

**The Lamentable State of Science Education in Political Science**  
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Political scientists are long overdue in recognizing the poor job we do in educating our undergraduate students in the scientific side of our discipline-as well as the unfortunate consequences of this fact. Even in leading research universities the undergraduate educational program concentrates on describing political institutions and processes and exploring selected political history and current political controversies. The scientific aspects of the discipline that form the professional work of the vast majority of research professors are taught in fragmentary, ad hoc, and rare bits and pieces. Thus, at best, those aspects of the discipline are taught systematically in only a few courses in any given department, are taught in fragments in some larger number of courses, and are never sequenced or integrated for the typical student.

At least two observations suggest why we should take our science seriously in undergraduate education. First, the scientific legitimacy of the discipline is unassailable. That observation is best demonstrated in the facts of scholarly life for the vast majority of research political scientists. We seek scientific explanations for observable, natural phenomena. As I often explain to my students, ours is inherently a natural science-with no concern for supernatural, paranormal, or otherwise other-worldly matters. Any college graduate today who does not understand the scientific character of the social sciences is as ignorant as one who confuses astronomy and astrology or chemistry and alchemy.

Even a cursory knowledge of the history of science would also indicate why, as youthful sciences at an early stage of development, the social sciences are essentially identical to the mature physical sciences at equivalent stages in their development. This view of the social sciences is accepted in much of the history and philosophy of science, and it is well explained in selected texts for undergraduate students (e.g., Isaak 1985, esp. 51-69; Johnson and Joslyn 1995, esp. 19-40; Zuckerman 1991, esp. 151-81).

Second, the social sciences have a remarkable role in day-to-day life in the modern world. These sciences may not be far advanced theoretically, but whether for good or ill, they are widely employed for policy and administrative decisions in the public, private, and nonprofit sectors of modern society. It is the rare major policy decision of the U.S. government, General Motors, the Ford Foundation, or any other comparable entity that is made without notable recourse to social science argument and evidence. At one time or another, applied researchers also employ all the intellectual tools that basic research social scientists do. They use the general intellectual skills associated with the scientific method, draw upon theory from basic research to shape their research agendas, create their own versions of theory about cause and effect in applied settings, use the same kinds of nonexperimental and experimental empirical evidence as theory-building scholars do, and manipulate and evaluate such evidence with comparable mathematical and statistical tools. Lupia (2000) and his fellow PS symposium participants offer numerous additional examples of and perspectives on the public or applied value of political science.

For the preceding reasons our undergraduate students should acquire an informed appreciation of the scientific aspects of this discipline. They should understand the character of political science as a scientific enterprise, how scientific work is carried out in this field, the current level of scientific advancement and achievements therein, and the most notable challenges to the discipline's progress. Equally important, our students should gain some facility in the use of scientific procedures. They should have direct experience, that is, in employing the scientific method, along with the particular data-collection, analysis, and theory-development procedures of our discipline.

Our students should learn, too, the important applied role that the social sciences play in the world. Applied work is denigrated by some in our profession, but they forget how common and

influential it is in the world. They also fail to appreciate how virtually every scientific discipline spawns an applied practice that has an intimate relationship with basic research in the field. Undergraduate political science students gain little knowledge of these matters in their courses. Yet this circumstance may be an especially important one for our educational agenda. Many of our students will one day generate applied social science research or employ it for decision making in their professions.

These concerns arise out of something akin to professional embarrassment on my part. Ours is the only scientific discipline I know that essentially fails to educate its undergraduate students in its primary concerns. I would readily wager that, at the time they graduate, the vast majority of our majors cannot advance even a modestly articulate statement of why ours is a scientific discipline. Indeed, they are as skeptical about that matter when they graduate as when they matriculate. Appreciation of this matter among nonmajors is doubtless even lower.

Concern with these pedagogical issues also arises in other quarters, and for additional reasons. Many observers lament how poorly science is taught in all disciplines at the secondary and collegiate levels. My concerns about and goals for science education in political science are compatible with the arguments for the importance of science education generally and the strategies proposed for effective science curricula in such recent works as *Academic Preparation in Science* (The College Board 1986) and *Science for All Americans* (American Association for the Advancement of Science 1989), as well as with the argument for the importance of education in social science specifically in *Benchmarks for Science Literacy* (American Association for the Advancement of Science 1993, esp. 151-52).

### **What I Am Not Arguing**

I do not recommend that political science abandon its mission with regard to civic education, liberal learning, or an appreciation for the role of values and normative preferences in governance. I am arguing that education in the preceding matters alone is fundamentally incomplete. My ideal undergraduate curriculum would have science education at its core, but political philosophy and my own construction of the core elements for civic education would assume prominent roles, too.

Nor am I arguing that scientific knowledge is superior to other forms of knowledge. Medical scientists can extend our lives to a considerable old age today, but they cannot alone inform us about when it is wise to do so. Equally, the scientific study of politics can help us understand many natural phenomena: how individuals and organizations behave in the political sphere. But we must determine on other bases what of that behavior is for good or ill.

