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ABSTRACT

EXPER SIM is a computer-based experimental simulation system which allows instructors to develop models of experiments in their discipline, as well as providing access to simulation developed by others. These simulations are used to provide students with an integrated research training experience without the problems which often accompany real data collection. Background information and an introduction to simulated research are provided; the student then receives a list of variables available for manipulation and available dependent variables, generates hypotheses based on possible relationships between these variables, and designs an experiment to test them. Output provided by EXPER SIM is analysed using SPSS statistical analysis programs, and students submit reports of their projects. Follow-up studies are designed, with each student submitting several reports during a semester. Initial analysis of student experiences suggests they have a better understanding of the research process than in previous semesters. Current projects at Indiana University-Bloomington involve the development of models for use in two graduate courses in music--Experimental Aesthetics and Music as a Reinforcer for Non-Music Behaviors. The model for the aesthetics course is described, and a sample of the input program is attached. (Author/BBM)

USING AN EXPER SIM (EXPERIMENTAL SIMULATION) MODEL IN TEACHING GRADUATE RESEARCH COURSES IN MUSIC EDUCATION

by

Hal Abeles

Using an EXPER SIM (Experimental Simulation) model in teaching graduate research courses in Music Education.

EXPER SIM (Program: Michigan Experimental Simulation Supervision - MESS) is a computer-based experimental simulation system which allows instructors to develop models of experiments in their disciplines as well as providing access to simulations developed by other model builders. Several EXPER SIM models have been developed for experimental simulations in disciplines such as psychology, sociology and education. The current project involves the development of two models for use in graduate research courses in music. The two experimental simulation models being developed involve research in the areas of "Experimental Aesthetics" and "Music as a Reinforcer for Non-Music Behaviors."

The experimental simulations are used to provide the students with an integrated exposure to the steps of the scientific method, without the time consuming administration problems which often accompany real data collection. The student first becomes acquainted with research in the simulation field by completing two abstracts of related research articles. Additional background information describing relevant theories and a list of additional references is provided in the Student Handbook. The students also receive a list of variables available for manipulation and available dependent variables. After the students study the background information and discuss possible relationships which may exist between the manipulable variables and the dependent variables with the instructor, students generate hypotheses and design an experiment to test them. The output provided by EXPER SIM is then analyzed employing SPSS statistical analysis programs. Students receive consultation to assist them in selecting appropriate analysis procedures. Students then submit brief reports of their

projects in a journal format. Results of the projects are discussed by the class. Students are then expected to design additional studies based upon the new knowledge acquired from the first series of reports. Data analyses and reports are again required. During the semester the student submits a minimum of three research reports to the class and a final report which summarizes his as well as the work of the other students in the class.

Initial analysis of the student experiences with EXPER SIM suggest they have a better understanding of the relationship of the steps in the research process than in previous semesters. Students also have indicated strong positive attitudes (e.g. doing as many as 12 studies when only 3 were required) toward this instructional mode.

Additional information on EXPER SIM can be found in Pipeline, Vol. 3, No. 3, Summer 1978, published by CONDUIT which distributes the MESS software and documentation currently being employed at IUB.

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Training Researchers and EXPER SIM

During the initial stages of training researchers in the behavioral, biological and physical sciences, it is often difficult to give students experience with the various aspects of the scientific method. Often this need is fulfilled by the completion of separate projects for each of the different stepts of the research process. The instructor may have the students abstract assigned articles, to help them become discriminating consumers of research, write problem statements, conduct a class research project, for data collection experience, and analyze data which the instructor may provide. Frequently each of these projects deal with different research areas and thus do not provide an integrated approach to the research process. Experience with a sequential approach to the research process may not come until quite late in the training period, and in some disciplines (e.g. education) not until the dissertation. It seems likely that the more closely a research training experience parallels the activity of post-training researchers the more successful the training will be. The set of computer experimental simulation programs called EXPER SIM provides a training experience for the beginning researcher which sequentially exposes the student to the strategy of scientific inquiry.

EXPER SIM enables students to run experiments on a computer which has been programmed to generate data, based on an instructor's model. The computer replaces the data collecting experience which often can be

costly, time consuming and administratively impossible for large classes of introductory research courses. Students do formulate their own hypotheses, design their own experiments, analyze the raw data generated by the program and draw conclusions regarding the relationship of the manipulated and response variables in the simulation based not only on the students' experimental simulations, but also on the simulations of other students in the class, and previously published research reports.

