Outcomes of a research based intervention module on fluids for prospective primary teachers

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Abstract. The physics education course for prospective primary teachers (PPT) in the University of Udine offers 15 thematic topics integrating disciplinary education, content research path proposals and laboratory activities. This research based model [1] engage students in planning and experimenting teaching intervention modules in school. Here we analyze the learning outcomes on topic of fluids in terms of planned proposals by PPT.

Introduction

The lack of competences in physics (CK) combined with a separate general education on pedagogical knowledge (PK) produce a double challenge in the PPT professional education on scientific field [2,3]. As a wide research literature documented and underlined [4-7], the need of integration of the knowledge areas require a specific dedicated time and activities [9-10]. Relevant is the personal involvement of PPT in planning and analyzing research based educational proposal for primary school and in experience practice in school [10,11,12,].

The research

The model adopted for PPT education [1] imply to address physics topics by means of a meta-discussion and conceptual reflection on subject-related aspects of each topic as well as strategies and methods adopted in educational proposal on the same topic [12,13,14].
The PPT physics education course in our research based intervention modules is in the framework of a flipped Model of Educational Reconstruction [14,15,16], in which the disciplinary knowledge is introduced and discussed in an integrated way with the relative didactics. The presentation and discussion of the educational proposal offer the opportunity to reflect on the conceptual knowledge of the topic and to analyze the exemplification done by the educational proposal with the relative strategies and methods; paying attention to the conceptual knots addressed and to the didactic materials experimented with the children [17].
The research questions focused in this study are: 1) how PPT select the conceptual elements contained in the educational proposal on fluids and on the subject related reflection. 2) How PPT identify conceptual elements in a map? 3) How PPT organized an operative proposal? 4) How practice contribute to the professional development of PPT [18]?
The analysis of the paths planned on fluids by 85 prospective primary teachers (PPT) who have worked to identify the concepts considered fundamental and conceptual knots, designed by means of two standard Rubric (S1 and S2) the proposal and prepared the proposal of a path to do with the children. 26 PPT implemented in classroom with children the intervention proposals, after a discussion and revision, supported by the physics education course responsible. PPT analyzed pupils learning process by means of different instruments and methods, and reflected on their own learning [18].
Theoretical framework for PPT planning and for the whole process was the Model of Educational Reconstruction (MER) [14-16]. Resources for educational discussion were the documented implementation in primary classroom of the same topic [19,20], discussed during interactive lecture demonstration. Selected strategies and methods were Inquiry Based Learning and Prevision, Experimentation, Comparison. A conceptual analysis of the physics involved and goals addressed was in parallel with the educational discussion of the topic. The task to prepare tutorials and educational materials for children [21,22] produce a continue

reflection of the choices for the learning environment and of the approach step by step. During the implementation of the proposed activities of the path planned the PPT activated a meta-reflection on their educational practices These models have been integrated with the informal learning acquired in the experience, in the research-action process of the teacher who experiments the didactic methods.

Conclusions

The adopted model for PPT physics education contains the challenge to integrate PK and CK [4], including the construction of skills in the field of science education, combining different kind of knowledges, planning experience, discussion of outcomes and relative reflection. The learning in a research based activity in classroom practice complete the professional goal.

The analysis of project provides a relevant indication regarding the way in which the PPT uses the subject knowledge and how they fit it into the projects, to what extent they are able to reuse the teaching and laboratory activities they have experienced directly in the educational proposal. It also offers the possibility of comparing the consistency between planning and implementation of educational paths. The analysis of the reports highlights the ability of PPTs to collect children's spontaneous ideas through meaningful questions, to analyze learning data and to represent them and, consequently, to understand the learning processes during the meta-reflection phase.

From data analysis emerge:

- How the approach by physics education proposals play the role of build competence in the subject and the professional need to plan intervention modules for children
- How the process of planning, discuss and revise proposal build the professional competences
- How the implementation in classroom of a planned proposal and relative monitoring of learning by children contribute in a meta-reflection of the professional development.

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