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Museum-school interactions: the importance of continuing education programs for teachers in municipalities away from urban centres

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Abstract. Due to a series of misconceptions about science, science centers and science museums have proposed projects to break the paradigm of science education focused on a small portion of the population. These centers and museums have developed strategies aimed at social inclusion in terms of their educational character, thereby investing in strategies to upgrade vocational education, among other actions. However, most of these areas are concentrated in large urban areas, preventing the participation of the poorest sectors of society. Thus, this study shows a report of a pilot teacher education program developed by the Espaço Ciência InterAtiva do IFRJ, a science museum located in a suburban area of Rio de Janeiro, showing that a scientific exhibition can contribute to the inclusion of teachers in these areas of informal education, and to their ongoing training.

Keywords. Training of teachers, social inclusion, science museums, education.

1 Introduction

For a significant portion of society, the idea of understanding science is something intangible, where only the "enlightened" with a capacity for abstraction can understand the knowledge inherent to this field of human knowledge, while others see it as something that is very boring and tedious and therefore have no interest in these subjects. In their work, Brody and Brody (1997, p. 16) reveal that:

> […] for many of us, just the memory of Physics, Chemistry and Biology lessons in secondary education and at university already makes our eyes glaze over. We left the classroom believing that science was practically […] incomprehensible to the average person.

Many feelings arising from preconceptions regarding science come from the way in which we were taught Physics, Chemistry and Biology during our schooling. The science courses commonly offered in basic education are, for the most part, geared towards providing information, and developing students' emotional potential. The cultural baggage coloring each student's spontaneous conceptions, as well as the experimental aspect of science, are not taken into consideration (Pereira, Chinelli and Coutinho-Silva; 2008).

Nevertheless, when we analyze the position of Brazilian teachers, it is well known that it is not only they who are responsible for this situation. Among other things, the factors which hinder teachers' methods include the following:

- The issue of wages has led teachers to work in several schools, and this makes it easy to adopt a repetitive teaching model, thereby also rendering their continuing education more difficult (Constantino, 2003).
- Lack of science laboratories at education institutions. According to the 2002 census carried out by the Ministry of Education's National Institute of Educational Research, only 20% of Brazilian state schools have laboratories, with the greatest percentage in the South-eastern region, with 27%, while the North-east accounts for just 5% (Brasil, 2003).
- A high number of pupils per class. This arises "chiefly from an attempt to reduce education costs, since

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teachers' salaries form the largest slice of these costs" (Brasil, 2003).

- Poor initial training of teachers. Although the education model has been influenced by different trends, we still have teacher training courses which emphasize the model based on conveying knowledge, where the pupil passively accepts information, without developing critical capacity. We are also faced with contradictions brought up by the teachers themselves between their teaching ideals and their practice in the classroom (Pinto and Viana, 2006).

Corroborating the problems teachers currently encounter, Moreira (2006, p. 3) sets out a general summary of science education in Brazil. Starting from the following statements:

> With regards to formal scientific education, the picture is bleak, with Brazilian students generally performing very poorly in subjects involving science and mathematics. Science education is, generally speaking, lacking in resources, discouraging and out-of-date. Curiosity, experimentation and creativity are generally not valued. Alongside the enormous shortage of science teachers, particularly well trained teachers, a major factor is the precarious working conditions which do not stimulate improvement. The serious shortages in laboratories, libraries, didactic material, digital inclusion and other things only make the situation even more difficult. Even though our secondary education has expanded rapidly over the last few years, even so only a very small slice of the Brazilian population completes this stage. The average educational level of Brazilians (under the age of eight) is very low when compared with developed countries and even with other Latin American countries. University education still attracts only a very small proportion of students (11% of the population), and almost all of them attend private universities. Just 1% of Brazilian youngsters seek careers in the fields of Science and Technology.

As a result of this problem which permeates the Brazilian education system, it is of the utmost importance to ensure the continual implementation of activities which facilitate up-to-date scientific debate, as well as actions which contribute towards multi-faceted thoughts within the school environment, thereby encouraging an improvement in education.

