10 years with Planet Earth essence in the primary school children drawings

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Abstract

"10 years with Planet Earth" is the title of the calendar realized in 2016 by the Istituto Nazionale di Geofisica e Vulcanologia - Italian Geophysics Research Institution - for primary school. The Calendar Com on is a project conceived to support and complement 15 years of dissemination activities with schools. We have printed the calendars for 10 years, each year with a different subject related to a World in constant evolution. Each year we have launched com ions asking children to send drawings on the chosen theme, to stimulate learning about Earth Sciences and Planet Earth dynamics. Our aim is to raise awareness on water resources availability, prevention of natural disasters and planet sustainability. We have received about 10,000 drawings from students of more than 400 schools. For each yearly competition, we have chosen the most significant drawings and we have included them in the calendar. The authors of the drawings have been awarded by scientists, journalists, artists and science communicators and even by a minister. In addition to the competition, the drawings reflect impressions and thoughts, and illustrate the children's point of view. From drawings one can sense a great sensitivity, consideration, responsiveness, and respect for the Planet and a positive feeling for Science.

1. Introduction

The Istituto Nazionale di Geofisica e Vulcanologia (hereinafter INGV) is one of the most important international research Ins on in the field of geophysics. As part of the Italian Civil Protection Service, INGV provides vital support for seismic and volcanic risk mitigation programs on a global scale and for emergency management. INGV is entrusted with the surveillance of the seismicity of the national territory, the activity of Italian volcanoes and the early warning for tsunami in the Mediterranean area, through technologically advanced instrumentation networks. Particular attention is devoted to the dissemination of scientific culture and the development of the awareness of risks and prevention. INGV manages the museums dedicated to Geophysics and Volcanology - the Geophysical Museum of Rocca di Papa, the Vesuvian Observatory, the Aeolian Information Centres - and collaborates in the scientific management of the Laboratory Museum of Earth Sciences of Ustica and the Volcanological Museum of Nicolosi. In these museums, INGV created

permanent and temporary scientific exhibitions and installations (Pagliuca et al., 2007; Avvisati et al., 2015; D'Addezio et al., 2015). Furthermore, during national and international events and festivals, INGV researchers and technicians offer outreach initiatives on Earth Sciences (D'Addezio et al., 2014; Di Nezza *et al.*, 2018). organize yearly educational and outreach activities for schools (Pessina et al., 2012, Lanza et al., 2013; Musacchio et al., 2015a; 2015b, 2019; Amici and D'Addezio, 2018). The goal is to respond to the needs and the requests of the community on issues regarding our planet, and to engage society in a correct, straightforward and efficient communication on scientific research and technological innovations. In a world that needs citizens to be more informed, aware, and able to make crucial decisions about their own health and safety, knowledge is crucial to handle doubts and take de n with consciousness. Educational activities are designed to help raise awareness about Earth sciences and research, as well as stimulate interest in scientific culture.

This work summarises l rs of INGV's calendar competitions, and describes an experience of Earth Science education by drawings. The project, that ve scientific subject and its artistic representation by drawing, been presented at the EGU session Earth sciences and Art. The paper describes the project and investigates the impact and effectiveness of our approach.

The calendar projects

One of the most successful INGV initiatives is the creation of calendars, designed for the schools and realized thanks to competit among the children of primary schools. The objective is to provide a pleasant occasion for discussion among scientists, teachers, and students. The initiative achieved great participation and appreciation, as every year schools join in with enthusiasm by sending drawings made by children on a specific theme, that changes every year, and is chosen within the subjects of Earth Science. Earthquakes, volcanic eruptions, tsunamis, magnetic storms and other phenomena are manifestations of the complexity and dynamicity of our planet, which began more than four billion years ago and never ended. In the past decades, we recognized that global warming is part of Earth's dynamism and that it will have ound impact on future generations, although we are already facing the crises of climate change.

