Section B “About Learning”

Introduction

Elena Sassi, Matilde Vicentini

We believe that the vast majority of teachers will agree that “learning” is the word that defines the aim of his/her work. The “end product” of the teaching work is, in fact, or should be, that learning should happen in the mind of the students. Presumably then, all teachers act according to a model of learning, be it conscious or unconscious. We may say that different learning models have been developed in the human history but the learning of “learning models” has not become a must (and still is not) in contemporary society. It follows that many teachers act according to some sort of “intuitive pedagogy” which often amounts to assume the minds of the students as "tabula rasa" on which the teacher’s words will, if carefully chosen and organized, imprint what should be learned, as if the learning processes could be guaranteed by an optimized accessibility of the teaching contents. This model is still largely in use in many contexts, also in University courses.

Understanding the functioning of the mind and how people learn is a very complex problem, in which many interplaying dimensions have to be taken into account: from the motivation and interest of teachers and students to the many skills needed to learn, from the values attributed to what should be learned to the different styles of intelligence of the humans, to the role of memory, to the interaction between cognitive and emotional spheres of the humans, to …

Research in different disciplines has tried to address the learning processes and suggestions for reasonable/plausible learning models are now available; in particular for the scientific disciplines, on the basis of careful scientific investigations on the systematic “errors” made by students after instruction, on the problems the students commonly encounter when learning scientific contents.

The title of this Section “About learning” evocates the many dimensions of the theme and the three papers look at it from rather different perspectives.

The first essay “Learning and conceptual understanding: beyond simplistic ideas, what we have learned ?” by Laurence Viennot presents recent developments of research and basic models of learning with the aim of rejecting some simplistic views. She also discusses when and how the students should be introduced to the nature of science and if the latter is a necessary pattern for learning. Some consensual positions about the teaching-learning processes are commented, together with some consensual suggestions for the teaching practice. The issue of the choice of the content matter and its critical details is then addressed, also through specific examples. Finally the issue of “science in context” is discussed, pointing out that also other sources of motivation should be taken in strong account, as for instance, rigorous and coherent argumentation in the teaching of basic topics.
Most of the proposed reflections refer to conceptual learning. And what about skills and values?

The second essay “Development of Scientific Skills and Values in Physics Education” by Vivien Talisayon discusses the latter aspects by presenting also some approaches to the

definition of scientific skills, whose development is aimed at in various countries. Amongst the discussed skills are those appropriate for: scientific inquiry, ICT activities, communication, group work, critical thinking, … in the framework of the various principles of a sustainable development in physics teaching. Also some results from the Rose project about the students' attitudes toward science in "developing" and "developed" countries are presented. Interesting hints for reflections are offered by the conclusions: "Physics concepts has been a main goal of Physics teaching with skills often considered as tools to learn the concepts.. . ..Values.. . .have served as a motivation to learn the concepts. Yet, if skills and values are equally important.. . ..focus shifts are needed in teaching Physics".

Of course these shifts are important for all students not just the very motivated ones who happen to be involved in the international competitions illustrated by Gunnar Tibell in the third essay "Student's skills developed by participation in international physics competitions". The paper describes the International Physics Olympiad (IPhO), the International Young Physicists Tournament (IYPT) and the First Steps to Nobel Prize in Physics (FS), also through some examples of specific activities. The focus is on the skills developed by the students because of the participation to these competitions. These activities are also a powerful tool from the teacher education viewpoint, at least for the teachers coaching the students all along the competition. In the conclusions the motto "Physics should not be developed for physics itself- physics should be related to our life and serve the people" is offered for reflections to any person involved in developing and teaching physics.