Advice for Students Taking a First Political Science Graduate Course in Statistical Methods

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For many graduate students, the study of elementary statistics is a demanding experience. Often, the course challenges their stamina and professionalism like no other course they have taken previously. The style of thought is unfamiliar to them, and its no-nonsense structure may appear arid and inhumane. Their happy undergraduate life, full of effortless adolescent success and idealistic speculation, is now seen to be lost forever. The kindly and indulgent undergraduate faculty who convinced them to study political science have now been replaced by unsympathetic and unforgiving researchers, who insist that they adopt the new alien language and its cold thought. If the course is taken in the fall, as often happens, then for these students, the term proceeds painfully slowly through ever colder days, and as December approaches, a wintry season overtakes both mind and body. The instructor and the unhappy students stagger on, neither enjoying each other, until the holidays finally release them both.

Or so goes the mythology. Actually, no such outcome is inevitable. No matter what one's level of preparation, there is no reason to undergo a painful experience in basic statistics. Reasonable care and effort can produce an experience that is, if not pleasant, at least comfortably endurable and professionally profitable. Of course, as with crossing streets or cooking over an open fire, bad experiences do occur, and the victim is not always to blame. But many accidents are due to carelessness, inattention, or self-indulgence. Plain good sense will give most students a satisfying experience in basic statistics.

If you are beginning elementary statistics yourself, the first point to realize is that you should tailor your course planning to your individual needs. Graduate students take statistics courses for all sorts of reasons. If your area of interest is Machiavelli, for example, you may want to take a statistics course just to read the political science journals and to follow what some of your faculty and fellow graduate students are doing. You may have no desire or necessity to master everything in the course; an informal level of understanding may suffice. No sensible person will ever care what your grade is. Relax and enjoy it!

In fact, acquiring this intuitive understanding of statistics should be a goal for every student in the course, not just for humanistic students, but even (or especially) for those students who plan to specialize in quantitative political science. At the intuitive level, the student learns the vocabulary, the style of work, and sorts of questions addressed by statistical methods. Not every "statistical finding" in the newspapers or the professional journals is reliable, and not every important topic in political science can be addressed with statistical techniques. A course in quantitative methods helps sort out the quantitative and the humanistic, and within the quantitative realm, it should aid in distinguishing the true from the false, and the researchable from the unknowable. In short, at the intuitive level, the student becomes a knowledgeable reader and consumer, with sound substantive judgment about what is worth doing with quantitative techniques. No student of political science, whatever the field, should be without at least a little skill of that kind.

Most graduate students in the elementary course, however, will have professional needs that require them to go beyond sound substantive judgment about data and intuitive understanding of inference, important as those are. They will also require a knowledge of applied elementary statistics. That means acquiring a working grasp of the basic theory and a little actual experience of doing statistical research. It also means getting past mechanical use of canned computer packages and developing an understanding of when their output should be believed. For students in this group, whether they intend to do quantitative work themselves, or merely read, judge, use, and teach the results of those who do, some personal experience of doing the work themselves is needed for their professional futures.

If this is your situation, you should recognize that your background is probably quite unlike that of the student next to you. No course in political science graduate training programs treats a greater range of student preparation than does the elementary statistics class. Some students will have good mathematics backgrounds and perhaps even prior work in undergraduate statistics; others will have forgotten all their high school algebra. The same learning strategy will not work for both. Thus you need to tailor your course planning to your preparation.

Even among students who have taken no quantitative courses since high school, circumstances differ. Some students may just need a brush-up. Others will be at a more severe disadvantage. I have had students who could not remember whether, if A = B and B = C, then does A = C? For them, the course will be difficult, perhaps sufficiently so that they should take a refresher course in

high school math first. If you find yourself in that position, do not confuse your lack of coursework with lack of ability. If knowing the statistics is important to you, do not try to skip steps and get by on grit (or belligerence). Instead, go back and do what your fellow students have done: take the prerequisites. When you return to statistics, you will be amazed at how much easier the material will have become and how much faster you will learn it. The time you "lost" will be gained back.

Most students, though, have adequate preparation and are ready for the course. Elementary statistics courses in political science departments are aimed at the average mathematical background, and most students will find themselves with adequate groundwork. If you belong to this larger group of students, you can focus on learning the new material in the course. For that, however, you will need help. Lectures and homeworks are designed to provide it. Homework problems are critical, and much of your learning will occur as you do them. Working in groups can also be helpful, but don't use your group as a crutch and let other people do your thinking for you. Better a few C's on the homeworks and an A on your first professional research paper than vice-versa.

The textbook is meant to help you learn, too. Ah, the textbook. You will almost certainly dislike the text—virtually every student does, no matter which book is chosen. Most of the problem is that quantitative thinking is not a large part of most undergraduate political science courses, and so students come to elementary statistics with learning skills that translate poorly to a scientific context. For example, students may read only 300 pages of basic statistics in an entire semester, while they may be assigned up to several thousand pages in their other graduate courses—equivalent amounts of reading. Overlooking that, they allocate half an hour for reading 20 pages of statistics, as would be more than adequate in their other courses. When understanding at that rate proves impossible, students decide that the book is poorly written, and perhaps also that the course is "too theoretical."

No one can read mathematical material in the same way that one reads history or novels. Patient, line-by-line study is needed, pencil in hand. Sometimes an hour goes by on a single page. Sometimes one has to make up problems for oneself before a point is truly understood. Too often, students do not know this. They have gotten by with memorizing in previous mathematics courses and never learned to truly understand. If you find that this is your situation, the advice is the same as my professor gave me thirty years ago: find a quiet place to study, with a hard chair and a good light. Allocate enough time for the reading, and learn to read in the new way. This is easier than it sounds. Most of the challenge is seeing that one needs new learning skills; once you seek them, the skills themselves will arrive relatively quickly.

