

Developments in Business Simulation & Experiential Exercises, Volume 9, 1982

THE INVOLVEMENT OF STUDENT BODIES IN THE TEACHING OF ADVANCED TECHNICAL CONCEPTS

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ABSTRACT

This paper introduces an experiential method which consists of using student bodies and classroom movement to facilitate the learning of advanced computer programming concepts. A study of the attitudes and performance of two groups, one using the method and the other receiving the traditional lecture, is described and implications are drawn.

INTRODUCTION

The teaching of advanced programming concepts to undergraduate students in particular can be a frustrating and fruitless experience; the logic of the procedures is lengthy and quite complex. While common experiential methods such as simulation games can be useful for teaching management concepts, their application for presenting technical concepts is difficult and, therefore, limited. In a national seminar on "Teaching New (Computer) Technologies", David M. Kroenke, a nationally known author and educator in computer information systems, suggested the use of student bodies and movement to demonstrate the more complex computer programming concepts. The suggestion was immediately put to use in a number of senior classes at Arizona State University dealing with computer simulation programming.

A GAP IN THE EXPERIENTIAL LEARNING LITERATURE

During the 1970's, experiential learning which is, according to Kelley [7], based upon the idea of experiencing the material to be learned, has received considerable attention in both academic conferences and journals. A large number of experiential methods has been introduced, discussed, and evaluated (see for example [3; 5; 7; 8]). In many of these presentations, the experiential approach is compared to the traditional lecture method with an emphasis on student attitudes and perceptions. Furthermore, simulation games, which often use computerized instructions and reports, appear to be very popular [3; 6; 9; 10].

The application of the experiential methods to the teaching of advanced technical skills such as computer programming is less widely spread and documented than their use in management education. Some successful attempts, however, exist and are reported in journals like Decision Sciences, the Proceedings of the American Institute for Decision Sciences, and other more technical publications [4; 11; 13]. Tsai and Poh], for example, study the differences in student learning achievement in a computer course under two teaching/learning environments: lecture and computer-aided instruction [13]. Rushinek and Rushinek, on the other hand, investigate the relationship between computer assisted instruction and students' attitudes toward the instruction and the computer in the teaching of computer data processing [11].

It is important to note that the review of the experiential learning literature does not reveal any attempt at presenting,

discussing, and evaluating the "student bodies and movement" approach referred to earlier. Therefore, the need exists for researching the approach and particularly its application to the teaching of advanced computer concepts.

DESCRIPTION OF THE APPROACH

The Programming Logic

In a senior level course in Simulation, the language GPSS (General Purpose System Simulator) is used extensively. In order for the students to fully understand the language, a rather technical and somewhat tedious concept of chains needs to be mastered. For a variety of reasons including the difficulty and the abstract nature of chains, a certain amount of student disinterest and resistance accompanies this topic.

In an attempt to minimize this resistance and to maximize the educational atmosphere, a pageant has been developed in which students adopt roles as actors and physically simulate or "act" out the logic of the GPSS language. Before describing the pageant, it is necessary to briefly present some of the advanced concepts of GPSS chains. The intent is not to discuss GPSS in detail rather to present enough detail so that the reader can appreciate the application of the pageant to demonstrate advanced concepts in a high level and technical environment.

The basic logic of GPSS is controlled by the processor by initially undertaking an input phase and then successively iterating between the clock update phase and the scanner phase. In the input phase, the processor initiates all the activity in a simulation model by scheduling the first arrivals into the system and placing them on the future events chain (FEC). Then the processor transfers control to the clock update phase. This phase starts and controls the simulation clock as well as moves transactions from the FEC to the current events chain (CEC). The process then transfers control to the scan phase. In this phase, transactions are moved through the model. The processor switches control back and forth between these two phases until the simulation is concluded. The processor through these three phases and the movements of transactions from one chain (FEC) to the other chain (CEC) can monitor and control the operation of the model. While the basic logic can be presented briefly, the actual details and procedures involved is rather complex and typically difficult for students to understand.

The text for the course, Simulation Using GPSS by Thomas J. Schriber [12], devotes several pages of detailed discussion and demonstrates the process by a lengthy example using a simple GPSS model. Although the author's exposition and presentation is very well done and highly commendable, the abstract concepts typically are not fully mastered by students even after repeated readings and lectures. As an alternative to the traditional lecture in an attempt to

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reduce the difficult and abstract nature of the concepts, a pageant has been formulated.

