

IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)  
Ignition - Primary Space Education (1)

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## FROM OVERVIEW EFFECT TO LEARNING GAINS: VIRTUAL REALITY IN SPACE EDUCATION

**Abstract**

Since the Earthrise photograph by Apollo 8 astronaut William Anders of planet Earth from lunar orbit, the Overview Effect experienced by so few could be seen by many. The Overview Effect has been reported by most astronauts, a feeling of awe, self-transcendence, and a change of perspective and identity after viewing planet Earth from space, which led to a strong appreciation for our planet. The impact of the Overview Effect has been profound on questions regarding climate, citizenship, and sustainability.

A virtual reality simulation can bring the Overview Effect experience to school children. In the innovative SpaceBuzz educational program that now runs in 400 schools across Europe, we are doing exactly that. In a pre-flight training session at primary school, children are trained in a playful way to become young astronauts by doing fun exercises. After they finalize their pre-flight training, a life-size rocket ship arrives in front of their school and they are launched into space using a virtual reality simulation. Guided by a well-known astronaut they get into an orbit around the Earth and experience the view actual astronauts have experienced that led to the Overview Effect. Whether the simulation of the Overview Effect approximates the actual astronaut experience is a research question, one that we answered in an experiment with several hundreds of primary school children.

By using a series of questionnaires and pre- and post-tests we have found that children indeed experience the Overview Effect in virtual reality. Furthermore, we found that this experience is primarily caused by an individual's feelings of awe. Moreover, the experience of the Overview Effect yields learning gains in school children. By using head direction data as a proxy for what a participant was looking at within VR, we have made it possible to not only measure learning gains through questionnaires, but to connect which children yielded learning gains, resulting from experiencing the Overview Effect. This has potential for monitoring learning experiences while they take place. Meanwhile we are conducting brain imaging studies in the VR simulation to investigate whether the Overview Effect can be identified neurologically.

The findings from these experiments offer new insights in the use of virtual reality and artificial intelligence, and provide exciting opportunities for primary school STEAM education, and help foster a long-term passion for space.