All that said, sometimes the text will stump you. No text works well for everyone, and no text works well all the time for anyone. Be aggressive about finding a companion text that suits you and that gets you past difficult passages in the main text. Ask your professor for tips about other texts at the same level as the one you are using in class. There are dozens of introductory statistics texts in your college library. Spend a couple hours going through them during the first week or two of the course, and find one that works for you. Those two hours will save you half a week's work later on. Keep the book handy the rest of the term, reading it as needed.

Yet another supplemental book can be helpful as well. In any mathematical field new to me, I like to read a seriously dumbed-down book first, just to get the feel of the subject. Such books are often well written verbally, but they may have mathematically sloppy arrangements and slightly wrong intuitions that will make your professor cringe. Never mind! You'll forget all the mistaken details eventually anyway. Get the big picture in mind so that you have a feel for what you are doing and where the course is going, then fill in the details from the regular textbook so that your research work is right.

For this purpose, ask your professor to recommend "good, short, chatty books written at much too low a level for this course," perhaps books that would be used for undergraduates. There are dozens of such introductory statistics texts at a variety of levels, all the way down to picture books. Find one that works for you in the course you are taking. Don't wait until the end of the course to read it, when your confusions will have built upon each other and work pressures will have accumulated. Get it read the first two or three weeks of the course.

Above all, don't expect immediate success if you have been away from mathematics for awhile. You have work to do. Don't start ignoring the texts, letting your colleagues do your homework problems, and expect to be spoonfed by the lectures. The lectures will help, but in a course like basic statistics, slothfulness is fatal. You need to improve your intuitions by working partly on your own, doing both reading and problem sets. That way, you can hear the lectures and read the text with a firm foundation of previous material and an intuitive understanding of where the presentation is going and why. In turn, that will make the mathematics much easier. In this course more than most, steady work is rewarded.

Lastly, a word to those students for whom the class will expose previously unsuspected talents and interests in quantitative work. For you, the class will turn out to be intellectually fulfilling, perhaps even fun. It will open the way to additional coursework in political methodology and formal theory, and that in turn will lead to a lifetime of professional success and intellectual satisfaction. In a

stealthy way that you may not notice immediately, the course will change who you are.

As it dawns on you that you are in this group, you will see that you need to understand the subject more seriously than we can teach you in the introductory course. Why, for example, do we estimate the mean and median of a normal distribution with the sample mean, while we estimate the mean and median of a double exponential distribution with the sample median? When is maximum likelihood estimation a good idea, and when does it produce a foolish estimator? To answer questions like these, you will need to learn enough calculus and linear algebra to take several further courses in political methodology and econometrics, as well as additional coursework in mathematical statistics. Some aspects of statistical theory are important to formal theorists as well, and will be taught in game theory courses. The introductory statistics course may open up all these worlds to you.

But even if you are in this group, you, too, have much to learn from the usual political science introductory course. Political methodologists and formal theorists are not professional statisticians, and it is important not to get lost in the mathematics and computing to the exclusion of political data and political understanding. Don't ask the introductory course to replace a rigorous introduction to mathematical statistics. That you must learn elsewhere. But do ask the introductory statistics course to connect you to the right political topics, topics where the mathematics and the data can be intelligently deployed. Then go learn the math you need, and come back to political topics to do some science.

In summary, with a willingness to learn, a little hard work, and a certain maturity of spirit, the introductory statistics course can be a rewarding experience for nearly all students. That is not to say that it will be easy. (Indeed, if most members of the class are finding it easy, their future careers are probably being sacrificed to temporary comfort.) The point is rather that, for those students working in quantitative areas of the discipline, successful completion of this course takes them to a milestone on a road to professional competence. That is why, if you are beginning such a course, careful planning is so important. You need to assess both where you are starting from and which professional road you are on. With those decisions made, the trip through introductory statistics, challenging though it may be, can bring great professional satisfaction.

Testing Theory

Political Theory and Political Reality

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Perhaps the great divide between methodologists and the rest of the profession (and indeed, most of the rest of the human race) is our ingrained tendency to build models that incorporate a stochastic element. This has profoundly important implications for the way that we relate our models to data.

Incorporating randomness into our models instills a healthy aversion to "anecdata" and to "argument by counterexample". While we have all heard such arguments from our colleagues, let me illustrate the missleading use to which anecdata[1] can be put in an apolitical context. My grandmother, may she rest in peace, lived to be 84 years old, and smoked at least a pack of cigarettes daily. A typical "argument by counterexample" would use this as evidence that smoking did not shorten one's life span. Of course, readers will impatiently note that we don't know how long my grandmother would have lived had she not smoked. Defenders of "argument by counterexample" might then contend that we can never know what would have happened, and that tests must be based on observable outcomes. Fair enough a methodologist might respond, but we should look for a systematic relationship based on extensive datasets. How does the survival of cigarette smokers compare with what we would expect to see from an otherwise comparable set of non-smokers?

While the desire for a large sample is intuitive, it stems from our reliance on the error term. When the stochastic component is negligible, a single case can make or break a theory. The perihelion of Mercury, first photographed (Dicke 1967) in 1919, was more consistent with

[1] An idea for future issues of TPM—a small and suitable reward for the person who comes up with the best name for the units in which anecdata should be described—"story", "case", and other words fail to capture the malleability and divisibility of units of anecdata such as the outbreak of the first world war.