The student first becomes acquainted with the research area by reading a brief summary of the literature prepared by the instructor. This summary concludes with a list of additional references which the student may wish to examine while working on the simulation. The student then receives a list of variables available for manipulation and available response variables for the model being studied. After students have had the opportunity to study the background information and discuss possible relationships which may exist between the manipulable variables and the response variables, the students generate hypotheses and design and experiment to test them. The output provided by EXPER SIM is then analyzed employing SPSS statistical analysis programs. Early in their training students may receive consultation regarding the selection of appropriate statistical procedures. Efforts are made to have the students become independent in their selection of analysis strategies early in their EXPER SIM experience. Students are then required to submit brief (approximately five pages) reports of their projects in a journal article format. Results of the projects are then discussed by the class. Students are subsequently expected to design additional studies based on the new knowledge acquired from the first series of studies. Students may select additional manipulable variables not originally available for their second investigation. Data analysis, reporting of the

project, and class discussion of the reports are again required. A third project allows the student the option of selecting dependent variables not provided in the original list. At the end of the semester the students are expected to submit a final report summarizing the results of their own investigations, their classmates studies, and the related literature which they have examined.

EXPER SIM is designed to be employed during the student's initial exposure to the research process. This initial exposure comes at different times during training in different disciplines. For many of the "sciences" initial research training courses are taught early in the undergraduate program. In the case of education and specifically music education, training in the strategy of scientific inquiry comes (unfortunately) much later, often at the masters level, but at times not until the doctoral stage. EXPER SIM is currently being employed in both masters and doctoral level research courses in the Music Education Department at Indiana University in Bloomington. For most of the students enrolled, it is their first and only exposure to empirical research methodology, thus necessitating that a comprehensive overview of the entire research process be undertaken with one semester. In previous semesters the course requirements included four seperate projects, two assigned abstracts, a SPSS computer project, a replication study which included some data collection, and writing of a proposal. EXPER SIM now serves as a substitute for the first three projects.

The Experimental Aesthetics Model

The field of experimental or empirical aesthetics has its foundations in the late nineteenth century. Research in experimental aesthetics generally involves the systematic manipulation of the characteristics of an

art object (e.g. a melody) and the examining of the effects of this manipulation on a subjects' verbal or non-verbal responses. Although neglected for most of this century it has received recent attention from psychologists and artists, particularly D. Berlyne. In his recent book, Studies in the Non Experimental Aesthetics (1974), Berlyne defines the research area, presents some theoretical underpinnings, and reports on several research projects. It is this source that served as the primary base for the development of a EXPER SIM model in experimental aesthetics.

The experimental aesthetics model, which was developed at IUB in the Fall of 1978 presents the student with five manipulated variables and one dependent variable. The model is based on the relationship among these variables reported in approximately 45 journal articles in the field. The effect of the manipulated variables, the complexity of a melody, the type of sound source (e.g. synthesizer, piano), and the age, sex, and musical background of the subject, are examined on the response variable, a seven-point semantic differential scale, pleasing-displeasing. This provides a relatively rich experimental environment for the students and seems to have allowed the students to run a series of studies without exhausting the model. Sample student interactions with EXPER SIM (the Fortran IV version program, called MESS-Michigan Experiment Simulation Supervisor, can be used in batch or interactive mode) are attached.

IUCN and EXPER SIM

The experimental aesthetics model developed at IUB is currently available for use by network users. A second research area in music education-Music as a Reinforcer for Non-Music Behaviors-is under development and should be available by June 15. Other simulations in disciplines in the social, biological and physical which have been developed on other campuses,

are available either from CONDUIT or directly from the authors of the simulations. For users planning to develop their own models a model builder's guide is available. The time requirements for model building vary with the complexity of the model. The experimental aesthetics model was developed with approximately 150 hours of graduate research assistants time and required approximately 50 hours of programmer's time which included putting MESS on the IV system. For IUCN model builders the amount of programmers time should be greatly reduced.

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E X P E R  S I M
V4.0-S, SEPTEMBER 1978
   EXPERIMENTAL ESTHETICS
   ABELES LUCIA NERHEIM
   DECEMBER 31, 1978

 ENTER SUPERVISOR COMMAND
? >>commands

 COMMANDS AVAILABLE:
    STOP
    EXPT
    ECHO
    NOECHO
    VARS
    COMMANDS
    SHORT
    VSHORT
    LONG
    STAT
    REPEAT
    NORPT
    DATAOUT
    NODATOUT
    XPRINT
    NOXPRINT


 ENTER SUPERVISOR COMMAND
? >>vars

 VARIABLE   LEGAL VALUES                    DEFAULT VALUE
 COMPLEX      1.000     TO   50.00           25.00
 AGE          1.000     TO   5.000          3.000
 MUSEXP       1.000     TO   6.000          1.000
 SEX          1.000     TO   2.000          1.000
 SOUND        1.000     TO   2.000          1.000