By involving primary school children in this project we have the chance to bring science closer to them and also to investigate the children's point of view on the Earth, Science, Environment, and Sustainable Behaviour. Indeed, the content of children's drawings may provide insight into their feelings and thoughts about the world and the way it fu n. Drawing is an important activity for children since it stimulates their imagination, and an amazing way of displaying emotion. Children's drawings can tell you so much about their fears, joys, dreams, hopes and nightmares. The drawings

of young children have attracted and interested many authors in the field of education (Farokhi and Hashemi, 2011; Cherney et al., 2007). The use of drawing as a tool for science teaching and learning, is described and discussed in literature (Phyllis, Eds, 2017). For ex es, drawings have been used to investigate learning strategies (Van der Veen, 2012), to analyse children volcanic risk awareness (Brasini et al., 2020), and the children perceptions of E nment (Günind, 2012). In our p t children's drawings may represent useful tools that provide valuable information for the assessment of children's environmental perceptions and their major expectations and concerns for the future.

The first calendar has been realized as a result of an educational project with a school (see the description of the 2004 – 2005 Calendar). The success of the initiative suggested the repetition of the experience, ex ng to all Italian primary schools the invitation to participate. Launch calls were prepared for each competition. The calls included a brochure illustrating the n notivations behind the chosen theme and some starting points for discussion. Information on the competition was spread via institutional websites, and via social media. A INGV venues and locations contributed to the calls diffusions, even in occasion of education and outreach activities carried out in their venues. As a result, we collected drawings from schools distributed in entire Italian territory. The first four calendar editions were organized by the INGV Settore Formazione e Divulgazione Scientifica (Training and Educational Office). Starting from the 2009 calendar, I have coordinated the competitions with the INGV Laboratorio Didattica e Divulgazione Scientifica (Educational and Outreach Laboratory).

For each calendar the drawing selection managed by a working group, composed by researchers and graphic experts, occasionally with science communicators and/or psychologists. The collected drawings were selected based on their relevance to the theme, originality and attractiveness and, last but not least, the inherent message. For some calendars, also texts have been chosen among those sent by the children, together with the drawing. In the final selection we have considered the gender and ages balance and the uniformity in the geographic distribution of the winners.

The graphic designs of the calendars were developed and realized by the INGV Laboratorio Grafica e Immagini (Graphics and Images Laboratory) (Riposati et al., submitted). Each graphic project was inspired by the theme of petition and realized by taking into account the heterogeneity of drawings, using different techniques, colors and subjects, and always keeping the focus on the children's work. Educational materials produced by INGV, in addition to copies of the calendars, were sent to the participating schools. Copies of the calendar distributed also to the schools participating NGV projects and events.

Events were organized to award the winners. They were hosted in the INGV venue in Rome, with their classmates, teachers and often their relatives. They received certificates, medals, games scientific games, and T-shirts with the logo of the competition. We invited scientists, journalists, artists, and science communicators, to the award ceremonies. Remarkably, the Italian Minister of Public Education came to the INGV headquarter in Rome to support the event on October 20, 2005, personally rewarding the winners.

2. The 2016 calendar

For the 2016 calendar we have chosen drawings used in the past calendars, dedicated to the Earth (Fig. 1). This initiative gave us the opportunity to reflect, evaluate, and sum up the message that these 10 year long project is communicating to the scientific community regarding the relationship between children and planet Earth.

Fig. 1. The cover page of the 2016 calendar made with a collage of all previous calendar covers (edited by INGV Laboratorio Didattica e Divulgazione Scientifica and INGV Laboratorio Grafica e Immagini).

