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**The natural history museum of the southern state of Espírito Santo -
MUSES: didactic activities in Geosciences and Paleontology**

**Museu de história natural do sul do estado do Espírito Santo - MUSES:
atividades didáticas em Geociências e Paleontologia**

DOI:10.34117/bjdv5n9-072

Recebimento dos originais: 18/08/2019

Aceitação para publicação: 12/09/2019

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ABSTRACT

The Natural History Museum of the Southern State of Espírito Santo is a space for the improvement of learning that develops activities such as workshops and events to increase the interest of visitors. The Museum also stands out in the human resources formation such as preparation of materials, lectures, courses for the monitors training. This work aims to present the activities developed by the scholarship and volunteer monitors during the XIV Science and Technology Week. The museum gave the opportunity to train more than 80 monitors (fixed and volunteers), students of the Geology and Biological Sciences courses in workshops geosciences during the event. The results showed that 38% of the monitors had no contact with museums in the last twelve months and that 45% still had no monitoring experience. The work showed that many reported lack self-confidence, about 45%, which required more expository classes and hands-on training for upcoming events. The conclusion is the Natural History Museum of the Southern State of Espírito Santo is a center of teaching and propagation of geosciences and paleontology, as well as the training of university monitors. This shows the extreme importance in the southern region of Espírito Santo State.

Keywords - Museum. Geosciences. Scientific communication. Training.**RESUMO**

O Museu de História Natural do Sul do Espírito Santo é um espaço para o aprimoramento do aprendizado que desenvolve atividades como oficinas e eventos ampliando o interesse dos visitantes. O Museu também destaca-se na formação de recursos humanos como preparação de materiais, palestras, cursos para a capacitação de monitores. Este trabalho tem como objetivo apresentar as atividades desenvolvidas pelos monitores bolsistas e voluntários durante a XIV Semana de Ciência e Tecnologia. O museu deu a oportunidade de capacitação de mais de 80 monitores (fixos e voluntários), discentes dos cursos de Geologia e Ciências Biológicas nas oficinas voltadas às Geociências durante o evento. Os resultados mostraram que 38% dos monitores não tiveram nenhum contato com museus nos últimos doze meses e que 45% ainda não tiveram nenhuma experiência com monitoria. O trabalho mostrou que muitos relataram insegurança, cerca de 45%, o que é necessário mais aulas expositivas e treinamento prático para os próximos eventos. Conclui-se que o Museu de História Natural do Sul do Estado do Espírito Santo é um centro de ensino e propagação das geociências e da paleontologia, bem como a capacitação de monitores universitários, de extrema importância na região sul capixaba.

Palavras-chave - Museus. Geociências. Comunicação científica. Ensino. Capacitação

1 INTRODUCTION

Museums are notable social institutions, especially as informal spaces for education and scientific dissemination and production. By the definition of ICOM (2007), museums are permanent, non-profit institutions, at the service of society and its development, open to the public, focused on researching the material testimonies of man and his surroundings, which acquire, preserve, communicates and exposes, aiming at studies, education and leisure. It is the fundamental role of museums, to influence society in the development of an attitude towards science and to make individuals more creative, constituting, according to Gomes and Cazelli (2016), a medium that provides an approximation between society and its cultural heritage, and thus In this perspective, the processes of mediation in the consummation of museological purposes gain importance.

Museum mediation aims to make museums and centers of scientific dissemination more attractive to visitors (BARROS, 2010). The mediators assume the role of adding importance to the exhibitions, placing information, as well as arouse the interest of visitors to the collection and what it represents. In small museums and university museums, these human resources assume the characteristics of monitors, performing functions other than mediation such as organization, cataloging, collection maintenance and development of materials and teaching activities.

The Natural History Museum of the Southern State of Espírito Santo - MUSES, is the result of an extension project linked to the Universidade Federal do Espírito Santo - UFES. It is located in the city of Jerônimo Monteiro, in the south of the state of Espírito Santo (Brazil) and is currently a complementary institution of UFES. It is coordinated by a team of teachers and with the participation of undergraduates and graduate of UFES Alegre Campus as monitors. Its focus is on scientific dissemination, even though research projects are being implemented (ASSIS, 2017a). The collection is organized by thematic areas, including Geology, Paleontology, Botany, Zoology and Parasitology. In the geological collection are exposed various rocks and minerals, from different origins, but focusing on the specimens of Espírito Santo. In the paleontology collection are ex-posed fossils, replicas and their relationship to the geological time scale.

