RELATION BETWEEN IMITATIVE AND CREATIVE MATHEMATICAL REASONING WHEN SOLVING PHYSICS TASKS

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This on-going pilot study is based on a framework that distinguishes between *creative mathematical reasoning* (CR) and *imitative reasoning* (IR) (Lithner, 2008). The former one refers to a reasoning that is anchored in intrinsic mathematical properties and that includes some novelty to the reasoner. If instead the anchoring is in surface properties and the reasoning consists of remembering an answer or following a process step by step, it is IR. The authors overall hypothesis is "how students reason mathematically when solving tasks in physics might have an impact on *their learning of physics* (as the reasoning has on their mathematical learning (Lithner, 2008))". As an approach to this hypothesis, the framework was used in a previous study by the author to categorise tasks from ten Swedish national physic tests with respect to the kind of reasoning required for solutions.

In this pilot study the above hypothesis is examined further. A quantitative analysis using the Mantel-Haenszel (MH) procedure (Mantel & Haenszel, 1959) is conducted on the categorised physics tasks. The addressed question is "Does students' success on CR tasks depend on their success on IR tasks?" Success is referred to as when a task is completely solved.

The sample used so far comprises 2612 upper secondary students' results on tasks from one of the ten categorised physics tests, as well as a teacher indicator for each student. In the MH-procedure one IR-task is compared to one CR-task while possible influence from the teacher is controlled for. The obtained chi-2 statistics (one d.f.) is $17.4 > 3.84$, which is the chi-2 (one d.f.) limit for a 95% confidence interval. This indicates that it is more likely to succeed on a CR-task if the student has succeeded on an IR-task. More studies have to be done in order to generalise the result and to decide if the MH-procedure is an appropriate method to use for analysing dependent between different kinds of reasoning. In the presentation I hope to discuss this further.

References

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