TOWARDS A MORE CURRICULAR FOCUS IN INTERNATIONAL COMPARATIVE STUDIES ON MATHEMATICS AND SCIENCE EDUCATION

WILMAD KUIPER[1], KERST BOERSMA[2], JAN VAN DEN AKKER[3]

[1]University of Twente, [2]University of Utrecht, The Netherlands

ABSTRACT

From international comparative studies (TIMSS, PISA) it appears that students in lower secondary education in the Netherlands perform relatively well in mathematics and science compared to their peers from other participating countries. Policy-makers, especially, are eager to bring these positive outcomes into the limelight. However, one may wonder whether, in case of the Netherlands, there is good reason for such zeal. An evaluation study, conducted by the Netherlands Inspectorate of Education, shows that lower secondary schools do not meet the quality required in implementing a curriculum reform that started in 1993, entitled 'basic secondary education'. So, in spite of all rhetoric on the positive outcomes of TIMSS and PISA in the Netherlands, when putting the relatively good student performance in the context of the implementation of this ambitious curriculum reform, many people become puzzled. Research findings on the quality of mathematics and science education seem to be in conflict with the results of TIMMS and PISA. This conclusion and also the observation that international comparative assessment studies have serious difficulty in meeting the goal of providing proper interpretations of student achievement, especially from a curriculum perspective, give reason to attempt to disentangle the conflicting images.

1. INTRODUCTION AND PROBLEM STATEMENT

The outcomes of international comparative studies like TIMSS and PISA get widespread attention in media and policy circles. Depending on the nature of the results, they tend to provoke a wide array of, often rhetorical, reactions. For example, the relatively poor performances of American 13 year old students in mathematics and science in TIMSS-1995 and TIMSS-Repeat 1999 gave cause to a still continuing flow of discussions, arguments, and reflections on origins of this problem ("the mathematics as well as the science curriculum is a mile wide and an inch deep") and on possible solutions to it ('rigorous' and 'demanding' new standards). The weak performances of students in lower secondary education in Germany in TIMSS-1995, in TIMSS-Repeat 1999, and especially in PISA-2001 (with 31 participating countries Germany appeared 20th in the ranking for mathematics and science and 21st in the ranking for reading comprehension) caused a public debate that was dominated by great displeasure and concern about the quality of education in Germany. Also in the Netherlands the reactions poured into

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the air, although they were quite different in nature due to the fact that – as it appears from TIMSS-1995, TIMSS-Repeat 1999, as well as PISA-2001 – students in lower secondary education perform relatively well in mathematics and science compared to their peers from other participating countries (Bos, Kuiper & Plomp, 1999; Bos & Vos, 2000; Kuiper, Bos & Plomp, 1999; Kuiper, Bos & Plomp, 1997; Wijnstra, 2001). Policy-makers are especially eager to bring these positive outcomes into the limelight.

However, one may wonder whether, in case of the Netherlands, there is good reason for such zeal, and especially for the sense of self-satisfaction that some quotes and comments seem to convey. This is not because of the low response rates in TIMSS-1995 and PISA-2001 that may have biased the good results, but rather because of the outcomes of an evaluation study conducted almost at the same time by the Netherlands Inspectorate of Education (Inspectie van het Onderwijs, 1999a-e). This evaluation study shows that secondary schools do not achieve the quality required in implementing a curriculum reform that began in 1993, entitled 'basic secondary education'. An even less favorable picture emerges when the performances of Dutch students in TIMSS are contrasted with the demanding instructional and learning goals as defined at system level in terms of attainment targets, instead of with the international mean achievement score (which is common practice in international comparative studies). Others (for example, Boersma, 2000a-b) criticize the new curriculum for mathematics, physics/chemistry, and biology, as it is overloaded and fragmented, lacks coherence and longitudinal alignment, is implemented without sufficient relevance for students, and is dominated by rather traditional modes of assessment.

So, in spite of all rhetoric on the positive outcomes of TIMSS (and also PISA) in the Netherlands, when putting the relatively good student performance in the context of the 'challenging' implementation of the curriculum reform in lower secondary education, many people become puzzled. Research findings on the quality of mathematics and science education seem to be in conflict with the results of TIMMS and PISA. This conclusion and also the observation that international comparative assessment studies have serious difficulty in meeting the goal of providing proper interpretations of variations in student achievement in view of policy implications (Bos, 2002; Kellaghan, 1996), in general and especially from *a curriculum* perspective, led us to attempt to disentangle the conflicting images. The outcomes of this attempt are described in this chapter. We start with a more in-depth analysis of conflicting images in the Netherlands as appearing from main findings from TIMSS and the Evaluation Study by the Inspectorate of Education (ESIE). This analysis is meant to clarify the debate and to articulate a curricular focus in international comparative studies like TIMSS. There is a clear need for doing the latter, as it has also been cogently substantiated by Westbury (1992) in his analysis of differences in achievement – found in SIMS – between American and Japanese secondary school students. A conceptual focus that emphasizes the "fundamental salience of curriculum" (Westbury, 1992, p.23) offers a chance for a sharper understanding of (factors influential to) mathematics and science achievement,