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AUTHOR Fortune, Jimmie C.; And Others
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ABSTRACT

The Educational Research Department at Virginia Polytechnic Institute and State University (Blacksburg) attempts to go beyond conventional use of a computer laboratory by offering services to further the educational knowledge of its students. Laboratory staff members demonstrate methods needed to accomplish educational tasks for program requirements as they offer appropriate help to novice and experienced users. This set of papers reviews approaches used at the laboratory. An overview is provided by J. C. Fortune and A. L. Packard. "Computer-Based Laboratory (Mini-Courses Aiding Students in Statistical and Research Methods" (C. J. Rogers) describes how these brief courses are used to familiarize students with options available to them. "Opportunity for Educational Support: Open Laboratory and Mini-Courses" (M. W. Cumbow) describes the physical layout, hardware, software, and courses of the educational research laboratory. "In Support of the Research Education of Graduate Students: Free Tutorials" (J. List) describes the free tutorials in software use provided at the Educational Research Computer Laboratory in the areas of: (1) word processing; (2) statistics; (3) mainframe communications; (4) spreadsheets; (5) graphics; and (6) database management. (SLD)

# The Computer Laboratory
# New concepts in teaching educational research

Education Research and Evaluation
College of Education
Virginia Polytechnic Institute
and State University

Paper presented at the Mid-South Educational Research Association; Knoxville, TN; November 11,1992

# The Computer Laboratory:
# New concepts in teaching educational research

Dr. Jimmie C. Fortune
Abbot L. Packard
Virginia Polytechnic Institute and State University

At the Educational Research Department (EDRE) at Virginia Tech, there is an attempt to go beyond the conventional use of a computer laboratory by offering service to further the educational knowledge of it's students. As a provider of services, the staff of the laboratory demonstrate for the students the methods needed to accomplish educational tasks needed to complete their program requirements. Whether qualitative or quantitative, aid is available for the completion of homework, papers, projects, theses and dissertations.

The staff of laboratory technicians are graduate students in the EDRE section of the division of Educational Administration in the College of Education. These are students who serve for the two or more years while they are completing their doctorates. Each staff member is trained to provide mini-courses, tutorials, open laboratory time, and short, intensive specific subject teaching. A mentoring system exists where new assistants are paired with a more experienced staff member, and gradually introduced to the material. This prepares the technicians to work successfully with any student using the laboratory.

There seems to be three distinct types of student who avail themselves of the services of the computer laboratory. The first, the computer user with skills and confidence, who needs an introduction to topic specific software. Second, those who have been introduced to computers before they arrive, but are not particularly comfortable and are slightly anxious about new software and surroundings. The last group considers themselves computer illiterate and believe that are not as able as others to obtain competence.

Each of these groups will benefit from their experience with the educational research laboratory. The experienced user has the latest equipment at their disposal and the most appropriate software which we can supply to further their educational goals. The atmosphere of the laboratory is conducive to learning, with new methods to make work clearer, easier, and more efficient. The average computer user with help from laboratory technician, peers and coursework to grow as a user. The novice user becomes acquainted with computer and, with time, becomes more experienced and less anxious. Our ultimate goal is to convert educational research student laboratory users to become skillful computer users as they hone their research abilities.

The computer laboratory and staff create a place of learning. Performance of homework assignments enables the theory of the classroom to be presented graphically, allowing other sides of the theory to be seen. Hypothesis analysis performed on the mainframe as well as the PC software available allows the null to be tested. The Mini-courses offerings provide a classroom experience using computers to perform various levels of qualitative and quantitative research. Free Friday tutorials allow particular software skills to be learned in an open optional focused lesson.

A student's investment in practice time is a good habit and is allowed to flourish in the laboratory atmosphere. The laboratory technicians encourage these practice times with software knowing that it can enable the student to become more efficient at their studies.

The laboratory technicians are skilled in the application of the statistical and qualitative methods to aid students who need help with their homework. At the beginning of each term, each technician is assigned a professor who is teaching a specific course within the department. This association enables homework assignments and projects to be discussed before the students receive it. With this method, various solutions can be investigated and one method can be selected which best correlates with the professor's pedagogical intention. An added

benefit is the efficiency gained when the laboratory technician has the ability to guide the student in the proper methods of proceeding with the homework. As a reference for the technicians, new problems are completed and they are printed screen by screen to be placed in a folder appropriate for that particular assignment or for that particular professor. When unusual problems arise, separate from class assignments, the solution of that problem is logged into a notebook for future reference and to avoid repetition of the problem in the future.

Often professors within the department will have one or two different tasks which are most appropriately performed on the computer. The laboratory staff will then develop a class to illustrate/demonstrate the procedure which will enable the student to then proceed on their own. These classes might include the introduction of a piece of software, a unique procedure on a familiar piece of software, or a concept of using a group of software applications (for example databases).

