Chapter 23
Energy in 3D: Designing the City of the Future

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ABSTRACT

The course is developed from the study in Life Sciences and energy, till the deepening about the fossil and renewable sources, with video display, animations, little experiments, interactive games and multimedia presentations using the IWB of the renewable energy sources. After scoring a summary of key information, we switch to implement a Smart city planning workshop, drawing three-dimensionally objects with the 3D graphic application Sketchup, until build the city furnished with solar panels placed on the roofs. At the end of the trail, the educational activities are implemented in the Virtual World Scuola3D supported by a proactive and creative way to educate pupils by conscious and creative use of information and communication technologies, with the use of 3D and virtual worlds for live at three-dimensional virtual experience until they are able to design and build a three-dimensional ideal city, the “Smart city” for a sustainable future.

INTRODUCTION

“Energy in 3D” is a learning path aiming to encourage the introduction in school curricula of the new knowledge required to create a common, sustainable future. By the use of 3D and Virtual Worlds it makes it possible to educate to a responsible and creative use of information and communication technologies, placing as final objective the design and implementation in a 3D environment of an ideal city: the smart eco-sustainable city of the future.

Through three-dimensional virtual experiences, the path prompted discovery and cooperative learning, favoring team discussion about the topics presented, in-depth activities, research and group work, eventually shared with the whole class.

The project made use of Augmented Reality: through AR-media plug-ins, the 3D models created with SketchUp© software could be visualized outside the digital working environment, directly in the end user real environment by connecting a simple webcam and using the ‘marker’ (i.e. the printed code).

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BACKGROUND

The “Blue Economy” Model: Simplicity and Creativity for Sustainable Change

A balanced mix of energy sources (fossil and renewable) and a more efficient use of resources by eliminating wastage, are not enough to cover the great need for energy while respecting the environment.

The use of renewables is still expensive and not within the reach of all.

As Gunter Pauli explains in his book *Blue economy*, the solutions for a green economy are too expensive. If access is limited to rich people only, the world cannot change, pollution will continue, as will global warming and the destruction of ecosystems (Pauli, 2010).

The blue economy model, instead, looks different: everything that is good for us and covers living necessities can be available with no expense, just by using the available resources, as in the ecosystems.

Cultivating mushrooms on coffee grounds, using a mobile phone without its battery, exploiting the heat produced by the body and the vibrations of the human voice, or even imitating the water supplying system a beetle uses, in order to reduce global warming, replacing the “throw-away metal blades of razors with silk threads. Science fiction? No: reality.

In nature there’s no unemployment nor waste. Everyone plays an important role and one’s wastes become raw material for the others, in a “cascade” system where nothing goes wasted (The Blue Economy. mov, 2010). In a recent interview Pauli said: “We must make better use of the energies we have, without wasting any more time. And we’ll do that faster if we look at the world through the eyes of children.”

Why 3D

From an article by Silvia Sbaragli “Prima vengono i solidi” (Sbaragli S., 2005).

... The geometrical setting typical of a primary school is mainly centered on activities concerning the ‘plane’ to the detriment of those inherent to ‘space’.

That is, teachers usually require children to perform in two dimensions (2D) and only later - and not always - propose three-dimensional (3D) experiences.

The explicit admissions of different teachers who, with extreme sincerity, report using a 2D world related language with pupils - which is however often also improperly referred to the 3D world - give evidence to the predominance of plane vs. space in teaching. A teacher says, for example: “I call this (pointing to a cube edge with a finger) a side (a term which is plan related) and another: “I call this a triangle (pointing a model of triangular prism with the triangular face more extended) and this a square (a model of quadrangular prism with the quadrangular face more extended)”.

At the same time, some teachers interviewed declared that they did not know of, and so did not make use of, any specific language concerning space: “I don’t use the word face in mathematics”, or ” Is this the edge? I have always said that this tip (vertex) was the edge”.

These statements proposed by teachers to students may be the basis of misconceptions that can create barriers to the learning of further mathematical content; they are rooted in the lack of knowledge of 3D geometry and the attempt to start from recognition of plane geometric figures, for which there seems