

# Island of Science Laboratory: Scientific Divulcation with Vector for Popularization of Science

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**Abstract**— *The Island of Science Laboratory on the Federal University of Maranhão (UFMA), located in the State of Maranhão, northeastern Brazil is an interactive laboratory of science and technology for training and scientific information, through differentiated, playful and active ways of learning, in which academic discourse and colloquial language are integrated, formal and informal teaching, becoming a permanent learning space of the general public - adult and children (school age or not) - as well as training teachers, training technicians and monitors for new science and cultural centers, developing instructional materials and equipment for science teaching and scientific divulgation, training high school, undergraduate and graduate students. Island of Science Laboratory contributes strongly to scientific education in northeastern Brazil, especially in the State of Maranhão, with expertise in undergraduate education, graduate and high school, focusing on university extension and technological applications. This work presents actions account of the Island of Science Laboratory, especially those performed to bring science and the general public together, with their participation as articulator of the Science and Technology National Week – SNCT to making them the largest event of popularization of science in the State of Maranhão, Brazil.*

**Keywords**— *Interactive Science, Science Teaching, Popularization of Science, Scientific Education, Developing of Instructional Materials.*

## I. INTRODUCTION

The popularization of Science is a multidisciplinary theme that involves different scientific conceptions: Science & Technology, History of Science, Natural Sciences, Health, Education, Media, Linguist, impact of language used in social networks, cultured norm, Applied Social Sciences (L. Massarani, I.C. Moreira (2003). In the latter its emphasis is in embryonic phase. We can then foster the activity of scientific divulgation as a complex activity in which scientific and technological knowledge is placed within the reach of the population so that it can use them in their daily activities and decision-making involving the family, the community or society as a whole.

It is noteworthy that in addition to involving different areas of knowledge we also identified in the Brazilian literature an evolution of terminologies such as: scientific divulgation, scientific divulgation, 'scientific vulgarization'<sup>1</sup>(L. Massarani and I.C. Moreira, 2002) and

more recently the popularization of science was identified even as a line of research (Scientific Divulgation) in National Research Council of Brazil CNPq..

Given the scope the popularization of science is a process of transmission of knowledge of Science and Technology in a language directed to a non-specialized audience. In this context, Leitão and Albagli (P. Leitão, S. Albagli (1997)) treats the popularization of science as a scientific diffusion distinguishing it from communication of science and technology. Thus "scientific divulgation refers to any and all process used for the communication of scientific and technological information". While "The Communication of Science and Technology means the communication of scientific and technological information, transcribed in specialized codes to a select audience formed by specialist".

Our work in the "Island of Science Laboratory" goes beyond the Diffusion and Scientific Communication defined by Albagli, because there we developed Science, Technology of high complexity, we made experiments

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resulting from undergraduate and graduate research, producing monographs and papers, forming high school, undergraduate and graduate professionals, the latter, in face-to-face form and EAD in different areas of knowledge studying Evolution of Teaching Methods, developing Teaching Projects, Research and Extension (Oliveira, A. J. S., A.M.Nélo, C.C. Costa). For this production we have the financing of the research agencies CAPES, CNPq, FAPEMA, BNB among others in the form of support to research and scholarships. In this aspect we are doing technological communication and promoting Education as a vector of Popularization of Science.

Considering the processes used to transmit scientific and technological information, that is, the popularization of Science is carried out through experiments that demonstrate the laws that govern the Universe, especially physics, in a playful and interactive way, making the junction of Theory and Practice. In addition, these experiments make up a permanent exhibition that is visited by Researchers, Professors, Graduate Students, Undergraduates, High school and elementary school students and the Society in general. These visits are received by Teachers, Qualified Monitors. On one occasion a Frenchman reflected and mentioned on a visit "it was by visiting science houses like this that he became a PhD".

Our main purpose is to stimulate young people to study science as well as mitigate the distance between Research Centers, the Scientist and society, demystify science, if we have a "Festival like Carnival" why not have a "Science Festival?!" In the laboratory we have done many actions to promote scientific popularization and itinerant education in the State of Maranhão. In the present work we will report the actions of the Ilha da Ciência Laboratory in the triennium 2010; 2011; 2012 especially those executed to bring science and the general public together, as their participation as articulator of the Science and Technology National Weeks – SNCT's of making them the largest event of popularization of Science in the State of Maranhão.