The public comes from high schools and private schools in the region, at the basic, elementary and high school levels. The presentation of geosciences and paleontology to the public is one of the factors that can be found in the knowledge area than a knowledge area (KUCHENBECKER, 2017).

The visiting public is mostly students from public and private schools in the region, at the basic, elementary and high school levels. The presentation of geosciences to these students is a challenge given that in basic education is almost absent from themes related to this area of knowledge (KUCHENBECKER, 2017).

Open to the public since 2013, MUSES has since been contemplating the population of southern Espírito Santo from guided exhibitions on the collection and thematic exhibitions. As a university museum, the various areas brought together by natural history are the responsibility of the area's faculty and students. It also offers training courses for monitors to work on exhibitions and showcases, as well as training and improvement of museum-specific and collection-specific techniques, such as making mockups and resin works, thus serving as a teaching center in areas of geosciences and paleontology.

This paper aims to report the experiences of the Natural History Museum of the Southern State of Espírito Santo in the development of monitors in didactic workshops and guided tours and in the dissemination of geosciences and paleontology in the south of the state of Espírito Santo. Therefore, a survey was conducted with monitors working at the National Science and Technology Week 2017, with the purpose of profiling these monitors and their training mechanisms, important communication and dissemination tools of the Natural Sciences and, as a focus of the present work, Geosciences and paleontology.

2 MATERIALS AND METHODS

This paper presents some of the main actions of MUSES in the dissemination of science in the south of the state of Espírito Santo, with the exhibition of the geological and palaeontological collection and the development of events and thematic workshops open to the public.

The training of the monitors to perform in these workshops occurs with lectures explaining the scripts of the activities to be developed and the performance of the monitors/mediators, the materials on display and general guidelines for the visiting public.

For an approach to mediation in MUSES, a questionnaire was conducted to the monitors participating in the 2017 National Science and Technology Week aiming to survey the profile of the monitors, their expectations, experience for the event and difficulties.

3 NATURAL HISTORY MUSEUM OF SOUTHERN STATE OF ESPÍRITO SANTO: GEOSCIENCES AND PALEONTOLOGY

3.1 EDUCATION BY THE GEOLOGICAL COLLECTION

One of the main proposals developed by MUSES for the education and dissemination of sciences is the exhibition of the collection with guided tours by media-tors. In the area of geosciences, MUSES maintains 25 rocks samples (Figure 1), of which 09 igneous, 08 metamorphic and 08 sedimentary, in addition to 51 samples of miscellaneous minerals and gems and 03 meteorite fragments, where the main one is the Guaçuí Meteorite, found in the homonymous municipality in the south of the state in 2010. Completing the collection, the museum has 40 samples of rocks, 120 samples of minerals and various geological models, mainly exposed at frequent thematic fairs promoted by the museum (ASSIS, 2017a).

The samples have several origins, but the im-portance of local samples in order to promote the dis-semination of the local geology to the south of Espírito Santo population is very important.

During guided tours and exhibitions, visitors are pre-sented with ideas about the formation of Planet Earth and the Solar System, what meteorites represent and what they can inform, being key to understanding the origin and evolution of Planet Earth, the diversity of rocks and various formation environments (igneous, sedimentary and metamorphic) and the rock cycle. Therefore, we seek to correlate local geodiversity with minerals as rock forming, mineral richness, common gems in the region and basic mineral identification methods, such as the Mohs scale presentation.



Figure 1. Geology collection of MUSES. Photo of the authors.

3.2 PALEONTOLOGY COLLECTION

The paleontological collection (Figure 2) consist of 29 pieces. Part of the fossil content was found in sedimentary basin around the world, being several specimens of Brazilian basins, making possible an important interaction between Science and people of Espírito Santo state. The paleontology collection, like the others, aims to en-courage the teaching and learning of scientific knowledge in a didactic and dynamic way, which facilitates the understanding of the sciences. (PIMENTA, 2018).

