

## Helping Students to Change their ways of Learning in Science and Engineering

We cannot always count on students arriving at university with a sound understanding of the nature of science. Indeed, most arrive with a high degree of ignorance or serious misunderstandings. Although changes are happening at pre-university levels that contribute to better scientific foundations, science education at the university level will for a long time, perhaps permanently, require not only covering the content but also building the conceptual and motivational bases for making meaning from that content. Student learning is typically related to compartmentalized segments of the course. Indeed students have been accustomed to learn science by “template” learning. Until midway through high school, students can be successful at courses by memorizing templates for every situation encountered on an examination. Even if students successfully change their mode of solving problems, they are likely to maintain their method of acquiring knowledge by compartmentalization. Some students can dismiss the conceptual basis of the problems, because their epistemology is formula driven and they accept calculated answers as a goal in itself.

**General Objectives** (a) to understand the nature of the scientific and nonscientific modes of thinking used by students in gateway science and engineering courses, (b) describe and understand the factors affecting student understanding of the nature of science (NOS), and (c) promote instructional changes in order to improve student science learning.

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