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A mixed method study on teachers' diaries: teachers' narratives and value-added patterns

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Abstract

This study explores the relationships between the improvements in students' achievement in mathematics and the teaching methods. The sample consists of lower secondary students (N=868) and a group of teachers (N=53) who participated in a programme for the improvement of the teaching and learning of mathematics in Italy. A mixed methods methodology was used and both the accounts of teachers written in logbooks created for the project and the results obtained by students in mathematics were analyzed.

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Keywords: value-added models; cognitive activation; text mining; reflective practices; social learning; process-oriented teaching.

1. Introduction

The present study is focused on the relationships between teaching styles and improvements in students' mathematics achievement at the classroom level and it is based on a group of teachers (N=53) who participated in an experimental programme called M@t.abel. This programme had the goal of increasing lower secondary school achievement in mathematics in Italy, by providing teachers with alternative solutions and methods for presenting traditional contents (Argentin et al, 2014). The programme was aimed at maths teachers in grades 6-8 (middle school) and 9-10 (the first two years of high school) who were voluntarily involved in the project.

The M@t.abel programme used specially prepared materials and educational activities that teachers tested on one specific class (the experimental class). These materials, most of which were designed for studying in small

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groups of students, using non-direct teaching methods, were related to four key thematic areas in mathematics: numbers, geometry, relations and functions, data and forecasts. The teachers had to address each of these four areas, but they had a range of possible materials and activities from which they could choose those that they considered most effective and appropriate. The progress and results of this experimental teaching were contained in a specific instrument for evaluation and information: the log book, which forms the basis for most of the data in this study. The logbooks compiled information relating to the practical experiences of teachers, the processes they initiated in the classroom and their outcomes. Each teacher compiled a minimum of four logbooks, one for each of the key thematic areas examined in the project and related to the classroom activities. The logbook was divided into two main sections: i) a questionnaire with items intended to determine the teacher's reasons for choosing specific activities, the methods and contents of these activities, the timescales and organization of teaching, the kind of evaluation adopted, and the impact of the activities on the students; ii) a "report of activities" structured as an open field in which the teachers were asked to recount their experiences regarding each teaching unit they adopted. In this section, the teachers were asked to focus on their work in the lessons, and to explain the context and the methodologies used.

M@t.abel was then followed by an evaluation plan intended to measure the effect of the programme on students' results in mathematics. The evaluation plan was one of the first randomized controlled trials to be implemented in Italian schools. In the evaluation plan, the emphasis was on the reports of the teachers of classes which had been a part of the M@t.abel project, in order to understand how these teachers applied the experimental process in their lessons, as well as to identify the possible effects of this process on students' results in mathematics[1].

2. Objectives

The general objective of this paper is to explore the relationship between changes in students' mathematics achievement from the beginning to the end of the school year and the teaching methods adopted by the teachers during the implementation of the project, as described and narrated in the teachers' logbooks. The present study specifically aims to:

- Identify the key concepts that describe the experiences of the teachers involved, trying to identify specific teaching strategies of the M@t.abel project and highlighting the process of narration-reflection-action that was initiated in the study
- Identify the networks of relationships between the key concepts, describing teaching experiences for lower and higher levels of value-added in mathematics achievement with the aim of reconstructing the different patterns of the educational process undertaken by the teachers, while highlighting any particularly virtuous practices adopted

3. Method

3.1. Data

The data was taken from 145 logbooks complied by 53 teachers who participated in all the phases of training and evaluation. The student data was based on the mathematics test results at the beginning and the end of the school year (N=868). We chose to analyze the field of "experience" inside the logbook, which contains the set of teaching practices and processes adopted by the teacher and which is characterized by a richness and significant diversification of its contents. Each teacher was assigned a specific class, and the level of competency of its students in mathematics was evaluated before and after their participation in the M@t.abel project.

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[1] M@t.abel is an acronym for *Matematica, apprendimenti di base con e-learning* and was carried out with EU funding - PON Education 2007-2013 (Evaluation of M@t.abel Plus I-3-FSE-2009-2). F or more information: Evaluation of PON M@t.abel, Report on the preliminary results on the effects of the programme PON M@t.abel 2009/2010, Volume I and II; Report of the analysis of logbooks 2009/2010.