Difficulties to teach mathematics and beliefs on mathematical modelling by prospective teachers

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From a research program on the teaching of modelling we present results related to French prospective teachers. These students have answered an online questionnaire about the difficulties to teach mathematics taking in account biographical variables and beliefs on mathematics, mathematics teaching and mathematical modelling. Heterogeneous beliefs are revealed and the analysis constructs three clusters from difficult to easy relation to different topics on mathematics teaching. The next steps of this ongoing research are mentioned, particularly looking for partners.

Keywords: modelling, beliefs, questionnaire, mathematical teaching, prospective teachers.

RESEARCH TOPIC AND QUESTIONS

From 2016 modelling becomes in the new curriculum one of the six main components of mathematical activity and modelling is already knowledge to be taught in secondary school. For these reasons it is important to train prospective teachers on modelling. Research shows that teachers 'conceptions play a key role in the teaching and the learning of mathematics (Philipp 2007). We didn't find research related to France. Our research question is: what are conceptions about modelling in France? In this paper we will focus on the prospective teachers.

THEORETICAL FRAMEWORK AND METHODOLOGY

We will adopt the theoretical framework on conceptions proposed by Philipp (2007, p.259) and on modelling by Maass (2006, p.115). Cabassut and Ferrando (2015) describe how the questionnaire is structured, using different levels of didactic codetermination from anthropologic theory of didactic. The questionnaire is composed of 48 multiple choice questions with sometimes four-point Lickert scale on biography, mathematics conception and modelling conceptions. This online questionnaire was answered between February and May 2015 by 152 French prospective teachers. The statistical analysis is made with the software SPAD that provides frequency table, cross-tabulation and cluster analysis. We adopt an exploratory approach (Tukey 1977) what means we do not need a representative sample.

RESEARCH RESULTS

First we observe a high heterogeneity of answers making difficult the interpretation of clusters. Previous results with in-service teachers (Cabassut, Ferrando 2015) have shown that difficulties to teach modelling are often related to difficulties to teach

mathematics. A majority of prospective teachers consider as difficult the following topics: heterogeneity, assessment of group work, time management, teaching conditions, inquiry based approach. On the contrary a majority consider as easy the following topics: small groups work, assessment, open problem solving. The cluster analysis produce three clusters. The first cluster represents people feeling difficulties in mathematics teaching: trainee, people studying mathematics or sciences, older people, women are overrepresented. The second cluster represents people neutral on difficulties: students who are not trainees, studying no mathematics and no sciences, who don't understand what is modelling are overrepresented. The last cluster represents people finding easy different topics of mathematics teaching: people understanding modelling, studying mathematics, younger people, men, agreeing with our definition of modelling are over represented. We find significant dependences for example between difficulties on heterogeneity and open problem solving, on inquiry based approach and open problems solving or small groups work.

RESEARCH PERSEPECTIVE

This research will go on by comparing prospective teachers answers and teachers answers. The cluster analysis will produce paragons who will have semi-structured interviews to clarify the analysis in order to produce a course on modelling for prospective teachers (Cabassut 2015). Partners from other countries are invited to take part to this research in order to compare the role of institutions.

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