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ABSTRACT

This critical review of 13 political science software simulations and tutorials rates the programs both by quality of presentation and by educational content. Courseware does have a truly interactive nature yet allows the student to be in an active mode of control. The software programs reviewed feature a variety of graphic, textual, and interactive qualities. The difficulty with comparing simulations (and the less complex interactive tutorials) lies in determining whether to do so according to the educational or substantive content, or according to the sophistication of the programming and presentation. The computer can be best used to add value to professorial time by permitting students to learn on their own time in a manner that is more motivational that conventional homework. Some of the software titles reviewed are: "On the Campaign Trail"; "Balance of Power"; "President Elect"; and "Congress and the Presidency." Prices and publishers of 19 software items are given, along with 37 references. (PPB)

POLITICAL SCIENCE COURSEWARE:

A COMPARATIVE ANALYSIS.

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POLITICAL SCIENCE COURSEWARE:

A COMPARATIVE ANALYSIS.

I. *INTRODUCTION.*

This paper will evaluate and develop a basis for comparison of polical simulations and sub-simulation level courseware such as tutorials. There are broad surveys of political science courseware available, (See Hart, 1985 & 1988; and Frantzich and Purkitt, 1987); therefore, this paper will review critically some of the most successful efforts in simulation, classify them and rate them both by degree of polished presentation and by educational content. We shall leave aside research materials available on CD-ROM and online; leave aside statistical programs and datasets, and consider simulations and tutorials which present aspects of a political system in microcosm.

The quality of presentation is a valid factor alongside educational content, since packages vary greatly at the moment, in part because of the disincentives to write courseware rather than engaging in scholarly publication or textbook writing. Nonetheless, there are several packages which provide an attractive supplementary medium.

It is our belief that simulations and other interactive databases will rapidly become respectable in academic circles as it becomes more widely appreciated that they have application at the professional level. *HIDDEN AGENDA*, for example, is used for training at the State Department, and *CASCON III* was developed in that department for an institutional memory.

We should first consider which qualities are desirable in courseware, and how it fits a niche. As Alan C. Kay has put it (somewhat iconoclastically), "The book was the original solid-state two megabyte technology for 'individualized'

learning."[1] But, as he argues, the book failed to displace human contact as the leading educational resource.

Of course, modern educational practice blends the use of books with that of audiovisual materials, which often deliver material in a more memorable way, but in less mass and with attendant equipment problems. Computer use contains all of the problems from which audiovisual material suffers, yet more so. No computer program can contain onscreen the information found in a few chapters of a book, nor should it attempt to. But courseware does have a truly interactive nature, unlike filmstrips, audio cassettes, film or videotape. The student is in active mode, and in control, yet can derive about the same level of information from a program as from the audiovisual media. Courseware, then, can be expected to acquire a modest share of the syllabus as its quality improves.

Courseware for politics does not have the intensely visual explanatory value of some applications in physics, chemistry or psychology, where (say) moving mechanical phenomena can be represented in one window, while a graph builds in another and statistics in yet another, in real time. There is not yet a political analogue of the computer screen simulation of a moving bicycle with graphs of its acceleration and the muscle forces applied; nor to the biological simulation of the breeding patterns of living insects.[2] But there could be fully dynamic graphical applications of voting or of the passage of a bill.[3] Political science will therefore share to some degree in the growth of this primarily visual and dynamic medium.

II. *TYPES OF COURSEWARE:*

A. *FULLY DYNAMIC, FULLY GRAPHICAL AND TEXTUAL SIMULATIONS:*

1. *BALANCE OF POWER.*

Chris Crawford, has produced a sophisticated, *WINDOWS*-based simulation of international politics, with fully functional map graphics, an extensive bibliography, an intelligent manual, and a large database spanning 1948-88. Many variables have been reasonably imputed, but are not explicit, and this factor renders the simulation less educational. For a generally unfavorable review see Behar, 1988.

The object is to survive eight years of foreign policy while amassing more prestige points that the other superpower, playing against the program or against a whole cabinet of other students. The game is set up as a zero-sum, and gaining points requires use of the Briefing menu to learn about the strategic position of any country one seeks to influence.

Prestige points are a necessary but unfortunate construct for the simulation. There is a bipolar world, because the original game was too complex for the play testers; even at Beginner level, the game is difficult to control without going to a nuclear crisis. Dialogue boxes allow the player to question the actions of the other superpower, then choose to escalate or to back down. At Defense Conditions above DefCon 4, there is a substantial risk of accidental nuclear war, which ends the game. At higher levels, the State Department Advisories which appear in dialogue boxes are unreliable, and more advanced concepts of foreign policy (including Finlandization) are introduced.

BOP does not permit altering explicit assumptions about the international system; indeed, other than from comments in the manual, it is difficult to discover the exact assumptions made. For instance, spheres of influence are a factor, but how strong a factor is unknown.

Generally, BOP relies on a hawkish view of world relations, whereby arms supplies to governments or rebel forces from contiguous territory are the means to serving national interests and thereby gaining prestige points. The forging of peaceful, economic or cultural alliances is absent; yet, as Hedley Bull (1977) reminded us, nation states do cooperate without a world government since there are occasions where their interests converge. Indeed, as Kenneth Waltz (1959) reminded us, the causes of war are systemic, human, and due to the nature of Nation States; the *BOP* thesis of third world interventions leading to superpower crises is only a partial explanation of international relations.