Therefore, it is only continual work providing teachers with knowledge which may have been disregarded or distorted during their initial training, and which contributes towards multi-faceted thoughts within the school environment, that can transform the current educational situation in Brazil (Jacobucci, 2006).

Some institutions are now investing in continuing education programs for teachers, including museums and science centres, as highlighted in this paper.

These informal educational spaces are favourite places to whet the appetite and promote interactions between people of different ages, socio-economic levels and beliefs (Jacobucci, 2006). They are therefore regarded as interesting hubs for developing continuing education programs for teachers, via training, empowerment, improvement or action-research groups (Hein, 2001).

However, we have observed that many teachers from regions which are far from the major urban centres are unaware of and/or do not take advantage of these spaces for informal education.

The present paper reports on the development of a pilot project for the continuing education of teachers and of a science museum near teachers from poor districts which are far away from the major urban centres in the State of Rio de Janeiro.

2 A brief summary of the inclusion of museums and science centers in society

Museums have become important places of learning and have had countless influences, arising from the historical and socio-cultural context of each era. According to Machado (1998) *apud* Quintela (2001):

> The first museums conceived and created by those in power in the past (collectors, great masters and sovereigns), were inspired by the idea of bringing together the greatest possible number of rare, strange, rich and memorable objects and works, and to display them in order to reaffirm their power. Created by the kings of France, for elite members of the nobility, the Louvre was the first institution designated as a museum.

In the Middle Ages, the Church assigned museums the role of receptacles for donations of ecclesiastical collections and paraphernalia belonging to princes and the wealthy families of the period. Access to these collections was very restricted, as they were only open to the nobility and clergy (Reis, 2004).

The first public museums began to emerge in the 17th and 18th centuries in Europe (Gaspar, 1993), and the first was called the Ashmolean (Gaspar, 1993). This was formed in 1683 as a museum intended mainly for university students. According to Gaspar (1993, p. 10), 1759 saw the opening of (1993, p. 10):

> A new public museum, the British Museum, which arose from the collection of Sir Hans Sloane, a naturalist and the court doctor, acquired by the British Parliament. During approximately the same era, other European monarchs started to allow the public limited access to their art collections.

This was the context in which the Cabinets of Curiosities arose, the ancestors of modern science museums. They were crammed full of objects from different areas of knowledge, such as: coins, fossils, scientific instruments and other items, all placed randomly. Nevertheless, they were select places, and visits were still restricted to noblemen, monks, poets, scholars and other such people (Reis, 2004).

In the mid-18th century, these collections started to be organized in a more structured manner, and natural history museums were ordered into a system during this period (Cazelli *et al.* 2002; Loureiro, 2003). It was an era in which, despite the "scientific renaissance", and consequently the

appearance of public museums and culture in general, access to art and to knowledge was still given only to the bourgeoisie and the upper classes, restricted to the small minority. According to Hobsbawn (1982, p. 151-157), the vast majority of Europeans and non-Europeans had no education: "0.5% of the Slavs in the south could read and/or write in 1827… Great Britain, France and Belgium had an illiterate population of around 40 to 50% in the 1840s".

Most people were on the fringes of the whole process of cultural and intellectual evolution. For them, science was magic. Some scientists would perform experiments in public squares and would end by reinforcing and legitimizing the image of the "man of science" capable of solving all the mysteries of nature, and among other things, enabling the betterment of Mankind (Dorea and Segurado, 2000).

At the end of the 19th and beginning of the 20th centuries, society formed part of a world of industrial technology (Mercadante, 1993); many museums were erected based on these technologies. They were the "new" science museums, whose specific nature was similar in Europe and the United States. However, their activities were limited to promoting industrial development, and the museums worked as showcases for industry (Padilla, 2002). As stated by Cazelli *et al.* (2002, p. 212), "passivity was key to the educational process… in museums, surrounded by historical objects encased in glass exposed in never-ending rows".

For society of the time, these spaces were still intended for the dominant class. According to Leon (1978, p. 51), "in the end, for the social strata which were less culturally developed, the cold and distant efforts did not satisfy any need… They were limited to their usual audience".

