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The evaluation of mathematical competency: elaboration of a standardized test in Ticino (Southern Switzerland)

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Abstract

Since 2010 a project with the aim of producing and administering a standardized test (Woolfolk, 2007) to evaluate mathematical competencies in the fourth class of primary school has been started in Ticino. In order to produce the test several steps was necessary: a team has first identified the areas of the mathematical program to be tested, second a group composed by primary and lower secondary school teachers, discipline experts and teachers of mathematical didactics has produced items coherent with the aim and with the characteristics of students and school programs, third the item produced were tested on a sample of students to evaluate the discriminative capacities of the items, fourth a preliminary analysis of the items was carried out, fifth the test was produced and administered to the whole population of students. In the fourth phase we used the classical Rasch model (1960) to evaluate and select the items and the software ConQuest supported in the analysis.
Every teacher received a report on his or her own class in which it is possible to identify the strengths and weaknesses of the class on each part of the tested program.
This is the first experience in Ticino in producing this kind of tests in the primary school.

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1. Introduction

1.1. Background

The term “mental test” is traditionally linked to the work of Cattell (1890) who used the experimental method, in order to measure cognitive processes. Since these pioneering works many researchers in the psychological field have been trying to build material instruments to evaluate invisible or latent dimensions (like intelligence

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but also competencies). These efforts have produced some instruments that are aimed to give some information that can be helpful in understanding similarities and differences among people. In order to make such a kind of evaluation it is indispensable that each instrument is administered and corrected always in the same way.

Standardized tests are administered, scored and interpreted in a standardized manner, i.e. with the same directions, time limits and scoring for all (Woolfolk, 2007). In the psychometrical jargon the use of term standardized when referring to tests is the tautological cause of the test need to be standardized to give useful information and to be considered a test at all (De Battisti, Salini & Crescentini, 2006). Competency test used in school are finalized at assisting in the evaluation of student's attainment in a content of a certain subject area in a certain country and in a specific class (Boncori, 1993). The tests can be administered to students of different grade level, concern different subjects and be composed of multiple-choice questions, true and false questions and short answers or essay questions subsequently recoded according to specific rules. They can be standard-referenced or criterion-referenced. In the first case the scores are determined by comparing how well individuals achieved on the test to other individuals who took the same test. In the second case scores are compared to certain predetermined criterion (Popham, 2011).

Standardized testing is a highly controversial and well debated topic. If on the one side they are a relatively objective tool for measuring student achievement that consumes little class time and produces useful information on which both teachers, school administrators and policy makers can rely in order to assess and improve their classes or schools, on the other side according to some authors they only reveal students' knowledge during the very short timeframe in which the tests are administered (Boaler, 2003). Moreover some students may not do well in standardized tests independently from their abilities for reasons connected to anxiety or to the pressures of the time limit attached to the tests (Buck, Ritter, Jenson & Rose, 2010). According to others (Moses and Nanna, 2007) they reflect the inequities that already exist within schools rather than meaningful differences in intelligence, student learning and teacher effectiveness and advantage the students from higher socioeconomic statuses. Two other risks mentioned about the abuse of standardized tests are that students undergo hours of intense test preparation in the classroom (Barrier-Ferreira, 2008) ending up being obsessed and that teachers devote most of the classroom time and of resources to preparing students for the standardized test (the so-called phenomenon of "teaching to test") (Popham, 2011), this latter phenomenon has been frequently mentioned as one of the consequences of the international tests such as PISA.

Despite all the criticism, we believe that the introduction for the first time in the Ticino's primary school of a standardized test in mathematics can have beneficial effects. In our opinion a certain score in the test must not be read as a definitive absolution or conviction but on the contrary it can help teachers to individuate their pupils' weaknesses and the strengths and to concentrate their efforts on the former. In no case it can replace the traditional evaluation method used by teachers in their own class that is based on a mix of different kinds of evaluation and must take in account specificities, history and characteristics of each student.

The primary school in Ticino is organized on a geographical basis. There are 9 districts (called "circondari") and in each district there is an inspector that is responsible for the quality of teaching. In the bigger schools there is a school manager that coordinates all the activities of the school. The nine inspectors are coordinated by a director of the infant and primary school.

In the primary schools of Ticino there is no tradition in using standardized tests. The learning process is followed with the aim that each student can reach his or her potentials and having a precise idea of the level of competency of the students has never considered relevant by the system in the last 20 years.

Recently some pressure in the direction of a more precise evaluation came from the federal organization due to a process of harmonization of compulsory education in Switzerland.