Postprint

This is the accepted version of a paper presented at CERME 9.

Citation for the original published paper:

Problem solving competency and the mathematical kangaroo.
In: Konrad Krainer, Naďa Vondrová (ed.), Proceedings of the Ninth Congress of the European Society for Research in Mathematics Education (pp. 1095-1096). Prague, Czech Republic

N.B. When citing this work, cite the original published paper.

Permanent link to this version:
http://urn.kb.se/resolve?urn=urn:nbn:se:kau:diva-42509
PROBLEM SOLVING COMPETENCY AND THE MATHEMATICAL KANGAROO

Elisabet Mellroth
Karlstad University/City of Karlstad

The goal of the study was to investigate differences in how two groups of students activated mathematical competencies in the mathematical kangaroo (MK). The two groups, group 1 and 2, were identified from a sample of 264 students (grade 7, age 13) through high achievement (top 20 %) in only one of the tests: the MK or a curriculum bounded test (CT). Analysis of mathematical competencies showed that the high achievers in the MK, activated the problem solving competency to a greater extent than the high achievers in the CT, when doing the MK. The results indicate the importance of using non-traditional tests in the assessment process of students to be able to find students that might possess good mathematical competencies although they do not show it on curriculum bounded tests.

RESEARCH QUESTION

How can differences in achievement on the MK be explained by mathematical competencies?

THEORETICAL BACKGROUND

Teachers in Sweden have observed that some students achieve highly in the international competition, the MK, although they have trouble with the national courses in mathematics. Some teachers suspect that those students are highly able in mathematics (Mattsson, 2013). To investigate if differences in achievement between groups of students on the MK can be explained by mathematical competencies, Mathematical Competencies: a Research Framework (MCRF) (Lithner et al., 2010) is used as framework. In MCRF six mathematical competencies are described: applying procedure competency, representation competency, connection competency, communication competency, reasoning competency and problem solving competency (Lithner et al., 2010).

METHOD

Empirical data is test results of same students’ (n = 264) from the national test (CT) given in grade 6 and from the MK given in grade 7. Two groups of students were identified: Group 1, top 20 % achievers in the MK but not in the CT, i.e. among the bottom 80% in the CT. Group2, top 20% achievers in the CT but not in the MK. The two groups’ activation of mathematical competencies on the MK was compared after eliminating the achievement factor. Therefore the activation of a competency is within an individual, showing that individuals strength and weakness. Each
identified individual belonged to one of the two groups, and differences between the
groups were analysed.

RESULTS AND DISCUSSION
This study verifies teachers’ observation, that there are students who achieve among
the top in the MK but not in the CT. It is shown that on the MK, Group 1 activates
the problem solving competency to a greater extent than Group 2. Some tasks (6 out
of 21), in the MK differ more than others in response rate between the two groups.
Those tasks have in common that they all give opportunity to activate either the
problem solving competency (n = 5) or the reasoning competency (n = 5). The
reasoning competency is in the MCRF closely related to the problem solving
competency, it is its juridical counterpart (Lithner et al., 2010). This study shows that
the MK consists of a relatively high number of problem solving tasks, the MK also
aims to offer interesting challenges. The use of challenging problems are important
when working with mathematically highly able students (Nolte, 2012), The MK has
inspired part of a model used to identify students highly able in mathematics (Pitta-
Pantazi, Christou, Kontoyianni, & Kattou, 2011), maybe the students in Group 1
actually are mathematically highly able and given challenging mathematical
problems makes them achieve. This study indicates that through the MK some
students show good mathematical competencies that they not are able to show on the
national test. It is therefore important to use both curriculum bounded test as well as
non-curriculum bounded in assessment, so that students get more and varying
possibilities to show their strength.

POSTER FORMAT
The poster will present the MCRF, the analysis procedure and the results in
diagrams, pictures and text.

REFERENCES
Mathematical competencies: A research framework. In Mathematics and
mathematics education: Cultural and social dimensions. (pp. 157-167). Stockholm:
Swedish Mathematics Education Research (SMDF).


The 7th Mathematical Creativity and Giftedness International Conference, Busan,
Südkorea.

Pitta-Pantazi, D., Christou, C., Kontoyianni, K., & Kattou, M. (2011). A model of
mathematical giftedness: Integrating natural, creative, and mathematical abilities.
Canadian Journal of Science, Mathematics and Technology Education, 11(1), 39-
54.