The Deutsches Museum was created in Germany in 1903, which was quite unlike any other museum. It is regarded as the precursor to contemporary science and technology museums, an innovation making use of interactions and seeking a new way of communicating with the public (Cazelli *et al.,* 2002). Later on, other science museums were structured with a view to introducing social discussion into the development of science and technology.

In the mid-20th Century, the museum was finally intended, at least officially, for the general public. Nevertheless, museums were still reserved in some way for scholars, since the language they used in publicizing their exhibitions was long-winded and unintelligible to the layman, even though they were open to the general public and were larger in terms of space (Reis, 2004).

We can see that the less privileged population remained scientifically illiterate during this period. Therefore, the concerns over ending the elitist image of traditional museums which began to be heard in the late 1960s in the United States and Canada[1], led to new models for science museums: centers for science or equivalent fields (Padilla, 2002), spaces where the emphasis was placed on the subject of scientific phenomena and knowledge. That generation was marked by education through fun, by interactivity, objectifying bringing science to all of society, as a strategy for shattering the intellectual, ideological and cultural monopoly which governed and tainted this information. As described by Padilla (2002, p. 115), since then:

> There has been an explosion of interactive museums and science centers, which are apparently becoming an important and excellent social resource for increasing the popularity of and disseminating science in many countries.

This tendency was also repeated in Brazil, where there arose science centers and museums with characteristics similar to the American model. The following informal education spaces were opened at the end of the 70s and during the 80s: Museu de Ciência e Tecnologia da Bahia (UNEB), inaugurated in 1979; Espaço Ciência Viva in Rio de Janeiro (independent–formed by researchers and educators, 1983); Museu de Astronomia e Ciências Afins, also in Rio de Janeiro (currently governed by the Ministry of Science and Technology, 1985); Centro de Difusão Científica e Cultural (USP/São Carlos, 1985); Estação Ciência (USP/São Paulo, 1985); and Museu Dinâmico de Ciências de Campinas (UNICAMP and Prefecture of Campinas, 1985) (Gruzman and Siqueira, 2007).

During the 1990s, actions aimed at popular science within the scope of culture and education were extended by dint of the presence of bills to ensure funding drawn up by different government agencies–at municipal, state and federal levels–which sought to support the emergence of museums in the fields of science and technology. Privately-funded organizations, such as Fundação Vitae, took part in this movement to promote scientific education in informal spaces (Gruzman and Siqueira, 2007). Within this context, we can see the integration of different informal education spaces aimed at investing in roadshows, where the first initiative arose based on the "Praça da Ciência Itinerante[2]" {science roadshow} project in Rio de Janeiro. During the aforementioned three decades, we have seen that the public and private agencies charged with funding these areas have very beneficially enabled the emergence and improvement of spaces for scientific education in Brazil, particularly in the State capitals.

3 General framework for popular science in Brazil

Over the last few decades, we have witnessed a significant expansion of actions aimed at disseminating science in Brazil: the creation of science centers and museums, greater newspaper coverage of science subjects, emergence of magazines, increasing publication of books, and events that arouse interest in diverse audiences throughout the country (Moreira, 2006).

[1] The first science centers in USA and Canada were born in 1969: the Exploratorium, in San Francisco, California, and the Ontario Science Centre, in Toronto, Canada.

[2] Project headed up by the Cecierj in partnership with other science education institutions (Espaço Ciência Viva, Museus de Astronomia e Ciências Afim, Espaço UFF de Ciências, Escola de Belas Artes–EBA/UFRJ), education and research, which commenced operation in the 1990s.

However, when we analyze the role of science centers and museums in Brazilian society, we can see that although one of the goals of science museums is to increase the popularity of science within society, a significant number of people are unaware that the museums exist. This was shown by Pereira, Chinelli and Coutinho-Silva (2008) who interviewed 162 pupils living in Baixada Fluminense/RJ, in a very poor metropolitan region of Rio de Janeiro. They noted that 53% of the interviewees had never heard of the existing science museums in the State of Rio de Janeiro. When they surveyed the same pupils regarding the methods of publicizing these science museums and centers, they noticed that teachers' contributions were irrelevant.