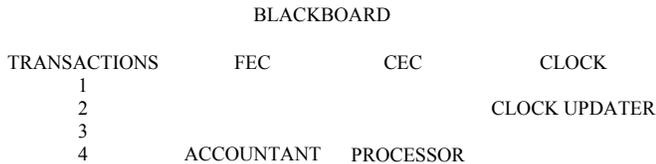
The Pageant

The pageant begins with the instructor assuming the role of the PROCESSOR and requesting volunteers to fill the roles listed below:

ACCOUNTANT
CLOCK
CLOCK UPDATER
SCANNER
TRANSACTION 1, 2, 3, and 4

If there are no volunteers (usually not the case) then the instructor assigns the roles. The actors are requested to bring their books and come to the front of the rooms. Each is given a placard identifying their role and are instructed to hold the placard in such a way that all members in the class can read them. The actors are positioned as shown in Figure 1 and the letters FEC and CEC are written on the blackboard.

FIGURE 1
INITIAL POSITIONS OF ACTORS



The three actors on stage right, CLOCK, SCANNER, and CLOCK UPDATER, represent the simulation clock, the clock update phase and the processor's scan phase respectively. These three actors never move. The PROCESSOR, ACCOUNTANT, and TRANSACTIONS (4 separate actors), however, are continually moving. It is this activity as directed by the processor's clock update and scan phase that captures the logic and procedure of GPSS chains.

The PROCESSOR begins by directing the ACCOUNTANT through a series of tasks. The ACCOUNTANT physically moves transactions from their initial position to the FEC according to the PROCESSOR's commands. After completing the input phase, the PROCESSOR calls the CLOCK UPDATER. This actor directs the ACCOUNTANT to perform certain tasks such as writing the next clock time on the CLOCK'S placard and moving transactions from the FEC to the CEC. The CLOCK UPDATER completes his algorithm by calling the SCANNER. The SCANNER instructs the ACCOUNTANT to move TRANSACTIONS to and from the FEC and CEC as well as into and out of the model. The SCANNER completes his phase by recalling the CLOCK UPDATER. The simulation continues by iterations between the SCANNER and the CLOCK UPDATER until the model is shut down by the PROCESSOR. During all this activity the PROCESSOR is continually monitoring and requiring the ACCOUNTANT to keep meticulous records of all TRANSACTION movements on the placards held by each TRANSACTION.

In the actual pageant, the PROCESSOR initially assists each actor in his role. Gradually the PROCESSOR plays less and less of a role and the ACCOUNTANT gradually assumes this role with the assistance of the other actors. After several unassisted iterations, the instructor "freezes" the activity and refers the students to their textbooks and discusses how this pageant is an exact analogy of the logic presented by the author.

Furthermore, the ACCOUNTANT'S meticulous records can be seen to duplicate the author's example.

THE TEST

Three sections of a senior level systems simulation class were used as subjects. Each of the two day classes (7:40 a.m. and 12:15 p.m.) was divided into approximately equal size groups. In the last class prior to the pageant, half of the class was instructed to come to class exactly 30 minutes after the regular starting time. The other half was to come at the regular starting time. On the pageant day, half of the students in each section received a traditional lecture on chains and the other half went through the pageant. The experimental design is shown in Figure 2.

FIGURE 2
EXPERIMENTAL DESIGN

Class	Time	Test Groups	
		Control	Pageant
7:40	a.m.	20 students	23 students
12:15	p.m.	18 students	22 students
6:40	p.m.	-----	40 students

The pageant procedure had been developed and modified in a preceding semester. The day before the pageant, however, a final pretest was conducted on 40 evening students. After the pretest, the students were encouraged to express their opinions concerning the pageant and this teaching approach. Based on their comments, some minor procedural adjustments were made.

Ten days after the pageant, a questionnaire was given to all students. Twenty days after the pageant, all students took a 90 minutes exam. Five questions worth 25 percent of the exam score dealt exclusively with GPSS chains.

RESULTS

The questionnaire used was given to both the control group made up of students receiving the lecture and to the test group composed of those who attended the pageant. The questions addressed their attitude towards the class, the instructor's method of teaching and the effectiveness of the technique.

In general, the students' attitudes toward the course and the instructor were positive. A comparison between the lecture and the pageant groups did not show a significant difference in their perceived interest in the course. On the other hand, the pageant group expressed a more positive attitude toward the instructor's approach than the lecture group.

It should be noted that the pageant was better received by the day class than by the early morning class. However, the attitude of those who participated in the pageant was not significantly different from the attitude of those who were simple observers.

The efforts of the instructor in preparing and conducting the pageant were rewarded by the alertness of the students in class, their appreciation of the instructor's efforts and especially by their performance in a test on the subject.

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While further testing and validation is needed, these results tend to suggest a general favorable attitude towards the use of the pageant method and a slight improvement in the performance of the students on the subject.

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