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MEANINGFUL NOTEBOOKS AND ENHANCED LEARNING USING A TOTALLY MENU-DRIVEN DATA BASE AND DECISION SUPPORT SYSTEMS (DSS) PROGRAM

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ABSTRACT

Journals, also called notebooks or log books, are frequently used in conjunction with computerized business simulations. This paper discusses the use of notebooks, as a form of learning device. The paper takes the position that while notebooks are used by most instructors -- as a written assignment to accompany the simulation -- instructors are not sure what to expect of notebooks and/or have no criteria by which to evaluate notebooks. The paper suggests that a notebook's use can be enhanced through the use of menu-driven computer support programs. The paper describes one such support program written with LOTUS 1-2-3 (release 2.00)™ for the DECIDE™ simulation.

INTRODUCTION

Many instructors who use computerized simulations in their courses frequently require their students to keep a log, journal or notebook of their decisions. If you are one of them, then this article is for you. Similar to our experience you may have found that for the most part, notebooks tend to reflect "seat-of-the-pants" decision making and analysis, rather than clearly thought out planning and strategic analysis. Before a recent semester, one of the authors put what he considered to be examples of "excellent" notebooks from past semesters on the reserve reading shelf In the Business Library (three different notebooks). You can imagine the result: students simply mimicked these notebooks. Perhaps Dr. Samuel Johnson's epigram for the student would be appropriate here, "Dear students, your notebooks are both good and original; unfortunately the good parts are not original and the original parts are not good!" Thus, instead of reading about well defined strategies and carefully planned decisions, we read entries such as: "We really did not understand why stock price or ROI (or almost any dependent variable) was acting this way, so we went ahead and changed our price or promotion (or some other independent variable)." Or, "We changed X or Y and it seemed to come out okay;" or "We wanted to experiment with promotion. . but we ran out of time." While such statements are more or less expected during the first round of decision making, these comments unfortunately appear throughout the rounds of play. In fact it sometimes appears that students' confusion about which variable(s) is related to which only increases during subsequent periods of play. Conclusions stated in the notebook reflect a general feeling that they got a lot out of the game, even though there were problems such as lack of time to investigate the interrelationships of the variables more carefully, problems with some team members arguing or not showing up, and/or problems with the computer. some student teams are candid enough to confess that they are not sure what to write in their notebooks. Unfortunately, reading a notebook of this kind leaves one with the feeling that students are still using guesswork to make many of their decisions. Notebooks reflect the failure of students to adequately integrate the qualitative and quantitative techniques. This seriously limits the value of notebooks as a learning tool.

We should not, however, totally blame the students for this lack of sophisticated analysis. We believe that the inadequate kinds of analyses frequently found in notebooks reflect a shortcoming of both students and instructors. Instructors, for example, expect that students have become so familiar with various kinds of quantitative techniques that the students can use them quickly to assist in making their decisions. This expectation, however, fails to take account of the fact that students have only a cursory knowledge of most techniques, and also that computer support in utilizing such techniques is not readily available to the students -- or if it is, it is not tied into simulation in such a way so as to make it readily available for the student to apply. Perhaps we expect the students to integrate many different skills and techniques, when in fact, we ourselves have not provided students with adequate ways in which to do the integration. This led us to ask several questions:

1. What do we expect of the notebook?

2. Can we improve the method by which students maintain the notebook -- and if so, how?

3. How should we evaluate the notebook?

The Notebook

It is not uncommon to find the use of notebooks or journals in classroom settings. Many Literature courses, for example, require that students keep a notebook as part of the course (Platt, 1975b). The idea being that notebooks can augment writing skills simply by requiring that the student write daily and that the notebook forces the student to carefully and clearly think through their explanations for or about various phenomena.

Surprisingly, little has been written about the "notebook" as a pedagogical tool for computerized management simulations. This is particularly noteworthy since we know, based upon casual conversations with ABSEL members that their use or recommended use is standard in many courses. Many of the instructors' manuals which accompany computerized simulations recommend that a notebook or journal of team decisions should be maintained and that it should reflect the rationale for the teams' decisions. As instructors, however, we have to ask ourselves whether we make it clear what the notebook should contain. While it might be difficult to state precisely what an ideal notebook should look like, most would agree that It should have something more than guesses as to why certain numbers were chosen. One particularly

important feature might be the demonstration of students' ability to understand the interrelationships among the variables. Unfortunately, students' attempts at understanding or analyzing various relationships generally fall well short of expectations. There are several plausible explanations for this: 1) students do not understand what is expected of them in the notebook; 2) students do not have the skills, time or perhaps predisposition to maintain a data base which can serve as the basis of a notebook; or 3) students have forgotten how to use or never truly understood the quantitative skills necessary to serve as the analytical component of a notebook. For instructors, we suggest that the criteria for a "good" notebook include: from the students part, (a) a demonstration of writing skills, and (b) a demonstration of the appropriate application of logical quantitative analyses. From the instructor's standpoint, the notebook must have maintainability. That is, it should be relatively easy for the student to maintain. Hence, the quantitative techniques that we as instructors require the students to use should somehow be part of the simulation itself.