Corroborating this research, Moreira (2006, p. 2) reported figures which demonstrate that popular science in Brazil is still very feeble. According to the report:

> Reflecting on the uneven distribution of wealth, science and technology resources and educational facilities, **science museums are heavily concentrated in few areas of the country**[3]. Despite the impressive growth over the last few years, a very small number of Brazilians, around 1% of the population, visits any science center or museum every year. For the purposes of comparison, in some European countries, visitation figures can be as high as 25% of the population… Academic valuation of out-of-school activities, particularly in popular science, is still very low.

This being the case, the countless factors which hinder the insertion of these centers for diffusing science among the population include their locations. In their work, Chaves and Shellard (2005) discuss the fact that these spaces are concentrated in 12 states, led by São Paulo, Rio de Janeiro and Rio Grande do Sul, and are generally located in or very close to the capitals.

Actions to increase the popularity of science, which are the role of today's science centers and museums, encompass different responsibilities with regards to society. Their activity strategies are geared towards ending the intellectual, cultural and ideological monopoly, in order to function as a mechanism for social inclusion and contribute towards breaking down prevailing attitudes. But to what extent are contemporary science museums and centers operating as a means of social inclusion, involving all social classes and reaching the farthest corners of Brazil?

4 The construction of a science museum away from the axis of the capitals: the experience of Baixada Fluminense, Rio de Janeiro.

Baixada Fluminense forms part of the Metropolitan Region of the State of Rio de Janeiro. It comprises 13 municipalities, and has approximately 3.5 million inhabitants. The region is nationally recognized for its concentration of urban poverty, together with infrastructure shortfalls and its lack of effective public policies. The inequality seen between the municipalities of Baixada and the city of Rio de Janeiro clearly shows the need to promote development in that region, since this is one of the ways to redress the balance in society in a sustainable manner (Brasil, 2005).

Table 1. Cultural Facilities in Rio de Janeiro–2000

	Number of libraries	Number of cinemas	Number of museums	Number of theatres
State of Rio de Janeiro	223	184	124	177
Capital	77	125	77	104
Baixada Fluminense	11	17	3	13
Belford Roxo	0	0	0	0
Duque de Caxias	2	5	1	3
Guapimirim	0	0	1	0
Itaguaí	1	0	0	1
Japeri	0	0	0	0
Magé	2	0	0	2
Nilópolis	1	0	1	1
Nova Iguaçu*	1	4	0	3
Paracambi	1	1	0	0
Queimados	1	0	0	0
São João de Meriti	1	6	0	2
Seropédica	1	1	0	1

* The data for Mesquita was computed in Nova Iguaçu
Source: Brasil, 2005

The 2000 census (Brasil, 2005) revealed that in some municipalities in Baixada Fluminense, illiteracy still affects a significant slice of the population, as is the case with Japeri and Guapimirim, where approximately 11% of the population over the age of ten is illiterate. On average, the region of Baixada has an illiteracy rate of 7.25% of the population over the age of ten, contrasting with a rate of 4.22% in the capital.

The number of theatres, cinemas and museums is very low and represents just 9.2% of cinemas, 2.4% of museums and 7.3% of the theatres located throughout the State of Rio de Janeiro (Table 1).

This is the background for the Espaço Ciência Inter-Ativa (ECI) {InterActive Science Space} belonging to the Instituto Federal de Educação, Ciência e Tecnologia do Rio de Janeiro (IFRJ) {Federal Institute of Education, Science and Technology}, the first science museum in Baixada Fluminense, inaugurated in 2002, and whose headquarters are in the municipality of Nilópolis.

The ECI carries out various different activities to disseminate and increase the popularity of science, such as: permanent and temporary exhibitions, workshops, story-telling,

[3] Our emphasis.