2004 – 2005 Calendar ***"A natural phenomenon called earthquake"***

The first calendar was inspired by the project "When the Earth has a stomach ache" (Burrato et al., 2004). In 2000 a sma[illegible]e earthquake hit a [illegible] near Rome. This event was strongly felt by teachers and students of the local primary school, and suggested the idea ~~of a project fo~~[illegible]~~d~~ on earthquakes. Children, who have been taught about earthquakes, can be engaged to use their artistic expressions, and demonstrate their awareness on this phenomenon through drawings (Izadkhah and Gibbs, 2015). The aim of the project was for the children to learn about the causes of earthquakes and to become familiar with a phenomenon often considered random and unforeseeable. Moreover, an important task of the project was to train students and teachers to behave properly during the occurrence of an earthquake. At the end of the project the researcher team realized a calendar that displays earthquakes using the kids' original drawings and texts, showing their own impressions and experiences on earthquake and on shaking effects. In accordance with the researchers' efforts, most students have focused on what they have learned about the simple behaviours that can help reduce the damage.

Calendar 2005 – 2006 ***"Once upon a time there was a Volcano"***

Drawings of this calendar were chosen among 853 works dedicated to volcanoes. The drawings show the fascination and fear that the "mountains of fire" arouse in children. Month after month, children tell us the legends of the past regarding volcanoes. Hephaestus, the god of fire in the Greek mythology, that had his nether forge in the interior of Etna, working alongside the Cyclopes, giants with a single eye. Many drawings represented the volcano as an island, such as the island of Vulcano in the Eolian archipelago, the dwelling of the homonymous god of fire of the ancient roman people. It's from Vulcano Island itself that, at the end of the Middle-age, the mountains of fire were given the name volcanoes. Children also represent volcanoes in their activity, with the damage of eruptions, fire and flames, housing in danger and frightened people, but also the role of volcanoes for the life of the planet with the emissions of flowers and fish from craters and the slopes of the volcano covered with vegetation.

Calendar 2006 – 2007 ***"Telling the Story of the Earth"***

In this calendar, children drew the Earth's History and the many different living beings that have dwelled on it, showing Mother Earth's diversity and grandeur. We received 2200 drawings, illustrating the children's point of view on the history of the planet, from the origin of the Universe and of the solar system, the first forms of life, the differentiation of species in the waters and then on land, with dinosaurs, mammals and humans. Through the children's drawings one [illegible]follow the

story of an extraordinary adventure, a Universe full of energy, seas and oceans crowded with life forms, with the unmissable giant dinosaurs among luxuriant vegetation, grappling with smoking volcanoes, the beginning of the human race, with human ancestors and other hominids engaged in hunting, and finally the incoming of civilization.

Calendar 2007 – 2008 ***"Living with a Star"***

On the occasion of the International Heliophysical year (IHY), the 2007 competition were dedicated to the Sun, "our star" (Fig. 2). Thanks to the ST269 project partnership, schools from 8 European countries - Czech Republic, Cyprus, Finland, France, Italy, Poland, Spain and United Kingdom - participated this competition. Drawings were chosen among about 1300 works. Realized in all the languages of the participating countries, this calendar collected the drawing inspired by "our star". Fantastic images were produced of the Sun, sitting in space with other celestial bodies, rockets and satellites, and spreading out coloured rays. ~~T~~ are drawings ~~that~~ recall life on Earth, the Sun and the rainbow and the warm rays in the beaches in summer. There are images related primar e energy and life brought by the Sun. Finally, Sun interaction with the Earth at different latitudes: eclipses, auroras, the Sun in summer and non-Sun in winter, in some cases probably inspired by personal ~~children~~ experiences.

2009 Calendar ***"The Earth of tomorrow is today in my hands"***

For the UNESCO International Year of Planet Earth we focused on the issue of human responsibility on the sustainability of the planet, trying to stimulate young students' in becoming active citizens of tomorrow. Children's relationships with nature for environmental education has been explored using 'draw and write' methodology (Kalvaitis and Monhardt, 2012). Climate change will have multiple effects on human health and is the defining challenge fo velopment of young human in the 21st century. We suggested topics on climate, oceans and seas and continental water to sensitize the younger generation to the Earth beauty and natural resources, as well as natural hazards and the relation between humans and Earth's health. Children responded by sending drawings of rainbows, waterfalls, volcanoes and flower fields, but also with images showing concern for environmental degradation and the indiscriminate use of the planet's resources. Disrespectful behaviour is sometimes represented as fought "Superheroes" or protectors. Moreover, drawings on natural environments and everyday life highlight virtuous and environmentally friendly behaviour, respect for e nment and the importance of taking care (Fig. 3).