Finally, I do not suggest that political science is especially advanced in terms of providing general explanations for the phenomena we study. Indeed, we are at an early, though not primitive, state of development, and we should convey this to our students. One might even see this as a source of opportunity. Students nurtured on the sense of discovery and excitement that motivates those who labor in the discipline, and who also appreciate the opportunity for new contributions to the field, are more likely to be motivated to become political scientists.

### **Critical Elements of a Science Education Program**

At least seven objectives are central to a sound education in political science, or any other science for that matter. First, students should be taught early in their curriculum exactly what science is, or, as Kerlinger (1973, 5-6) puts it, what science is as a "method of knowing." Kerlinger, elaborating ideas from Charles Peirce, offers an especially accessible explanation of the character of scientific knowledge, how it differs from other forms of knowledge, and the intellectual procedures employed in the scientific method.

As a part of this first objective students should understand, too, the frequent competition between science and other forms of knowledge over their rival explanations for some natural phenomena. Consider the rejection of Copernicus and Galileo's advances in astronomy by popular critics-based on knowledge by common sense-and by Protestant and Catholic religious leaders-based on knowledge by "authority" (Fermi and Bernardini 1961, 68-88; Kuhn 1957, 185-200). The critical reception of Pasteur's evidence for the causes of disease and infection by much of the professional medical establishment (Debre 1998, 257-93) is equally instructive. And the debate provoked by contemporary philosophers about whether some aspects of quantum theory in physics are subjectively, or "socially," determined reminds us that such controversies are not merely quaint events of the distant past (Weinberg 1996). Indeed, most modern sciences have been challenged by advocates of one or another religious, philosophical, or political idea. Equally frequent are attacks based on various strands of common sense, some of which are far too common, though not so sensible. It is young sciences like that of Galileo and Copernicus-and political science today, of course-that suffer most in these contests.

Also as a part of this first objective students should learn what scientific knowledge is and is not useful for, a matter succinctly delineated by Sjoberg and Nett (1968, 23): "It would be a mistake to confuse scientifically based knowledge with wisdom. . . . Wisdom involves sound ethical direction, the exercise of good taste, and distinguishing the worthwhile from the not so worthwhile. The scientific method (in the narrow sense) does not tell us how to use empirically verified knowledge other than to further the ends of science; however, by utilizing more of the empirically validated knowledge and less of the unverified and often fiat knowledge of other epistemologies the cause of humanity may be advanced."

Second, students should acquire a strong foundation in the general procedures of inquiry employed by all sciences for advancing knowledge: conception, hypothesis, measurement, empirical confirmation or disconfirmation, deduction, and re-conception-in whatever order one prefers for explaining this creative process. Despite idiosyncratic, individual variations in how this creative work is executed, there is a common logic to its component parts. And there is much good expository material on that logic and those parts which is accessible to undergraduates. Discipline-specific adaptations to discipline-specific puzzles must, of course, be taught, but an appreciation for the continuities of mind and method that all sciences share is especially important. I must add, reacting to a perversion of this idea that is widespread in our discipline, that education in statistics and quantitative methods alone is a poor and incomplete substitute for this objective. Rote instruction in the use of statistical procedures and computer software with little concern for theoretical objectives and broad methods of scientific inquiry is even worse.

Third, students should learn the current state of basic research and theoretical knowledge in the field. In a highly fragmented discipline like ours, that may mean learning the state of knowledge in a subset of subfields, but that qualification would not be very different from what is achievable in many other sciences. Admittedly, teaching what theory is, what it "looks like," how it is developed, and how the state of our theoretical knowledge has evolved over the history of our discipline is one of the greatest pedagogical challenges. Nor is there much published advice on this score, although for a rare exception see Mayer (1988). Along with learning about the content of our theory, students should learn, too, what we do not know. And they should appreciate how contingent much theoretical knowledge is in all sciences.

Fourth, and as an outgrowth of the preceding objective, students should gain an appreciation of how political science has evolved over the course of its short scientific life. One may cite here the evolution of theoretical knowledge and the evolution of our research technologies. On the former score there now exist prospective general theories about various political phenomena that indicate exceptional progress in some subfields. One can usually trace, as well, the major milestones of discrete discovery and of middle-range theory that led to these general formulations. In addition, the advancing sophistication of such technologies as survey research, experimental and quasi-experimental methods, and various other data-collection and data-analysis methods indicates some of the progress in the latter area. Our

``microscopes" have gotten remarkably more precise, though they are still cruder than we wish.

Fifth, and a near-universal recommendation of every treatment of science education, our students should get deep exposure to the creative and discovery aspects of our discipline. This idea is the core concept of the Boyer Commission report for entirely reforming undergraduate education, *Reinventing Undergraduate Education* (State University of New York at Stony Brook 1998). Too often we concentrate on simply transmitting the store of accumulated knowledge-after, of course, it has been purged of its creativity, complexity, and contingency. And often, too, after it has been otherwise selectively refashioned for textbook presentation.