## II. HISTORICAL BACKGROUND

UFMA has been actively participating in the National Week of Science and Technology, sometimes as a co-executor (versions 2004 and 2005), another as director (2006 and 2007), promoting a series of lectures, seminars and interactive workshops in several cities of the State (A.J.S.Oliveira, J.A.S.Oliveira, 2009). From 2007 the SNCT in Maranhão had as one of its goals the interiorization of the Week, a fact that led to the opening of the event the city of Palmeirândia (2007) and the city of

Santa Inês (2008), located in the State Center. In these years we had as object to intensify the interiorization, mobilizing the largest number of campuses of UFMA, UEMA, IFMA and Agrotechnical Schools. In 2009, the object of SNCT was to strengthen the process of popularization of Science, Technology and Scientific Divulcation in the State of Maranhão, in a continuous process of joint construction and social inclusion. Thus, the debate between the different areas of knowledge and the access of the Maranhão population, primarily children and young people from high school and elementary school in the state network, who mostly do not have access to Science and Technology.

Our actions are based on the theme chosen by the MCTI to promote the debate of cohesive related themes both in the State in correspondence with the National theme. In 2010 the debate was on "Science for Sustainable Development". That year it was very peculiar because we held a forum to promote the debate of public policies and the holding of the "I State Conference of Science, Technology and Innovation in Maranhão with the theme "Inovar para a Desenvolvimento Sustentável – 2010", in Portuguese, which subsidized the proposal of the State of Maranhão for the 4th CNCTI.<sup>2</sup>

In April 2011, the researchers involved with the Popularization of Science promoted a workshop that the debate was very restricted to the city of São Luís and we should expand the debate on environmental and technological education to the State of Maranhão. Considering the size of this State raised the following question: how to overcome the gap mentioned heres, it was decided to launch the "Caravan of Integration of Science, Technology and Education" based on the cities where there were UFMA Campuses to have at least one support base, hence we held "Science Exhibition" scheduling meetings with Educators, Municipal managers aiming that each municipality takes science to the community, preferably to public squares aiming at society to know the potential of existing science, in addition, integrate other people, or scientists so to speak that they are not linked to any Research Institute, that is, "discover their treasures of science", including in this context, the maxim of the Clock Square of USP "in the Universe of Culture the center is everywhere".

In São Luís since 2010 we have been conducting the "Caravan of Voluntary Academic Extension of Science, Technology and Education". In this Caravan, the graduate monitors of public and private Graduate Education

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<sup>2</sup> CNCTI - National Conference on Science, Technology & Innovation.

Institutions trained to hold a workshop on popularization of science and invite them to spend a week living with laboratories in public squares and doing academic circuit visits. These actions justify sharing the experience of three years of work taking “science to where the people are” (Nélo).

Moreira and Massarani (2002) described the historical aspects of scientific divulgation in Brazil, in fact, they held almost a treaty from when Brazilian education was in the hands of the Jesuits until the end of the 20th century. They addressed participation in the way that science museums, periodicals, the importance of television radio including the risk of not turning scientific divulgation into scientific marketing. In this text they address the importance of science museums also gaining interactive form on a national basis.

F.F.S Aguiar (1993) addresses scientific divulgation by presenting the social contribution of the researcher: vices and resistances.

*The public image of the scientist is of considerable prestige, particularly in applied areas. People unrelated to the characteristics of academic and scientific experience think they are the intellectual novelties untouchable and sacred. The scientist remains popularly seen as an eccentric creature, reserved, bowed and provided with special powers. Their findings and findings may have great potential to arouse the curiosity and interest of the general community, but many experts ostensibly despise the possibility of making public their own works or works related to their areas of activity.*

In this sense (Oliveira, Nélo and Costa,2012) described the way that knowledge is usually passed on or scientific discoveries as belonging to “privileged minds” or “brilliant” theory dissociated from practice. We often add the specialty of an area or academic reductionism has reached such a way that sometimes understanding is restricted to the small group of scientists.

We do not oppose experts because we are or intend to discard or even devalue their role, more than scientific knowledge should not be restricted to academic boundaries or research institutes, but we advocate that this knowledge be passed on to society, carefully. When we are mentioning that we take science to the streets we lead in these caravans the specialists, our proposal is to make science a popular good.

Of course, this conception is not new is more common to the idea of communication between intellectuals, that is, congresses between experts more between experts and lay

people in science or attract/encourage young people to study science is the effort of a small portion of those who hold the power of knowledge.

