Chapter 23
Physics and Creative Thinking Connected by "Bit"

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ABSTRACT

In this work, innovative methodologies to teach scientific matters have been put to test, aimed at recovering the those human attitudes that lies at the foundation of physics, including curiosity, ability to observe nature, and the search of explanations. Observations made during the experimentations can then be discussed together by the students and finally organized according to a layout to highlight logical connections. Through the new didactical path, personal motivations and inward reflection on one's own ability to learn are encouraged, and the student is lead to gain skills for more effective study and to master memorization techniques. The mythology has been here put into practice in the first level at high school, also exploiting internet and multimedia facilities.

INTRODUCTION

The main reason to devise new methodologies was the urgency to face the steadily increasing gap between teachers and students, who show scant regard for physics and mathematics together with a general little ability to pay attention and little power of concentration. All these issues are made heavier by old style school, still found even in today's lessons. Add to that that the author felt a deep sense of frustration at her inability to improve the situation, to catch students attention and schedule appealing proposals by the only use of chalk on the blackboard

The author realized that communication channels she was used to are very different from the teens' ones, whose life is surrounded by a variety of digital communication links, that they handle with much more confidence than many adults in school and in their families.

The experience, devised with the awakening interest and motivation of students in mind, took place in a first year class, made of thirty students, half boys and half girls, at senior high school specializing in science and technology education

Specific aims of the experimentations are recovering of expertise, enhancing proficiency, increasing students' ability to 'live in school,' gaining motivation, improving powers of concentration, learning peer education, exploiting peculiar approaches to study at school.

The recovery of specific disciplinary skills, which is the ultimate goal for the teacher, are through the discovery of the skills of documentation, as a set of knowledge (knowledge of computers and network, use of sources such as texts and techniques of cataloging) of know-how (to use computer packages, collect data and materials, analyze, catalog, build share, promote communication) and other ways of being (collaborative, empathic design, available).

The adopted methodology was based on the mixing of the most operative techniques that take their cue from the reflection on the two key elements that make up knowledge: the meaning and method.

- **Meaning:** To know the definitions, concepts, symbols, graphic representations of the symbolism used. The knowledge of meanings does not imply competence.
- **Method:** Ability to work, ability to conduct activities according to predefined procedures.

The implementation of a method is not synonymous with rote learning, but neither of meaningful learning. The ability, in the broadest sense is considered as the ability to resolve the situation or problem solving issues in different contexts, involves both knowledge of the meanings, both of the method.

For every education act, we must ask what method is in use and how much of the meaning of

concepts has been assimilated, if conditions have been set for enhancing both. Only then learning is significant because it becomes personal wealth and also usable in other contexts.

It is then necessary working in a laboratory or in a virtual environment that presents simulated experiences (e.g. all the applets that can be found on the internet) that can be managed individually or in groups. From these physical, although virtual, situations, you can begin to propose questions and/or problematic situations in which you must find a solution and/or an explanation starting from the elements available. These are the prior knowledge and suggestions given by the teacher at the opening.

Then you will guide students to build a mental model and/or mathematics consistent with the argument and let them produce on their own so that it is their intellectual achievement. To do this you must create a stimulating environment, sufficiently complex, uncertain and unstable, but unique, because every time the action is based on concrete and personal student's actions.

To realize such conditions, electronic tools can be used, that allow several approaches and subjects to be chosen. The activities managed by the computer, such as simulations, may be the actions of a new "learning workshop," where the teacher becomes a mentor and can follow, easy and complete learning. The shares in a computing environment perfectly recovered that kind of learning called "experiential" that is the most effective way of learning we know.

Knowledge emerges from this "experience" in a personal way and with their peers through the use of all synchronous communications (class, chat) and asynchronous (forum, mail). Learning of experiential origin is accessible when you are an environment where someone can ask "how to" or "how" and get a straight answer just like in a shop. The more the school simulation is natural the more it is motivating and learning can be less tiring. Moreover, that way of learning embraces the scientific method on which research, and

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