List 1. Activities performed by the ECI in the year 2010 (from February to October)

List of activities held at the ECI		
Activity	**Timetable**	**Target audience**
"Energy and Life" Exhibition	From March 2010 Tuesday to Friday, from 09h to 19h30	Over 7 year olds
Teacher training mini-course relating to the "Energy and Life" exhibition	August 2010	Teachers
Story-telling "Who tells a tale…" Popular science and Monteiro Lobato	From 30th June to 1st July during National Science and Technology Week	Children aged 2 to 12 years old
Event which forms part of National Science and Technology Week in Baixada Fluminense	From 21st to 24th October 2010	General public
Event commemorating the 25th birthday of the Museu de Astronomia e Ciências Afins	From 11th to 12th September 2010	General public
IV Academic Week of Paracambi–IV SEMAC	From 19th to 22nd October 2010	General public
XXX Chemistry Week–IFRJ Campus Maracanã	From 8th to 12th November 2010	General public
"Science's Tent" project–Science roadshow	This activity takes place throughout the year, subject to booking	General public

Source: Paula (2010)

mini-courses, cycles of talks and debates, plus the "Science Tent" project, which brings opportunities for learning play into public areas, schools and events. the list 1 shows some of the ECI's activities during the year 2010.

The main challenge for this informal educational space is to collaborate in starting a new phase in the people's social life and in building up scientific awareness in a population which has historically been on the fringes of society, thereby offering the community a place for great cultural and human enrichment.

From this standpoint, the ECI developed its first programme for the continuing education of teachers, via a pilot project, with a view to strengthening the museum-school partnership.

4.1 Development of the continuing education program for teachers based on a science exhibition: "Energy and Life"

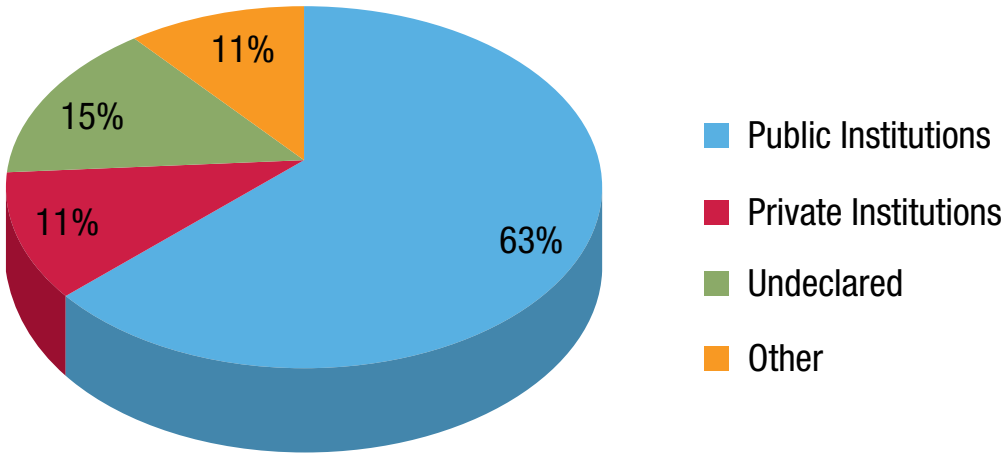
Given the need to create a multidisciplinary environment, the ECI conceived and developed the "Energy and Life" science exhibition. This exhibition enabled us to bring together and hold a dialogue with different areas of knowledge, as well as to establish debates on current topics. It should be pointed out that issues relating to energy have been the subject of intensive discussions over the last few decades, due particularly to environmental aspects which signal the search for new energy alternatives. Since the invention of the steam engine, our energy sources have changed enormously, giving rise to issues such as: wind power, nuclear energy, renewable energy sources, among others. Therefore, the subject of energy is intrinsically linked with economic, social, historical and environmental aspects, thereby enabling discussions about the influence of science on society throughout history.

> In animals, organelles are involved in cellular respiration. In plants, photosynthesis. To switch on machines or lights, steam, coal or non-polluting sources such as wind and rivers. These are some of the ways of producing energy – an element which is essential for the working of living organisms and machines on our planet– presented at the Energy and Life exhibition. Running from the end of March 2010 at Espaço Ciência InterAtiva (ECI) of the Instituto Federal de Educação, Ciência e Tecnologia do Rio de Janeiro…, the permanent exhibition was developed with the help of the bill for the Support for Diffusing and Increasing the Popularity of Science in the State of Rio de Janeiro (Zepada, 2010).

