A Role for Formal Logic in Informal Logic Courses

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I

The distinction between "formal" and "informal" logic is based upon an apparent distinction within the domain of logic itself: those areas of the discipline that utilize technical apparatus and those others involving problems that are predominantly dealt with in ordinary English. In the educational context, however, formal and informal logic courses are usually distinguished on the grounds that they have different roles to play in the college curriculum. The commonly held view of the matter is that formal logic courses are designed to teach the special subject matter of logic. Informal logic courses, on the other hand, are perceived as providing those broad analytical skills that have a more general utility. These skills are believed to be basic to the acquisition of academic proficiency in the large spectrum of academic disciplines.

At Hunter College, CUNY, where I have developed a Logical Thinking course over the past several years, Logical Thinking courses are described as "designed to serve as a foundation for work in the various academic disciplines." Similar claims seem to lie at the heart of the proliferation of informal logic courses in colleges throughout the Unied States and Canada. However, in the design of many of these courses, it is too often not realized that informal logic is in and of itself only minimally useful for the development of those skills central to proficiency in technical courses in the Sciences, Mathematics, Computer Programming, Accounting, and the like. In other words, Logical Thinking courses which are exclusively limited to teaching informal logic seem to be geared more towards helping students in the Humanities and Social Sciences, and do not have quite the same degree of usefulness for students interested in doing work in the more formal disciplines. Therefore, if Logical Thinking courses are to really serve as a "foundation for work in the various academic disciplines," they need to also help develop the skills required to deal with technical vocabularies and the use of rigorous and careful procedures that define the Sciences, Mathematics, etc. And, in order to do so, it seems to me that the design of such courses must make room for "formal" logic in addition to the "informal" logic that generally completely exhausts the course content.

In this paper, I will briefly outline the design of a Logical Thinking course which I have developed at Hunter College. In order to address the basic needs of students in the different academic disciplines, this course offering includes formal logic in its content. In giving an account of this course, I will make a special note of the different sorts of needs that must be addressed by courses which claim to teach the basic skills, including those of reasoning, analysis and critical thinking in the different educational fields of study. In doing so, I will examine the reasons why teaching formal logic must not be viewed simply as teaching a specialized subject with no generalizable applicability; that, on the contrary, formal logic could play an important role in easing the process of initiation into the more technical and rigorous disciplines. Note, however, that I am not recommending that formal logic be taught for its own sake. Rather, I am urging that this formal discipline be used in such a way as to generate basic skills and attitudes needed for the study of the more difficult technical matter of the scientific and mathematical disciplines.

II

The Logical Thinking course that I have developed follows a fairly standard procedure for roughly the first two thirds of the term. We use an informal logical text [1], and attempt to develop analytical skills through a discussion and writing based program. A noteworthy aspect emphasised in this section of the course is that in their examination of arguments, students are encouraged to write brief analytical essays. Rather than merely classifying fallacies, students are asked to analyse examples and give arguments as to the contextual considerations that would support or defeat a charge of fallacy.

The main area of innovation in the course, however, is to be traced to the use of elements of formal logic to develop and fashion in a self-conscious way skills required for learning technical subjects. And, in teaching these formal elements, a special attempt is made to guide and help students with the problems of maintaining a level of concentration commensurate with the difficulty of the class material, taking careful notes and reorganizing and studying from class notes. Along with these basic classroom issues and others involving learning from technical texts, reading slowly enough for comprehension, the use of underlines and marginal notes, the careful serial development of required skills and the close attention to exercises and the performance of required tasks on demand. The insight governing this approach is that when taking technical courses, students who are deficient in these basic classroom skills as well as in the skills of analysis have to deal with their deficiencies within the context of intrinsically difficult subject matters. And the student cannot distinguish problems that are the result of basic skills deficits as distinguished from the difficulties arising from issue related to the inherent complexities within the subject at hand. It seems to me that even at the beginners level, college courses in Math and Science required conceptual abilities that are far in excess of those demanded in the learning of portions of elementary formal logic.

