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EDITORIAL

PCK for dummies. Part 2: Personal vs Canonical PCK

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Abstract In a previous editorial (Garritz, 2013), we started presenting some features on Pedagogical Content Knowledge considered for "dummies". In this occasion we will be going further, presenting new recent attributes to the construct. We will present two different conceptions of PCK: the "canonical" PCK (substantiated by systematic research) that can be shared and applied by many teachers, and personal PCK (substantiated by personal experience and beliefs/orientations of a single teacher)."

PALABRAS CLAVE
CPC canónico;
CPC personal

Conocimiento pedagógico del contenido (CPC) para bobos. Parte 2. CDC personal frente a canónico

Resumen En un trabajo editorial previo (Garritz, 2013), empezamos a presentar algunas características del Conocimiento Pedagógico del Contenido (CPC) consideradas "para bobos". En esta ocasión iremos más allá, al presentar otros atributos más recientes del CPC, entre ellos dos concepciones diferentes del constructo: el CPC canónico (sustanciado por investigación sistemática), que puede ser compartido y aplicado por muchos profesores, y el CPC personal (basado en la experiencia personal y las creencias y objetivos de la enseñanza de un profesor determinado).

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Introduction

The teachers professional knowledge base is composed of a complete set of knowledge, that include subject matter, pedagogical, assessment, curricular and knowledge of students. All of them impact their conceptions of student needs, the selection of a given textbook and of teaching methods, the presentation of the content at the classroom and questioning patterns, among other things. One teacher does not only need to dominate content knowledge for showing teaching excellence, but he/she needs a model structured for pedagogical purposes, which is related to PCK.

Shulman (1987, p. 8) said about PCK: "It represents the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction". In other place, Shulman (1987, p. 9) speaks of "an amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding". We dare to say that this special physical mixture mentioned by Shulman through the terms "blending" and "amalgam" may be reinterpreted instead as a "chemical change" in which the result of reacting "content" and "pedagogy" makes a new substance that we call PCK (Farré & Lorenzo, 2009). The characteristics of the new substance are absolutely different from those of the reactants as it serves much better than the other two to lead a good class in practice on a specific topic. In this sense, we can assure that PCK is integrative, instead of transformative, as has been discussed by Gess-Newsome (1999).

All of these features related to PCK are treated in a new book that will appear next March (Berry, Friedrichsen, & Loughran, 2015).

Personal PCK

In a recent meeting (The PCK Summit) in Colorado Springs, USA, in October 2012, a set of experts on PCK were discussing about definitions, applications and interpretations of this construct, and the following description was proposed by one of the groups under discussion, that at the end of the meeting was approved by consensus: PCK is a "personal attribute of a teacher, considered both a knowledge base and an action. It is the knowledge of, reasoning behind, planning for, and enactment of teaching a particular topic in a particular way for a particular reason to particular students for enhanced student outcomes" (Carlson & Gess-Newsome, 2013).

It was also approved the Figure 1 that represents the set of professional knowledge base of a given teacher which

