Well-designed computer simulations allow students to work within the variety of options, conflicts, and uncertainties that characterize complex situations.

Plant Closings and Capital Flight: A Computer-Assisted Simulation

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The increasing mobility of capital, both nationally and internationally, has intensified the process by which some communities and regions are dismantled while others are reconstructed. A contemporary national debate has become framed in the language of deindustrialization, the Rust Belt versus the Sun Belt, the Japanese challenge, and the international competitiveness of U.S. industry. In 1988, a plant-closing notification law reflected congressional compromises and the threat of a presidential veto. How does one assess the social costs that arise when corporate capital withdraws from one territory and relocates in another, and what possibilities for community and regional intervention are both realistic and justified?

These questions led the present authors—one an economist, the other a social geographer—to design a teaching framework that would simulate

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the decision-making environment in which various constituencies in a medium-sized U.S. city would respond to the closing and relocation of a major corporate plant. We decided on a simulation approach for three reasons. First, we wanted to emphasize critical inquiry in an issue not defined by prior "right" answers. Second, we sought a framework that would combine both quantitative and qualitative patterns of thinking. Third, we were in search of a format that would require students to engage one another in a context that offered a high level of real-world immediacy. The project as a whole was constructed as a role simulation. Within that framework, we use a computer component that seeks to model the ways in which computers are typically used as an aid to analysis.

As in most other upper-division Hampshire College courses, there are no content-specific prerequisites rather, we expect students to have developed the skills of reading and thinking critically, of using the library, and of coherently presenting their work orally and in writing. Students typically are in the middle or later stages of their individually designed concentrations. Approximately half our class time is spent on developing the technical and theoretical background necessary for this subject, and we draw on such areas as the economics of the firm, location theory, urban and regional sociology, labor and women's studies, political geography, and so forth. The other half is devoted to the simulation process, to students' presentations, and to discussions of conflicting positions, as set out in the current literature.

No established text provides a reading "backbone." We use three or four specialized paperbacks and provide (at cost) a four-hundred-page package of simulation materials and current articles. In the latest versions, we have made more explicit the treatment of gender-based issues and the analysis of the First World/Third World dimensions of capital mobility.

We spend the first few class sessions discussing some of the readings. The first assignment is to write a research report on a local corporation. Students do this assignment in teams. We have recently used General Motors in Framingham and General Electric in Pittsfield, both in Massachusetts and both within a few miles of Hampshire. Students use library sources and visit these two firms, interviewing key personnel, to acquire the information required by our structured questions. These questions (in addition to the standard ones on profitability and so on), emphasize relationships between the local plant and the parent corporation and between the local plant and the community. While students must work cooperatively with their research teams, they submit individual essays. This preliminary exercise gives students experience in researching a corporation, as well as a concrete sense of the issues evoked by the simulation.

The Simulation

As the first step, we assign each student a role: plant manager, union president, personnel director, city planner, real-estate developer, or one of ten other roles. (Roles may be combined or multiply assigned, to accommodate class size.) Students are provided with personal biographies outlining education, life experience, and work history and are given detailed packages of information describing the standard metropolitan area of "Culpepper" and its largest employer, "Plastico." The simulation proceeds through three stages: predicting corporate closure, assessing the community impact of job loss, and designing alternative responses to capital flight. At the conclusion of each stage, students present oral and written reports. We have developed computer programs for the first two projects, and we are working on the third.

Several considerations guided our design of the computer software, as follows:

1. The programs should be able to run on a desktop personal computer comparable to what a city planner or a plant manager might use. (At the moment, we are stretching the limits of 192K memory on an IBM XT.)
2. The programs should assume little or no computer experience on the part of the user. Our intent is to demystify what computers are and what they can do. (This has meant building in a silent background of "dummy-proofing" that blocks certain keystrokes, provides escape routes, and offers onscreen assistance, if needed.)
3. There should be no predetermined "right" answers or conclusions. Persons using the program must experience it as a framework for organizing information and developing answers that still require independent interpretation and analysis.

These are not easy objectives to achieve simultaneously. Desktop limitations on memory are partially alleviated by the partitioning of exercises onto separate floppy disks. The larger problem—joining the "no computer background" assumption with an open-ended problem-solving capability—is full of thorns and compromises. Our approach was to begin with a narrow range of options and then increase the degree of user choice and initiative.

Project I: Predicting Corporate Closure. Students are asked to evaluate the financial condition of the hypothetical firm, Plastico, and determine the likelihood of a plant shutdown. The first few screens of the program set the context, introduce the problem, and offer a menu of options for proceeding. The corporate balance sheet, income statement, and capital investment record may be examined, with the standby aid of a directory of financial definitions, if one is needed. Plastico shows low reported profits but a high depreciation contribution to cash flow,

which indicates the possibility of a "cash cow" strategy of deliberate underinvestment by a parent corporation, to maximize the short-term transfer of funds.

Under one option in the program, it is possible to introduce changes in revenues or costs and explore the impact on profitability. Another subroutine, based on the research of Edward Altman (for instance, Altman and McGough, 1974), asks students to provide income and balance-sheet ratios, which are then used to calculate a weighted score that predicts the possibility of a shutdown. Users may type in their conclusions and print all parts of the data, including their own modifications. This first exercise introduces the framework of nested menus, the notion of interaction with the computer, and the expectation of a personal analysis. While the content requires reasonably sophisticated input and judgment, the computer format tries to anticipate and block the most common errors. A student typically requires thirty minutes to one hour to complete work at the computer.

