



PHYSIKALISCHES KOLLOQUIUM

Vortrag: **Prof. Dr. Paula Heron**
University of Washington,
Department of Physics,
Seattle USA



Thema: **Improving Student Learning: The Dual Roles of Conceptual Understanding and Reasoning Ability**

Zeit und Ort: Dienstag, 17.5.2022, 16:40 Uhr - Hybride Veranstaltung

Vortrag vor Ort in REC/C213

Online Teilnahme möglich:

Zoom-Meeting: Meeting-ID: 689 9524 9470 / Kenncode: Kolloq#1

<https://tu-dresden.zoom.us/j/68995249470?pwd=SkVtQ3VrOzBjM3ErbzZaaFhGaUhXQT09>

Leitung: Prof. Dr. Lana Ivanjek

Kurzfassung: Why do students make errors on physics problems? Errors that directly contradict what they have been taught? Errors that don't arise from the failure to remember the correct formula? For the past several decades, physics education researchers have focused on one compelling explanation: students arrive in the classroom with pre-formed ideas about how the world works. Even though they may blend these ideas with those presented in formal instruction, the prior conceptions often win out. According to these accounts, students' prior knowledge has been built through rational, if imperfect, processes of observation and analysis, and any new or different ideas presented in the classroom must likewise be built, not simply received. Figuring out what ideas students bring with them to the classroom, and how to take them into account, has proven to be a complex, multi-faceted program of research that has significantly influenced physics teaching. However, it is not always the case that students produce incorrect answers through logical inferences based on incorrect or inappropriate premises – often they don't know why they chose a particular answer, just that it seems right. "Dual-process" theories suggest that their answers might not be based on so-called "slow" thinking, which is deliberate and laborious. Instead they might be based on so-called "fast" thinking, which is automatic and effortless. The basic idea is that students immediately and effortlessly form a first-impression of a physics problem. If this impression is found to be satisfactory, it will be adopted. Otherwise, a deliberate and analytical process ensues. It is believed that this sequence cannot be "turned off." That is, a first impression will always be formed. If it is attractive, and the benefits of engaging in more effortful



thinking are not obvious, then a student may answer incorrectly, masking their conceptual knowledge. In this talk, I will discuss recent efforts to improve both conceptual understanding and reasoning skills. Examples will be chosen from first-year university-level physics.

Biographie: Paula R.L. Heron is a Professor of Physics at the University of Washington. She holds a B.Sc. and an M.Sc. in physics from the University of Ottawa and a Ph.D. in theoretical physics from the University of Western Ontario. Dr. Heron's research focuses on the development of conceptual understanding in topics including mechanics, electricity and magnetism, and thermal physics and on the development of formal reasoning skills. She has given numerous invited talks on her research at national and international meetings and in university science departments. Dr. Heron has served on the Executive Committee of the Forum on Education of the American Physical Society (APS), the Committee on Research in Physics Education of the American Association of Physics Teachers (AAPT) and on the ad hoc National Research Council committee on the status and outlook for undergraduate physics education. She is Chair-elect of the Executive Committee of the Topical Group on Physics Education Research of the APS. Dr. Heron co-chaired a joint task force of the APS and AAPT that produced the report Phys21: Preparing Physics Students for 21st Century Careers. She also serves as Associate Editor of Physical Review – PER. She was elected Fellow of the APS in 2007 and in 2008 she shared the APS Education award with colleagues Peter Shaffer and Lillian McDermott. Dr. Heron is a co-author on the upcoming 2nd Edition of Tutorials in Introductory Physics, a set of instructional materials that has been used in over 200 institutions in the US and that has been translated into German and Spanish.

Get-Together

Im Anschluss an das Kolloquium (ca. 18 Uhr) sind Studentinnen und Mitarbeiterinnen eingeladen zu einem hybriden Get-Together mit Prof. Paula Heron. Wir treffen uns im Raum B101 und zusätzlich ist die Einschaltung online über Zoom möglich. In diesen Rahmen gibt es die Gelegenheit, mit der Referentin ins Gespräch zu kommen und sich über weibliche Perspektiven auf Herausforderungen in Studium und Berufsleben auszutauschen.

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The colloquium will be followed by a Get-Together with Prof. Paula Heron in Room B101 and online in Zoom (about 6 p.m.). Female students and staff are invited to talk to the speaker and discuss female perspectives on challenges in studies and professional life.