In testing, students constantly attempted to violate the rules of spheres of influence by targeting countries adjacent to the opposing superpower, or their own major allies. The simulation blocked attempts at the U.S. targeting France for example, but targeting Afghanistan produced a Defense Condition close to nuclear war. (The real U.S. intervention for the *mujaheddin* produced no nuclear brinkmanship, and by 1988 the Russians conceded defeat.) So, testing for realism produced ambiguous results which required interpretation in the classroom, itself a desirable by-product. The simulation could be improved for teaching purposes if there were greater realism and less excitement, if the nuclear crises occured far less frequently, and prestige points were distributed on a more modest scale.

A student derives a feel for the difficulty of influencing third world countries even from a brief exposure to BOP, with a feel for the wording of diplomatic back channel discussions and protest notes. Most striking for beginners is the value of the limited but functional world map: geography was the quickest lesson learned by my sample of students.

BOP has already gone into its second major edition, that for 1990. My early review copy (spring 1989) of this did not show substantial changes beyond the

updating of the database content to cover 1988 statistics; however, the *PC Magazine* review of a later version of the 1990 edition shows multipolarity (with more than two superpowers) having been restored from the original pre-release game.[4] There have been improvements to the menu (replacing the confusing US and USSR choices with the more understandable "Relations") and to the mapping of the Middle East and Central America (which are now shown in merciful close-up). There remains a substantive problem of inconsistency, though: following a coup your aid package to the rebels switches to the new set of rebels rather than to the incoming government, thereby confounding your political purpose of serving marxism or capitalism, assuming instead that you intended sowing instability in the abstract. Different menus may also lead to different and occasionally contradictory information on the same subject, which may be taking realism too far. Nonetheless, these are the problems of a sophisticated piece of courseware, not those of an elementary nature. *BOP* has consistently been top rated both by my students and by the computer room technicians who admire it as a cleverly designed piece of software. If a separate educational version were developed with more realistic protest notes being passed, with alliances rather than constant nuclear crises, this game would be contributing something valuable beyond the introductory level; unfortunately it now deserves high praise for its environment and criticism for its fast food approach to conflict.

There is a *beta* test product being circulated which will run on a Mac and which functions as a sort of counterpoint to *BOP*: *WILDFIRE*, produced by the Roosevelt Center for Policy Studies, is an exercise in controlling nuclear proliferation. The program is interesting but my disk is still not debugged sufficiently for a full classroom test. It will not be so sophisticated in programming as *BOP*, but as a liberal foil to *BOP*'s conservative content, it may prove valuable.

B. *FULLY DYNAMIC WITH STATIC GRAPHICS OR MAPS:*

1. *PRESIDENT ELECT.*

This simulation of a presidential campaign by Nelson Hernandez uses cruder screens than does BOP, but it retains the construct of unidimensional measure, in this case Political Action Points which are combinations of money and staff effort expended in campaigning. This attempt to create a currency of politics destroys one of the salient distinctions between politics and economics.

The screens are mostly text based, the dialogue being interrupted by state maps colored to represent partisan tendencies. Having the machine run a candidate speeds up the process, but the decisions in each state for nine weeks of the general election campaign can become tediously repetitive.[5] A hand (or TSR pop-up) calculator is advisable for the deduction of Political Action Points from those available; at present the way to edit inputs is to overspend PAPs and force a second turn at the input. The best use is to demonstrate the simulation in class, then assign it for homework: a demonstration of the 1960 election is one of the first menu choices, and it takes twenty minutes.

Primaries are missing, so there is no feel for the dilemma of seeking activist voters in the primary and then centrists in the general election. Assumptions are not explicit, although the manual does sketch out the need for disbursing resources according to the electoral college votes to be targeted. The most educational feature is the listing of each candidate by quantitative measures of their liberalism on economic and social grounds, and their speaking poise. It is hard to disagree with the judgments; however, the simulation compounds the media emphasis on personality campaigns and plays down the importance of party and the state of the

economy. There is no provision for buying media time, or for taking issue positions in response to the electorate. There is consequently an over-emphasis on travelling around states, rather than on substantive politics. The piece does allow Historical or Ahistorical simulation, where candidates can be tried out against historical Presidents, and it was satisfyingly realistic in predicting the outcome of a Bush versus Dukakis race; several students testers found a Dukakis win only possible by Bush taking unlikely routes around the country.

Academic treatment of elections should offset the television and software stress on individual candidates, but simulations such as this imply that the choices made in a campaign are the primary determinant of presidential selection; yet the state of the economy and of partisan affiliation (in peacetime) may be more important than tactical errors in a campaign.

2. *CASTELLON.*

This is a calculated simulation with static graphics where the participant chooses a budget for a Latin American nation. For a review of the program, see Slatta, 1988; for the companion text see Scott, 1987. The President's adviser appears in static cartoon form with scripted advisory memos about the political reactions to the latest decisions. Budget headings are chosen from a table where a running total of spending is calculated satisfactorily, and faulty decisions are blocked. The designer, a former Peace Corps official, has delivered the cuteness factor (national motto, tourist map etc) which will attract undergraduates. Feedback from a selection of the partisan newspapers appears after many moves, with the language changing subtly. It is more engaging even without functional, dynamic maps on the Chris Crawford model, than material presented as a spreadsheet, or as text screens.