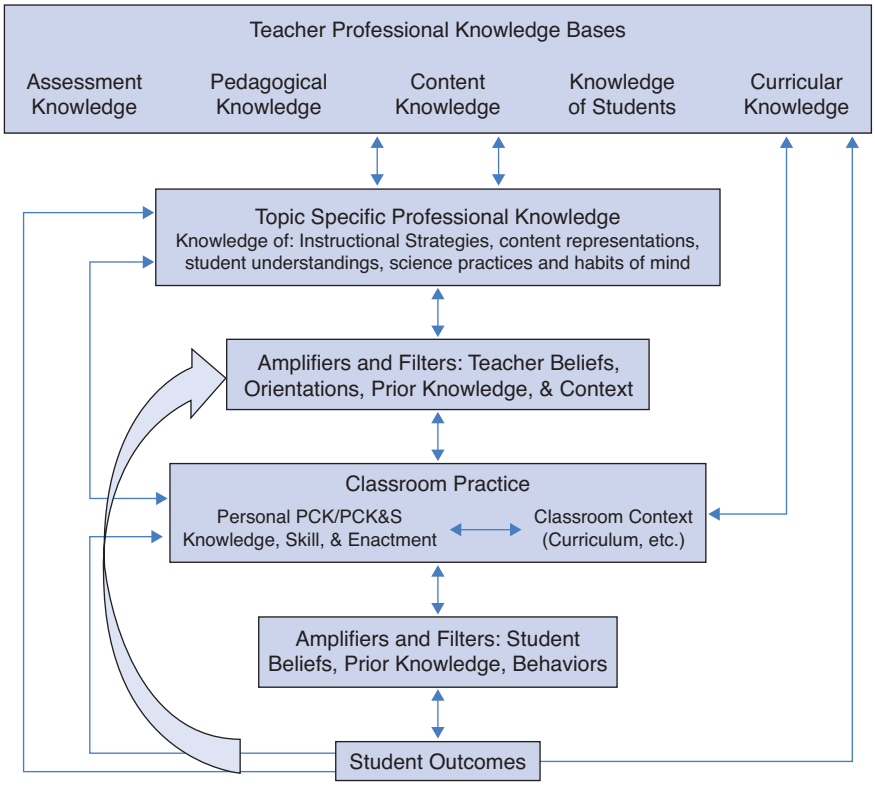

Figure 1 The teacher knowledge base consists of a series of knowledge that goes to a topic specific subject matter professional knowledge to lecture in a class. There are amplifiers and filters related with teacher beliefs and orientation and the context in which the class is given, going to the classroom practice in which it is displayed the Personal PCK of the teacher. After that practice, it is supposed to become in students' learning, mainly with another set of amplifiers and filters, given the characteristics of students' beliefs, prior knowledge and behavior.

culminates in the practice of teaching, through the personal PCK

The most generalized set of components of PCK are those given by Magnusson, Krajcik, and Borko (1999), and are those shown in Figure 2.

Nevertheless, the orientations component has been recently criticized by Friedrichsen et al. (2011). These authors proposed three dimensions for science teaching orientation, instead of the seven ones presented by Magnusson et al.: *a)* beliefs about the goals or purposes of science teaching (learning science, learning to do science, and learning about science); *b)* beliefs about the nature of science (what counts as knowledge, how this is produced and warranted or justified), and *c)* beliefs about science teaching and learning (the role of the teacher, the learner, how students learn science, how to teach science to make it comprehensible).

Canonical[1] PCK

Sean Smith and Eric Banilower (2012) mentioned in their extended paper to attend PCK Summit: "We believe that PCK is a knowledge base shaped by other knowledge bases (e.g., content knowledge and pedagogical knowledge). We also believe that there is both 'canonical'[1] PCK (substantiated by systematic research) that can be shared and applied by many teachers, and personal PCK (substantiated by personal experience and beliefs/orientations) that may or may not apply across learners. All teachers have personal PCK, whether tacit or explicit. Not all teachers possess canonical PCK".

How a collective PCK shall be constructed? Park and Oliver (2008, p. 266) cited that "to employ PCK effectively, teachers must have knowledge on what students know about a topic and areas of likely difficulty. 'Knowledge of students' understanding in science' is a PCK component that includes knowledge of students' conceptions of particular topics, learning difficulties, motivation, and diversity in ability, learning style, interest, developmental level, and need". Further they say (p. 278) that teachers develop their PCK through a relationship that is in the dynamics of knowledge acquisition, new applications of that knowledge and reflection on its application in practice. This assertion also supports the idea that teachers do not simply receive knowledge that others create to teach, but produce knowledge for teaching through their own experiences. In occasions teachers gather in departmental meetings to discuss on the effectiveness of certain representations used by some of them, constructing in this way a Canonical PCK. This characteristic is essential to view teachers as professionals.

