UNIVERSITÀ DEGLI STUDI DI UDINE

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Invito al seminario - webinar
di

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

Venerdì 22 aprile 2022 Ore 12:00
Sala Riunioni – I piano - DMIF – Università di Udine
il seminario si può seguire in rete al link https://bit.ly/3LXPYLi

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.

Paula Heron

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. She joined the Physics Department at the University of Washington in 1995. 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 is co-Founder and co-Chair of the biannual "Foundations and Frontiers in Physics Education Research" conference series, the premier venue for physics education researchers in North America. She 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.

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