

## Assumption of Cognitive Goals in Science Learning

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**Abstract :** The aim of this research is to identify ways for achieving sustainable conceptual understanding within science lessons. For this purpose, a set of teaching and learning strategies, parts of the theory of visible teaching and learning (VTL), is studied. As a result, a new didactic approach named "learning by being" is proposed and its correlation with educational paradigms existing nowadays in science teaching domain is analysed. In the context of VTL the author describes the main strategies of "learning by being" such as guided self-scaffolding, structuring of information, and recurrent use of previous knowledge or help seeking. Due to the synergy effect of these learning strategies applied simultaneously in class, the impact factor of learning by being on cognitive achievement of students is up to 93 % (the benchmark level is equal to 40% when an experienced teacher applies permanently the same conventional strategy during two academic years). The key idea in "learning by being" is the assumption by the student of cognitive goals. From this perspective, the article discusses the role of student's personal learning effort within several teaching strategies employed in VTL. The research results emphasize that three mandatory student - related moments are present in each constructivist teaching approach: a) students' personal learning effort, b) student - teacher mutual feedback and c) metacognition. Thus, a successful educational strategy will target to achieve an involvement degree of students into the class process as high as possible in order to make them not only know the learning objectives but also to assume them. In this way, we come to the ownership of cognitive goals or students' deep intrinsic motivation. A series of approaches are inherent to the students' ownership of cognitive goals: independent research (with an impact factor on cognitive achievement equal to 83% according to the results of VTL); knowledge of success criteria (impact factor - 113%); ability to reveal similarities and patterns (impact factor - 132%). Although it is generally accepted that the school is a public service, nonetheless it does not belong to entertainment industry and in most of cases the education declared as student - centered actually hides the central role of the teacher. Even if there is a proliferation of constructivist concepts, mainly at the level of science education research, we have to underline that conventional or frontal teaching, would never disappear. Research results show that no modern method can replace an experienced teacher with strong pedagogical content knowledge. Such a teacher will inspire and motivate his/her students to love and learn physics. The teacher is precisely the condensation point for an efficient didactic strategy - be it constructivist or conventional. In this way, we could speak about "hybridized teaching" where both the student and the teacher have their share of responsibility. In conclusion, the core of "learning by being" approach is guided learning effort that corresponds to the notion of teacher-student harmonic oscillator, when both things - guidance from teacher and student's effort - are equally important.

**Keywords :** conceptual understanding, learning by being, ownership of cognitive goals, science learning

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