

# **Improving Teaching and Learning by Using Computational and Electronic Instrumentation Resources on Engineering Introductory Physics Courses**

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By 20 years ago, while Computation Science started its process of popularization, the general opinion was that, in a few years, we would have a massive application of computers in the classroom. This is a natural reaction every time when a technological evolution has real possibilities of application in Science Education. Today, this is a point of view of difficult convergence. Among lots of opinions, we have people that say computers can support a huge effort on teaching Science. An opposite opinion has ones that says computers do not permit students a complete contact with nature, affecting in a negative way how students can learn to measure and calculate. Now days we know that the path to be followed sets computers as an accessory on science learning, once they have a great potential to improve student achievement, but it is necessary. So, the computer is a tool that is able to mediate knowledge transmission, but it is not the final stage of teaching and learning.

This project aims to enhance student-learning acting in two fronts. The first one is the intensive use of laboratory experiments as a complement to regular classes. The second step is how to assist these experiments integrating them with computer data acquisition. The innovation here is that students are able to perform a computer simulation before the experiment. With software developed to integrate simulation and experiment, the student could predict the behavior of a physical situation, perform the experiment and compare both results in order to build a synthesis of them.

In the first stage of the project, we are concerned in three experiments. The first one is a pendulum, which permits students observe the behavior of damped oscillations. The second experiment consists in an air track with a data acquisition system. This system is able to measure time and displacement in a real time way. Integrated with software it can show the evolution of physical quantities. Finally, the third experiment is an impact transducer that performs evaluations in collisions, in order to verify the conservation of linear momentum.

The first results of the project, assisting classes with these experiments integrated with computer simulation, have shown a significant enhancement in the student-learning process.