

Strategies Using Lecture Demonstrations to Promote the Learning of Thermodynamic Concepts

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Thermodynamics is unpopular among college students and some of them believe it is too abstract, impossibly difficult, tedious, etc. We believed one reason of these views are the student's incomplete or incorrect ideas (misconceptions) concerning matter's thermal behavior and particulate nature which come from their everyday experience, from previous soft science teaching and from the traditional teaching practice and evaluation techniques at university level. As a result most students don't correctly understand the basic and the advanced concepts build upon those fundamentals.

To promote that students learn the scientific meanings of the concepts of thermodynamics, we propose teaching concepts before the mathematical expressions via the use of active learning strategies to help them develop their thinking and building of a molecular understanding. In our view, lecture demonstrations of science experiments, which have been used mainly to focus students attention on the behavior and properties of the matter and as a complement to teach scientific concepts, have all the elements needed to be a central tool of our strategies where it can be easily integrated : i) as diagnostic test instrument to assess student's misconceptions, ii) to present strong evidence for the interested phenomena, iii) to promote and stimulate observation, questioning and argument, so the students can think of explanations for what they see, iv) to confirm or limit the applicability of the ideas, vi) to evaluate students learning, etc.

We present strategies sequences for the conceptual areas of changes of state, heat and temperature, heat capacity and chemical energy, showing the incorporation of classical demonstrations.