While one can make limited changes to the economy (open or trading, closed or autarchical) the central assumptions are neither explicit nor changeable.[6] The game is defended as being generic, but is clearly pluralist, and the assumptions cannot be changed from a menu to be conservative, marxist, or (say) a *dependencia* view of Brazil. This would be more complex but would render a professional teaching tool in conjunction with the promised full graphical interface. That being said, the game is successful in helping students understand the political consequences of budgetary decisions, a topical goal for the early 1990s.

3. *HIDDEN AGENDA.*

HIDDEN AGENDA is based on a mythical Central American country occupying the space of El Salvador. It has partial dependency upon the US, cash crops of cotton and coffee, with only a limited middle class and small light manufacturing base. Its main assets are a surprisingly large number of interesting personalities with pungent political views and the ability to express them in a quarter screen of text. (Occasionally they seem like cariacatures, but this is forgivable in the small space available.) Those characters include a variety of members of a self-contradictory *junta*. The player picks among these for four cabinet level ministerial posts, knowing that their advice will be polarized, populist promises will be necessary to ride the tiger of local politics, but that those promises will be unfulfilled in such a delicate economy and fragile polity.

At the outset one suffers a post-inaugural press conference at which one sets the goal of the presidency of economic growth, economic justice or open government, with a choice of three subgoals. Following this, one conducts the main menu choices from a desktop upon which are binders for reports, consultations, and encounters. There is a log book of meetings, and drawers for

Saving and REsuming the game. Both Mac and PC versions use a *HYPERCARD*-style interface, clicking or ENTERing on a button or icon. A wall calendar keeps the seasons. Here is a classic example of cosmetic graphics which add to the functionality of the program: even a complete novice would enjoy these controls.

Testing a moderate conservative course of economic growth with military assistance from the US soon produced interrupts with various groups protesting or striking at the emphasis on private ownership. These were survivable, though they clearly show the underlying relations are set for hair trigger confrontations. An attempt to hold the military responsible for past crimes under the old dictatorship, soon produced a coup from a radical female whom I had left out of the cabinet. My resistance led to my assassination within a year of my presidency. (I have not had the opportunity yet to test this with a class, but it will undoubtedly prove popular). The program Verdict of History (an amusing solution to feedback, but not terribly informative) failed to scold me for the risky confrontation with the military, and leaving a dangerous radical outside the cabinet, but it did successfully interpret my lack of preparation for the hasty policy choices, which were taken after wide consultations but without the delaying factor which placing them on the agenda two weeks ahead provides. Reversing the policy of accepting US military aid successfully produced a back channel warning that the US would henceforth look at my actions to evaluate my proposals, rather than taking me at my word. However, there was no option available to select types of weapons, nor to play a finesse game of accepting full support while speaking against it. The choices throughout the game are presented in polarised fashion.

The User Manual and Reference Manual show the program as having been designed in cooperation with at least one political scientist, but they are limited to

tactical matters and plenty of screen shots; onscreen help is excellent for reminding one of keystrokes, but conveys nothing about strategy. Neither contains a booklist to political science materials, unlike that in *BOP*; picking the term "quintal" to look up in the glossary found a good definition, but also showed that nearly all the information provided lies within the simulation rather than relating to the reality of Central America. Both manuals, though very clear, are thus more limited than the single manual included with *BOP*. Clearly the program could have been better designed for colleges with a third manual explaining the politics of Central America, and providing a list of further reading.

The program varies with each playing, forces one to include opposing politicians in the cabinet, and forces decisions within the range of advice offered by the four ministers. One cannot choose middle paths or to oppose both the relevant minister and the encountered activist in a conversation in the street, although that is frequently what one would want to do. The effect is to lead one into an appreciation of the difficulties of governing a nation which lacks the US assumptions of stability, consensus, economic growth, and a subordinate military.

HIDDEN AGENDA is excellent at expressing the governmental politics model, and at giving a feel for the backstabbing within a cabinet, and the difficulty of satisfying popoular demands in a Latin country. It does not have explicit spreadsheets for the budget tradeoffs, which are a quality of *CASTELLON*. Nonetheless, it sports feedback from the press in much the same way, and it does have *BOP*-type graphs which show the miserable progress on the economic and social fronts. Game "Turns" are an improvement on *BOP* since they occur with an automatic clock of the seasons, based on the number of decisions the president makes. It is not necessary to introduce the "artificial" element of deciding when to call a new turn as in *BOP*. However, the map provided is on paper, and it is

difficult to see what function it serves, other than a cosmetic one.

HIDDEN AGENDA is better than *CASTELLON* at bringing characters alive with images scanned from photos instead of cartoons (they ingeniously turned for the generals to uniformed New York doormen.) So, overall the qualities of *HIDDEN AGENDA* and *CASTELLON* are fairly similar: they allow policy decisions in a microcosmic, generic Latin nation; but *CASTELLON* is better at the budget tradeoffs, while *HIDDEN AGENDA* is better at the personal politicking aspects, involving consultation with many interested individuals, some of whom will speak out of both corners of their mouths.

Neither attempts the infinitely more difficult task of simulating a real country with exposed assumptions and relationships, hence they will not be persuasive to economists who must deal with this constantly. But both will be successful in an introductory college class in politics, with attendant classroom discussion to elicit the assumptions US citizens normally make about political stability and the probability of success in implementing consensual policy.