The mini-courses of qualitative and quantitative skills also attempt to teach in parallel with the classroom instruction. These are taught in the one credit courses which are offered each semester. With the communication connection, the laboratory technicians' introduction of new software procedures coincides with the classroom instruction. This procedure often aids in the clarification of the classroom presentation. The software used in the quantitative courses were chosen to benefit the conceptualization by the student. Qualitative skill classes enable student to discover themes within their class notes and readings enabling the understanding of the concept which they are developing or learning.

Friday morning tutorials are special topic courses presented in a two-hour format. The presentations usually offer a new twist or use of a support program such as Word-Perfect or database for references. Sometimes the topic may be a program which is not normally supported by the lab, for example, new data entry methods, but is of interest to the students. An attempt is made to have all the technicians on hand for these Friday morning

tutorials to avail each with this new procedure. Periodically, individuals from outside of the program area are utilized to demonstrate a new technique. A workshop can be developed to teach new software to faculty and/or staff, as well as students.

The laboratory can provide the simple benefit of offering computers and software to aid the completion of the student's work. Students without their own computers or the resources to acquire their own, benefit from the existence of the laboratory and its equipment. While on campus, students with computers at home can avail themselves of the equipment not only for those last minute adjustments but also for advanced software that they may not have available elsewhere.

Any student can, during open hours, come to the laboratory and learn a new skill. Technicians are trained in the sixteen different software programs which are supported by the laboratory. Each technician has strengths in several programs and students using the laboratory can check a list posted to determine the individual most suited to help with their projects. In addition to staff tutoring, there are on-screen tutorials for two of the most popular programs. Using Harvard Graphics to produce slides, information on a particular software program is presented one screen at a time. Since all students do nct read or comprehend at the same rate, this system provides the student with the ability of working at her/his own pace. This system also provides the privacy in learning needed by some students who are intimidated by computer technology, and in addition, allows the students to learn at the times most convenient for them.

The hours of the laboratory are presented to students at the beginning of each semester in each class taught by the department as well as being posted in the department. At the beginning of the semester, laboratory technicians visit each class with a schedule of open hours as well as an invitation to attend a mini-course which would support the student while she or he is taking that particular class. During the course of a semester, free software tutorials are presented and announced in classes most appropriate for that topic. These visits and announcements

continually demonstrate the support available to each student in the program of education by the research computer laboratory and staff.

# *COMPUTER-BASED LABORATORY MINI-COURSES*

# *AIDING STUDENTS IN STATISTICAL AND RESEARCH METHODS*

*Catherine Jane Rogers*

*Virginia Polytechnic Institute and State University*

*Mid-South Conference*

## *OVERVIEW OF COMPUTER-BASED LABORATORY MINI-COURSES*

*Computer-based laboratory mini-courses are primarily designed to accompany introductory and advanced research methods and statistic courses for students in education. The main purpose of such a course is to provide instruction in basic research and statistical techniques, as well as their associated computer applications, so that the student can begin the pursuit of independent research associated with the graduate program. In order to meet this purpose, it is important that the students attain some technical and methodological competence through which they can pursue their research ideas. Mini-course instructors emphasize and elaborate on general knowledge, certain methodologies, and specific research and statistical skills learned in educational research and statistic courses, such as making an annotated bibliography on a topic, performing a literature review, developing a preliminary proposal with problem statement and sampling design, developing an analysis strategy, methods for data collection and personal computer database packages. The mini-course along with conscientious study, should enable the students to rise above the stage of ideas and pursue their research in a meaningful and correct manner.*

*Research is carried on in a host of situations by a variety of individuals. Scholars of various levels of sophistication in the disciplines and professions engage in research. They meditate in secluded rooms, work in laboratories with equipment*

*of various degrees of elaborateness, or search in the ruins of ancient civilizations, to mention just a few of the possible research settings.*

*The beginning graduate student hardly identifies with any of these situations. He/she does not have the experience or knowledge of the sophisticated scholar and a student's financial resources are usually very limited. Yet to pursue a degree successfully, students are required to produce some original research. They may realize repeatedly that research is necessary, but this does not provide students with much knowledge or direction as to how to go about it.*

*Currently, courses are designed to help the student master the necessary research and statistical skills. Graduate courses, in general, vary greatly in their levels of sophistication: some are abstract and theoretical, while other place a great deal of emphasis on application. The approach of the computer-based laboratory course is more of the latter persuasion, although some of the underlying ideas may seem to be abstract when initially presented.*

***THE INSTRUCTIONAL ENVIRONMENT***

*Of equal importance to general teaching is the physical setting of the instruction (i.e., the layout of the classroom). We provide our students with a comfortable, roomy, positive atmosphere in which questions are allowed to flourish. Six computers outline the instructional room. This enables the instructor to visually monitor the computer screens and provide the students with prompt*

