



UNIVERSITÄT  
LEIPZIG

Fakultät für Physik und  
Geowissenschaften

Prof. Dr. J. Vollmer  
— on behalf of the Physics Lehrteam —

# Teaching Workshop

**Wednesday, 29 January 2020 at 9.00 - 13:00**

**Prof. Dr. Claudia Schäfle**  
**Prof. Dr. Silke Stanzel**

Technische Hochschule Rosenheim

## **Active Learning in Physics.** **A practical workshop for instructors and students**

Active learning methods have repeatedly been shown to be superior to the traditional teacher-centered approach to instruction [1]. They improve short-term mastery, long-term retention, and depth of understanding of the course material. Moreover, they support methodological and social competence.

We therefore changed the teaching method in six Physics introductory courses from “seminaristischer Unterricht” to a combination of three active learning methods: Just-in-Time Teaching (JiT) [2], Peer Instruction (PI) [3], and research-based collaborative worksheets (“Tutorials”) [4]. Students prepare for lectures in advance by obtaining weekly reading assignments, answering online-quizzes, and posing questions on the subject. In class we answer questions, address misconceptions, and reach a deeper understanding. The methods are suitable for heterogeneous and large groups (> 200 students), and they are appreciated a lot by students. JiT has the advantage that the lecturer knows about students’ difficulties in advance. This allows us to address systematic misconceptions on physical concepts that students often preserve otherwise even after passing exams. We will present science-based learning material, collaborative-group work sheets, and so called “tutorials” developed to overcome the misconceptions. They spawn students to undergo a process described as “elicit-confront-resolve”.

The workshop will be held in a JiT/PI-style. To this end the participants are expected to prepare for the workshop for about 30 min in advance (reading a text, answering a short online-quiz). The results of the online-quiz, the comments, and the questions will be addressed in the workshop. Participants will learn how to apply JiT and PI, discuss experiences with the practical implementation, and can develop their own JiT/PI-session with individual teaching material, that they can directly use in class. Besides, they will get to know the Mc-Dermott Tutorials [4].

[1] Freeman, et al: Active learning increases student performance in science, engineering, and maths. PNAS 111, 8410 (2014).

[2] Novak, et al: Just-In-Time Teaching: Blending Active Learning with Web Technology. (Addison-Wesley, 1999).

[3] Mazur: Peer instruction: A user’s manual. (Pearson/Prentice Hall, 1997).

[4] McDermott, Shaffer, Kautz: Tutorien zur Physik. (Pearson Studium, 2009).

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