Improving the Notebook Through Automation

If we accept the idea that keeping a notebook contributes to learning, then we must look for ways to improve that process, and thereby, minimize the problems raised above. To facilitate use of a meaningful notebook, a menu-driven data-base and DSS program was developed for a general purpose policy simulation, DECIDE. The authors believe that this program can easily be adapted for use on any general purpose policy-type simulation. In order to develop a totally integrated program, the authors decided to combine a data-base/DSS program already developed for the

Use of the Menu-Drive Program

Students receive a worksheet template to be used with LOTUS 1-2-3 (Release 2). On an IBM microcomputer, the student simply inserts the template diskette into Drive B, the LOTUS system diskette into Drive A, and turns on the computer. An AUTOEXEC batch file is then executed and from this point on the process is completely automatic and menu-drive. At this point the student has two options, entering new data (viz., the current round of decisions for the simulation), or carrying out data management analysis (see Figure A).

This screen provides a menu, whereby the student can choose to do data entry or data management/analysis. If students elect to initially do data entry, they are provided with a series of menus which automatically enter their data for the particular period for which they are making decisions. At the end of this phase, (or if they had initially chosen the data management option), they can use past data (basically a data base of previous decisions and the results of decisions made in competition with other teams) to help them understand the relationships among various variables. An illustration of this screen is provided in Figure B.

FIGURE A: GENERAL OPTIONS SCREEN

BEFORE BEGINNING THE ANALYSIS OF THE DATA, YOU MUST MAKE SURE
THAT THE DATA IN THE DATABASE IS COMPLETE. IF YOU HAD SO DESIRED,
DATA ITEMS DISPLAYED IN WHITE (IN THE DATABASE) HAVE AUTOMATICALLY
BEEN TRANSFERRED FROM YOUR DECISION WORKSHEET.

IF THE DATA ITEMS DISPLAYED IN GREEN
ARE NOT COMPLETE FOR AND UPTO THE PERIOD FOR WHICH YOU HAVE
RECEIVED THE RESULTS OF YOUR OPERATION FROM THE MARKETPLACE, YOU HAVE
COMPLETE THE DATA USING OPTION #2 BELOW.

IF YOU DESIRE TO LOOK AT THE DATABASE, MOVE/ CHOOSE
OPTION #1 BELOW.

1. VIEW THE DATABASE

2. BEGIN INPUT OF MISSING DATA

3. BEGIN DATA ANALYSIS

FIGURE B: QUIT/START ANALYSIS SCREEN

FIGURE C: VIEW DATABASE, INPUT, OR BEGIN SCREEN

WOULD YOU LIKE TO:

1. BEGIN DATA ENTRY FOR A SPECIFIED PERIOD

2. BEGIN ANALYSIS OF DATA IN THE DATABASE

WAITING FOR YOUR RESPONSE

This screen marks the beginning of the data management/analysis phase of the program. The student has two basic options, either to perform regression analysis or graphic analysis. For example, let us assume the student elects to do some graphic analysis. He or she would select option 3 shown in Figure C and a screen would automatically appear asking the student if he/she wanted to perform regression analysis or graphic analysis. Since the student wanted to perform graphic analysis, he/she would choose this option and another screen would appear provoking him/her with a set of initial options regarding his/her choice of variables to be graphed. Figure D illustrates one of the first screens under the Graphics option.

As shown, one of the options the student has in the QUIT option, which further allows the student to include or exclude the present round of decisions into the data management/analysis program. If the student decides to continue, he/she has the following options as illustrated by Figure C.

Another feature built into the program is the ability to perform bivariate and trivariate regression analysis on variables which are selected by the students. As in the case of graph construction, the regression process is fully automatic and simply requires that the students selected the variables which they would like to examine in the analysis. Figure E shows sample output as it is presented to the student.

