

# REFORMATION OF INTERMEDIATE LABORATORY COURSES AT THE UNIVERSITY OF HELSINKI

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The intermediate laboratory courses at the University of Helsinki have undergone a reformation. Previously, students have completed these intended second-year courses in their fourth or fifth year. Peer support was lacking, and the laboratory instructions left little room for students to make choices regarding measurement strategies. A common issue was that data obtained in the laboratory did not translate to an understanding of the results.

The makeover began with adapting University of Colorado Boulder learning goals [1] around which laboratory and homework exercises were designed. Each laboratory assignment focuses on one or two of the learning goals and the order is chosen to accumulate student skills. The laboratory assignments are open-ended problems and the focus is on transferable skills, *e.g.* building or choosing measurement devices for a particular problem, data-analysis skills and choosing research questions.

The renewed courses consist of weekly tutorials, small-group laboratory sessions (three groups of three students each) and homework. Biweekly changing laboratory assignments give students a chance to change their strategy or redo measurements after preliminary data-analysis. Students present their results mainly as written reports that adhere to the structure of a scientific article, but one poster and one oral presentation are included.

In this presentation, we discuss the need for better laboratory courses and our solutions. We present experiences from the first course in spring 2016 (enrolment >60 students) in light of student feedback, teacher and assistant experiences, student retention and learning outcomes.

[1] B. M. Zwickl, N. Finkelstein, and H. J. Lewandowski, [American Journal of Physics](#) **81**, 63 (2013).