According to Simone São Tiago (S.S. Tiago, 2010)

*In the context of scientific divulgation, teachers play a strategic role, such as educators, opinion makers, multipliers and mediators in the processes of knowledge construction. Education here is understood as processes that result in critical awareness of knowledge, causing changes in attitudes, interests and values. The role of education is to train the citizen able to make decisions and make well-informed choices about all aspects of life in society that affect him. This requires having access to information and also knowing how to process and resignify it, that is, training enabling an adequate appropriation of information.*

But all this effort of popularization of science or diffusion stems from a great effort of researchers has already had its declines as moreira and Massarani reports (2002) of these events many derive from the groups that integrate the Brazilian Society of For the Progress of Science [SBPC]. There are times when this movement expresses opposition to the forms of governments, other communication and popularization of science; the authors report that 1993 was created the young SBPC, more recently a similar initiative for the elderly. In 1998 UFMG, in Belo Horizonte after having organized one of the Meetings of SBPC began to have a great activity for children and young people.

In recent decades, interactive science museums have been increasing where it stimulates the knowledge of the methods of doing science as well as a science in a language in an interactive playful language and transmitted to laypeople, in this sense it is worth emphasizing that science demystify. This movement gains more strength in the State of Maranhão with the advent of the National Week of Science and Technology. In 2004 this event became law and entered the national agenda [SNCT]. For Ildeu de Castro Moreira, <sup>3</sup> this event should promote a greater interaction between science, culture and art, valuing the cultural and humanistic aspects of science; stimulating popular participation in the debate about the impacts resulting from C&T. (...) The activities will only succeed when they bring together HEIs, FAPs, Research Institutes,

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<sup>3</sup> Secretary of Popularization of the Ministry of Science and Technology, Brazil.



Government in all Brazilian regions, with the aim of disseminating and popularizing science and technology for society in general and, thus contributing to social inclusion (inin S.S Tiago, 2010).

In Maranhão, SNCT is becoming the largest event of Popularization of Science since its conception, but prior to this fact comes the works of scientific education by the “Island of Science Laboratory”, the same longed for the approach of Science with children and begins to develop projects such as "Scientist of Tomorrow" (1992), which had as proposal the Junior Physics Course, educational lecture and visits to different laboratories of UFMA.

In 1998, the space was created for permanent exhibition and a mechanical workshop was incorporated; glassware and refrigeration workshop, called at that time as the “Island of Science Laboratory”. Then he created some programs talking to the city he was conducting "Science Shows" and in the neighborhoods where there were drug problems invited expert professors to promote awareness of “No to Drugs” (A.J.S.Oliveira and J.A.S.Oliveira, 2009).

This interactive exhibition receives an average of 850 to 1,000 scheduled visits. In addition to the on-site work, we held Itinerant Science Exhibitions and aimed to promote educational actions of interactive playful science in a daily language in the State of Maranhão. This report somehow integrates the history of popularization of science in Brazil.

However, our purpose is limited to addressing the actions carried out in favor of education and "implementation" of science popularization policies in the last three years. For this purpose, we use as a hub for discussion "Science for Sustainable Development" - SNCT 2010; Climate Change, Natural Disasters and Risk Prevention - SNCT 2011; Green Economy, Sustainability and Poverty Eradication 2011. Our motto is National Week of Science and Technology for several reasons, first the suggested theme should promote the debate between educators and scientists and managers about problems involving the planet, for example measuring the pH of water in 2011. Furthermore, it is made available by the Ministry of Science, Technology & Innovation after it is fertile period in which several institutions are predisposed to form partnerships, in each of these years we carry out different actions and obtained significant results.



Fig.1 - Ph Measurement Map in several municipalities in Brazil. State of Maranhão (MA) located northeast (<http://ONIntsbq.org.br/agua/mapa.php>)

### III. METHODOLOGY OF THE ACTIONS OF THE POPULARIZATION OF SCIENCE

In 2010 we discussed and wrote public policies on science, Technology & Innovation for Social Development one of the axes of the 4th National C&T Conference, for this purpose, we do not carry out alone with the support of SECTEC 5 we request contributions from the Poles of São Luís (A), Imperatriz (B), Açailândia (C), Pinheiro (H), Barra do Corda (D), Caxias (E), Codó (G), Chapadinha (F).



Fig.2 - SECTEC Teaching Centers in Maranhão, Brazil

<sup>4</sup>Island of Science Laboratory - UFMA.

<sup>5</sup> Secretary of C&T of the State of Maranhão.