C. *FULLY DYNAMIC BUT WITHOUT MAPS OR GRAPHICS.*

1. *ON THE CAMPAIGN TRAIL SIMULATION.*

The State of Tarragon provides a more sophisticated Senatorial simulation exploring more aspects of a campaign and based on dollars rather than Political Action Points. It sports greater variety of actions deployed from a moving bar main menu with Enter-a-number submenus, and colored boxes; even without maps it engages the interest. The options include targetting a selected demographic audience for a media buy with a chosen issue position, mass mailings, visits from dignitaries, travel to different counties, and extensive surveying options for the benchmark polls. The calculation speed is very acceptable. Where large cross-tables are presented, one can scroll across or down them, and prompts appear for

this as with all functions. The main menu gives an option of 1 to 10 weeks for the program, and saving the simulation in progess permits a coffee break. Consequently the program will prove highly flexible for class demonstration and for extended homework. On-line help is functional, though one might wish for an onscreen introduction to the whole process, and for explanations of voting theory and tutorials on aspects of campaigning to be integrated with the program rather than left to a manual. As usual, the assumptions and relationships should be open and reconfigurable within the menu structure to provide the best learning experience. But even as it stands in version 1.3 this is an attractive unit which provides an authentic political experience.

2. *CONGRESSIONAL INSIGHT SIMULATION:*

Although too expensive for my class, this was favorably reviewed by Wilcox (1988). Users make tactical political decisions to allocate their scarce resources such as time, taking a trip to their districts, voting to please the party leadership, and reacting to opinion polls. Wilcox's students became well engaged with the program.

D. *DATABASE OF CODED REAL EXAMPLES, LACKING GRAPHICS:*

1. *CASCON III.*

The Computer Aided System for Analysis of Local Conflict was developed for the State Department by Lincoln Bloomfield of MIT[7]. By using professional Foreign Service Officers to code about sixty real crises according to about a hundred and sixty variables, the design was to develop institutional memory on a mainframe computer.[8] In a new crisis, ideally an incoming desk officer would be able to find that in (say) the previous five crises of similar characteristics, there had been a limited outbreak of war in three. The search for selected characteristics of crises

within certain regions, is controlled by the participant. Consequently, the coding and the assumptions are explicit, making the database accessible for input of newer situations.[9]

A graphical interface is in development, but the text-database interface is clear enough for advanced undergrads (the variables are spelled out in full). There are two valid methods of using this database for pedagogy: either students conduct historical research in order to code further events; or they look for past incidents in the database to predict the outcome of events in today's headlines.

E. *NON-GRAPHICAL INTERACTIVE TEXTUAL SIMULATIONS:*

1. *CIVRIT64 & PRS-TWO.*

These simulations from Robert Loevy emphasize educational content within text interfaces. The Civil Rights Bill of 1964 and the Presidential Race for Two Players present screens of background information, news flashes and major events. *Civrit64* is the more original, demonstrating the difficulty of passing a civil rights bill under the historical conditions of 1964. The filibuster in the Senate for example is subject to cloture with the approval of two thirds of Senators, rather than the modern three fifths; the Southern conservatives control key committees, and Luther King's demonstrations occur frequently. One can introduce a bill to either chamber, always subject to the House Rules Committee, and to the Senate clerk passing the bill to a committee other than the one specified. Where the bill is blocked by the House Rules Committee, one can initiate a Discharge Petition. Amendments are offered to the main bill to strengthen it, and each is voted on.[10]

The Presidential campaign simulation allows two players to select issue

positions, allocation of money and gathering of momentum during the 1988 race. Points are scored from all three factors. One can modify issue positions by one point on a 1-7 scale in each state, after reading benchmark polls, beginning with the Iowa caucuses and New Hampshire primary. Reducing policies to a single digit on a liberal to conservative scale afflicts this simulation as it afflicts others; furthermore, one cannot play historical candidates or allocate debating time as in *PRESIDENT ELECT*. This program also lacks the scope and the semi-graphic interface of *PRESIDENT ELECT*, but it is brief and does represent V.O. Key's concept of the "echo chamber" where politicians and the electorate respond to each other, and Downs' notion of spatial voting.[11]

Both of these simulations introduce students successfully to the political process, but would be more educational with open and changeable assumptions, or with a fuller user interface. One can easily imagine a more qualitative experience where a fully interactive map of the U.S. is used for the geographical elements of campaign tours, and even within a text-based system one could design a multiple-choice of key phrases for a speech on policy, which would draw the student into the process considerably more than multiple choice from numbers. Nonetheless, for a one-professor effort at a nominal price, these are a bargain.

2. *AT THE BRINK:*

Richard Best wrote this simulation of events in 1992 where the United States challenges the Soviet Union in a nuclear crisis triggered by events in Nicaragua. The text is based on Janis' *Groupthink*, which suggests a common hawkish view permeated the White House in the 1962 Cuban Missile crisis, limiting the options considered. The pedagogical quality depends on the book; the decisions are seemingly independent of the personalities involved, yet the simulation suggests

that the player play close attention to the dynamics of interaction between the participants. To the degree that nation states behave as rational actors, Janis' book is of limited import. The events and dates are those of the Cuban missile crisis, providing a valuable history lesson.