To construct a graph the user simply responds to prompts and a graph is then automatically generated. Incidentally, students may select a line graph, bar graph, or stacked-bar graph. This feature provides flexibility to view a single set of variables in several different graphical formats.

important feature might be the demonstration of students' ability to understand the interrelationships among the variables. Unfortunately, students' attempts at understanding or analyzing various relationships generally fall well short of expectations. There are several plausible explanations for this: 1) students do not understand what is expected of them in the notebook; 2) students do not have the skills, time or perhaps the predisposition to maintain a data base which might serve as the basis of a notebook; or 3) students have forgotten how to use or never truly understood the quantitative skills necessary to serve as the basis of the analytical component of a notebook. As instructors, we suggest that the criteria for a "good" notebook include: from the students' part, (a) a demonstration of writing skills, and (b) a clear demonstration of the appropriate application of logical quantitative analyses. From the instructor's standpoint, the notebook must have maintainability. That is, it should be relatively easy for the student to maintain. Hence, the quantitative techniques that we as instructors require the students to use should somehow be part of the simulation itself.

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```
1  2  3
WAITING FOR YOUR RESPONSE
    BA        BB        BC        BD        BE        BF        BG        BH
41                    FIGURE A:  GENERAL OPTIONS SCREEN
42
43          BEFORE BEGINNING THE ANALYSIS OF THE DATA, YOU MUST MAKE SURE
44     THAT THE DATA IN THE DATABASE IS COMPLETE. IF YOU HAD SO DESIRED,
45     DATA ITEMS DISPLAYED IN WHITE (IN THE DATABASE) HAVE AUTOMATICALLY
46     BEEN TRANSFERRED FROM YOUR DECISION WORKSHEET.
47
48          IF THE DATA ITEMS DISPLAYED IN ORANGE (IN THE DATABASE)
49     ARE NOT COMPLETE FOR AND UPTO THE PERIOD FOR WHICH YOU HAVE
50     RECEIVED THE RESULTS OF YOUR OPERATION FROM THE MAINFRAME, YOU MUST
51     COMPLETE  THE  DATA USING  OPTION #2 BELOW.
52
53          IF YOU DESIRE TO LOOK AT THE DATABASE AGAIN, CHOOSE
54     OPTION #1 BELOW.
55
56               1. VIEW THE DATABASE
57
58               2. BEGIN INPUT OF MISSING DATA
59
60               3. BEGIN DATA ANALYSIS
```

FIGURE B: QUIT/START ANALYSIS SCREEN

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To construct a graph the user simply responds to prompts and a graph is then automatically generated. Incidentally, students may select a line graph, bar graph, or stacked-bar graph. This feature provides students with the flexibility to view a single set of variables in several different graphical formats.

Another feature built into the program is the ability to perform bivariate and trivariate regression analysis on variables which are selected by the students. As in the case of graph construction, the regression process is fully automatic and simply requires that the students selected the variables which they would like to use in the analysis. Figure E shows sample output as it is presented to the student.

```
1  2
WAITING FOR YOUR RESPONSE
    A     B     C     D     E     F     G     H     I
941
942
943
944            FIGURE C:  VIEW DATABASE, INPUT, OR BEGIN SCREEN
945
946
947     WOULD YOU LIKE TO:
948
949           1. BEGIN DATA ENTRY FOR A SPECIFIED PERIOD
950
951           2. BEGIN ANALYSIS OF DATA IN THE DATABASE
952
953
```

FIGURE D: GRAPH SCREEN

FIGURE E: REGRESSION SCREENS, WITH GLOSSARY

```
Press [Enter] to continue....