The paleontology collection is very diverse, containing some specimens from northeastern Brazil and other specimens of the world, for example, two specimen of trilobita from Marrocos and one specimen of belemnite from Alemanha.



Figure 2. Paleontology collection of MUSES. Photo of the authors.

The pieces of the paleontology collection were distributed in temporal order, from oldest to newest. The pieces organized in this way provided a better explanation of the collection and consequently facilitated the understanding. In addition to showcasing the pieces, the collection is also composed by a replica of the icnofossil pterosaur.

The paleontology collection is growing over the years with a greater variety of fossils, making the collection more diverse and offering more content to everyone who visits MUSES. (PIMENTA, 2018).

3.3 ACTIVITIES DEVELOPED BY MUSES AND THE NATIONAL SCIENCE AND TECHNOLOGY WEEK 2017

In order to serve and publicize geosciences to the public, MUSES promotes, besides guided tours of the collection, thematic fairs and other events are periodically promoted by the museum, especially at the National Museum Week (in May) and the National Week of Museums. Science and Technology (usually in October), where workshops and various activities are focused on teaching and disseminating science. It is at these events that the museum receives the most visitors.

The workshops are organized by MUSES teachers and monitors. Volunteer monitors (undergraduate students from the UFES Alegre Campus) also participated in the exhibition and workshops.

The 2017 National Science and Technology Week (23-28 October) involved approximately 80 monitors in 5 days of workshops related to the various areas covered by the museum and focused on mathematics, given that the theme proposed for the week was “The Math is in Everything”. For this week, the MUSES geology team developed three workshops: Crystallography - the Geometry of Nature; The greatness of Geodiversity and Ornamental Rocks of the state of Espírito Santo. These workshops are presented in the work of Marques et al., (2017a).

In the workshop Crystallography - The geometry of nature, were assembled on cardboard by the students of the crystallography discipline of the UFES Geology course and exposed, the 84 main shapes and combinations of geometric shapes of crystals in nature. The crystallographic models are based on the 7 crystallographic systems as combined shapes and twinnings were displayed alongside subhedral and euhedral crystals to illustrate the diversity of crystalline forms and to present basic concepts of crystals, minerals, crystalline symmetry to the public (MARQUES et al., 2017b) (Figure 3).



Figure 3. Organization and exhibition of the Workshop "crystallography: The Geometry of Nature" in the science and Technology week of 2017 MUSES. Photo of the authors.

In the workshop The Greatness of Geodiversity, the concept of Geodiversity and its aesthetic character was disclosed, represented by the geomorphology of widely known geological monuments in the south of the state of Espírito Santo, and most of the landmarks such as Serra do Caparaó, Maciço Forno Grande, Frade e Freira Peak and Cachoeira da Fumaça. The approach was in terms of altitude and amplitude and scales, and the use of a stereoscope for public viewing of 3D orthophotos (Figure 4) (SOUZA et al., 2017).



Figure 4. Child visitors observing the relief in table Stereoscopes during the science and Technology week of 2017 MUSES. Photo of the authors.

The ornamental rocks workshop of the state of Espírito Santo (Figure 5) consisted of the presentation of several lithotypes extracted and benefited in the state to the public, such as marbles, granites and metamorphic rocks as gneisses in order to disclose the occurrence of these lithologies of the state, of diversity. of rocks found in Espírito Santo lands. After the workshop, the rocks were integrated into the museum collection and described macroscopically (MARQUES et al., 2017c). There were also some basic parameters for the identification and classification of rocks, such as the size and shape of their constituent minerals. It was observed during the workshop how easily the public noticed the difference between the exposed lithotypes, many even identified to be similar to some coating in their homes.

These workshops were attended by the work of the monitors since their preparation, in the preparation of teaching materials and exposure to visitors.



Figure 5. Exhibition of the workshop of ornamental rocks. Extracted from Marques et al., (2017c).

