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## Co-constructing models as tools in vocational practice

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## Summary

Presently in VMBO, teams of teachers are trying to find the right balance between theory and practice. One of the proposed reforms envisions the teaching-learning process as an activity embedded in a simulation of real world practices, whereby students, guided by teachers, work on products for 'real' customers, in the meantime acquiring new knowledge and skills. The basic assumption behind this approach is that the learning of codified knowledge and vocational skills can be integrated into authentic workshop practices. How teachers best guide this learning process is still unclear. We have theoretical reasons and empirical evidence from earlier research projects in the mathematical domain to the effect that guided co-construction is an effective teaching and learning approach

This design-based project addressed the following general research question: do students, who participate as model designers in a process of guided co-construction with an expert (teacher) and peers, show better learning outcomes than students who learn to work with ready-made models provided by the teacher? The general, working hypothesis is that collaboratively learning to design and use models in vocational education has positive effects on learning outcomes, compared to providing ready-made models to the students. The overall research project was divided into three interventions: a case study, and two experiments in a pre-test post-test control group design. In the three interventions the students were to design and construct a technical product in the form of a tandem tricycle. In all stages of the research video data was collected.

Based on the tests in the two experiments, the conclusion is that there is hardly or no difference in learning outcomes as measured by traditional knowledge tests. However, two findings led us to believe that guided-co-construction might improve the students' understanding of modelling and codified knowledge. This led to the overall conclusion that the use of models as tools for communication and orientation in product-oriented vocational practice resembling that of professional designers, help students develop better understanding, while codified knowledge of both academic and vocational disciplines is enhanced. In addition to addressing the overall research question the four studies also resulted in a closer analysis of the research process and, in particular, the use of video in design-based research. In retrospect we can see that the extensive use of video data co-determined the course of the research trajectory in ways that would not have been possible with quantitative data alone.