        BA        BB        BC        BD          BE        BF        BG        BH
141   PERIOD SALES (#)    PRICE    PROMO.     Brief explanation of terms:
142
143         0    388720        25    500000   Constant = y-intercept in regression
144         1    234555        29    500000   equation
145         2   2222222        28    300000
146         3    500000        24    250000   R Squared = variation in dependent
147         4    500000      30.5   1000000   variable associated with variation
148         5    344444        90    100000   in the independent variable(s)
149         6    350000        28    300000
150         7    388720        25    500000   Degrees of Freedom = number of
151         8    550000        30    320000   observations minus the number of
152                                             population parameters being
153           Regression Output:                estimated
154 Constant                       1121309.
155 R Squared                      0.075236   X Coefficient(s)  = the relationship
156 No. of Observations                   9   between the respective independent
157 Degrees of Freedom                    6   variable(s) and the dependent
158                                           variable, all other things held
159 X Coefficient(s)  -7514.51 -0.60673       constant
160 t stat of coeff.  -0.59354 -0.58549
161                                           t stat of coeff.  = t value used to
162                                           the significance of the respective
163                                           coefficient.  If absolute value of
164                                           the t stat exceeds   2.447 then the
165                                           coefficient is significant (i.e.
166                                           statistically different from 0)
167                                           at the 5% level.
168
```

One of the highlights of this program is the glossary, which is basically a brief explanation of the key terms used in regression analysis. You will notice that the glossary appears on the right side of Figure E. This feature was built in to serve as a review aid for students who presumably learned regression analysis in a previous course. Using regression analysis students can readily observe the influence of one (or more) variables upon another variable, and do so over time. The main point is that this is the actual, historical data for the student's own firm.

Advantages of the Menu Drive Program in the Preparation of the Notebook

The use of the menu driven program facilitates the preparation of a notebook in several ways. it simplifies the process of building and maintaining a data base of decisions and results. It permits the user to generate numerous graphs and regression analyses with ease. As a result it encourages students to do far more analysis than they would be apt to do if the process were more tedious. Students are given some guidance and assistance in doing and interpreting their results and therefore generate more meaningful results.

A typical problem that this program overcomes is the one concerning historical analysis. Students often do not know which data to use in their regression analysis. For example, students make a set of decisions for a particular period, e.g., set the price of their product, determine the amount of labor to schedule and inventory to purchase, etc.; then enter those decisions into the competitive arena (with other teams) and finally receive the results of those decisions, e.g., stock price, inventory, etc However, in constructing a data base, they should enter for a particular period, some of their decision entries for that period, e.g., price, promotion, R & D, etc., and some of the output (after the actual round of competitive play occurred) into the data base for that period. The program prevents them from confusing this data base entry by telling them which decisions actually will be taken from their present set of decisions and entered into the data base and which entries they will have to obtain from their print-out and enter into the data base for that same period of play.

The Notebook -- Evaluation

Evaluating a notebook remains the most difficult part of the instructor's task (Platt, 1975a). However, with this program, several points about grading can be made. First a minimum standard can be set. That is, all notebooks can be expected to have graphics and regression analyses. The choice of which variables and the student explanations (e.g., reference to economic or marketing theories) account for the various relationships has to be explained by the students. This cannot and should not be part of the program. However, there is no excuse for students not to carry out such analyses with rationalizations such as: "we didn't have time;" "we could not get the program to operate;" or more importantly, "it was too hard to transfer all the Information to a spreadsheet package."

CONCLUSION

Notebooks are an important part of the learning process, if for no other reason than they force students to express and explain their decision criteria in written form. Certainly, the maintaining of a notebook can be justified by informing the students that today's businesses are looking for people who can not only make good decisions, but accurately and concisely explain -- in writing **--** why these are the "best" decisions.

The menu driven data base and DSS program described above does not (and should not) write explanations about variables for students, but it goes a long way in helping the students to focus on the explanations for why things occur, while relieving them of the drudgery of having to go outside the simulation itself for tools and software to help explain and understand why various relationships occur.

While the program above is specific to the DECIDE Simulation, it can easily be adapted for most general purpose policy simulations.

REFERENCES

Barney, J. L. and G. N. Vik. "Giving Students Experience in Team Report Writing," Developments in Business Simulation and Experiential Exercises, (ed. by James W. Gentry and Alvin C. Burns), Vol. 12, The Proceedings of the Twelfth Annual Conference of ABSEL, Orlando, Florida, 1985, p. 56ff.

Biggs, W. D. "Computerized Business Management Simulations for Tyros," Developments in Business Simulation and Experiential Exercises, (ed. by A. C. Burns and Lane Kelley), Vol. 13, The Proceedings of the Thirteenth Annual Conference of ABSEL, Reno, Nevada, 1986, p. 187ff.

Proceedings of the tenth Annual Conference of ABSEL, Tulsa, Oklahoma, 1983, p. 130ff.

Platt, Michael D. "Writing Journals in Courses," College English, Vol. 34(4), December, 1975, p. 408ff.

Platt, Michael D. "Correcting Papers in Public and in Private," reprinted from College English, September, 1975 by the National Council of Teachers of English.

Pray, T. F. and D. R. Strang. DECIDE, Random House Inc., 1981.

Raia, A. P. "A Study of the Educational Value of Management Games." The Journal of Business, 1966, Vol. 113, pp. 339f.

Twelker, P. A. "Some Reflections on institutional Simulation and Games," Simulation and Games, 1972, Vol. 3, pp. 147f.