4 THE ACTIONS OF MEDIATORS IN MUSES

The MUSES monitor board is made up of official monitors, selected through specific calls and volunteers, summoned by special calls for specific shortterm events. They are mainly undergraduate and graduate students, interns or collaborators selected by specific calls, without longterm employment relationship.

The training of official monitors follows the practicecentered model for training mediators in museums proposed by Marandino (2008). Also according to the author, this type of training takes place in service, with the full support of more experienced monitors and guiding teachers. The training of volunteer monitors, given their more specific objective, occurs with the presentation and explanation of workshop scripts and visits by teachers and fixed monitors, fitting the model focused on the specific content of Marandino (2008).

The effective participation of undergraduate and postgraduate students at the UFES Alegre Campus as monitors in guided tours and events such as National Museum Week and National Science and Technology Week allows the complementation of the training these students, especially those who seek teaching as a profession.

The performance of students as monitors requires mastery of the subject and ability to adapt technical terms, so common in the university, to people of different ages and educational levels, which is the greatest difficulty and challenge reported by student volunteers. The work also requires student interdisciplinarity in inter-face with other areas of knowledge, especially biology and its subdivisions.

As a result of these experiences, the number of publications aimed at teaching and disseminating geosciences and paleontology grows (ASSIS et al., 2016; ASSIS et al., 2017b; MARQUES et al., 2017b; MARQUES et al., 2017c; MARQUES et al., 2016; NASCIMENTO et al., 2017;), as well as museology and geology collection (ASSIS, 2017a).

5 RESULTS AND DISCUSSIONS

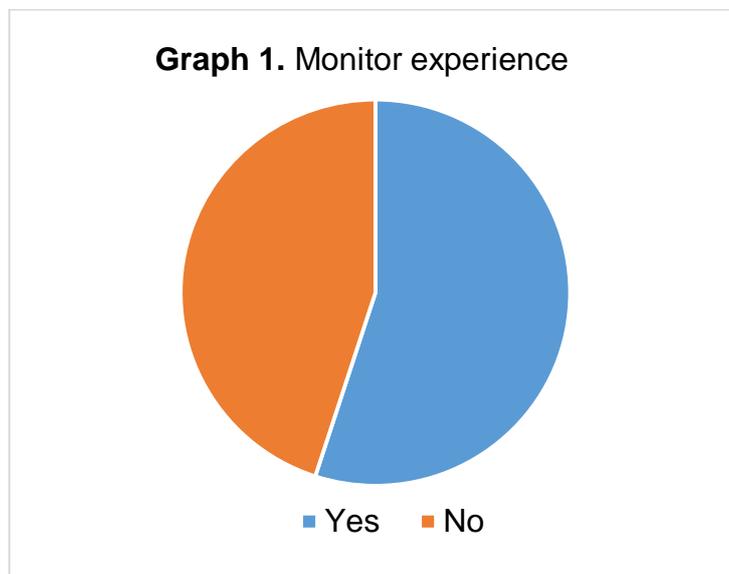
MUSES, from its collection and workshops, allows the complementation of the formation of visiting students, because it works with various subjects approached in elementary classrooms, where generally the scarcity of didactic material is observed, thus realizing, According Torino (2014), the role of pedagogical tools common to scientific museums. In addition, the focus on local geology allows even greater interaction between the public and the collection, enhancing the ideas of geodiversity, geological heritage, and geoconservation (ASSIS, 2016).

MUSES has 12 official monitors, all undergraduate and postgraduate students from UFES, from the Campus de Alegre in the courses of Biology and Geology. They are responsible, under the guidance of the teachers, for the organization of the museum, the preparation of teaching materials and the events promoted by the museum. Such participation contributes to the formation of such students, many of them future professional educators.

At events such as the National Science and Technology Week, MUSES has the collaboration of dozens of volunteer monitors to attend the large flow of visitors. In 2017 the event had 80 volunteer monitors, 45 of them from the UFES geology course, responsible for the mediation of the guided tours of the collection and the presentation of the workshops. Therefore requiring great multidisciplinary and communication to work in the various areas of science.