Fig. 2. The back cover of the 2007-2008 calendar dedicated the to the Sun and realized, through a partnering of European countries in the COST269 project, in 8 languages (edited by INGV Settore Formazione e Divulgazione Scientifica and INGV Laboratorio Grafica e Immagini).

2010 calendar ***"Precious Earth"***

The 2010 calendar still focused children's attention on planet Earth and the effect of human activity on the Earth. We asked children to create a message, by drawing an image to promote planet Earth. The title, Precious Earth, was chosen to underline how our existence completely depends on planet Earth, where we have evolved. We are part of it and will continue to be so if we manage to maintain a dynamic balance between a sustainable life and the Earth's ecosystem. The alteration of the planet's natural climate cycle calls for responsible and efficient use in the future and the promotion and development of alternative energy sources. From the collected drawings and texts emerges a sense of respect for the planet, a consciousness of its beauty and uniqueness and sadness for

activities that perceived as damaging for the planet. Also, the texts suggest the same sensitivity, i.e.: *Va bene cercare un altro mondo ma se ti trattiamo bene sarà sempre bello chiamarti casa* It's okay to look for another world but if we treat you well it will always be nice to call you home. *Chiudo gli occhi e sogno un mondo pulito e nessuno alza un dito. Sogno le persone rispettose dell'ambiente e la natura tornare vincente* I close my eyes and dream of a clean world and nobody raises a finger. I dream of people who respect the environment and nature becomes a winner again.

