

An "Evidence-Based" professional development program for physics teachers focusing on knowledge integration

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This dissertation is concerned with the design and study of an evidence-based approach to the professional development of high-school physics teachers. This approach responds to the need of developing effective continuing professional development programs (CPD) in domains that require genuine changes in teachers' views, knowledge, and practice. The approach was developed in three consecutive versions, within the context of a CPD program focusing on promoting knowledge integration (KI) in physics lessons by using innovative learner-centered activities --knowledge integration routines-- (KIRs). Each KIR guides the students to explicitly link between components of their physics knowledge and is carried out through a common five-phase structure: individual work, group work, class work, homework, and individual reflection.

In the program teachers implemented the KIRs, systematically collected "records of practice" about their teaching and their students' learning, discussed these records with their peers, and summarized the process and outcomes in evidence-reports. In addition, the program employed a "blended-learning approach" in which teachers were encouraged to interact via a website, by participating in a set of special activities designed to ensure continuity of learning throughout the whole program.

The study was carried out on 21 physics teachers and 324 students. The results show that the evidence-based approach contributed to changes in teachers' knowledge, views and practices concerning KI, evidence and learner-centered aspects. More specifically: 1. The KIRs contributed to teachers' practice and to students' learning. They supported the teachers in becoming more learner-centered in their teaching. 2. In order to engage the teachers with the evidence endeavor, it was useful to introduce the KIRs as an innovative teaching tool and to evoke teachers' curiosity to find out empirically about the influence of the tool on their students' learning. 3. The on-line platform enabled the teachers to engage in ongoing interactions about their experience and contributed to their professional development by supporting the experience in the face to face meetings.