More educational exposure to the preceding aspect of scientific work may also have benefits few of us currently appreciate. It has been observed that students learn and understand considerably less than we typically think and, thus, that parsimony is critical for deciding what to teach (American Association for the Advancement of Science 1989, 145). Learning how to think about and analyze problems scientifically may be of far greater value in the long term than learning the particular facts we presumably know at the moment about a given research question. And this may be the special contribution of an education in social science per se for the common liberal arts objectives of logical and critical thinking.

This common call for a focus on discovery in science education merits one amendment, however. The exercise of discovery should be married to the existing state of theory in the field, or more specifically, the frontiers of theoretical knowledge. Too often social science methods classes adopt this teaching objective, if they do at all, without attention to the body of current knowledge. All questions that students might form, all possible political puzzles, assume equal merit. Such a focus enhances unfettered and creative inquiry, a worthy goal itself. But students must also learn the particular value of focused research that seeks to advance existing theoretical knowledge or otherwise to solve notable puzzles in the discipline.

Sixth, students should come to understand how widely social science-and, yes, even political science-is used in the world for day-to-day decision making. They should appreciate the close associations between basic and applied research in the social sciences: how at times each stimulates the other and how comparable intellectual tools-including theory-are employed in both. I do not imply that our knowledge is universally used for good in the world, just as I would not so imply for chemistry or physics. Nor is social science knowledge often the exclusive criterion upon which applied decisions are made. Yet its role is prominent and influential.

Finally, students should have an integrated, progressive series of courses or educational experiences that builds on the foundation suggested in the preceding objectives. No single course can readily incorporate all these objectives, and exposure to only one or two courses with such material will be insufficient. This recommendation is a common one, of course, advanced by those who advocate better liberal education in our discipline (Wahlke 1991b, 55) as well as those who would improve science education generally (The College Board 1986, 38). Reinforcement, elaboration, and applications in multiple contexts are widely considered critical to a successful educational program.

### **How Contemporary Undergraduate Education Compares to the Preceding Criteria**

Science is being taught in our discipline, but as I observed earlier, it is taught in fragmentary and rare bits and pieces. There exist exemplary courses-and, hence, exemplary professors-that address many of the educational objectives discussed above. The companion essays in this symposium illustrate the educational practices and values of some of these exemplary professors. These essays also suggest an additional, important observation. There is no single best way to teach the educational objectives outlined above. Science is a creative activity. The teaching of science should be, as well. Thus these essays indicate how some noted scholars in

our discipline approach this task, and they may inspire others to adopt similar methods. Yet various teaching strategies and emphases are doubtless legitimate.

Unfortunately, only selected, individual courses in the typical department offer science education systematically. Thus no political science department in the country has an undergraduate curriculum that meets the seven objectives outlined above. And I base these conclusions on four kinds of evidence. The first of these was an intensive examination of the published materials on the degree requirements in the top 20 departments in the most recent ranking by U.S. News & World Report, along with those of selected, lower-ranked departments. The second kind of evidence came from a review of syllabi in the American Political Science Association's Course Syllabi Collection. I also base these conclusions on conversations with a large number of leading political scientists from a host of institutions, whom I have queried about their own teaching practice and that which is predominant in their home departments. The final evidence is from several cohorts of first-year doctoral students in my department, with whom I have discussed the character of their undergraduate curricula, from a wide variety of institutions. All four kinds of evidence uniformly support my assessment above.

As one common, example falling, I have not discovered an introductory course that educates students in the science of the discipline in a rigorous way. On this point, too, see the revealing comments in Wahlke (1991a). As another example, some departments require a course-while many others only offer it as an option-that explicates the scientific method or select, specific procedures of research. Rarely, however, is this knowledge called upon, much less built upon, in subsequent courses. Other examples could be cited but are unnecessary to make the general point.

### **The Consequences of this State of Educational Affairs**

I reiterate: My concerns about these matters arise out of professional embarrassment. How can we take ourselves seriously as scientists when our educational program is virtually devoid of the actual work that we do? Is our confidence in our work-whether in its worth or its excitement, to recall John Platt's (1962) word in the latter case-so low that we will not share it with our students? Or do we denigrate our students, thinking them unable to comprehend what we do? Whatever the reason, there is no justification for failing to educate our students in the actual content of the discipline.

Similarly, how can we expect those outside our discipline to take us seriously as scientists if we do not do so ourselves within the university? Our students come to us skeptical of our character because of their lack of exposure to social science in secondary school-an apparently world-wide phenomenon (Kazancigil and Makinson 1999, 12). But they leave us in much the same state. The lay public has no more general appreciation of what we do scientifically. And much of the rest of the scientific community does not accord us any higher esteem. (I believe the latter point would be confirmed by any political scientist who has recently served as a program officer at the National Science Foundation.) This situation is not atypical, of course. Every youthful science suffers ridicule from those outside its circle of practitioners. Yet we are rare among the sciences for doing so little to advance the general understanding of our work. The best starting point for correcting this problem is in our undergraduate educational program, the most public ``face" of the discipline.

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