In a proposal to study the profile of these collaborators, an individual online questionnaire was conducted, addressing the mediation of museums, personal experiences and expectations, opinion about the importance of museums, perspectives and difficulties in acting as a mediator. Data were generated based on the total responses of volunteer and fixed monitors, and approximately of all active monitors, 36% answered the questionnaire. The results are presented below.

Regarding the experience of the monitors, as presented in Graph 1, it was found that 55.2% reported having experiences as monitors in museums or subjects of their undergraduate courses, the other 44.8% had no experience as a monitor.



Source: The authors.

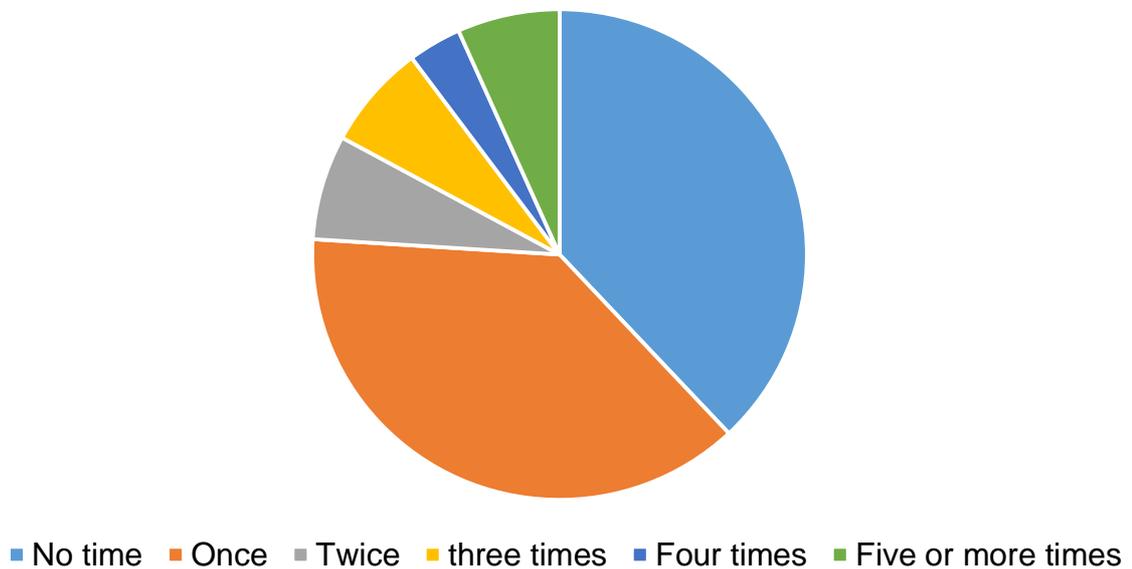
In the experience of working in museums, as can be seen in Graph 2, it was asked how many times monitors had visited a museum in the last 12 months prior to the survey. The results showed that 38% of the monitors had not visited any museum during this period, 38% had visited once, 6.9% visited twice, 6.9% three times and 3.5% visited four times. Only 6.7% of

monitors reported having visited more than 5 times a museum in that period. This fact demonstrates the little habit that the Brazilian population rarely frequent museums (IBRAM, 2011; FALCÃO et al., 2005).

