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INTERACTIVE SIMULATIONS FOR EFFECTIVE LEARNING OF PHYSICS

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Appropriate educational technologies have the potential to make the concept of physics more accessible through visualization, modelling and multiple representations. Students are engaged in more powerful scientific activities and they are able to perform investigations that would not be possible without the use of technology.

The educational potential of technology products is reviewed based on current theories of learning and on recent research. Educational software supports teachers in presenting new knowledge to students and supports students in applying and extending what they have learned on a more individual basis.

This paper presents examples of highly modular and flexible software products available on the internet for teaching and learning physics which were used in the classroom. They were used in different ways: first, as presentation aids for teaching a topic to the students, then to anchor and stimulate classroom discussions and finally encourage students applying and practicing new concepts and skills on their own. Using interactive simulations teachers can quickly discuss and demonstrate the effect of varying parameters in an experiment, and then have students make conjectures about the results. Through the variation of parameters and the use of different types of representations in the simulation, comprehension of the relationships between concepts, variables and phenomena can be fostered in the students. At the same time, also phenomena which cannot easily be shown in a classroom or laboratory can be investigated. But simulations are not conceived here as substitutes of the real

laboratory experiences. Their use as a complement of experimentation can be highly effective for learning physics concepts.

Experiences in grade 7 to 12 (i.e. with 13- to 18-year old students) in an Austrian school are reported. Some of the versatile tools are introduced and some suggestions for how to effectively use these interactive simulations in different learning environments are provided.

In summary, simulations, hypermedia and activities with software tools were used as a follow-up to hands-on activities and empowered students to pursue their own research questions without being hindered by the limitations of "real" experiments and to construct their understanding through (partially) guided exploration.

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