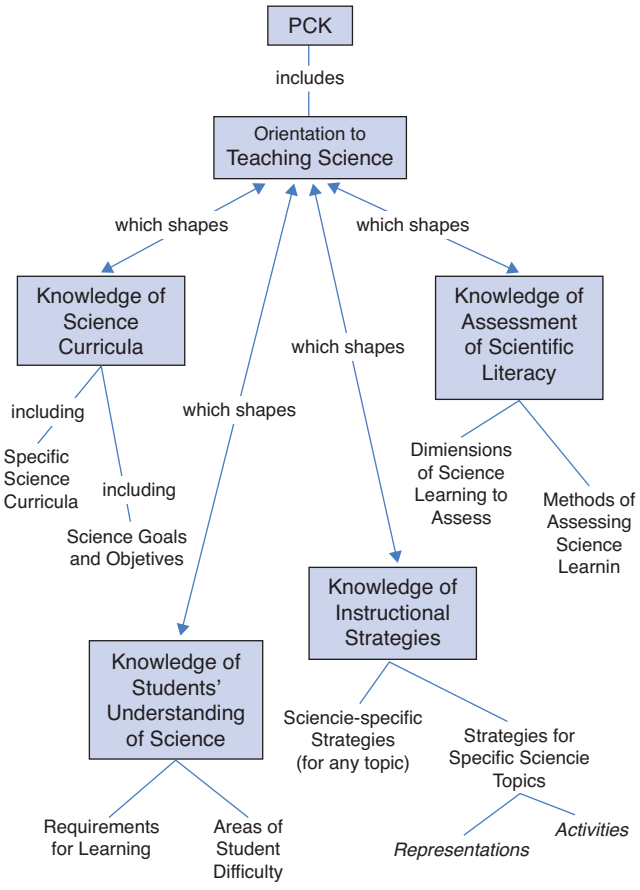

Figure 2 The five components of Magnusson, Krajcik, and Borko, with some of their subcomponents. It can be seen that four of the components derive from the central one, related to the orientations of science teaching.

The author of this editorial has developed a Canonical PCK for teaching acid and bases (Alvarado et al., submitted) by extracting the most important features of the content representation exposed by a set of ten-selected High School teachers on this topic. It was constructed by characterizing the topics first as conceptual (historical aspects, importance for learning, relations with the daily environment, knowledge and skills required for learning, difficulties in the teaching/learning process, representations and resources to motivate students, assessment); second as procedural (logical skills, mathematical skills, experimental skills, communication and dissemination skills), and, finally, as attitudinal (related to teachers and with regards to students).

References

Alvarado, C., Cañada, F., Garritz, A., & Mellado, V. (submitted). Canonical pedagogical content knowledge by cores for teaching acid-base chemistry at High School. *Chemistry Education: Research and Practice*.

Berry, A., Friedrichsen, P., & Loughran, J. (in press). Re-examining pedagogical content knowledge in science education. Series: Teaching and Learning in Science Series. Oxford, UK; Routledge.

[1] This term has had a religious connotation, but now it has some other interpretations. For example, in the *Webster's Third International Dictionary* (1971) it is defined as "2: Like or conforming to a general rule: accorded wide acceptance; SANCTIONED, ORTHODOX, AUTHORITATIVE"; and as "5: Relating to various of the simplest and most significant forms or schemata to which general equations, statements or expressions may be reduced without loss of generality; STANDARD, BASIC."

Carlson J., & Gess-Newsome, J. (2013). *The PCK Summit Consensus Model and Definition of Pedagogical Content Knowledge*. The Symposium "Reports from the Pedagogical Content Knowledge (PCK) Summit, ESERA Conference 2013.

Farré, A.S., & Lorenzo, M.G. (2009). Conocimiento pedagógico del contenido: una definición química. *Educación en la Química, 15,* 103-113.

Friedrichsen, P., van Driel, J.H., & Abell, S.K. (2011). Taking a closer look at science teaching orientations. *Science Education, 95,* 358-376.

Garritz, A. (2013). PCK for dummies. *Educación Química, 24,* 462-465.

Gess-Newsome, J. (1999). Pedagogical content knowledge: an introduction and orientation. In: Gess-Newsome, J., & Lederman, N.G. (eds.), *Examining Pedagogical Content Knowledge* (pp. 3-17). Dordrecht, The Netherlands: Kluwer Academic Publishers.

Magnusson, S., Krajcik, J., & Borko, H. (1999). Nature, sources, and development of the PCK for science teaching. In: Gess-Newsome, J., & Lederman, N.G. (eds.). *Examining Pedagogical Content Knowledge* (pp. 95-132). Dordrecht, The Netherlands: Kluwer Academic Publishers.

Park, S., & Oliver, J.S. (2008). Revisiting the conceptualization of pedagogical content knowledge (PCK): PCK as conceptual tool to understand teachers as professionals. *Research in Science Education, 38,* 261-284.

Shulman, L.S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review, 57,* 1-22.

Smith, S., & Banilower, E. (2012). Extended Paper for PCK Summit. Retrieved from http://pcksummit.bscs.org/sites/default/files/Smith Banilower EP.pdf