Students do get absorbed by the text and ten decision screens, even though the content of many screens does not affect the decisions. They do opt to see the feedback on the options they did not choose; but ideally, there would be the option of playing an ahistorical version, where the decision questions and inputs changed each time. Despite the limitations, this approach is more absorbing and memorable than reading a chapter of a textbook. A bibliography is included.[12]

3. *CONGRESS AND THE PRESIDENCY:*

Two text simulations of the first week in the White House and on Capitol Hill with moving bar menus, by Jeremy Lewis. They cover questions varying from organizing a staff structure to extricating oneself from scheduling conflicts and from hostile public meetings. Rather than reducing the purpose to scoring, they offer feedback screens of advice and examples, with caveats. For instance, the television qualities of witnesses testifying before you will affect your questioning: you will be cautious with the telegenic young colonel and more aggressive with an elderly admiral. When organizing the White House staff, you are reminded of the tendency of presidents to change from the spokes of a wheel or troika models in the first year, to the Chief of Staff and pyramid model in later years; examples with the merits and weaknesses of each, are explained in feedback screens. The Instructor's manual has a booklist and assignments, taking a more adult approach than with games, and a more qualitative approach than with calculated simulations.

F. *QUIZZES, TUTORIALS AND INTERACTIVE REINFORCEMENT.*

Robert Loevy of Colorado College has produced interactive quiz-type study guides, simulations of the political process, a graphic game called *BRAIN TRAIN*, and extensive State and County voting data with a menu-driven analysis program. The quizzes are suitable for introductory courses, the simulations for advanced courses, and the County voting data are useful at all levels.

1. *STUDY GUIDE.*

The interactive quizzes, known as the *STUDY GUIDE*, are supplied for the Presidency, Vice Presidency, and general American Government. They use a question window, a scoring window, and an answer window presenting ten numbered choices. One matches the President to his year or party by entering a number; one can control the level, the factual material being equivalent to that in an introductory textbook.

2. *BRAINTRAIN.*

Braintrain involves moving a cursor "train" to hit an answer which matches the text in the question window. The database is similar to the Study Guide, but the game is an amusing reinforcement at 4.77 MHz[13]; it also offers obstacles and time traps. Like all games, it may distract from the educational content, but may also motivate students.

3. *ELECT88.*

ELECT88 by Jeremy Lewis allows viewing screens of text and graphs of public opinion, policy and electoral results for the 1988 presidential and congressional campaigns. Major theories of voting are explained briefly and the user is asked to evaluate the linkage between policy and campaigning by following moving bar menus through brief data tables and attendant questions. The program can be used for classroom, for homework, or for lecturing, since menu-driven "graph shows" present sequences of graphs at the touch of a key. The menu system permits selecting topics separately or following the progress of the campaign and then examining the results in the popular vote and the electoral college. This is useful for courses on elections, presidential politics, and public policy.

III. *COMPARING THE SIMULATIONS AND TUTORIALS.*

The difficulty with comparing simulations (and their less complex brethren, interactive tutorials) lies in determining whether to do so according to the educational or substantive content, or according to the sophistication of the programming and presentation. In doing so, one should lay down one's choices first, before comparing the simulations. My feeling is that the new medium of computer aided instruction has to stand on its own in a class of audiovisual aids, but cannot ever supplant lectures and books. Therefore, I do not expect computerized material to attempt to replicate the volume of information stored in books. Software's interactive nature does, however, permit trial and error without the inhibitions of trying out ideas in front of a class. Software also excels at redrawing graphs and images accurately in real time, which is rarely a strength of blackboard drawings. Software also has the virtue of consistency once it has been prepared, whereas classroom lessons vary, and seven sections of the

introductory course may leave a body of students with seven different interpretations of different materials to provide an uneven base for intermediate classes. Courseware then, needs to be as graphical and dynamic as possible, to justify its enormous preparation time by providing qualities other audiovisual materials lack. A temporal argument further leads us to emphasize the structure of the courseware over sophistication of content: since only the first few decent programs have arrived at the time of writing, we must consider these for models which will follow, and the substance of political science can be added to them in future once the role of courseware more firmly established. We must look forward several years to the day when commercial quality courseware designers use sophisticated political science content to its maximum, although economics which has the advantage of being more readily quantified, has a number of computer models available already.

Commercial quality courseware, though late in arrival, is already upon us in political science, and at this level the adaptability of games to the classroom is a matter of educational content. For politics, the elements which have proven adaptable to courseware so far are maps (which are of use for electoral and foreign policy simulations); short textual conversations (diplomatic messages, or consultations with aides); databases (of demographic, opinion and economic statistics); and spreadsheets (of budgets, opinion polls and electoral predictions and outcomes.)

Those attempting to use simulations for the first time, despite having used (perhaps) electro-mechanical or electronic arcade games, are struck by the difficulty of coming out above an even score. Out of a typical class of thirty students trying *BALANCE OF POWER*, for instance, one could not expect more than two to have a positive score after an hour's use, and that is at Beginner level in

a game which proceeds to Expert and Nightmare levels where the onscreen State Department Advisories are completely unreliable. The gap between a game and professional level simulation is narrowing in political science, just as it has in the more glamorous areas such as flying fixed-wing aircraft and helicopters, driving submarines and cars, and guiding military missiles. Yet even in the 1960s this author was struck with the concentration shown by Royal Naval ratings learning to guide missiles or memorizing facts with earlier mechanical arrangements. Since then, military simulators have gone from crude mechanical beasts to electronic marvels with high resolution graphics and thousands of lines of code.

