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Teaching Science at School

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"Chemistry Is All Around Network" (http://www.chemistryisnetwork.eu) is a three-year project funded in the framework of the Lifelong Learning Programme – Comenius sub programme – Networks Action, aiming at stimulating the students' interest towards the study of chemistry. It is based on the collaboration of school teachers, scientific experts and university researchers. Each year foresees different activities within a specific area of interest: 1. students' motivation; 2. teachers' training; 3. successful experiences and good practices.
The first year of work, dedicated to analyse students' motivation in studying chemistry in the Countries involved, was completed in December 2012 and the material produced (papers, reports, teaching resources etc.) is available in the project portal. The second year, dedicated to teachers' training, is in progress and few considerations related to Italy are herein presented.

COMMUNICATION AT SCHOOL AND THE CHOICE OF CONTENTS

The primary task of teaching should be to identify the conditions that can make communication effective; in other words, the most appropriate conditions to minimize the difference between what the teacher means and what the student perceives. This is particularly difficult when the subject taught is chemistry, because of the relationship between the macroscopic and the microscopic models and of the necessity of using symbols.
Three main contents are involved in communication at school [1]: *the language, 2. the requisites, 3. students' interest and motivation*

The language

Teachers should take the language into a great consideration, despite the discipline they teach: they should use, as much as possible, words of the common language, at least initially (it means starting from the language of their pupils), and, at the same time, they should work to enhance the linguistic skills of their students. Pupils' linguistic problems occur from the beginning of primary school, since the very first day of school: it is when the kids realize that some topics are difficult for them to get through and, thinking they won't be able to understand, they will rather use their memory than their brain to learn. This somehow inevitable choice, is irreversible because if the pupil gets good results by memorizing and repeating, he will continue and become increasingly able at this feature; memorizing requires less effort than understanding, and students will hardly choose this option, particularly those who have never been purposely trained.

The requisites

When the addressees of a message haven't got the necessary requisites to interpret it, this creates problems in communication. In this case, we refer to the conceptual requisites, skills and abilities that are essential in order to understand what is being proposed. For this reason the choice of contents becomes an extremely important factor in school.

The motivation

Once the teacher has created adequate conditions so that the message is understood as the teacher wants, there is the problem of passing from the so-called comprehensibility of the message to its proper understanding by the recipient. Interest and motivation are factors that influence the transition from comprehensibility to proper understanding. As a matter of fact, there is a strong relationship between learning and interest in learning: it could be argued that if pupils have no reasons to understand, the learning will be very hardly achieved. It is necessary to identify appropriate tactics and strategies to attract the students' interest, to make sure that they feel the need to "look for explanations."

THE LABORATORIAL APPROACH

The laboratorial approach is a very useful tool for teaching to develop the cognitive autonomy of pupils [2]. It foresees a sequence of actions where the student is not a banal performer that follows the instructions of a recipe, but a person who reflects about the way the experiment should be carried out, performs it, collects data, analyses the results and communicates them.



A typical sequence of a laboratorial activity should be:
1. Focus on the specific topic that will be dealt with, through the description or presentation of an experience
2. Individual written work: each pupil has to express his point of view about the topic. The work has to be performed by the use of a worksheet where the teacher clearly indicates what is requested by the students. The task usually consists in one or more specific open questions
3. Written work made by small groups (on another related worksheet): pupils compare the individual answers and try to reach a unique shared answer. Should different points of view persist, they must be written
4. Presentation of the conclusions by the representatives of each group; the teacher will try to build up a summary of the results
5. Teacher's considerations about the topic dealt with, additional information and suggestions.



If we want motivational aspects, laboratories and other educational tools have a positive role, it is indispensable to realize an efficacious **communication** by choosing suitable contents. Only if the recipients possess the necessary cognitive requirements and the transversal basic skills, the new knowledge can interact with what they already know.

[1] Borsese A. (2001). Orientamenti Pedagogici, 48, 923-934
[2] Borsese A., Parrachino I. (2012). Orientamenti Pedagogici, 59, 253-262