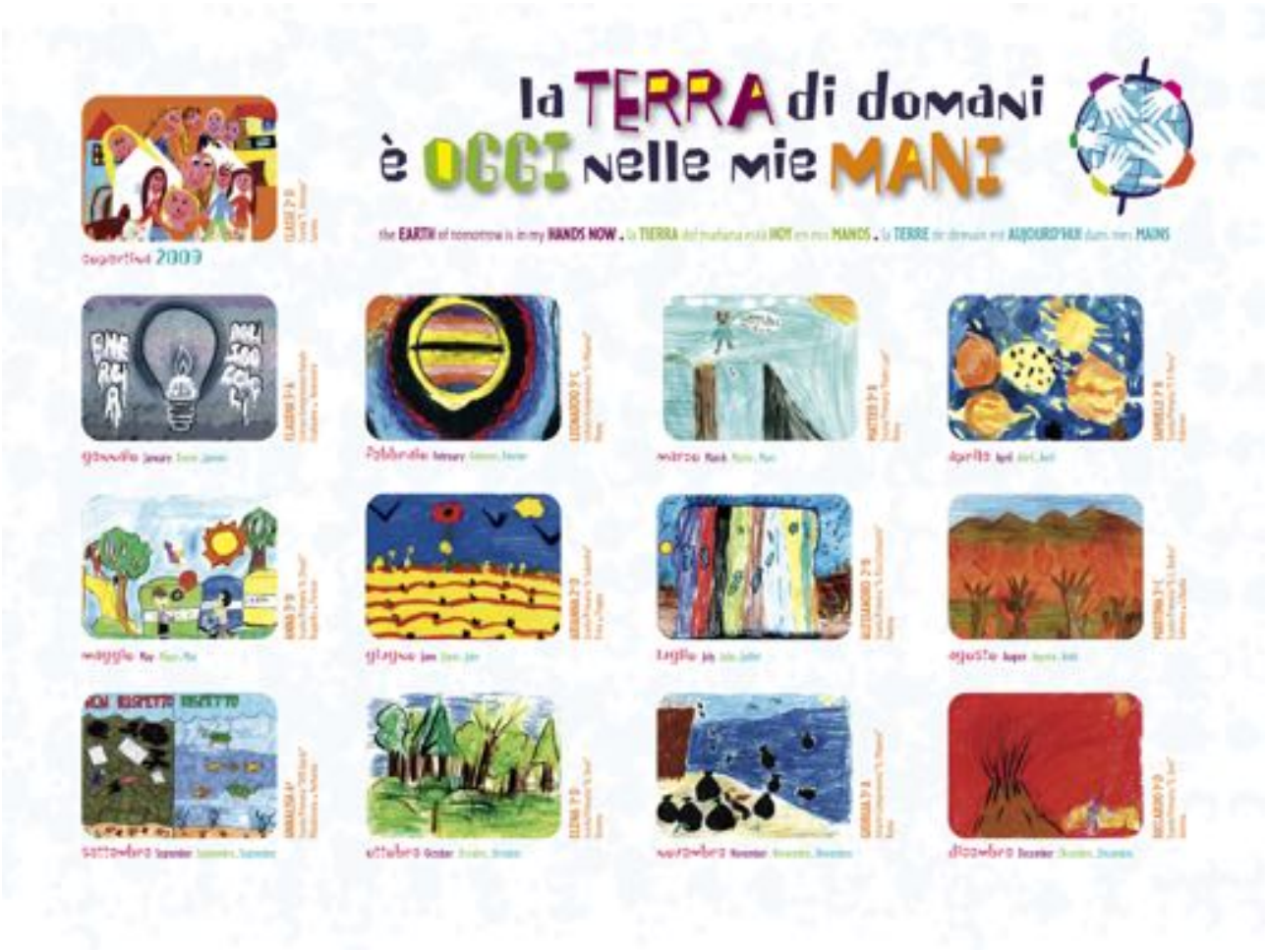

Fig. 3. The back cover of the 2009 calendar dedicated the to the Earth and to ~~the~~ today responsibility to protect the environment (edited by INGV Laboratorio Didattica e Divulgazione Scientifica and INGV Laboratorio Grafica e Immagini).

2011 Calendar ***"I'm a Scientist too! Science and scientists from the children point of view"***

In the International Year of Youth, established by the United Nations General Assembly, the theme was selected ~~with the purpo~~ ~~finding~~ how children see the world of science, scientists and research, and its potential and future perspective. Children were given the suggestions and asked to create a ~~d~~ ~~n~~: (1) How do you imagine a scientist? How do you imagine the daily activities of a researcher? (2) What is the invention you consider the most important among all those you know? (3) What would you invent?

During the competition, 986 d ng were collected. What we got is a colorful and busy world, full of young scientists confident in the power of science and technology, engaged in inventing devices to make us happy, to travel in space and time, and to solve the problems of the Earth (Fig. 4).
A sample of 200 drawings been analyzed in order to test and tune a classification scheme and to infer some considerations of the perceived image of science, scientists and inventions from the child's point of view (Rubbia et al., 2015). The analysis reveals a persistent gender stereotype related to scientists, since 70% of the depicted persons were male and 45% of girls draw male scientists. The image of a 'mad scientist', mainly related to male scientists, is still present (15%). Female scientists are drawn by girls; they are represented as young, not crazy and are usually good-looking. Scientists of both genders are young, and this is a positive image, in that scientists may be perceived as closer to everyday life (Rubbia et al., 2015).

2012 Calendar ***"Mission Possible: let's save the world"***

The theme was inspired by the International Year of Sustainable Energy for All, designated by the United Nations General Assembly to promote research of new green technologies and to focus on environmental problems and the future of the Earth. Our planet provides all the resources that allow life to flourish. Many of these resources depend on delicate balances and are not unlimited. We consume more resources than the Earth can generate. Almost all of the energy and raw materials we use to produce or build what surrounds us and what we needed to live comes from the Earth. A land that feeds, warms and offer us beauty.