These poles as shown on the map represents a radius of approximately 2,096km, meaning that we were already discussing the policies for the sustainable development of the State of Maranhão and inviting the partner institutions to program the actions of SNCT. In April we made the wide popularization to the partner institutions and articulated with the seven UFMA Campuses to carry out the SNCT in their cities. Some testimonials are interesting to record "we have no computer program", that is, we do not have activities to hold C&T Week, we soon realized that the concept of SNCT had not been understood. After holding an on-siteworkshop, the 1st SNCT was held on that Campus/UFMA.

We invited undergraduate students to visit the schools to deliver material about SNCT properly identified in the schools of São Luís to realize that students had opportunities to conduct laboratory experiments, academic circuit visits, environmental lectures etc. Even though they were properly identified, they were barred, we did not even find the presence of those schools in the public square.

Already in 2011 we have evolved a lot, with the realization of the previous SNCT; the 1st State Conference of Science and Technology in 2010, we considered that the event was crystallized for the academic community in the City of São Luís, however the need to visit the schools doing workshop on Science on the Street persisted. Our challenge would be to make the event happen in the cities of the interior of the state. How to overcome this gap? it was decided to launch the "Caravan of Integration of Science, Technology and Education". Therefore, the SNCT/2011 is not restricted to the National agenda from October 17 to 23. Our main goal was to publicize and launch SNCT on UFMA<sup>6</sup>campuses and its surroundings.

The launch on campuses is not restricted to meetings with Directors, Teachers and Students, it was also invited the municipal managers, Mayor and Secretary of Education. In addition, promote science exhibition with itinerant laboratories of the São Luís Campus together with local laboratories promote environmental education, education and the importance of Science and Technology for sustainable development

Considering education as a fundamental vector for Maranhão to extinguish the rates of poverty, the SNCT represents a small stage that should represent a sequence of other stages of the education and training program of professionals in the State of Maranhão.

In 2011, the popularization of the Science and Technology Week with lectures and science shows reached a radius of 2,770/km in the State of Maranhão, events from the actions of the Coordinators of the "Island of Science Laboratory" - UFMA.

In 2012 we analyzed the activities carried out in the previous biennium and carried out the following records: the science exhibition was promoted with itinerant laboratories of the Campus/UFMA de São Luís together with the local laboratories promoted environmental education, education and the importance of Science and Technology for sustainable development. Considering education as a fundamental vector for Maranhão to abandon the rates of poverty, the SNCT represents a small step between a sequence of other stages of the education and training program of professionals in the State of Maranhão. The fact of visiting municipalities and their surroundings at the launch of SNCT resulted in a significant number of events.

#### IV. ANALYSIS OF THE RESULTS OF THE SNCT

One of the great achievements of the SNCT realization in the State of Maranhão was the Law that instituted the Science and Technology State Week of in our State by Governor Roseana Sarney Murad published in DOEMA on 16/03/2012 p. 07.

SNCT in Maranhão is growing significantly according to the illustration of the graphs below. The activities performed were illustrated and described through photographs, where we can observe the interaction between exhibitors, schools and the general public.

In the records contained in the MCTI website, Maranhão: in the Northeast ranking occupies the 1st place and in the national ranking 5th place, Figure 3. However, there is much to be developed since so far, we have only reached 30 municipalities and the state has 217. It means that partner institutions have to make efforts to bring "science to where the people are", the ranking represents symbolic information, but the main work still to be done: promoting education to eradicate poverty and achieving sustainable development.

<sup>6</sup>Campus I - St. Louis; Campus Empress II, Campus III Bacabal; Campus IV Codó; Campus V Pinheiro; Campus VI Chapadinha; Campus VII Saint Bernard and Campus VIII Grajaú.

