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Challenges in the implementation of a competency-based curriculum in Spain

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ABSTRACT

This paper addresses some of the challenges involved in implementing the new approach established in the Spanish National Curriculum in 2006, which brought as a major change a focus on the development of key competencies. The paper focuses on scientific competency and the challenges involved in the itinerary from policy documents to classrooms are addressed in three sections: (i) an analysis is made of the changes in the science curriculum as a consequence of the emphasis on scientific competency, comparing the assessment criteria in the previous and current steering documents; (ii) trends in teacher education are discussed; (iii) the findings of the diagnostic evaluation are analyzed. The paper is framed in a theoretical approach, viewing students' participation in scientific practices, and the development of higher-order thinking as necessary goals of science education. We argue that the focus on competencies, characterized as the ability to apply knowledge and skills in new contexts, involves a major change towards knowledge transfer and higher-order thinking skills. Some issues emerging from the analysis relate to the implications of assessment criteria and the challenges involved in its implementation, to the trends in teacher professional development and the difficulties related to the current economic crisis and to the results of the diagnostic evaluation and time frame needed for reforms to have an impact. It is argued that the development of both competencies and higher-order thinking requires students' prolonged engagement.

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1. Introduction: the meaning of a competency-based curriculum

The focus of this paper is on scientific competency and higher-order thinking. It addresses some of the challenges involved in implementing the new approach established in the Spanish National Curriculum since the Educational Act of 2006 (LOE, 2006) and developed through steering documents for primary and secondary education (MEC, 2007). The object of the analysis is the curriculum for secondary education. The 2006 reform brought as a major change a focus on the development of key competencies. This shift is aligned with European Union recommendations (EU, 2006) for an emphasis on core competencies. We begin by discussing what competency means in a curriculum context and whether or not it entails a new approach.

According to the Organisation for Economic Cooperation and Development (OECD, 2005), competencies involve the ability to meet complex demands by drawing on and mobilizing resources such as knowledge, skills and attitudes. Developing competencies is the ability "*to tackle complex mental tasks, going well beyond the basic reproduction of accumulated knowledge*" (OECD, 2005; p. 8). This document also emphasizes reflective thinking, which implies the use of metacognitive skills and

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creativity. One feature of competency is action: competencies are targeted not only on school learning, but also on lifelong learning. Learners are expected to take responsibility for their learning and for their actions: "*Individuals who are reflective also follow up such thought processes with practice or action*" (OECD, 2005, p. 8). In the Spanish curriculum, competency is characterized as the ability to put into practice knowledge, skills and attitudes in different contexts and situations. We argue that this notion of competency as the ability to *apply* knowledge and skills in new contexts involves a major change towards an emphasis on knowledge transfer and higher-order thinking. It would mean a shift from inert knowledge, which cannot be accessed by the learner (Brown & Palincsar, 1989). The paper focuses on the thinking dimension of competencies, on higher-order thinking and on how knowledge is mobilized. It should be noted, however, that competencies involve not just thinking about actions and decisions but also translating the thoughts into actions. This tension between thought and action is not always present in the curriculum documents, but researchers and teachers should be aware of it.

How are competencies and higher order thinking developed? We propose that they are developed through *practice*. For students to be able to mobilize knowledge and use it in different settings, they need to engage in tasks that demand this type of mobilization. In other words, they should be required (by the curriculum goals, assessment criteria and classroom tasks) to participate in complex tasks in a variety of contexts: applying, analysing and evaluating knowledge; creating products, rather than just recalling facts or remembering information; and engaging in decision-making.

Is that new? As Zohar points out, discussing the introduction of higher-order thinking in Israel: "*higher order thinking goals are already there. The problem is that while these goals exist on the declarative level, they are not implemented. Thus, in most classrooms these goals are not expressed in the mainstream teaching and learning activities*" (Zohar, 2008, p. 78). Supporting the development of competencies is a complex process, which, as a European Commission report (European Commission/EACEA/Eurydice, 2012) suggests, is better achieved by adopting a strategic approach. In this context, a strategy or action plan is said to contain clearly defined policies and goals for improvement, together with a timeframe for completion. It may allow the implementation of a range of actions, curriculum reform, teacher education, professional development and support for low achievers. Two of these issues are addressed here: curriculum reform and professional development. This paper focuses on the introduction of competencies and higher-order thinking goals in the Spanish National Curriculum and the challenges involved in the itinerary from policy documents to classrooms. More specifically, the objectives of the paper are as follows:

(1) To compare higher-order thinking goals and the development of scientific competencies in the assessment criteria of the current (2007) and former (2003) science curriculum steering documents.
(2) To analyze efforts in teacher professional development since 2007, as well as other programmes for the promotion of science.
(3) To analyze the design and findings of the diagnostic evaluation regarding scientific competencies (MEC, 2010).

These three issues are analyzed in separate sections; however, the next section first of all discusses the theoretical approaches informing the paper.

2. Scientific competencies, scientific practices and higher-order thinking

The paper is informed by a theoretical approach to viewing students' participation in scientific practices and the development of higher-order thinking skills as necessary goals of science education. We suggest that there is a relationship between the role accorded to scientific practices in this theoretical view and the role of scientific competencies in EU and Spain policy documents, as well as in the Programme for International Students Assessment PISA (OECD, 2006). In the US, the National Research Council new framework (NRC, 2012) and the Next Generation Science Standards (Achieve, 2013) based on it explicitly emphasize engagement in the practices of science as one of the three dimensions of the framework, alongside crosscutting concepts and disciplinary core ideas.

Kelly (2008) suggests the need of reframing the goals of science education in order to include the development of scientific practices among learners. He argues that participating in science involves learning the epistemic practices associated with producing, communicating and evaluating knowledge. Kelly defines epistemic practices as "*the specific ways members of a community propose, justify, evaluate and legitimize knowledge claims within a disciplinary framework*" (Kelly, p. 99).

The NRC (2012) framework characterizes practices as behaviours scientists engage in as they investigate and build theories and models about the world. The choice of "practices" over skills is justified "*to emphasize that engaging in scientific investigation requires not only skill, but also knowledge that is specific to each practice*" (NRC, 2012, p. 30). The eight practices proposed for K-12 are: asking scientific questions; developing and using models; planning and carrying out investigations; analysing and interpreting data; using mathematics and computational thinking; constructing scientific explanations; engaging in argument from evidence; and obtaining, evaluating and communicating information.

We propose that there is some degree of correspondence between the theoretical approach to scientific practices and the policy approach that focuses on scientific competencies as emphasized by the OECD (2005), PISA and the EU (2006) framework on core competencies. Although the PISA and EU documents do not highlight practices (unlike the NRC framework), the characterizations of scientific competencies and scientific practices share relevant features. In particular, the

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