In the brochure of the call we have suggested some priority for the mission:
1) counteract the pollution of air, water and soil;
2) stop global warming and the destruction of ecosystems;
3) develop new green technologies.
Children's fantasy offered us images of a planet with rainbows, trees, clean rivers and lakes, school buses powered by pedals, eco-volcanoes, machines that convert waste into flowers. In fact, the real challenge for children was to draw inventions. We can see green' ideas and technologies based on solar energy for high-speed trains or pizza ovens, e y that comes from destruction of weapons or by harnessing volcanoes (Fig. 5). In other words, Sustainable Development that is able to meet the needs of the present without compromising those of future generations.

Fig. 4. The design chosen for the 2011 calendar cover, summarizes the main themes present in the drawings sent by the children. Smiling scientists, confident of the potential of science, engaged in enthusiastic discoveries to improve planet life (edited by INGV Laboratorio Didattica e Divulgazione Scientifica and INGV Laboratorio Grafica e Immagini).

Fig. 5. One of the d g selected for the 2012 calendar. The drawing shows a very complex project of an eco-volcano, with very detailed instructions and precise statements on the low cost of the project and on the absence of pollution (edited by INGV Laboratorio Didattica e Divulgazione Scientifica and INGV Laboratorio Grafica e Immagini).

2013 Calendar ***"In the heart of the Earth"***

What do students of primary schools imagine there is inside the Earth? Scientists agree for a representation of the interior of the Earth, but so far no one has yet gone to check it. Inside the Earth, temperature and pressure increase progressively until they reach very high values, that challenge any technology known to date. We went to the moon, but we have not been able to go for more than a few kilometres inside the Earth. From the 1034 drawings we have received, the interior of the Earth is definitely very colourful and sometimes animated by turtles, butterflies and fire-breathing dragons. In some cases it consists of candy, cream and chocolate, precious stones and fire feeding volcanoes. Some drawings were inspired by legends and myths alluding to the existence of underground, hidden and mysterious worlds, also inhabited by people and fantastic creatures.

2014 Calendar ***"The Magic of Water"***

Water is an essential part of the Earth making it a rare planet. Precious and indispensable to life, water is a wealth we are claimed to protect. By increasing awareness we can avoid water wasting or polluting of water.

We received 1195 children's drawings, where water is represented in its plentiful manifestations, in the atmosphere and on the Earth's surface (Fig. 6). Placid waters of lakes and lagoons, pouring waterfalls where the sun is reflected, more troubling water that gives rise to glaciers and ice figures and polluting boats. There are also suggestive images that remind us of extreme events such as floods and very powerful rain, which represent a sign of awareness. In fact, the understanding of water's varied and sometimes powerful manifestations in the atmosphere and on the Earth's surface, promotes a correct use of the territory and a behaviours of respect and attention for the natural environment.

Fig. 6. The back page of the 2014 calendar dedicated the to the water (edited by INGV Laboratorio Didattica e Divulgazione Scientifica and INGV Laboratorio Grafica e Immagini).

3. Final considerations

The 10 years of INGV's calendar competitions directly involved t 400 schools. In addition, at least 500 other schools have been reached by the initiative each year by receiving copies of the calendar. We have collected about 10,000 dr g. These data indicate a good level of impact of the calendar drawing competition approach. With the exception of the first calendar, resulted from a specific in presence educational activity, the scientific messages were conveyed without a direct interaction researchers. The launch call brochures represented only a starting input. her had the opportunity to or ze special lessons to raise pupils awareness on the competition topics and to better develop the calendar theme subject. The interaction with researchers can be enhanced in future competitions by organizing, for the participating schools, lectures and workshops using distance learning technologies. This could more effectively convey the scientific messages to teachers and students. Moreover, a direct int on, even if at distance, can give the possibility to have a feedback on the efficacy of the initiative on raising knowledge and awareness.