*corrective measures to many common errors. The white-board, located in full view for all students, transcends the atypical instructional room into the conservative, historic classroom setting, providing visual aid to all students.*

*Recently, the College of Education invested in a Magnalite Display Plate, which is utilized regularly in all mini-courses. Rather than instructing students in the necessary manual computer operations while describing a new procedure, we instead use the data display plate to illustrate the procedure on an overhead projector before students perform the task individually. This has shown to be the modernization of classroom instruction. We believe the demonstration enables the student to attain greater comprehension of the procedure and the associated computer tasks. In summary, the orientation of the mini-course is geared toward the design of research studies and the quantitative and qualitative procedures of dealing with research data. The procedures taught have wide application and are typically illustrated with "real life" examples. Furthermore, the procedures presented are general enough so that they apply to many specific research problems, enabling the student to easily choose the appropriate statistical procedure for his/her dissertation and/or thesis. The student of educational research needs to be cognizant of the existence of statistical procedures, the reasoning underlying them, and their significance, as well as the personal computing packages available to assist them in their research efforts. The mini-course provides such a background.*

*Opportunity for Educational Support:*

*Open Laboratory and Mini-courses*

*Melinda W. Cumbow*
*Virginia Polytechnic Institute and State University*

## *THE EDUCATIONAL RESEARCH LABORATORY*

*The atmosphere of the education research laboratory was designed for the support of all students who choose to use the facilities. The basic function is to further education of the user. With this as the determinant, the selections of the physical layout, the computers, and the laboratory technicians are made.*

*The physical layout was designed to give as much work space as possible with each station having a tower model computer placed on the floor giving more counter space. Sufficient space between computers supports teams of students if the project requires cooperation. The computer laboratory has natural light provided by large windows as well as plenty of artificial lighting*

*The computer laboratory is equipped with six 386 33Hz computers with 5 1/4" and 3 1/2" external drives and 130 MB harddrive. This capacity allows the work to proceed quickly and a large number of computer programs installed in the computer. The lab supports fifteen different programs as well as main frame access.*

| | |
|---|---|
| *Statistical:* | *Number-Cruncher, Multr, SPSS, SAS, Stat-Pac Gold, Lisrel* |
| *Editors:* | *Kedit, Kermit* |
| *Database:* | *Ask Sam, Westlaw, Harvard Project Manager* |
| *Graphics:* | *Harvard Graphics* |
| *Spreadsheet:* | *Quattro Pro* |
| *Word Processor:* | *Word Perfect, Word Star* |

*The laboratory technicians are graduate students within the department of Educational Research and Evaluation (EDRE). Each is selected with ability and personality considerations. The laboratory technicians are continually given the opportunity to learn new techniques which adds to their current expertise.*

## *OPEN LABORATORY*

*The laboratory is open and has a technician working approximately 60 hours a week. Twelve to sixteen hours each week are set aside for mini-courses and Friday morning tutorials. On occasion, the lab is reserved to facilitate classes on special topics. The remaining hours (44-48) a week are set aside for open laboratory time. The open laboratory invites all students to use the facilities to complete homework assignments, projects, theses and dissertations. Technicians are responsive answering questions which may arise.*

*Technicians are trained continually to be informative about the expected questions which will arise. Each assignment given in the EDRE program area is brought to the lab before the students are asked to complete it. It is done with a complete step by step description so every technician can be efficient with the help they give. The help is given in techniques of the software program such as how to enter data, how to obtain results, whatever the program might require to complete*

*the assignment. At no time are technicians to perform the homework for the student or even to direct the procedures, step by step. Even the most expert of the lab personnel will not always have the answer to the problem, so the lab is equipped with the proper reference guides.*

*Those students with the need or desire to learn a new software program can come to the lab to learn. For two of the most popular programs, there are self-guiding on-screen tutorials for the students to use. For more detailed instruction or for other programs, the lab technicians are available by appointment for instructing an individual for 1/2 hour to 1 hour at a time. Handouts outlining the most often requested information are available: Quick tutorial for Number Cruncher; AskSam; Mainframe access and commands; DOS commands; Quattro Pro; etc.*

***COMPUTER MINI-COURSES:***

*The lab offers four series of mini-courses for one hour of pass-fail credit coordinated with certain research classes; these are taught by the Graduate Assistants employed in the lab. Two of these are qualitative based; the other two quantitative.*

***Basic Computational Skills:***

*The most popular of these mini-courses is Basic Computational Skills which is recommended for the Statistics for Behavioral Science graduate level course. The program used for this mini-course is the Number Cruncher Statistical System. This software package is inexpensive for students to buy for their home computers and is easy for students to use. Since most of the students are taking Statistics for Behavioral Sciences to fill a requirement, they do not have a background in statistics; this program allows students to do homework without much of the worry of exact syntax which other programs require and concentrate on understanding the concepts.*