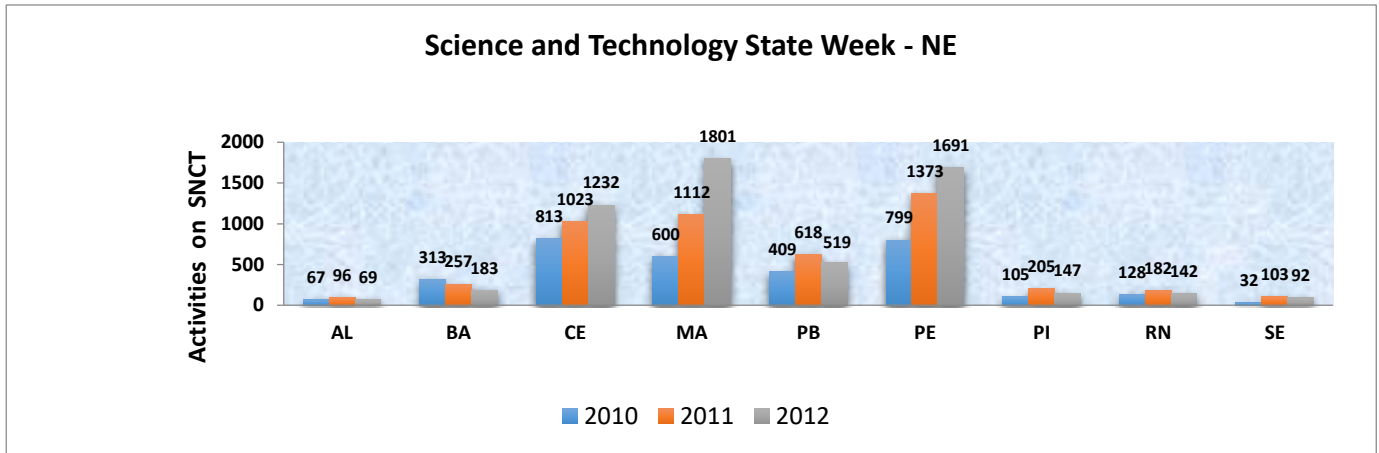


Fig.3–Number of activities at SNCT by State of the Northeast Region of Brazil

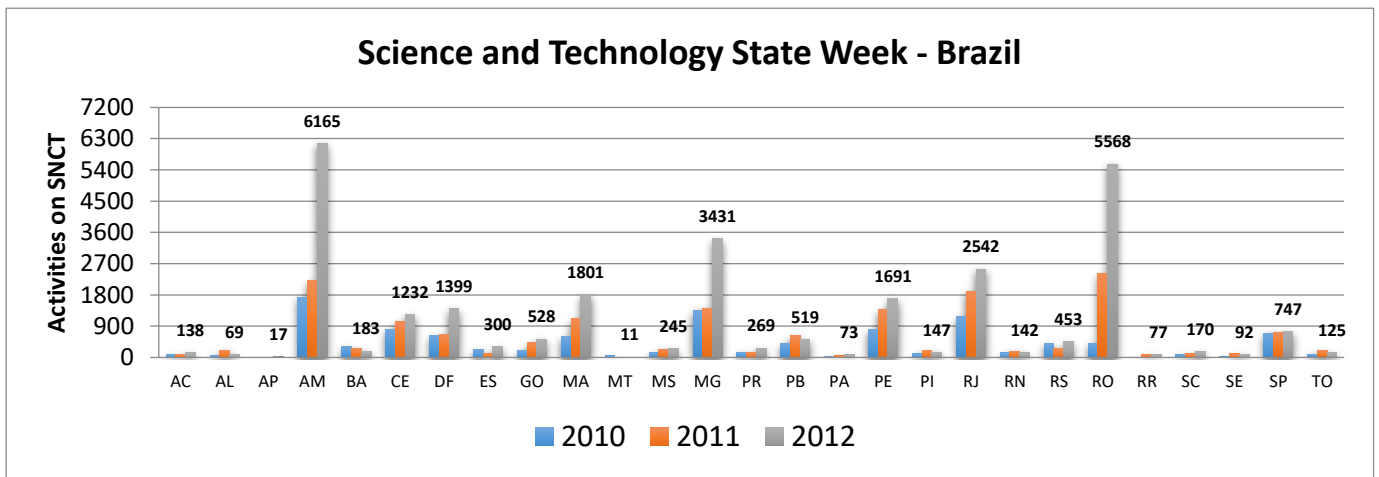


Fig.4 - Number of activities at SNCT in all Brazilian States

It can be stated that the 2012 SNCT exceeded our expectations reaching approximately 150,000 people directly and indirectly.

We cannot fail to note that the Science and Technology National Week of is the largest event of popularization of Science in the State of Maranhão according to the illustration of the graph that Figure 4.

## V. CONCLUSION

After these actions, a mobile science unit was incorporated into the Island of Science Laboratory to transport researchers and material for actions in the city of São Luís and in the interior, a mobile digital planetarium with capacidade for 40 people and various telescopes for astronomical observations. It was also obtained a space in the largest local newspaper "Jornal o Estado do Maranhão", with a circulation of 15,000 copies a day, for a Column of Science called Vida Ciência, *in portuguese*, and its publication always takes place in the last week of the month.

With these actions, scientific divulgation actions have grown considerably.

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