The organization of training and outreach activities can benefit fro owledge of the cognitive and emotional outcomes of the beneficiaries. Projects with schools and wit lic have been analysed in order to gauge the effects of the training activities and the motivations of participants. These studied provided information the amount of popularity and effectiveness of training in various contexts (D'Addezio, 2019; D'Addezio *et al*., 2014; Lanza *et al*., 2013; Musacchio *et al*., 2015a; Musacchio *et al*., 2015b). Moreover, we can perform a more general analysis on how the scientific message has been received, on the ability of scientists in transferring concepts, ideas, information in a correct but also captivating way.

Apart from the competition, the drawings we received in ten years of continuous activity with schools depict children's impressions and reflections, and provide an opportunity to understand the children's point of view. In fact, children's drawings can provide valuable information on the development of children's environment perceptions (Farokhi and Hashemi, 2011). How do young people cope with global problems, such as climate change, potential sources of worry and distress? Generally, children cope with worry by using less problem-focused behaviour and more distancing and place trust in researchers and technological development to a higher degree than adults (Ojala, 2012). Our analysis shows that this attitude can be observed in the children's drawings. In fact, from the drawings and texts we have collected, a great consideration, a deep environmental concern and respect for the planet emerge. As shown in other experiences, children demonstrated a positive relationship with nature (Kalvaitis and Monhardt, 2012). A similar positive relation between children and science and scientists also emerges from the calendar drawings. Science and technology are perceived as powerful tools that are capable to handle the continuous challenges

humanity is facing. Moreover, children represent themselves as users of these tools to solve problems and improve the world. In this light, the outcome of the calendar project, gives hope that similar initiatives can contribute in increasing the knowledge of the Earth and the fragile human ecosystem in the hearts and minds of future active citizens.

The author declare that she has no conflict of interest. Figures are from INGV publications.

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References

Amici. S., and D'Addezio, G.: Earth observation from space: a school work path way experience. EDULEARN18 Proceedings, doi:10.21125/edulearn.2018.2490, (2018).

Avvisati, G., de Vita, S., Di Vito, M. A, Marotta, E., Sangianantoni, A., Peluso, R. G., Ricciardi, P., Tulino, S., Uzzo, T., Ghilardi, M., and De Natale, G.: Reale Osservatorio Vesuviano: the First Volcanological Observatory in the World. Geophysical Research Abstracts Vol. 17, EGU2015-1671, (2015).

Brasini, F., Modonesi, D., Camassi, R., Ercolani, E., Pessina,V., Todesco, M., and Nave R.: L'eruzione immaginaria. Un'indagine sulla rappresentazione del rischio vulcanico nella fantasia dei bambini, Quaderni di Geofisica, 161ISSN 1590-2595, (2020).

Burrato, P., Nostro, C., Tertulliani, A., Winkler, A., Casale, P., Marsili, A., Castellano, C. Cultrera, G., Scarlato P., Alfonsi, L., Ciaccio M.G., and Frepoli, A.: When the Earth has a Belly-Ache: Young Seismologists at School. Eos Trans. AGU, 85(47), Fall Meet. Suppl., Abstract ED33A-0759, (2004).

Cherney, I. D., Seiwert, C. S., Dikey, T. M., and Flichtbeil, J. D.: Children's Drawings: A mirror to their minds, Educational Psychology, Vol. 6, 127-142, doi.org/10.1080/01443410500344167, (2006).

D'Addezio, G., Rubbia, G., and Marsili, A.: The experience of ScienzAperta, a week of scientific information and dissemination. Engineering Geology for Society and Territory, Volume 7, 103-107, (2014).

D'Addezio G., Giordani, A., Valle, V., and Riposati, D.: 100 years after the Marsica earthquake: contribute of outreach activities. Geophysical Research Abstracts, Vol. 17, EGU2015-13401-1, (2015).