We already have courseware which does a good job of teaching small sectors of academic subjects. For politics, *BALANCE OF POWER* teaches the feel of the difficulty of influencing third world countries with money and military support; it also teaches the important of the rational actor model of foeign policy, preparing a way for the other side to back down gracefully. But it cannot conveniently teach about extended diplomatic negotiations in full text, in the sense that one can learn from reading the story of the Camp David negotiations in President Jimmy Carter's memoirs, *Keeping Faith*. Rather than expecting it to cover all aspects of international relations, we would be better off accepting its limited content area, and looking for other courseware to cover the other aspects of international relations.

We can define simulations, perhaps, in classes according to their degree of dynamism and of graphics. A fully dynamic simulation uses variables, stochastic elements and counters so that it plays differently each time. A static program would be simply an interactive tutorial or quiz. Text based programs stand perhaps at the lower end on the graphics scale, above which stand text based programs with decorative but essentially non-functional images or bars. Above

them we can envision text based programs with functional maps or graphs, and at the top of the current crop we would place programs such as *BALANCE OF POWER*, which overlay fully functional shaded maps with menus and dialog boxes, using no purely cosmetic effects. Another layer will soon appear above these, using hypermedia to overlay video and digitized voice. Some text based programs are dynamic, for instance Robert Loevy's *CIVRIT64*, in that they change their responses each time, but make no use of graphics. His *BRAINTRAIN* is on the other hand an example of a semi-graphic program (with a moving cursor "train") for which the questions and answers remain the same each time played.

Setting out the different tutorials and simulations schematically gives us the following:

Hypermedia, fully dynamic simulation, CD-ROM sized database with sound and video. Interface by voice, touchscreen or mouse.	(future)
Fully dynamic functional shaded maps, functional graphs, calculated simulation with real and imputed database variables, textual responses. *WINDOWS* or Mac interface.	*BALANCE OF POWER.*
Interactive, coded database of real events, without graphics.	*CASCON III; COUNTY*
Dynamic, calculated simulation with intermittent linked colored maps, spreadsheet, numerical responses.	*PRESIDENT ELECT*
Dynamic simulation with linked graphs, static images, some cosmetic animation, mostly textual feedback.	*HIDDEN AGENDA.*
Dynamic simulation with static cosmetic cartoon images, spreadsheet, mostly textual response.	*CASTELLON.*

Dynamic simulation without graphics but with bar menus, luxuriant choices, windows.	*ON THE CAMPAIGN TRAIL.*
Static factual and theoretical tutorial, with static functional graphs.	*ELECT88.*
Dynamic simulation, text responses only.	*CIVRIT64; PRS-TWO.*
Static simulation, text responses only.	*CONGRESS AND THE PRESIDENCY.*
Static factual quiz, with graphic pointer or spreadsheet scoring.	*BRAIN" 'IN; STUDY GUIDE.*

Chart of programs ranked by sophistication of content and sophistication of presentation:

Sophistication of Presentation:

CASCON III.

BALANCE OF POWER

Sophistication of content:

ON THE CAMPAIGN TRAIL
COUNTY
'PRESIDENT ELECT
HIDDEN AGENDA
CASTELLON

ELECT88
CONGRESS & PRESIDENCY

CIVRIT64; PRS-TWO
STUDY GUIDE BRAINTRAIN

IV. *THE FUTURE: AUTHORING, INTEGRATION, HYPERMEDIA, EXPERT SYSTEMS AND DATABASES.*

Within a decade, we should see the integration of what are currently separate developments. Simulations which are currently mainly suitable for undergraduate level and below, will become more sophisticated; they will draw upon databases of real world examples to point to on feedback screens, linking success or failure in

the game to more valuable educational material.

Authoring systems already permit non-programmers to call in video and sound to courseware, with appropriate boards installed in a PC. *SCENARIO* combines all media into a compiled program on a PC, and *The Best Course of Action* on a Mac. Both are polished, powerful and friendly, though hypermedia requires more work than do conventional tutorials. Political science adaptations are still awaiting. For favorable academic review of *VP-EXPERT* and *1st CLASS FUSION*, two inexpensive expert authoring systems, see Grafton, (1988) and Grafton and Permaloff (1987).[14] The PLATO-based authoring systems *tenCORE*, *PILOT*, and *cT LANGUAGE* use relatively friendly programming languages and mice to write interactive tutorials with static graphics and answer judging far more easily than one can do with conventional languages like *BASIC* AND *PASCAL*. The National Software Clearinghouse is developing its own authoring system[15] for simulations, and Springboard software has its own authoring system *DEUS* which was used for generating *HIDDEN AGENDA*. *HYPERCARD* and its later PC counterpart, *HYPERPAD*, may prove to be more popular than any of these, because their general purpose nature may lead them to market dominance.

At present, there is a great deal of skepticism towards teaching with a computer, because like audiovisual material generally it conveys less information than does the printed word and requires greater preparation than does the lecture. Neither of these factors can be substantially changed. However, the computer is best used to add value to professorial time, by permitting students to learn on their own time in a manner which is more motivating than conventional homework. Business is acquiring computerized training for the same reason it uses video based training: it is more cost effective than teaching repetitive material with humans from the personnel department.

