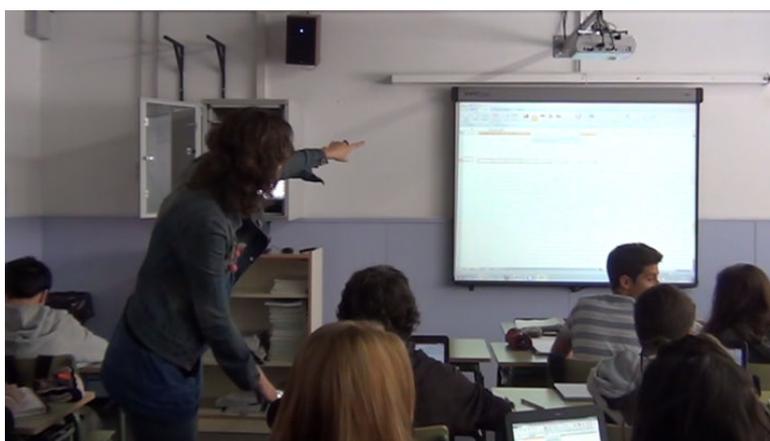


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## Technology in Secondary School Science Classes: Analysis of Change Processes in Teachers



Through questionnaires, classroom observations and interviews with teachers, this thesis has studied in detail the use of multiple devices in science education at the secondary level and the influence that teachers' opinions about this technology had in their use. The results show, among other things, that devices such as interactive whiteboards, laptops and digital textbooks are used as substitutes for traditional blackboards and textbooks.

Has the introduction of technology in the classroom, and in particular the interactive whiteboard, involved a change in science lessons in secondary schools? What are the motivations that lead science teachers to use digital devices in their lessons? Can we identify some changes in teachers' use of technology for teaching and in learning science in a certain period of time? These questions, together with other queries, are answered along this thesis through a detailed study of the use of various devices for science education and the influence of teachers' beliefs on their teaching practices.

In a first stage of the research, a general perspective of the types of hardware and software most frequently used in science lessons is performed. A special attention is paid to the specific uses of

the interactive whiteboard, laptops and digital textbooks for teaching science. These results are obtained by conducting a survey with 98 secondary science teachers from various public and private schools. Results from the survey reveal a dominant role of the interactive whiteboard, although the use of laptops and digital textbooks is also significant compared to other available devices, such as data-loggers and digital microscopes. However, the interactive whiteboard, laptops and digital textbooks would be used to emulate other existent tools –such as the blackboard and ordinary textbooks- and to mainly address teachers' needs –speed up the pace of their explanations, manage the classroom, etc. In addition, the survey allows establishing relationships between these main uses, teachers' beliefs and the characteristics of professional development activities in which science teachers have participated.

In a second stage of the research 10 science teachers from diverse secondary schools are observed and interviewed. These observations allow a more detailed description of the uses of the interactive whiteboards, laptops, tablets and digital textbooks, as well as the role of these devices in the teachers' explanations or interactions between the teacher and the students. Based on various conceptual frameworks, and in particular the Activity Theory, different kinds of tensions arisen from the use of these devices are identified. Moreover, the relation and the influence of some of teachers' beliefs in their observed practices is discussed – special attention is given to the role of perceived self-efficacy of teachers in the use of the technology and the exclusive use of the technology to view or access already prepared information.

Finally, in a third stage, 6 science teachers from the 10 teachers previously mentioned are observed and interviewed two academic years later. From the analysis of gathered data, differences along these two years are highlighted focusing not only on the specific use of the various devices, but also on the variations in teachers' beliefs, the dynamics of the classroom or the types of used tools, among others. Moreover, the thesis identifies and discusses the role of the educational context and the personal and professional identity as possible agents of change and its relevance in the process of the introduction of technology in Science teaching.

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