D'Addezio, G.: Il libro dei commenti di mostre scientifiche temporanee: analisi e prospettive, In: Studi empirici di educazione museale, edited by Poce A., Edizioni Scientifiche Italiane, Napoli, ISBN 978-88-495-4063-5, (2019).

Di Nezza M., De Santis A., D'Addezio G.: CityQuest & "Caccia al… Tesoro dei Castelli". La nuova frontiera della divulgazione formato 2.0. Rend. Online Soc. Geol. It.,Vol. 45, 17-22 https://doi.org/10.3301 /ROL_2018_23, (2018).

Farokhi, M., and Hashemi, M.: The Analysis of Children's Drawings: Social, Emotional, Physical, and Psychological aspects, Procedia - Social and Behavioral Sciences 30 (2011) 2219 – 2224. doi:10.1016/j.sbspro.2011.10.433, (2011).

Günind, Y.: Environment in My Point of View: Analysis of the Perceptions of Environment of the Children Attending to Kindergarten through the Pictures They Draw. Procedia - Social and Behavioral Sciences, 55, DOI: 10.1016/j.sbspro.2012.09.541, (2012).

Izadkhah, Y.O, and Gibbs, L.: A study of preschoolers' perceptions of earthquakes through drawing. International Jou. of Disaster Risk Reduction, Vol. 14 132-139.
doi.org/10.1016/j.ijdrr.2015.06.002, (2015).

Kalvaitis, D., and Monhardt, R. M.: The architecture of children's relationships with nature: a phenomenographic investigation seen through drawings and written narratives of elementary students. Environmental Education Research, Vol. 18, 209-227, doi.org/10.1080/13504622.2011.598227, (2012).

Lanza, T., Crescimbene, M., La Longa, F., and D'Addezio, G.: Bringing Earth into a Scene of a Primary School: a Science Theatre Experience, Science Communication, Vol. 36, 131-139, doi: 10.1177/1075547012473841, (2013).

Musacchio, G., Piangiamore, G. L., D'Addezio, G., Solarino, S., and Eva, E.: "Scientist as a game": Learning geoscience via competitive activities. Annals of Geoph., Vol. 58, doi:10.4401/ag-6695, (2015a).

Musacchio G., Lanza, T., and D'Addezio, G.: An experience of science theatre to explain the interior of the Earth and its hazard to children. Journal of Education and Learning, Vol. 4, (2015b).

Musacchio G., Eva E., and Piangiamore G. L.: The KnowRISK Action for Schools: A Case Study in Italy. In: Rupakhety R., Olafsson S., Bessason B. (eds) Proceedings of the International Conference on Earthquake Engineering and Structural Dynamics. ICESD 2017. Geotechnical, Geological and Earthquake Engineering, vol 47, (2019).

Ojala, M.: Regulating worry, promoting hope: How do children, adolescents, and young adults cope with climate change?. International Journal of Environmental & Science Education, Vol. 7, 537-561, ISSN 1306-3065, (2012).

427 Pessina, V., and Camassi, R. (Eds): EDURISK 2002-2011: 10 anni di progetti di educazione al
428 rischio. Miscellanea INGV, 13, 77 pp., (2012).

429 Phyllis, E. (Eds): Drawing for Science Education. An International Perspective. SensePublishers-
430 Rotterdam, The Netherlands, pp. 270, 10.1007/978-94-6300-875-4, (2017).
431
432 Riposati, D., D'Addezio, G., Di Laura, F., Misiti, V., and Battelli, P.: Graphic design and scientific
433 research: the INGV experience, submitted to this Volume.
434
435 Rubbia, G., D'Addezio, G., Marsili, A., and Carosi, A.: Science and scientists from the children
436 point of view, an overlook from drawings. Geological Society, London, Special Publications 419
437 (1), 161-170. http://dx.doi.org/10.1144/SP419.11, (2015).