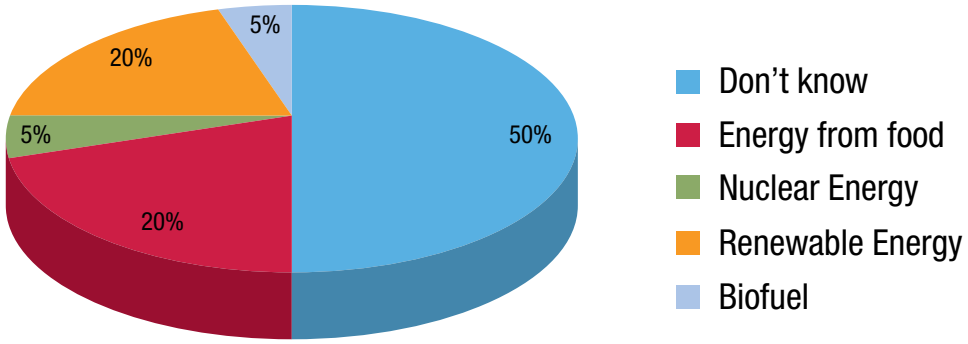
Inaugurated in March 2010, the exhibition allows the public to learn about subjects ranging from cellular respiration to alternative energy sources, and has already attracted over 2,500 visitors. The graph 1 summarizes the average percentage of visitors by institution at the "Energy and Life" exhibition in 2010.

While still at the exhibition panning stage, we invited some Primary and Secondary Education teachers to suggest themes relating to the exhibition, so that we could include subjects which would be of interest to teachers. This entailed 22 state schools from some municipalities in Baixada Fluminense, and involved contributions from 23 teachers. These interviews resulted in the answers set out in graph 2 (Pereira, Soares and Coutinho-Silva, *in press*).

> Despite the vast science content in Primary and Secondary Education, 50% of teachers interviewed did not know which subjects could be used to help them in their teaching practices. Nevertheless, 20% of teachers asked for renewable energies to be addressed at the exhibition, and 20% cited energy from food in the form of the food chain. They also wanted the exhibition to look at the subject of nuclear energy, as well as biofuels, which both appealed to 5% of the interviewees (Pereira, Soares and Coutinho-Silva, 2011).



Graph 1. Average percentage of visitors to the "Energy and Life" exhibition in 2010



Graph 2. Themes suggested by teachers
Source: Pereira, Soares and Coutinho-Silva, (2011)–extracted with permission

Thus, as well as the themes suggested by the doctors, the exhibition explored the following subjects: different respiratory mechanisms and processes whereby living things obtain energy, electricity and magnetism, consumption of electrical energy and waste, different methods for transforming energy, as well as raising socio-environmental issues raised, such as, for example, unequal access to modern forms of energy. It also dealt with historical aspects relating to the advent of the steam engine, such as the Industrial Revolution in the 18th Century, which set off profound changes in the world and changed relationships and socio-economic and commercial concepts.

4.2 The continuing education program for teachers

Following the inauguration of the "Energy and Life" exhibition and using research which demonstrated that a great number of teachers in Baixada Fluminense were unaware of the science centers and museums (Pereira, Soares and Coutinho-Silva, 2011), we organized a pilot project for the continuing education of teachers.

This project was classified as a mini-course because of the low number of timetabled hours. It took place over one day and lasted for five hours for each group and had the participation of 24 teachers from the private and public education network in Baixada Fluminense, 11 at the first session and 13 at the second (Pereira, Soares and Coutinho-Silva, 2011).

We started the mini-course with a brief discussion of the science museums and centers in Brazil and around the world. We also described the aims, goals and proposals of the Espaço Ciência InterAtiva, as well as the challenges it faces given the situation of Baixada Fluminense, and lastly showed videos which dealt with some of the themes addressed in the exhibition.

Immediately after this first stage, the teachers participated in a guided tour around the exhibition, as demonstrated in Figures 2 and 3. Ideas were suggested for constructing low-cost equipment based on the models on display at the exhibition; and instruction materials produced for the course were distributed, with footnotes, folders and magazines provided by the Brazilian electrical sector[4].

