# 037
# Comparing Group and Individual Problem Solving: A Case Study from Newtonian Mechanics

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Previous research has demonstrated that many students not only emerge from their studies of physics with serious gaps in their conceptual understanding but that they also experience serious structural difficulties when solving physics problems, such as being able to see the structure of possible solutions and answers before actually solving the problem [1, 2]. One commonly implemented instructional strategy to bridge these two types of gaps is to let students solve problems in groups, as this leads to better conceptual understanding and students are able to solve more complex problems in groups than individually [3,4]. There has, however, been very little research focusing on how the problem solving process changes when students solve physics problems together rather than individually.

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In this case study, we explore differences and similarities in how students formulate and solve physics problems in groups and individually. The empirical data comprised video-recorded sessions of students solving problems in groups [5] and semi-structured interviews with other students solving the same set of problems individually [2]. All students were enrolled in Engineering Physics at Chalmers University of Technology in Gothenburg, Sweden. The problems were drawn from Newtonian mechanics and the solution to the problems required an understanding of basic notions such as force, friction, acceleration and system. Success on the problems also required an understanding of basic mathematical notions such as functions, systems of equations and derivatives. An analysis of the video-recordings and the interviews revealed how the students struggled with both near- and far transfer [6, 7], i.e. transfer to a similar and a different context. Moreover, different patterns of problem solving that were connected to the social context, i.e. if the problems were solved in groups or individually, became apparent. A comparison between these contexts illustrates some of the benefits of collaborative learning. Some implications for instruction are also discussed in the paper. ■

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