*This mini-course covers the analyses studied in most Basic Statistics courses. The content includes descriptive statistics; such as the measures of central tendency and dispersion; as well as inferential statistics; including t-tests, ANOVA's, correlation, regression, and chi-square.*

***Advanced Statistical Skills:***

*The Advanced Statistical Skills mini-course follows the Advanced Statistics/Multiple Regression and Advanced Research Design courses. The major content of this mini-course is to apply data using SPSS-X and Lisrel. Students will*

*learn to work on the mainframe computer, access large data sets, and to create and run statistical analyses.*

***Basic Research Skills:***

*The Basic Research Skills mini-course is designed for students in the Foundations of Educational Research class. Basic Research Skills include accessing the library system; using electronic databases, including ERIC; operating database managers, such as ASKSAM; and producing final projects using word processors, Word Perfect, for example. An introduction is also made to Harvard Graphics for use with tables, graphs, overheads, etc. and Number Cruncher Statistical Systems for obtaining descriptive statistics.*

***Advanced Research Skills:***

*The Advanced Research Skills mini-course includes much of what the Basic Research mini-course covers; but in this mini-course the programs are more in-depth. This course is intended for students in the Behavioral Science Methods in Education course. The main focus is to aide students who are preparing for their dissertation or thesis.*

*Many students are novice computer-users or not yet comfortable with computers. These mini-courses introduce students to computers and help to alleviate some of the fears many students have. Throughout the course the students continuously work on a computer; after realizing that nothing will explode when the keyboard is touched, students tend to be more experimental, exploring different functions a computer can perform.*

*Being coordinated with graduate courses, the mini-courses provide support for classwork. The mini-courses follow the professor's syllabus so that students receive a supplement or reinforcer to the material covered in class.*

*A main focus of the mini-courses is to help students learn different software programs which may be used to apply theories or concepts discussed in class. Being able to work with a situation helps students understand the purpose behind the material, whereas merely learning the concept without applying it often leaves the students confused.*

*The mini-courses help to reinforce or clarify instruction given in class. Often students will not ask questions in the class for fear that the professor or other students will consider them stupid. The mini-course instructors are considered peers and often the students will refer to them for clarification.*

*Frequently a student feels he/she is the only one having difficulty in a class. The mini-courses enroll up to twelve students in a section, providing students with the knowledge that they are not alone, that other students are also having complications in class. Also with students interacting in the mini-courses, they often construe class material to each other, reinforcing the material in their minds.*

*The instructors of these mini-courses help to mediate between the professor and students so that the students can receive support or assistance when needed and apply or enhance the material learned in class.*

In Support of the Research Education of Graduate Students:

Free Tutorials

Jill List

Virginia Polytechnic Institute and State University

Every Friday morning during the academic term, the Educational Research Computer Lab at Virginia Tech is available for free tutorials. For a period of two hours, students and faculty are encouraged to learn about a software program and its applicability to their needs. To attract students and faculty to sign up for the tutorials, the list of tutorials offered are announced in educational research classes. Several times during the semester, lab assistants visit graduate classes to invite participation. Students from other department, such as educational administration, are also encouraged to attend.

**Programs Offered.** The software available in the lab consists of word processing, statistics, mainframe communications, spreadsheets, graphics, and database manager. The lab tutorials are beneficial to users with varying degrees of experience and expertise.

**First Time Users.** Many students enter graduate school with no specific knowledge of computers, but instead, many possess an attitude of apprehension regarding computer use. For these students, a computer introduction with a DOS tutorial is offered at the beginning of each semester. This course is repeated during the first part of the semester as more students learn about the tutorial through classes and though other students. Additionally, some beginning students repeat the course as a review. Students benefit from hands-on experience and individual attention from lab assistants.

**Intermediate Users.** Students and faculty may request that a particular software program be offered as a tutorial. This is beneficial to meet corresponding course needs, introduce new software, and upgrade the knowledge base of the student, the student lab technicians, and the faculty. The workshop topics are chosen from new and existing software. These are informal sessions.Perhaps as important as the tutorial is the informal exchange of information. Members of the group ask each other to share tips and experiences with software programs. In addition, students enrolled in the minicourses may practice their new skills and acquire useful techniques.

**Advanced Users.** Students and faculty are encouraged to work on software that is not currently supported but owned by the University in the educational research computers. In this manner, new software is introduced to students. Advanced topics in current software are also presented during the free tutorials. Professionals from outside the departmert present workshops in the lab. In this manner, students are able to integrate academic use of computers with "real world" application. During open forums, advanced users are invited to use the computers, share "tricks" with each other and informally discuss how the computer has aided them in their research. Feedback from the faculty, students, and student lab assistants has been extremely favorable towards the tutorials.