking countries, created the Weeks, their conceptions and achievements, based on the analysis of the information available in the official charts of events. In Brazil, the focus of the research was the direct observation of activities held in São Paulo in 2012 and in-depth interviews with national and regional coordinator.

Scientific Culture: The importance of science communication for the formation of a scientific culture in society has been advocated by scientists, journalists, researchers and by the government itself. There is a movement to democratize knowledge and speed up access of science to the general public, through various actions. One of them is scientific communication in the formation of a scientific culture (Vogt, 2003).

The scientific disclosure should act in harmony with education and culture so that scientific knowledge can be suitable by the population. There are several ways to promote science to the lay public: arts (cinema, theater, comics, music, poetry, literature, exhibitions, games); museums and science centers, media (TV, radio, magazines, newspapers and internet).

The function of science propagation, according to Bueno (2010:5), is to "democratize access to scientific knowledge." Therefore, it is considered that the disclosure is an early stage to achieve a satisfactory scientific culture. Caldas (2010:33) believes that "almost everything that happens in society is influenced by C&T". According to her, "it is necessary that scientific speech is widely understood by the public, so they can make decisions from multiple information, considering the positives and negatives of every situation."

Moreover, it is noticeable an improvement in the coverage of CT&I, from the increasing specialization of professionals and collaboration of scientists, science is yet disclosed, and frequently in a positive way. The propagation of science covers more production results without discussing their processes, interests, risks, frauds and social impacts.

Therefore, is necessary not only to educate, as well to mobilize society, increasing the interest of the population for scientific and technological knowledge. Only could be possible to understand the role of science and technology and its advances, as well as participate in decision-making processes, in a critical and analytical perspective.

The coordination of the Portuguese Week is the responsibility of the As Barros (2005:117) explains, "the propagation of science today takes a political role more extensive, because only from the awareness of society will be possible to think of other models that are not guided by the ideas of progress and development".

Results

The International Weeks

National Week events of Science and Technology, Science Fairs, Science Museums are essential to mobilize society and awaken public interest in the area. Thereby, knowing what different countries are doing is essential and the reason of this article. Below is a summary of those activities that usually happen in science centers, museums, universities, libraries and research institutions.

Portugal: In Portugal, the regular activities of science communication have gone through different stages. Portugal has implemented three distinct phases to solidify its public policy science communication with activities like the Week C&T. It is from 1997, a decade after the beginning attempts to popularize science in the country, that Portugal structure an effective public policy on science propagation through a National C&T Week.

National Agency for Scientific and Technological Culture, also called Live Science, established in July 1996[4]. Since then, 17 editions of the Week (1997-2013), which always happens in November when we celebrate the National Day of Scientific Culture.

France: A Fête de La Science is an annual festival of science organized by the Ministry of Higher Education and Research of France and happens in October. They perform workshops, exhibitions, conferences, debates, open research lab, parties, rallies, games, shows and movies.

It was established in 1991 by the then Researcher Minister Hubert Curien, in celebration to ten years of the existence of the Ministry. Due to the success of the public, the following year, the event lasted three days, with the participation of 540 thousand visitors. Since 1995, it takes place in October and since 1998 was brought to public schools. The theme of 2013 was "From the infinitely large to the infinitely small."

United Kingdom: The Week of Science and British Engineering (NSEW), "National Science & Engineering Week", it is held in March and carried out under the responsibility of the British Science Association. It began to be organized in 1994, completing in 2014 two decades. This is a national ten days program of events related to science, engineering and technology. The British Science Association helps organizers in planning and support resources. In addition to the outreach activities also promotes activities, competitions, tests and online experiences. One of the main activities of British Week is The Big Bang Fair, with theater performances and exhibition companies.

[4] http://www.cienciaviva.pt/cienciaviva/, accessed in 16/5/2013

In 2013, the theme "Invention and Discovery" had 4.061 activities organized by 2.423 institutions. It was estimated that 1.6 million people attended the NSEW through public events, private activities and national projects. These activities, 79% occurred that, in all the schools, 88% did not receive funding whatsoever. Approximately 67% of participants from the NSEW attended the event for the first time. About 50% of participants said they learned a lot, 40% and learned a little, and only 6% claimed to have learned less than that. Furthermore, 97% of respondents intend to participate again.

EUA: In the United States, between the years 1985 to 1999, the National Science Foundation (NSF) organized similar activities, with the Brazilian format. For one week, students, teachers, parents, scientists and engineers were engaged in public communication of science.