[4] As a result of the "Energy and Life" exhibition, the Espaço Ciência InterAtiva, funded by FAPERJ (Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro), received donations of books, institutional material, magazines with cartoon strips, scientific magazines, catalogues and videos from two companies in the Brazilian electricity sector: Eletronuclear and Furnas Centrais Elétricas.

Figure 1. "Energy and Life" exhibition

Figure 2. Teachers on the capacity building course interacting with the "Energy Consumption" module.

Lastly, after these activities had been carried out, we assessed the impact that the program may have had on the teachers, via interviews and questionnaires. The results demonstrated that these actions contributed towards whetting teachers' appetites for science. We noted from the testimonials, as exemplified below, that some teachers had preconceptions regarding some of the themes addressed by the exhibition, while others were unaware of the ECI, but after participating in the mini-course, they understood the importance of making use of this informal education space in their teaching practices (Pereira, Soares and Coutinho-Silva, 2011).

> *After taking part in this capacity building course, I wanted to do Chemistry or Physics here at IFRJ, and after attending the course my view has changed, I am looking at things differently, I am more interested in science* (Teacher L).

Also according to Pereira, Soares and Coutinho-Silva (*in press*), a further result of this study was that 22 of the 24 teachers who took part in the continuing education course returned to Espaço Ciência InterAtiva on a class trip. One school in particular in the municipality of Mesquita came with all of its classes, from Nursery School to Year 9 of Primary Education. All of the 22 teachers who returned brought other teachers with them together with their classes.

It must be emphasized that the number of visitors to the ECI tripled following the first continuing education program for teachers.

5 Final considerations

By analyzing the general framework of the situation in Brazil, we noted that a significant slice of the population is prevented from joining in actions for disseminating science, particularly in the most underprivileged regions and those furthest from the major urban centers.

Although nowadays science is discussed in the media, we should be careful with information conveyed though these channels. Moreira (2006) analyzed popular science presented by the media and noted that:

> … the coverage of Science and Technology in media organs is generally inadequate and frequently of poor quality. In the press and on television, science is usually presented as a magnificent undertaking, where scientific discoveries are made by particularly high-achieving individuals. The real or imagined applications of science are greatly emphasized, but their production process, context, limitations and uncertainties are usually ignored, and the prevailing idea is of simplified conceptual models on the relationship between science and the public, like a 'default model''.

Therefore, teachers also need to pay attention to new discoveries and discussions on Science and Technology. Teachers must not rely solely on the information imposed by the media, and must not regard them as absolute truths. Nevertheless, we know that methods for generating and communicating knowledge are increasingly vast and agile, particularly with the advent of the internet (Zamboni, 2001). As a result of the constant need to update information and knowledge, initial teacher training on its own ends up being insufficient for any educator throughout his or her career. It is therefore invaluable for teachers to participate in continuing education programs.

Furthermore, we noted during this work that many teachers–including those who teach science subjects–are burdened by different preconceptions about the sciences. Pereira, Soares and Coutinho-Silva (2011) noted that, when they come into contact with these spaces via continuing education programs, many teachers regard science museums differently, and start to look at science in a new light, restructuring their pre-conceived ideas about scientific knowledge. This is likely to influence their teaching practices. It is important to point out that during the organization of the "Energy and Life" exhibition, when we asked questions about the subjects interviewees would like to see addressed at an exhibition, we commenced the continuing education

Figure 3. Teachers in the mini-course interacting with the "Electricity and Magnetism" module.

program for teachers at the ECI. We thus stimulated teachers to reflect on the themes in question, and involved them in the process of setting up a science exhibition.

Therefore, we believe that science centers and museums are in a position to implement continuing education programs for teachers aimed at educators who work in peripheral and poor regions. In this way, using the museum-school partnership, both can contribute towards improving science education in Brazil, thereby destroying the hegemony of science geared towards a small proportion of the population.

Finally, the work also demonstrated the need for public policies aimed at creating science centers and museums in the regions lacking cultural facilities, chiefly in places which are far away from the major urban centers.

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