The Case for Inductive Teaching

Students can engage in active problem-solving even before they master theories and equations.

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HIGHER EDUCATION is filled with strongly held beliefs that do not always stand up to rigorous scholarly analysis; for example, "You can't be an effective teacher unless you're actively engaged in research" or "Students learn more by working individually than by cooperating in teams." Another well-entrenched tenet of traditional instruction is the notion that students must first master the underlying principles and theories of a discipline before being asked to solve substantive problems in that discipline.

An analysis of the literature suggests that there are sometimes good reasons to "teach backwards" by introducing students to complex and realistic problems before exposing them to the relevant theory and equations. A broad range of inductive teaching methods such as inquiry-based learning, problem-based learning, project-based learning, case-based teaching, and just-in-time teaching do just that. What inductive methods have in common is that students are presented with a challenge and then learn what they need to know to address that challenge. The methods differ in the nature and scope of the challenge and in the amount of guidance students receive from their instructor as they attempt to complete their tasks.

Inductive approaches have many other features in common, all of which are well grounded in educational theory and widely supported by empirical studies. Inductive methods are all student-centered, meaning that they impose more responsibility on students for their own learning than the traditional lecture-based deductive approach does. They can all be characterized as constructivist methods, building on the widely accepted principle that students construct their own versions of reality rather than simply absorbing versions presented by their teachers. The methods almost always involve students discussing questions and solving problems in class (active learning), with much of the work in and out of class being done by students in groups (collaborative or cooperative learning).

Of course, the most relevant question from the standpoint of classroom instructors is, "Do these methods work?" In a word, yes. While the quality of research data supporting the different inductive methods is variable, the collective evidence favoring inductive over traditional, deductive, pedagogy is conclusive. Inductive methods promote students' adoption of a deep (meaning-oriented) approach to learning, as opposed to a surface (memorization-intensive) approach. They promote intellectual development, challenging the dualistic type of thinking that characterizes many entering college students, which holds that all knowledge is certain, professors have it, and the task of students is to absorb and repeat it. And they help students acquire the critical thinking and self-directed learning skills that characterize expert scientists and engineers.

This is not to say, however, that simply adopting an inductive method will automatically lead to better learning and more satisfied students. As with any form of instruction, inductive teaching can be done well or poorly, and the outcomes that result from it are only as good as the skill and care with which it is implemented. Many students are resistant to any type of instruction that makes them more responsible for their own learning. Instructors who set out to implement an inductive method should therefore first familiarize themselves with best practices in using the method, such as providing adequate scaffolding—extensive support and guidance when students are first introduced to the method and gradual withdrawal of support as students gain more experience and confidence in its use. They should also anticipate some student resistance to the method and be aware of effective strategies for defusing it. If these precautions are taken, both the students and the instructor should soon start seeing the positive outcomes promised by the research.

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