

# **Does astronomy really inspire and change perspectives?: A randomized controlled study of an astronomy outreach program**

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## *Introduction*

One of the most cited reasons for communicating astronomy to the public is that Astronomy is inspirational and exposure to such topics leads to the development of an interest in science and STEM. Astronomy communicators, educators and professionals frequently engage with children and the general public to teach, demonstrate, and talk about Astronomy. But very rarely is the impact of such communication evaluated scientifically. The results of public communication of Astronomy are generally based on surveys and feedback forms which may not be designed to reveal weaknesses.

There is a need for more rigorous evaluation methods which would reveal the successes and failures of current methods of astronomy communication and whether they might lead to any inadvertent harm. We share the implementation of a pilot Randomized Controlled Trial carried out in Cape Town, South Africa to test whether exposure to an astronomy intervention affects empathy and altruism in children (that is, whether astronomy induces a perspective of 'One Global Humanity' as is often said). The pilot demonstrated that it is possible to use such rigorous methods to evaluate impact of astronomy outreach in an inexpensive manner.

The One World Experiment was carried out as a pilot effort in Cape Town, South Africa, to test whether exposure to an astronomy intervention affects empathy and altruism in children. The intervention focused on introducing children to knowledge around the Earth's position in the Universe and collecting data to assess the effect. This paper presents the project background as well as the methodology from the project's first phase, designed to understand the possible difference in empathetic response between a child and other "ingroup" and "outgroup" children; for any child, an 'ingroup' child is one belonging to their own social group (in this case, nationality), and an 'outgroup' child is one belonging to a social group other than their own. It is found that the students across the study have a strong cohesion to those of the same nationality but that there is no nationality bias in their feelings towards how other children share their joy with them. Full analysis of the data, which will compare the control group and experimental group results and focuses on the impact of astronomy intervention, is underway for future publication.

## *Background*

The Pale Blue Dot is a famous image of Earth taken by the Voyager 1 spacecraft on 14 February 1990, when it was around 6 billion kilometers from us. In this picture, taken at the suggestion of the

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astronomer and science communicator Carl Sagan, Earth appears as a pale blue dot, a tiny point of light, less than a pixel in size. As Sagan later wrote in his book, the image ‘underscores our responsibility to deal more kindly and compassionately with one another and to preserve and cherish that pale blue dot, the only home we’ve ever known’ (Planetary Society, n.d.). The image and the philosophy behind the Pale Blue Dot have inspired awe and excitement in many people around the world. It is assumed that knowing one’s place in the Universe alters perception and induces more empathy towards fellow humans. But there is little evidence supporting the claim. Empathy, altruism and pro-sociality are critical foundations for a stable human society. Research shows a tendency for individuals to feel more empathy and engage in more prosocial behavior towards individuals categorized as belonging to their own social group relative to other groups.

### *Pilot Study*

From October to November 2015, the astronomy outreach project ‘One World Experiment’ was carried out among 938 secondary school students in Cape Town, South Africa. The IAU Office of Astronomy for Development and Hosei University together with the South African Astronomical Observatory conducted a Randomized Controlled Trial (RCT). The main objectives of the study were a) to test whether exposure to an astronomy intervention affects empathy and altruism in children b) prove feasibility of evaluating an astronomy intervention in a low-cost manner.

Participants were randomly assigned (as a class group) into experimental and control groups. The experimental group received an astronomy intervention where a qualified Physics teacher taught the students about their place on Earth and in the solar system. The students were taken on a tour of the solar system (using a combination of Google Street View, Mitaka software and Google Mars) to foster the idea of ‘One Common Humanity’.

The intervention was followed by two measurements: 1) a voting process intended to test the helping behaviour of the children toward children from other groups. Each student had a card with envelopes affixed under a gender-neutral picture of a child from their country (ingroup) and a child from a chosen foreign country (outgroup). Students were given 3 tokens each and told that each token represents 1 unit of currency. They were told that whichever envelope they put the token in, a real donation of that amount would be made to the child whose envelope they chose. 2) questionnaire to test their feelings towards children from ingroup and outgroup. There were two sets of five questions, one for the home country and the other for the chosen foreign country.

### *Conclusion*

The RCT was implemented as a pilot project to test the feasibility of adding and running a low-cost evaluation component to a typical educational intervention at the school level. The trial and results are important not only in the context of this particular intervention but also for astronomy and science popularisation and outreach activities. Our findings demonstrate that it is possible to run evaluations to better understand the impact of such interventions.

The full analysis will consider the impact of astronomy intervention on ingroup-outgroup bias. All the publications based on this study only present summary statistics and ensure that neither any school nor any of the children are identifiable. Participation in this study was entirely voluntary.

### *References (when applicable)*

Planetary Society (n.d.). The Pale Blue Dot. Retrieved from <http://www.planetary.org/explore/space-topics/earth/pale-blue-dot.html>

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