Computerized training, in conjunction with expert systems, will also catch on the civil service where individuals being given a task in the absence of other knowledgeable colleagues will at least have access to software explaining the law and regulations, and offering practice in simulated implementation of the program. Defense departments which have entrants of average intelligence and a need to convey standardized information, have been undisputed leaders in audiovisual production, and will no doubt lead in courseware production. Computerized simulation of expensive hardware will develop into simulation of decisionmaking with comparative ease.

However, in universities which lack incentives towards cost-effective instruction or high-quality instruction, acceptance of simulations as courseware will depend partly on the connection between these and research use of databases and expert systems.

In expert systems, international relations is the leading field of political science. *CASCON* is an early entrant in the diplomatic field; indeed, an early A.I. project at Yale in the 1960s was Integrated Partial Processing, parsing UPI news of terrorist incidents known as script demons. The RAND corp's RITA (Rule directed Interactive Transaction Agent) broke down terrorist incidents into components, looking for novelty elements. Mills (1989) has developed an expert system for writing formal communiqués after diplomatic negotiations; this prompts the user with question about the negotiation meeting, pops up windows to explain the purpose of each question, and demands weighting and uncertainty factors for each answer. International relations, then, has been among the subject matter for artificial intelligence from its inception.[16]

V. CONCLUSIONS:

Courseware will become cheaper and of more professional quality in the 1990s. Despite the lack of incentives within the academic reward structure, which traditionally favors publication over teaching or ancilliary efforts, the cottage industry of courseware development will give way to greater professionalism. In part, this will be encouraged by the availability of authoring systems for the logical-thinking non-programmer; secondly, it will be furthered by the need for expert systems in government; and thirdly it will benefit from the growth of private sector "trainingware" and databases.

Trainingware for industry will pay the development costs of authoring systems, as on-line databases are being made affordable by a subscriber base of well-financed businesses. Trainingware will be developed by individual enthusiasts in business and academia, but these efforts will be overtaken by grant-supported professional-quality courseware with graphics and hypermedia. If courseware use is successfully made both friendly and self-explanatory, faculty will adopt it up to the point where the marginal utility in class declines below the marginal cost of setting up to use it. There will be a limit in political science to this software, for many fields are qualitative rather than quantitative or visual in nature.[17] However, the computer will increase our ability to improve political judgment by viewing selected speech fragments according to policy topics, and comparing them with budgetary graphs and opinion poll data, a service which could have application in public libraries as well as in class. The leading texts already deliver sidebars of such material, but without the interactive and dynamic visual quality of software.

This will be incorporated in hypermedia technology within a few years, and could help bridge the gap between introductory and professional level, since

different scholars can select from the same database according to their own needs. Students will routinely expect courseware complementing a lecture, a richer environment for learning.

ENDNOTES:

1. Sprecher, Jerry W. 1987, p.55.

2. See for example the muscle-force program *BIKER* in Meiss, (1987). While the biological breeding habits of politicians retain their ability to titillate, it is unlikely that a simulation of this would prove educational.

3. The development of computer graphics generally is proceeding at a phenomenal pace, and high resolution graphics boards will become sufficiently inexpensive for classroom use in the early 1990s. Large-screen high resolution monitors, currently costing around $1,000 and hence a rarity in college undergraduate labs, will probably halve in price in the same period, making them affordable for institutional purchase.

4. Jennifer Zaino, "Balance of Power: You Decide the World's Fate -- War or Peace?" *PC Magazine*, Sept 12, 1989, p.382.

5. This author never completed the simulation on an Apple IIe, because his patience ran out. With a PS/2 or AT class machine, the calculation is swift but there remains the problem of repetition.

6. In fact, the instructor can reinitialize the student disks using a supplied utility, to engage different assumptions on forty variables; a common choice would be to select an open or closed economy. For further information, request IBM, 1988.

7. Professor Lincoln P. Bloomfield served in the State Department for eleven years, and in 1979-80 was director of global issues for the National Security Council. See Bloomfield, 1988.

8. See Ball, 1988.

9. Several programs for courseware, some having political science application, including CASCON III, were presented at IBM Academic Information Systems, Madison Avenue, New York, on November 7th, 1988.

10. One can choose to support each amendment in order to develop momentum. This could be used in conjunction with Berman's volume about the two civil rights bills, *A Bill Becomes Law*, and with Redman's (1974) autobiographical work in which a student intern succeeds in obtaining passage of a health bill in the name of his sponsor. For wider civil rights understanding, one could assign J. Harvie Wilkinson III, (1979).

11. See Vladimir Orlando Key, 1964. *The Responsible Electorate*, edited by Milton C. Cummings, jr. For both presidential election simulations one could assign Polsby and Wildavsky, (1988); Stephen J. Wayne, *The Road To The White House*, and Watson, *The Presidential Contest*. There are plenty of journalistic volumes, for example Theodore White's series on *The Making of the President*, and Joe McGinniss' *The Selling of the President, 1968.*

12. The simulation is programmed in interpreted BASIC, and has a limitation in that it opens files for input constantly, thereby delaying the scrolling up the screen, and lacking moving bar menus which would be more dynamic than the pick-a-number menus used here. The program design of course has the virtue of permitting changes in the text screens and keeping the kernel of the program small.

13. Many of the turbo clones can be slowed to 4.77 MHz with a key combination. Instructors unsure of their coordination at higher speeds would be wise to practice before demonstrating during a class.