 ENTER SUPERVISOR COMMAND
? >>expt

 ENTER EXPERIMENT ID LINE
? iucn  conference example

 ENTER NUMBER OF CONDITION(S)
? 1

 DEFINE CONDITION(S)
? sex=2
? age=1
? musexp=1
? $
 1 CONDITION(S) DEFINED

 VARIABLE SETTINGS FOR CONDITION(S) A
      COMPLEX=  25.00          AGE=  1.000       MUSEXP=  1.000
          SEX=  2.000        SOUND=  1.000
```

```
 ENTER NUMBER OF SUBJECTS IN EACH GROUP
? 25


 IUCN  CONFERENCE EXAMPLE
  13. 8.10      79/ 4/ 4
 CONDITION(S): A
 NUMBER OF SUBJECTS: 25

 VALUES FOR PLEASIN
        4.00        1.00        4.00        1.00        5.00        2.00
        3.00        2.00        3.00        3.00        1.00        1.00
        1.00        1.00        3.00        3.00        1.00        3.00
        4.00        2.00        3.00        3.00        3.00        2.00
        1.00

 EXPERIMENT COMPLETED

 ENTER SUPERVISOR COMMAND
? >>expt

 ENTER EXPERIMENT ID LINE
? iucn conference example 2

 ENTER NUMBER OF CONDITION(S)
? 4

 DEFINE CONDITION(S)
? sex=1
? sound=1
? $
  1 CONDITION(S) DEFINED

 DEFINE CONDITION(S)
? sex=1
? sound=2
? $
  2 CONDITION(S) DEFINED

 DEFINE CONDITION(S)
? sex=2
? sound=1
? $
  3 CONDITION(S) DEFINED

 DEFINE CONDITION(S)
? sex=2
? sound=2
? $
  4 CONDITION(S) DEFINED

 THE FOLLOWING VARIABLE SETTINGS ARE CONSTANT ACROSS ALL
 CONDITION(S)
      COMPLEX=  25.00        AGE=  3.000        MUSEXP=  1.000

 VARIABLE SETTINGS FOR CONDITION(S) A
          SEX=  1.000        SOUND=  1.000

 VARIABLE SETTINGS FOR CONDITION(S) B
          SEX=  1.000        SOUND=  2.000

 VARIABLE SETTINGS FOR CONDITION(S) C
          SEX=  2.000        SOUND=  1.000

 VARIABLE SETTINGS FOR CONDITION(S) D
          SEX=  2.000        SOUND=  2.000

 ENTER NUMBER OF SUBJECTS IN EACH GROUP
? 25
```

```
IUCN CONFERENCE EXAMPLE 2
 13.13.35     79/ 4/ 4
CONDITION(S): A
NUMBER OF SUBJECTS: 25

VALUES FOR PLEASIN
      2.00      4.00      3.00      3.00      4.00      2.00
      4.00      4.00      3.00      1.00      5.00      2.00
      5.00      2.00      2.00      1.00      3.00      1.00
      1.00      3.00      3.00      2.00      5.00      3.00
      4.00


IUCN CONFERENCE EXAMPLE 2
 13.13.35     79/ 4/ 4
CONDITION(S): B
NUMBER OF SUBJECTS: 25

VALUES FOR PLEASIN
      2.00      2.00      3.00      2.00      5.00      5.00
      1.00      4.00      3.00      4.00      1.00      1.00
      3.00      1.00      2.00      4.00      3.00      4.00
      1.00      2.00      4.00      2.00      4.00      2.00
      4.00


IUCN CONFERENCE EXAMPLE 2
 13.14. 7     79/ 4/ 4
CONDITION(S): C
NUMBER OF SUBJECTS: 25

VALUES FOR PLEASIN
      1.00      2.00      6.00      6.00      5.00      2.00
      2.00      2.00      2.00      4.00      3.00      6.00
      2.00      6.00      4.00      2.00      4.00      2.00
      3.00      5.00      1.00      1.00      2.00      1.00
      2.00


IUCN CONFERENCE EXAMPLE 2
 13.14. 7     79/ 4/ 4
CONDITION(S): D
NUMBER OF SUBJECTS: 25

VALUES FOR PLEASIN
      1.00      3.00      2.00      4.00      5.00      5.00
      4.00      4.00      5.00      3.00      3.00      2.00
      2.00      2.00      5.00      1.00      1.00      2.00
      5.00      5.00      4.00      2.00      2.00      1.00
      2.00

EXPERIMENT COMPLETED

ENTER SUPERVISOR COMMAND
? >>stop

    NUMBER OF EXPERIMENTAL RUNS    2
    NUMBER OF GROUPS SIMULATED     5
/bye
 13.15.17. 79/04/04.
 INT CHG       $0.40
 EXT CHG       $0.32

 LOG OFF. a
```