Logic, in its formal aspect, as taught at the elementary level, is without a doubt the most simple and obvious of the technical disciplines. Beginning courses in Mathematics, Physics, Geology or Calculus, all require more specialized skills than those demanded in the learning of truth tables, term logic or elementary set theory. Formal logic is thus ideal for developing generalizable techniques available to the technical subject areas. Logic is particularly appropriate, when the course design uses formal elements, as a device for coming to grips with fundamental problems of learning unfamiliar but highly coherent subject matters. Furthermore, my experience with such a course design reveals that basic technical skills development is consistent with learning a respectable amount of logic and elementary meta-mathematics, all within the framework of a course wehre two-thirds of the class time is spent in acquiring the linguistic skills required for sound critical thinking.

The design of the formal aspect of the course divides the student's task into two independent but related procedures. Starting at mid-semester, and in addition to their work in informal logic, the students are asked to begin working through a programmed logic text. [2] Students are expected to finish the first two sections by the end of the semester. (Better students complete the entire book for extra credit.) Students do the programmed text at home, at their own pace, and with no formal assistance within the class. The assignment of the programmed text is timed so that students have truth tables within their repertoire when we begin the last third of the course, and are working with Predicate Logic as we are completing the final segment of the course.

During the last third of the semester, I teach segments of term logic, using a lecture format. What is most crucial is that this material is taught with **no supporting text.** Students can only learn the material by attending class, by maintaining a high level of attention and by taking careful notes. I teach an artificially mathematized version of term logic. So, for example, the square of opposition is taught with truth value functions. Definitions are given in mathematical style. Relationships are presented formally as holding between unordered and ordered pairs. To classify categorical propositions, I use elementary matrices. The matter of existential presupposition and the shift into Boolean Algebra is treated within a set theoretic context. Students are asked to prove elementary theorems in set theory, using truth tables in intuitive ways. But, again, what is crucial to the whole process is that by not using a text, students are forced to confront their inability to learn from a teacher. Notice: what we are doing here is artificially isolating a very significant variable. By not having the support of a text, the student is forced to face his inability to sustain attention, maintain an adequate level of concentration, and take careful notes. Thus, the absence of a text forces the student to get the material through a classroom process. Information must be compiled in the form of class notes. By the end of the semester, a student will have completed a notebook in term logic and set theory. This notebook constitutes one of the major tasks for this segment of the semester. The notebook is the result of rewriting and reorganizing the classroom notes on a regular basis. The criterion of adequacy for the notebook is that it permits someone uninitiated in the discipline to learn it from the student's notes.

During this segment of the semester, the students take quizzes frequently, as a corrective to the process of learning in the classroom. These exams, although used in part for grading, have as their main function that of calling the attention of students to the problems of compiling, organizing and retaining classroom lecture materials. The work covered in class, in conjunction with homework assignments, is sufficient, if properly managed, for excellence in the quizzes. The quizzes thus afford the student a probe into his adequacy at the task of classroom learning. Homework assignments are similarly constructed to force the student to come to grips with shortcomings. Assignments cannot be handled unless the student has adequately accurate notes. Again, this is crucial. Thus, the lack of a supporting text compels the student to adequately compile class lectures if he is to do the required work at all. This prevents, among other things, the self-defeating practice, common to students who have only a poor conceptual grasp of abstract material and tasks, of using text book examplars to dummy up approximations of correct work in doing text book exercises.

At the end of the semester, the students take a final exam on the material in the programmed logic text. The examination is structured progressively, designed such that all students can answer some questions in each of the areas covered in the text. But questions become difficult fairly rapidly so that only the very best students can answer all of the exam questions. Performance on the exams is fairly indicative of how much has really been learned from the text — governed only by the students' own sense of responsibility and their awareness that the task must be completed by the semester's end. Needless to say, the amount of material actually mastered varies widely within a class. But this is crucial information for the student. The student has a measure of his own effectiveness as a reader of technical material and as a learner of rigourous techniques.