The country went through a lapse of events of this format, and in 2009, the Science Festival Alliance (SFA)[5] has been gathering information from many independent science festivals in the U.S. In 2010, the SFA suggested the organizers worked in a partnership project. Today there are projects funded until 2015. A two-year project (2012-2014) was funding by Alfred P. Sloan Foundation and other of three-years (2012-2015), was financed with funds from NSF, being both organized by the Museum MIT (Massachusetts Institute of Technology).

Canada: in Canada, the Week began in 2008. It is organized by the Canada Science and Technology Museums Corporation, and happens in October. Has a website for the dissemination of activities, but with little information. The 2012 figures, indicate a still shy public participation: 84.017 participants, 249 events around the country, accounting for 752 activities (similar to the number of the state of São Paulo in SNCT 2012) and 253 partners. In 2013, public participation was lower, although the number of activities had increased 77,200 participants, 261 events and 953 atividades[6].

[5] http://sciencefestivals.org/partner, accessed in 30/12/2013, at 20:03
[6] http://www.science.gc.ca/default.asp?lang=en&n=70F5D90C-1, accessed in 4/3/2014

México: In Mexico, the Week of Science and Technology (SNCyT) celebrated its 20th anniversary in 2013. Organized by the National Council for Science and Technology. It was created in 1994 from an initiative of the American Alliance, for Public Understanding of Science and Technology, and is held in partnership with the National Science Foundation from USA (NSF), the Ministry of Industry Canada and the National Council for Science and Technology (CONACYT) of Mexico. In 1995, the National Commission for Scientific and Technological Research (CONICYT) of Chile joined this cooperative effort. (CONACYT, 2013[7])

The SNCyT have a website directed to children[8]. However, the information is succinct: do not show the activities that are part of the Week schedule and photo gallery has few images. On the other hand, the section of the site, which contains the reports that came out in the media about the SNCyT, the texts are dense, with in depth information about propagation of scientific area.

Argentina: Organized by the Ministry of Science, Technology and Productive Innovation, Argentina's Week has existed since 2003. The Week has its own logo. The Argentina`s Week site Week has little information, and is possible to observe a significant increase in the number of participants. Moreover, 2003 began with just 4.500 participants and grew until 2008, when reached the pinnacle of 140.000 attendees. In 2009, there was the first fall in the number of participants (73.000), with new growth in 2010 (92.098) and 2011 (101.184). No recent data of the Weeks are available on the site.

Chile: The National Week of Science and Technology of Chile[9] was created in 1995. The National Commission program of Scientific Investigation and Technologic (CONICYT) called Explora. Non-Formal National Program of Education in Science and Technology.

Among many free activities of the program are lectures, exhibits, science cafes, tours, contests painting, photography, competitions and visits to historical sites. The 2013 happened in October and brought together over 400 thousand people.

[7] http://www.conacyt.gob.mx/comunicacion/Paginas/SemanaNacCyT.aspx, accessed in 27/5/201321
[8] http://www.conacyt.gob.mx/comunicacion/Paginas/SemanaNacCyT.aspx, accessed in 27/5/2013
[9] http://www.explora.cl/index.php?option=com_content&view=category&layout=blog&id=515&Itemid=1656, accessed in 30/12/2013

Peru: Peru has one of the newest National Weeks of C&T in Latin America. It was instituted in 2006, but its first release only happened in 2011. Also called Peru with Science[10], created to promote the scientific and technological activities of the research institutes among the academic community besides the general public. Therefore, is also consisted of several research projects exhibition, experiments and innovations, showing the scientific advancement of the country. Always happen in November, with the organization of the National Council of Science, Technology and Innovation of Peru (CONCYTEC). Also receives support from the municipal government of its capital Lima. The second edition of the Peruvian Week, in 2012, brought together activities like XXII. National School Science & Technology Fair (FENCYT). It was co-organized with the participation of the Ministry of Education, besides the National Exhibition of Innovation and Technological Research Higher Technological Education, Technical Production and a fair also organized by the Ministry of Education.

In 2013 edition, four activities happen in parallel to the Week: the Expocit 2013, a fair that featured the designs of CT&I from universities, and research institutes. The International Fair of Postgraduate, for disclosure of masters and doctoral is mainly for technical and scientific careers. The Journey to university Students, which aims to promote research in Peruvian graduate universities, and the Science and Technology Forum for the government city, which discussed themes as Natural Disaster, Management of Environment and Water, and Public Health and Nutrition.