Project II: Assessing the Community Impact of Job Loss. The second project expands both the analytical task and the range of independent computer interaction. This program presents a data base for Culpepper that covers (1) employment in fifty-three industries and sectors, (2) occupational distribution, (3) age and income distribution, and (4) education level, with all four categories subdivided by race and sex. The program begins with the following text:

> Welcome back to the community of Culpepper. Recent events now suggest the metropolitan area's largest employer, Plastico, will shut down. Your task is to assess the economic and social impact. That assessment includes not only the direct loss of jobs at Plastico but also a variety of "rippling" effects throughout the larger community. These effects are social as well as economic and include a consideration of such factors as job and income loss, physical and mental health, erosion of the local tax base, and changes in the composition of jobs available. The program provides you with a data base for the community of Culpepper and challenges you to discover what patterns of significance can be extracted.

Different conceptual approaches to estimating the economic and social impact of a plant closing have already been presented in class meetings and readings at this point. Working on the computer, students can manipulate the data base by invoking one of several computational options in order to apply established theoretical models or pursue independent approaches of their own. For example, the percent distribution of employment by industry for Culpepper can be computed and compared with the U.S. distribution, to produce a vector of "location quotients" that indicates the extent to which particular sectors are export-

oriented (that is, produce more than is required to meet local demand). Those figures in turn can be used to calculate a local "multiplier," based on the ratio of export to nonexport employment, that then provides an estimate of the additional jobs that would be lost if an export firm such as Plastico were to close.

To take another example, information on Plastico workers according to sex, race, and age can be compared with Culpepper data, to consider the degree to which the loss of jobs by women, minorities, or older workers would create special problems, both in job replacement and in the quality of jobs available. The intent is to provide a more thorough understanding of the range of social impacts triggered by a plant closing, as well as to encourage students to use this information selectively in developing reports consistent with the roles they occupy.

Project III: Designing Alternative Responses to Capital Flight. The last project is even more open-ended. Plastico will in fact close, and the immediate loss of 1,200 jobs will create the possibility of an extended and deep-rooted community crisis. Students are asked to make class presentations that combine the social impact analysis of Project II with their reading of the literature on what other communities and regions have attempted. Moreover, each student must do this in a context that reflects his or her role as a member of management, labor, or the local community. Sometimes sympathy for the plight of dislocated workers leads to an early and easy proposal, which contradicts the reality of most experience. We then remind students of their role constraints (for example, by using a memorandum to plant managers or a letter to the regional and city planners that says they are overreaching the discretionary options of their positions).

Results

The traditional theoretical literature for understanding the relationship between capital flight and the reconstruction of communities and regions is under serious challenge. The "Other Resources" section listed at the end of the chapter offers a guideline to the major contributors of that theoretical debate. The newer literature rejects the "natural endowment" tradition, in which the uneven spatial distributions of minerals, water, or climate becomes commingled with such variables as cheap labor or a stable political environment, to explain growth or its absence. It also questions the "stages of development" theories built around the notion of one-way progress, from underdevelopment to economic maturity. Instead, the more recent work emphasizes the extent to which the social conditions necessary for the profitable use of capital are shaped and reshaped both by past patterns of deployment and by new organizational options for disassembling production across space.

How does this debate at the theoretical level influence the design of a simulation? We reached an early decision that students should confront the full range of theoretical disagreement and yet be faced with reaching resolution by constructing independent responses to concrete situations. The computer-aided part of the simulation should reinforce this emphasis on exploration, discovery, and choice.

We reviewed a number of interactive computer programs for teaching, ranging across such subjects as economics, biology, chemistry, and paramedical training. Some were far more imaginative than others in their latitude for personal input, diagnosis, and participation, but virtually all shared the feature of guiding users to correct responses and returning people to earlier subroutines to learn from their mistakes. In our simulation, participants who move through the stages of predicting a plant shutdown, assessing community impact, and proposing responses encounter not answers but a widening set of analytical possibilities and an overload of empirical information.

The use of computers in this simulation also differs in a more formal sense. This project does not offer computer modeling of the movements of capital across space, in chessboard fashion—a problem to be solved, for example, through game theory or linear programming techniques. Rather, it offers modeling of the normal use of computers in a simulated environment. That distinction at least partly alters the mindset of simulation participants. The computer is not a surrogate teacher; it is a device for assisting problem solving. Among other things, it can be commanded to display, manipulate, and print information on command.

How does the experience of students match these expectations? First, students are not sure whether the open-ended nature of their work on the computer means that all responses are equally acceptable. That uncertainty is dispelled when they begin reading the varied theoretical literature and presenting and critiquing their own findings. They discover (as we do) wide-ranging differences in originality, depth, and organization. (Some ask for their projects back, in order to improve them.)

Second, as the simulation proceeds, students often experience internal conflict as they try to reconcile their role positions (as members of management, labor, local government, or the community) with the moral sense of a just outcome and the analytical sense of a logical outcome. We try to use this frustration, as well as its related ambiguity, to develop a different level of understanding about the way information often is selectively organized and defended.

Finally, the willing suspension of disbelief—necessary both for good theater and for a simulation—is never quite achieved. We send students to the computer (as managers, planners, and so forth) to use it as a problem-solving tool, but they know that we wrote the script, choreographed the data, and, in some cases, loaded the deck. The knowledge

that this is, after all, a simulation is often displaced by fascination with the possibilities and by the desire to anticipate and counter positions taken by these on the other side of the debate.

The course, which we call "Capital Versus Community," has been offered four times in the past five years. It continues to evolve as we learn from past experience, expand the simulation options, and change the mix of readings to reflect new published research. Each cohort of participants brings a different group chemistry and engages the simulation in ways that surprise us. Our students sometimes think they are learning too much about the specific subject of plant closings, but we hope they are acquiring the habits of mind that foster good social inquiry.

Other Resources

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