Development of Teacher Students' Thinking Skills and Its Relation to Acquisition of Pedagogical Content Knowledge for Science Teaching in High School

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Resumen / Summary

Since it was formally installed AKA Project 04, in March 2011, improving our understanding of how students learn specific scientific notions and how this knowledge can develop quality learning has become a fundamental axis of our research, as well as the teachers' processes of learning to teach science It is expected that the greatest impact on science education arises from our own teaching models. As a consequence eliciting the construction of these models during real life professional experiences has been the leading aspect of our research strategy. In the willing of The identification and characterization of classroom practices lead to propose new theoretical and methodological guidelines that contribute to the development of school science. The improvement of teaching in high school and teacher education in science will only be achieved with a deep understanding of the subject matter. On the basis of this research is especially important the understanding how the student thinks and conceptualizes different scientific contents that are indeed the subject of learning and teaching, as well as identifying the levels of development and coherence between scientific concepts and their use, as the consistency of explanatory science patterns and processes of construction of school scientific knowledge, which facilitate the formation of such knowledge.

Interdisciplinary work helps clarifying the core principles of learning science in school and various instructional strategies to achieve them, as well as a thorough understanding of the conceptual structure of science and nature. Our project focused on identifying, characterizing and analyzing the learning of specific scientific notions in high school students. With this mission accomplished, we expect to improve classroom practices and teacher training within a culture of educational quality.

In view of these aspects during the first stage of the project we investigated, with different methods, the way teachers and students make a representation of the concepts of heat and temperature, specific interactions, chemical bonding, metabolism, among others. We decided to analyze and characterize these notions in depth; understanding the different ways in which they arise and act regarding the evaluation and relevant training processes, generating baselines from which we finally were able to approach the way teachers experience teaching an specific concept in the attempt to encourage Scientific Thinking Skills (STS) in their students.

In the second stage the teachers, as researchers of their own practice and "the school scientific activities", engaged in a program of innovation in the classroom based on designing teaching units to problematize, plan and implement assessment tools in favor of stimulating the development of STS.

In a third phase, we perform the final analysis with the goal of framing the theoretical and explanatory dimensions that contribute to promote the design, development and evaluation of new devices, strategies and practices in the science classroom. Altogether is oriented to improve the scientific thinking of teachers and students towards a culture of peace and science education linked to citizenship and democratic values.

Ultimately the project allows explaining the main processes of development that come to be the way teachers teach scientific matters and the way learners do. Even when the project ends in 2014 we kept on working and evolving with the group of science teachers that participated in the project.

Main scientific exchange within the national and international community

Scientific indicators	Año 1	Año 2	Año 3	Total
1. Books (print and / or digital)	2	2	3	7
2. Scientific articles, ISI, Scielo or SCOPUS.	3	3	3	9
3. Development and implementation of web sites to assist in the training of science teachers	1	1	0	2
4. Undergraduate thesis (Finnish advisory team).	2	2	1	5
5. Master Thesis.	1	1	0	2
6. PH.D Theses (Finnish consulting team).	4	0	0	4
7. Papers presented at Latin American and European international congresses	10	10	10	30
8. Research stay (3 months or more)	3	0	0	3
9. Research stay (15 days to 1 month)	1	2	1	4
10. Conferences and Seminars dissemination of the project	4	6	6	16
Total	**31**	**27**	**24**	**82**