Climate and Greenhouse effect

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This project is a workshop devoted to explaining the basic effect behind the warming of the climate, the so-called greenhouse effect. In short, the workshop shows with simple practical experiments the exchange of heat (energy) in the atmosphere and at the surface of the Earth. The important notion is the so-called “radiative (energy) balance”, which is about the heat received by the Earth from the Sun via absorption of sunlight, and the heat that the Earth loses by emission of infrared light (IR), a colour of light that the eye cannot see. The experiments require some equipment, notably a small IR light detector or a smartphone that can detect IR light (the IR detection by the phone camera can be tested with TV commands that operate with IR diode).

The purpose of the experiment is to test the transmission of visible or IR light through a range of material: a transparent plastic sheet, a black plastic sheet, a cardboard sheet, and a glass sheet. Each sheet is tested. In the first set of experiment, the source of visible light is simply a lamp and the detector is the eye to see whether the visible light is blocked or go easily through the different material sheet. The same experiment is repeated for the IR light. The source of IR light is simply a hand palm instead of a lamp and the detector is the smartphone or an IR light detector. A warm hand palm emits IR light but humans cannot see it with their eyes. In both sets of experiments, the 4 sheets are tested.

The children have to identify the material exhibiting sunlight and IR properties similar to the atmosphere. In that case, it is the glass which is transparent to sunlight but opaque to IR light, like the atmosphere. Then, ‘thought’ experiments are carried about how the absorption of visible light (or the emission of IR light by the Earth’s surface) can heat (or cool down) the Earth’s surface. The heat (energy) budget at the surface and the greenhouse effect are then discussed.

One of the key objectives is to make them manipulate simple physical concepts to understand a relatively complex effect, the greenhouse effect, and climate change.