Colombia: The National Week of Science, Technology and Innovation of Colombia is the responsibility of the Administrative Department of Science, Technology and Innovation (Colciencias). This Department promotes public policies for C&T in the country. One of the programs considered strategic by the government for social appropriation of scientific knowledge is the Week of CT & I.

The first week of the Science, Technology and Innovation happened in Colombia in 2006 and, unlike most countries, takes place every two years between the months from October to November, simultaneously throughout the national territory. Its activities are

[10] http://www.concytec.gob.pe/semanacti2013/presentacion.html, accessed in 4/3/2014

carried out in different places such as museums and science centers, planetariums, zoos, cafes and restaurants, institutes, universities, libraries, companies and trade centers, shopping malls, cinemas, hospitals, clinics, public squares and parks.

In the first edition of the Colombian Week 106 municipalities participated in 900 activities. In the second edition, in 2008, 120 cities with 1.100 activities. In 2010 the third, 1.483 activities (the website does not show you how many municipalities). The page with statistics of the Week does not work. There isn´t information on other pages regarding the participation of the public in the 2012 event, which the chosen central theme was Water.

Brazil, a decade of SNCT: Although much younger than several other similar initiatives in Europe, United States and Latin America, the National Week of Science and Technology, is completing in 2014 a decade of existence, it has grown each year and is one of the main strategies of scientific popularization from the government.

The thematic worked over the years were generally associated with international debates or important dates for Brazilian science. Evaluations of the results of the Brazilian Week show increasing trend in the number of activities in municipalities and institutions, as follows:

Table 1: Evolution of SNCT in Brazil

Year	Theme of the Week	Activities	Municipalities	Institutions
2004	Brazil look to the sky	1.848	252	257*
2005	Brazillook to the water	6.701	332	844*
2006	Criativity and inovation	8.654	+/- 400	1014**
2007	Earth!	9.048	357	672
2008	Evolution & Diversity	10.859	445	755
2009	Science in Brazil	24.970	472	716
2010	Science for Development of Sustainability	13.945	397	739
2011	Climate Changes, Natural Disasters and Risks	16.110	654	833

	Prevention			
2012	Green Economy, Sustainability and Eradication of Poverty	28.148	722	911
2013	Science, Health and Sport	33.555	739	1062

Source: GARROTI, 2013. Data taken from official sites from MCTI, Brazil (2006 to 2013)

The Brazilian Week 2012, "Green Economy, Sustainability and Poverty Eradication", added 28.148 activities in 722 cities and 911 organizing institutions across the country. The state of São Paulo has an important role on the national stage of scientific and technological production, as well as in science communication activities. In 2012 was recorded, according to the official website of the week, 741 atividades[11], 2.63% of the total activity of the country.

Although the state has 645[12] counties, the *paulista* capital concentrated most activities, 329 or 43.57% of the activities of the state. If on one side this reality reflects the strength of the capital, on the other side shows a lack of participation from other municipalities.

The knowledge areas with the greatest number of activities in the city of São Paulo were Astronomy, Biology, Entrepreneurship and Technology, Physics, Mathematics, Chemistry, Geophysics, Geology, Meteorology & Technology. Therefore, it is apparent the absence of the Humanities Science, which had just a few lectures, thus reinforcing the stereotype that science is present mainly in the areas of Physical and Biological. The arts were also poorly represented. The most represented sector was Technology and Innovation with Robotics.

Biology was present in almost half of the activities, overcoming Physics, Chemistry and Mathematics.

[11] http://semana.mct.gov.br/index.php/content/view/5938/Atividades_Cadastradas.html, accessed 3/6/2013
[12] http://www.saopaulo.sp.gov.br/conhecasp/principal_conheca accessed in 6/7/2013

Conclusion: Designed to stimulate interest in scientific and technological areas, as well as sparking new professional vocations, International Weeks of Science, Technology and Innovation has been consolidating every year. It is, therefore, a global movement for popularization of knowledge, begun in the mid-80s and strengthened between the late 90s and early 2000s. Integrate public policies for CT&I are largely financed by the government, depending on little support from the private sector.

The models and formats are multiples, they rely on volunteer work, and have infrastructure and organization problems, although, it is noticeable its evolution.

Moreover, the records of Weeks´ activities are still quite precarious, to the detriment of their own history. International recognition of the popularization of science activities must follow effective and systematic actions from different social groups, so the scientific culture can become in fact incorporated and appropriated by the public.

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