14. This requires natural language processing, which entails dealing with the circularity and ambiguities which humans readily interpret in natural language but which machines find exceptionally difficult. For an accessible interpretation of the difficulties in progression from first to fifth generation languages, see Harris and Davis (1986); for an anthology of reports on technical successes and limitations of the applications of expert systems and artificial intelligence generally, see Silverman, (1987). Mills (1989) discusses some of the problems associated with expert systems. Until recently, they soaked up excessive memory and processing power, and the need to cover all possibilities to prevent the system crashing led to a "geometric multiplication of rules"; thirdly, they seem better adapted to "measuring discrete events than processes". While the initial development of an expert system is a phenomenally difficult undertaking, later improvement is a major advantage. On the positive side, they can now be constructed in inexpensive languages such as *TURBO PROLOG* and *LISP*, necessary processing power and adequate memory are now within departmental and individual budgets. An AT class machine can run both these languages successfully. *VP-Expert*, the leading microcomputer expert system, has sold 30,000 copies, or 40% of total expert system sales.

15. The original name for this was *UDISS*, but it may have been changed to *STAK*. This authoring system is designed specifically for simulations.

16. The National Law Enforcement Telecommunications Systems Inc, set up by state governments, ensures integrity of their data flows; and governments share intelligence bilaterally, not much with the private sector; so the private sector has had to set up its own databases on terrorism. The FAA has also intercepted many hijackers using its own profiles. See Brown and Arnold, (1988).

17. There is a limit to what one can do with the scanning of politicians' photos, sketches of the capitol, and plans of the White House offices, none of which are particularly educational.

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AT THE BRINK, National Collegiate Software Clearinghouse, Box 8101, NCSU, Raleigh NC 27695. (telephone: 919-737-3067). $23.

BALANCE OF POWER: THE 1990 EDITION, Mindscape Inc, 3444 Dundee Rd, Northbrook IL 60062. IBM, Mac, $49.95. Severely copy protected.

BRAIN TRAIN, Robert Loevy, Political Science Dept, Colorado College, Colorado Springs, Colorado. $15 or part of $100 package.

CASCON III, for Beta test of PC version, contact professor Lincoln P. Bloomfield, Political Science Department, M.I.T., Kendall Square, Cambridge, Mass.

CASTELLON, Harcourt Brace Jovanovich, 7555 Caldwell Ave, Chicago IL 60648. IBM, $25. Teacher's manual $6.50.

CIVRIT64, Robert Loevy, Political Science Dept, Colorado College, Colorado Springs, Colorado. $15 or part of $100 package.

CONGRESS AND THE PRESIDENCY, National Collegiate Software Clearinghouse, Box 8101, NCSU, Raleigh NC 27695. $25. Lab Pack, $50.

CONGRESSIONAL INSIGHT SIMULATION, National Association of Manufacturers, 1331 Pennsylvania Ave NW, Washington D.C. 20004. IBM, $750.

ELECT88, National Collegiate Software Clearinghouse, Box 8101, NCSU, Raleigh NC 27695. $25. Lab pack, $50.

HIDDEN AGENDA, by Jim Gasperini and Trans-Fiction Systems, Springboard Software, 7808 Creekridge Circle, Minneapolis, MN 55435. (telephone 612-944-3915). IBM or Mac. $59.95.

PRESIDENT ELECT, Strategic Simulations, 1046 N. Rengstorff Ave, Mountain View CA 94043. $24.

ON THE CAMPAIGN TRAIL, by Murray Fishel, David Gopoian and J. Michael Stacey. Campaigns and Elections Inc., 1331 Pennsylvania Ave, NW, #12E, Washington DC 20004. (telephone 202-331-3222). IBM. $20.

PRS-TWO, Robert Loevy, Political Science Dept, Colorado College, Colorado Springs, Colorado. Shareware. $15, or part of a $100 package.

REG: PTSTR and PTREG, Jeremy Lewis, Political Science Dept, Lehman College CUNY, Bedford Park Blvd West, Bronx NY 10468. (telephone 212-960-8519). Submitted to the National Collegeiate Software Clearinghouse of Duke University Press, July 1989.

SCENARIO, Techbyte USA, 217 South Union St, Burlington, VT 05401. (telephone: 800-361-4993). Versions in English, French or Spanish. Workstation version, $489.95; Toolbox version, $89.95; Talk and Text version, $39.95; Toolbox Network 16 stations at $799.00; Workstation network, per 16 stations, $2449.00; package for

schools per 16 Toolboxes, 3 hours of training, 2 hours consultancy implementation, $1,749.00; package of 8 Toolboxes, 2 hours training, 3 hours implementation, $1,149.00. for IBM PC with 256K and DOS 2.x; or 384K and DOS 3.x, graphics card in mono, CGA, or EGA.

STUDY GUIDE, Robert Loevy, Political Science Dept, Colorado College, Colorado Springs, Colorado. Shareware. $15 or part of $100 package.

THE BEST COURSE OF ACTION, around $2400 for Mac; compiles for PCs or Macs.

UDISS: User-Defined Interactive Simulation System, by G. David Garson, NCSC of Duke University Press, Durham NC. $35. Text screens only in V 1.0.

WILDFIRE, Roosevelt Center for Policy Studies. *Beta* test at present. Macs only.