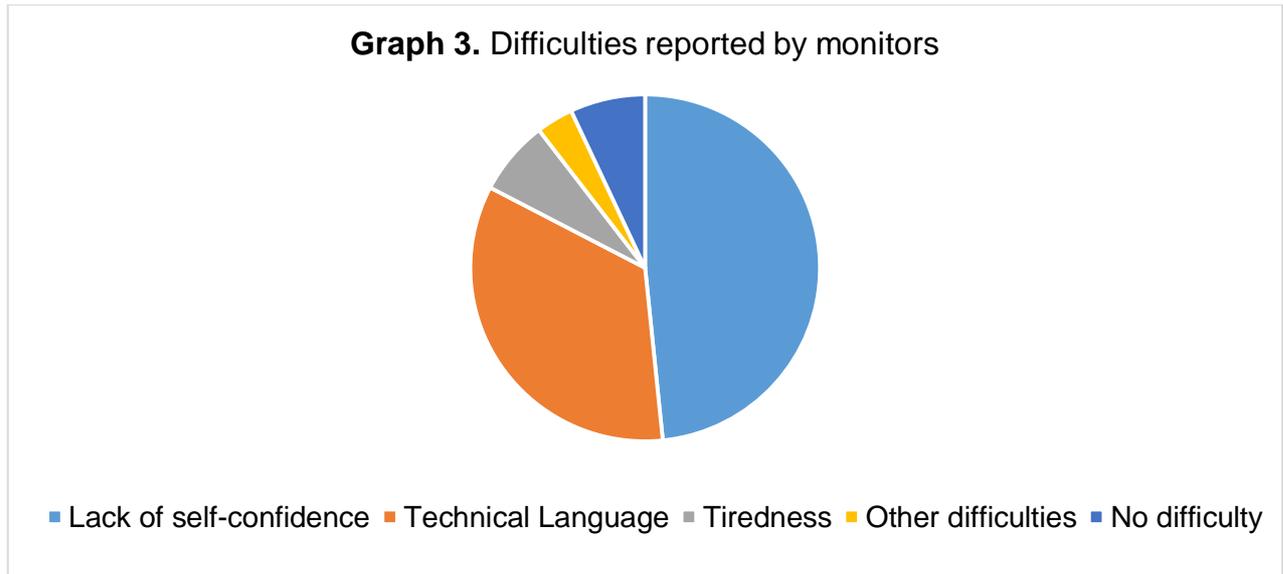
As an opinion about the role played by museums in society, 52% of the monitors placed museums as important spaces in the education and dissemination of sciences for society and 48% classified museums as fundamental for learning. Asked about an ideal audience, the monitors cited above all curious visitors, open to new ideas, interactive and inquiring, able to question what is going on and propose new approaches.

Regarding the difficulties in acting as a mediator, with results presented in Graph 3, the most cited difficulty was lack of self-confidence (48.3%), including apprehension, shyness and lack of mastery of the topic, followed by adaptation. technical language to different audiences (34%), especially children. Tiredness (6.9%) and other difficulties such as transportation (3.4%) were also mentioned. Only 6.9% of the monitors reported no difficulty in acting as a mediator.

Graph 2. Relationship of monitors with museums: How many times have you visited a museum in the last 12 months?



Source: The authors.

Graph 3. Difficulties reported by monitors

Source: The authors.

All monitors showed interest in interacting with the visiting public, also reported good or great expectations for their participation in the event and showed reasonable knowledge about the role of the mediator in museums. The roles reported by the monitors in the survey were to clearly inform, teach, encourage visitors interest in what is being exposed, respect visitors and ensure the integrity of the collection. Many of the characteristics and functions cited are in fact defined by Barros (2010), Gomes and Cazelli (2016) and Marandino (2008).

6 CONCLUSION

Through the development of didactic workshops and guided exposition, MUSES has brought science and research closer to the local community, transmitting part of the academic knowledge to the population, which is essential for the training of students from schools in the region who seek educational support in the museum. The workshops act as a communication tool between undergraduates and visitors. UFES students develop activities ranging from the organization to the presentation of the events, developing didactic materials and communication skills and teaching of geological knowledge. Thus, there is a greater interest of the monitors in relation to geological learning and participation as a mediator.

Most MUSES monitors have a profile with significant experience in teaching and mediation, although with few museum participations. However, they have knowledge of the role to be played in mediation and the role of museums in society. They are mainly young people between 18 and 25 years old, graduating mainly from the Geology and Biological

Sciences courses of the UFES Alegre Campus, curious and open to new experiences and seeking mediation as a complement to their academic and professional education. Finally, the participation of the monitors is crucial in the dissemination actions of the sciences developed by MUSES, at the same time, such experiences and training courses add to the professional training of students / monitors, especially those aiming at teaching as profession.

ACKNOWLEDGMENT

We thank FAPES for the encouragement of MUSES, the undergraduate students of UFES of the Alegre campus, always willing to act as monitors allowing workshops and guided tours, to the teachers responsible for MUSES and to the city council of Jerônimo Monteiro, to Bramagran and to Sindirochas for the support and trust in the work of MUSES.

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