

# REDESIGNING INTERVENTIONS FOR ENGINEERING STUDENTS: LEARNING FROM PRACTICE

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Engineering students' difficulties with mathematics in their first years' studies have been reported in several studies. The project MP<sup>2</sup>-Math/Plus aims at advancing engineering students' performance in mathematics by focusing on learning strategies and self-regulation. Its concept involves continuous critical reflection and redesign of all project elements, forming cyclic processes of thought and instruction experiments typical of design-based research (Burkhardt & Schoenfeld, 2003; Gravemeijer & Cobb, 2006).

Thus, after the first round with only a moderate pass rate, the MP<sup>2</sup>-Math/Plus interventions were modified true to the idea of demanding more commitment from the participating students, providing them with coordinated and linked interventions (including workbooks, learning logs, group meetings and a helpdesk, all focusing on a weekly topic and promoting each other), and planning the withdrawal of our personal support in three phases until the end of the project timeframe. Alternatively nurturing peer support paid respect to students' affective needs.

Evidence of the impact of these changes was given by empirical data, including, among others, demographic variables and exam performance. Out of the 783 (145 female, 19%) engineering students who attended the mathematics exam in March 2012, 58 (22 female, 38%) of these had been able to profit from all of the project interventions. A pass rate of 70.69% as compared to 53.33% in a reference group of comparable abilities suggested the desired effect. Closer inspection, however, revealed no significant differences when comparing exam scores, only the comparison of passes and fails proved almost significant ( $p=.052$ ). Comparing exam scores with reference to gender (male  $t(43.487)=1.32$ ,  $p>.05$ ,  $r=.197$ ; female  $t(27.949)=2.91$ ,  $p=.007^*$ ,  $r=0.482$ ) supplied the insight that women profited more strongly from the redesigned project interventions than men.

## References

- Burkhardt, H., & Schoenfeld, A. (2003). Improving Educational Research: Toward a More Useful, More Influential, and Better-Funded Enterprise. *Educational Researcher*, 32(9), 3–14.
- Gravemeijer, K., & Cobb, P. (2006). Design research from a learning design perspective. In J. van Akker, K. Gravemeijer, S. McKenney, & N. Nieveen (Eds.), *Educational Design Research* (pp. 45–85). London, New York: Routledge.