Teaching Introductory Physics

Subject area
Physics.

Description
Teachers guide and introductory text.

Authors
Arnold B. Arons.

Publishers/Suppliers
John Wiley & Sons, Inc (http://www.wiley.co.uk/).

Date/Edition
1997.

ISBN
0-471-13707-3.

Level
Beginning lecturers, teachers of foundation/year one undergraduate physics, those with an academic interest in physics education.

Price
£57.50.

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Summary Review

range: * very poor to ***** excellent	
Academic content	*****
Usefulness to student	***
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

This text, which is not a traditional textbook, is in three parts. Part one, 410 pages, takes the reader through the research into physics education. Following a strongly developed case for teaching some basics skills before rushing into the physics usually taught the author gives a teachers' guide to a possible teaching approach for kinematics, dynamics, momentum, energy, static electricity, current electricity, electromagnetism, waves, light and early modern physics. However this is not the only material covered in part one. Of particular interest is the manner in which the author integrates the concept of energy into each theme and a much neater, than any other text, introduction of the first law of thermodynamics. The author also addresses scientific literacy, critical thinking and a host of miscellaneous topics, including an approach for the mathematically gifted student. For anyone wishing to delve further into the physics education research part one is extensively referenced.

Part two, 212 pages, of the text covers homework and test questions grouped by chapter heading from part one. However, once again, this is not what it may appear for these are not the typical end of chapter questions you would find in a typical course text. The emphasis in these questions is more on the explanation of reasoning than the calculation of the answer. Indeed the author suggests that many of the problems would be better suited to group discussion exercises and we are told that the majority of them have been field tested in this way. This part of the text concludes with, chapter-by-chapter, learning objectives, which one assumes would more than adequately allow a newly appointed lecturer to demonstrate their competence in this area.

Part three, 153 pages, is basically a monograph on the classical conservation laws covering linear momentum, conservation of mass, the concept of heat and the concept of energy. This part of the text makes a self-contained course on conservation laws at a level suitable for any introductory, calculus based, course of study with ample questions embedded in the text. Indeed if part three was available as a separate text it would make a suitable course text for students being both easy to read and scientifically sound.

The numerical questions tried by myself and colleagues cover a wide range of both topics and demand. The less typical questions, pushing for explanation rather than calculation, also provide a basis for some hard thinking and heated debate!

Taken as a whole it becomes difficult to suggest where it would be used. It is certainly not, in my view, a text that could be given to a student as a course book. Perhaps the new lecturer, especially one working through an induction programme, would get some useful insights into the application of current research into teaching and learning in physics. To this end the text clearly shows the difference in approach between UK and US physics departments – what chance such research being carried out in a UK physics department?

However perhaps it would become us all to dip into, even if occasionally, a text of this nature, the only losers, if we don't, will be the students.