A large number of aims are associated with science education, among these the most frequently expressed ones are (1) the establishment of a solid scientific literacy for all young people, (2) the improvement of the thinking skills and (3) the preparation of a growing proportion of a given generation for science related professions. Although in a number of countries the education system cannot meet these goals and the interest in science is declining, new expectations have emerged, e.g. the improvement of the ‘21st century skills’, such as creativity, critical thinking and problem solving. To make science education more effective and more motivating and to meet these new expectations new teaching and learning methods are needed.

Among the emerging new approaches, Inquiry-Based Science Education (IBSE) is the most prominent one. The FP7 initiative of the European Union has also supported a number of IBSE projects. However, the need for assessing the outcomes of IBSE emerged only in recent times, as assessment – especially formative assessment taking place during the teaching-learning process acknowledging the importance of feedback in student’s learning – has come to the forefront of research and development.

A variety of IBSE implementations exists today; their differences can be characterized in terms of interpretation of inquiry, depth of changes compared to traditional teaching, areas of application, complexity of inquiries, and length or frequency of the application of the relevant activities. To make the outcomes of IBSE assessable, they should be operationalized and described in a measurable format.

This presentation shows how theoretical and empirical sources can be identified for developing scientifically established assessment frameworks. It elaborates how the gap between general goals of teaching and the classroom processes can be bridged by the application of theories and results of cognitive psychology. Three main groups of theoretical sources will be discussed: (1) research on social expectations and needs related to science education and contexts of application of scientific knowledge mastered inside and outside of school, (2) theories and empirical results on the structure and development of students’ cognitive abilities, and (3) theories on the organization of professional/disciplinary knowledge (expertise).

The last part of the presentation will focus on classroom work and other practical aspects of assessment. It outlines the general approach to framework development and shows several examples both for the skills identified in this process and for the science units which may be used to practice and assess students’ inquiry and reasoning skills.