This Logical Thinking course gives the students a thorough introduction to the techniques and processes of informal logic. They learn discussion as well as writing skills. In addition, they become familiar with useful fragments of modern logic and confront a style of mathematical prose that is common to many technical areas. But, most importantly, students learn these formal elements in a fashion that enables them to focus on the process through which they learn other technical subjects. They are forced to sustain attention and to represent a course correctly in their notes, compile these notes in an adequate fashion and perform related tasks requiring the memorization of elements and processes. They also work through a text in an alien and, perhaps, non-intuitive subject matter. They use this material in a theoretic fashion, since an effort is made throughout to use truth tables and quantified expressions, whenever possible in metalinguistic formulations of term logic and set theory. Students not only get this material, but they get it through seeing it applied within an inherently elementary subject matter, and in comprehensible ways. Again, since these concepts are only available through the compilation and organization of classroom material, these materials, if learned at all, are, of necessity, learned with comprehensiveness and clarity.

Needless to say, the course as I teach it requires a commitment to tutoring individual students. But what is surprising is that if the homework assignments and quizzes are carefully developed, most students learn the material with no special assistance; and, this in classes of students in their first year of college and including many with impoverished high school backgrounds and a host of intellectual and socio-cultural problems. The students learn logic through coming to grips with the logic of learning the technical disciplines in an artificiallly enhanced but fairly standard undergraduate setting.

III

The main contention of this paper has been that the elements of formal logic, if carefully presented, are useful for teaching a wide range of skills required for the learning of technical subject matter. Notice: I am not claiming that teaching formal logic is the only way to teach those skills. Just as informal logic affords a useful and available tool for teaching critical thinking, so formal logic affords a useful and available tool for basic techniques required for learning technical subject matter. Critical thinking skills can be taught through a wide variety of courses: history, literature and general philosophy courses, just to mention a few obvious cases. It is the claim of advocates of informal logic that informal logic courses can also teach critical thinking, but teach it in a more effective way. The basic skills of formal analysis can also be taught in a wide variety of courses. It is my claim that elements of formal logic, if properly presented, can be a device for teaching these technical basic skills in a maximally effective and self conscious way.

Notes

1. Kahane, Howard, **Logic and Contemporary Rhetoric,** Belmont, CA: Wadsworth Pub. Co., 1980, 3rd Edition.
2. I use Schagrin, Morton L., **The Language of Logic,** New York: Random House, 1979.

response

Why Be Charitable?

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In "Charity Begins at Home," Ralph Johnson [1], following Michael Scriven [2], proposes as the Principle of Charity that:

> ...the critic should provide the best possible interpretation of the material under consideration.

Johnson takes the primary justification for this principle to be ethical: "One is under the general obligation to be fair in one's dealing with others..." A **secondary** justification, again following Scriven, is prudential:

> ...you want to interpret the argument's meaning in whatever way makes the most sense and force out of it, because otherwise, **it can easily be reformulated slightly in order to meet your objections.**

My question about this pattern of justification for the Principle of Charity is epistemological: Johnson and Scriven appear to be viewing the analysis and evaluation of arguments as essentially **pragmatic**, rather than **objective** (less context-relative, as a rought implication). In giving primacy to fairness to others, and placing the secondary prudential justificaiton in a debate-like context, they are using ',argument" in its familiar, rather than technical sense. Can one find a justification for the Principle of Charity that fits with a more technical sense of argument, or a less rhetorical understanding of argument? Behind my main question is a more general one: can one provide an account of informal logic that unifies it with the theory of (cognitive) inquiry or methodology?

Broadly speaking, (cognitive) inquiry is aimed at comprehensive truth. We know from Peirce, Dewey and others that taking this aim seriously we can draw implications for the preferential forms inquiry shoud take. In particular, the public availability of hyotheses and data, open discussion and criticism, a **community** of inquiries sharing mutual respect, and so on, are among the optimal conditions for reaching that aim. What is most promising here is that this pattern of justification allows us to ground both the methodology and ethics of our teaching and investigating a problem in similar terms. We show these practices as promoting our general aim, rather than motivated by political, economical, prudential or even arbitrary reasons. I take it that we would prefer the former "**internal**" to the latter "**external**" justifications. We would