

VOLCANOES AS A GATEWAY FOR YOUNG PEOPLE TO THE GEOTHERMAL WORLD

Sofía Otero¹, Michel Parra²

¹Andean Geothermal Center of Excellence (CEGA), Facultad de Ciencias Físicas y Matemáticas, Universidad de Chile, Plaza Ercilla 803, Santiago, Chile.

² Science Communication Diploma – Facultad de Ciencias, Universidad de Chile, Las Palmeras 3425, Ñuñoa, Santiago.

sofia.otero.c@gmail.com, michpac@gmail.com

Keywords: *outreach, evaluation, exhibition, volcanoes, youth, Chile*

ABSTRACT

The Andean Geothermal Center of Excellence (CEGA) Outreach Unit has been testing different ways to bring the issue of geothermal energy to different audiences for years, with a focus on young people and the media. Our work includes books, videos, talks, murals, exploration kits for girls and more. During the first semester of 2019, CEGA developed a free interactive exhibition about volcanoes in one of the main subway stations in Chile, covering topics such as volcanoes forms, dangers and benefits through mixed media: virtual reality, augmented reality, scenographies, and the guidance of a team of geologists who accompanied the visitors - children and adolescents - during the tour, sharing research experiences and their passion for volcanoes with the audience. Although the central theme of this exhibition – “Journey to the center of the volcano”- revolved around volcanoes, our team conceived it as an excuse to relieve the issue of geothermal energy among the target audience, noting that the positive side of the volcanoes was the enormous amount of energy that could be provided to a country with the greatest unexploited potential of geothermal energy. The evaluation instruments applied to a sample of visitors, revealing whether the use of volcanoes as a hook to open the conversation about geothermal energy is effective. The application of the evaluation instruments (surveys) and the analysis of results is still a work in progress, and we are willing to present its results during the New Zealand Geothermal Workshop, along with the materials of the exhibition which are all licensed under Creative Commons.

1. INTRODUCTION

During winter holidays 2019, between July 23 and August 3, the Andean Geothermal Center of Excellence opened the temporary exhibition “Journey to the Center of the Volcano” at a popular subway station in Santiago, Metro Quinta Normal, a vibrant spot surrounded by five museums, theaters, galleries, a park, and the largest municipal library in the country. The pop-up exhibition was aimed at children and adolescents, and it addressed the issues of volcanoes, their formation process, the eruption dangers and the benefits of volcanoes to society. “Journey to the center of the volcano” was an interactive exhibition, that used augmented reality, virtual reality, scenography, models, and the guidance of a team of young geologists. Upon entering the exhibition, a guide received a group of 4 to 8 people and toured them through 12 informative panels, each of which contained some digital or analogous material for the entertainment of the attendees. At the end of the tour, the public was invited to board a ship (Figure 1) where they could take a trip inside a volcano with virtual reality headsets, taking them from the crater down to the magma chamber. The exit and entrance of

the Ship was next to a luminous sign asking “How much energy do you think we can generate with volcanoes in Chile?” a question that summarizes the intention of the exhibition, which was a fun excuse to talk about the power of volcanoes, the energy of volcanoes, and thus, geothermal energy.



Figure 1: The ship was inspired by the aesthetics of Jules Verne and had capacity for 4 passengers and a captain.

2. METHODOLOGY

To evaluate the effectiveness of the exhibition to promote knowledge about the anatomy, dangers and benefits of volcanoes in Chile, we used a quantitative approach, applying a 14 question survey to a sample of visitors through successive measurements. A probabilistic sampling was used and in total 56 people answered the survey.

The first question was of spontaneous mention (“what comes to mind when you think of volcanoes?”), and the others corresponded to true, false, does not know/does not answer. The sampling framework was built only considering kids and teenagers attending the exhibition, among the ages of 12 and 17 years old. This age range was chosen because the virtual reality technology is not recommended for children under 12 years old, and therefore, the entire exhibition was intended for this audience, although the entrance to the exhibition was open to people from all ages.

Each respondent was submitted to a questionnaire prior to entering the exhibition and then upon departure the same questions were applied. The instrument sought to evaluate both a cognitive impact dimension and an appreciation

dimension, in order to assess the visitor's imagination in geosciences and determine if after the visit to the exhibition the notions that they brought about the scope of living in a volcanic country had changed.

3. EXHIBITION VISITORS

In total, 2727 persons visited the exhibition, 41% of which were minors. Although in principle the exhibition was targeted for young people between 12 and 17 years old, it turned out that many visitors were adult couples, foreign tourists and elderly people. Youth audience only represented 14% of visitors. The exhibition started during the last week of school winter holidays and extended until the first week of the second semester, and it was expected to receive school visits during this period. However, no school visits for students older than 10 years old were booked during the exhibition.



Figure 2: A group of classmates between 11 and 12 years old visit the exhibition after school, before boarding a train home.

4. RESULTS

The results of the survey show interesting findings regarding the item that evaluated changes in the assessment of the volcanoes. Faced to the survey's statement: "Volcanoes bring benefits for people", 23% of respondents on the pre-test said it was true. This percentage rose up to 52% on the post-test evaluation. This increase was mainly due to those respondents who were not sure or did not know of any volcanoes benefits ("does not know/does not answer" alternative) and changed their option to "True" after visiting the exhibition. Those respondents who disagreed with this statement (25%) practically did not change their mind after visiting the exhibition.

One question on the survey evaluated cognition pro-appreciation, tracking how much young people knew about a specific benefit that volcanoes could bring. Faced with the

statement "The heat of volcanoes can be used to produce electricity," 63% of respondents agreed before visiting the exhibition, which could be considered a relatively high percentage. Once the tour ended, this percentage rose to 78%. Those who did not know or were not sure that the heat associated to a volcano can be used to generate energy before the exhibition fell from 20% to zero on the post-tests. However, on the spontaneous mention about what comes to mind when you think about volcanoes, no surveyed replied concepts like energy or geothermal energy either on the pre or post test.



Figure 3: A father (35 old) and his daughter (10 years old) hold hands while they virtually enter the volcano.

5. CONCLUSION

The main difficulty in evaluating the effectiveness of the exhibition "Journey to the center of the volcano" to promote geothermal energy in young people, was that this target group was not as abundant as expected. A lot more young adults, elderly people, and children under 10 years old visited the exhibition. Visitors between 12 and 17 years old represented only 14% of the audience.

After CEGA's evaluation meeting of the project, failing in attracting this particular audience was attributed to our lack of emphasis on the promotion materials for school visits, overconfidence in the offer of the science network of the municipal education department that offered shuttle buses to the exhibition that finally did not materialize, and also, that from April 2019 until July 2019 Chile experienced a teacher strike that hindered our work with schools in the area. Notwithstanding the relatively low visitors from this age range, still items in the survey that sought to assess the positive side of volcanoes and their contribution in the generation of energy for Chile showed interesting results, favorable to the general notion that being a volcanic country is positive for the generation of geothermal energy. It is also important to highlight that our target group had already a good

background of knowledge about the benefits that volcanoes can bring, and the visit to the exhibition boosted and raised this knowledge.

For more information about the exhibition “Journey to the center of the volcano” visit the project’s web page www.viajealcentrodelvolcan.cl

ACKNOWLEDGEMENTS

This work has been supported by the Andean Geothermal Center of Excellence (Fonda-Conicyt project 15090013). “Journey to the center of the volcano” was developed thanks to a competitive public funding (‘Proyecto Explora CONICYT de Valoración y Divulgación de la Ciencia y la Tecnología), the economic support of CEGA and the collaboration of Metro de Santiago and the National Geology and Mining Service (Sernageomin).