How-To-Do-It

Evaluation of Educational Software

Theodore J. Crovello

The two major concerns about educational software are: what programs are available; and how good they are. Here I will address both topics, although most attention will be paid to how good they are. My goal is to help individual educators become their own best consultants in the area of software evaluation.

General Aspects of Software Evaluation

Program evaluation is a recent phenomenon and can rightly be described as undergoing an evolution itself, just as software is. Serious evaluation of educational software is only a few years old, and confined almost exclusively to microcomputers. An obvious exception is CONDUIT (P.O. Box C, The University of Iowa, Oakdale, IA 52319). For over 15 years they solicited evaluations of maxicomputer software submitted to them. The constructive comments of reviewers were incorporated into each program before it was formally offered to educators. They continue to do this with their programs for microcomputers, as do many reputable organizations. Several reasons account for current high interest in evaluations of programs available on microcomputers: many programs exist, but some are not very good pedagogically; the programs are relatively expensive and budgets are limited; the number of

educators wanting help in choosing programs best for their situation is large and increasing; the federal government is supporting ambitious evaluation projects; and, regrettably, program piracy among educators is widespread enough such that vendors can not risk sending programs on a trial basis.

Educators must evaluate a program not in some general context but with the specifics of their particular courses and students in mind. What is a successful program in one person's General Biology course may impede education in another's. The guiding principle is again the total educational computing systems approach (Crovello 1982a, 1983). When selecting software you must consider the hardware and people that are part of your particular class. The reason for considering hardware is obvious; certain programs only run on certain types of computer, or even only on certain configurations of certain types. People must be considered since they will react differently to different programs. The same program may be too easy for some students and too frustrating for others; it may give wonderful coverage of an aspect of a topic, but an aspect that you do not cover; it may take too long for each student to use; etc.

Crovello (1982b) considered aspects of the who, when, where, and why of software evaluation.

Among other points, he emphasized that evaluation of a program is not made just once, and that your students should be involved at several stages of the evaluation process. Not only should students help, but also faculty colleagues. Rose and Klenow (1983) summarized the DISC model for software evaluation and support material design. It is characterized by teacher training for evaluation and actual evaluation, both at the school district level.

The two most important principles of software evaluation are: 1) ask whether the software really fits your course, not whether your course can be changed (with harmful results) to fit the software; and 2) do not go evaluating alone; involve your students and faculty colleagues.

Evaluation Guides

Several educational software evaluation guides are available and suggestions for evaluation regularly appear in journals devoted to educational computing as well as other computer journals. The journal *AEDS Monitor*, devoted its June 1982 issue to educational software evaluation (available from Association for Educational Data Systems, 1201 Sixteenth Street, N.W., Washington, DC 20036).

Over the last two years I have reviewed many evaluation guides and suggestions, including those of

CONDUIT, EPIE, and Consumer's Union (P.O. Box 839, Watermill, NY 11976), MicroSIFT (ICCE 1982), and The National Council of Mathematics Teachers (Heck, Johnson, and Kansky 1981). Those just mentioned, and others, are all useful, and several results emerged from their comparison. All include certain obvious software characteristics. The longer ones contain more information and thus take longer to evaluate. The result is that casual, unorganized use of the more detailed forms are sure to end in frustration. For the long forms a nationwide, well-staffed organization is needed, and that is what groups like MicroSIFT and EPIE have. In addition such groups include in-classroom use of the software as part of the review process. Both of these major projects focus mainly on the high school level. No similar evaluation exists for the college level. CONDUIT does focus on the college level, but its reviews are confined to the software that it is considering offering to educators.

As a result of my study of the above material, I developed a form that can serve two purposes: an evaluation form; and a questionnaire or registration form for use in a register of education computer programs, with special reference to biology. I call it the COMPEACE Evaluation Form; it was first published in Crovello (1983) and is distributed separately at lectures and workshops. It is a relatively short form yet from comments by other bioeducators seems to include the essential aspects of courseware review. It is reproduced here for three reasons: 1) to convey to readers the characteristics of software evaluation; 2) to provide readers with a convenient form for their own use; and 3) to encourage readers to duplicate it, complete one for every program you wish to evaluate, and return it to me for inclusion in the Register of Computers in Bioeducation. Contents of the Register then will be made

available to bioeducators in various ways, including the *The American Biology Teacher's* Computer Center Department.

Sources of Actual Educational Software Evaluations

Because the great demand for software evaluation is still relatively recent, there have been few sources of actual reviews until recently. But several types of sources do exist, and their number will increase greatly in the next few months and years. None of the following focus only on biology, which means that you may find a relatively low percentage of relevant reviews in them. Because of this, educators may find it best to encourage their schools or school districts to subscribe to one or more of these sources or services.

MicroSIFT is a project of the Northwest Regional Educational Laboratory (300 S.W. Sixth Ave., Portland, OR 97204). MicroSIFT is a clearinghouse for educational applications of microcomputers. Its evaluation guide was mentioned above. Using its nationwide Micro-SIFT Network of educators it carries out detailed software reviews that include classroom testing. These reviews are published in educational journals like *The Computing Teacher, Access,* and *School Microware.* They also are available *free* in many states through the state's Department of Instruction. In addition, educators can conduct an on-line computer search using RICE (Resources in Computer Education). Several hundred reviews are currently available, along with several thousand short descriptions of programs that have not been reviewed. A search in September 1983 by MicroSIFT's David Weaver produced 59 programs in biology, 49 of which had been indicated as relevant at the high school level. For access to RICE contact MicroSIFT. It is also available using a commercial serv-

ice, BRS (1200 Route 7, Latham, NY 12110), and on SPIN (Scott, Foresman and Co., 1900 East Lake Ave., Glenview, IL 60025).

EPIE and Consumers Union (P.O. Box 839, Watermill, NY 11976) also provide indepth analyses of courseware on a subscription basis. They also use classroom evaluations. Their reports are available on a subscription basis, and cover all disciplines.

School Microware Reviews (Dresden Associates, P.O. Box 246, Dresden, ME 04342) is a regular publication ($20 per copy) of original reviews by individual educators. They are informative although less extensive (and less expensive!) than those by EPIE.

The Digest of Software Reviews: Education (School and Home Courseware Inc., Suite 701 1341 Bulldog La., Fresno, CA 93710) is published quarterly ($52.95 per year). Each number contains several reviews (of up to 80 words each) of each of 50 selected programs. The programs are for grades K-12. The reviews have been previously published in over 60 journals and newsletters. The service of the Digest is to save educators the time of continuously sifting through 60 journals for reviews! The Digest's editor for education is Ann Lathrop, who also coordinates SOFTSWAP, and has just published a book on courseware in the classroom (Lathrop and Goodson).

The Apple Education Foundation (20525 Mariani Ave., Cupertino, CA 95014) publishes two courseware review journals on an irregular basis: *The Journal of Courseware Review;* and *The Apple Journal of Courseware Review.* They contain about 16 reviews per issue and are available only through dealers for about $5.95.

Individual program evaluations also appear in educational computing journals *not* dedicated to courseware review (e.g., *The Computing Teacher, Electronic Learning*) and also in computer journals *not*

dedicated to education (e.g., *Creative Computing*).

Finally, for completeness let us mention that you should carry out your own software evaluations whenever possible. Some vendors still do send software on approval. Usually their disks are copy protected to some degree. Others will send a demonstration disk containing the highlights (not necessarily the average screen scenes!) of their programs. Often the several dollars to buy such demonstration disks can be applied to the purchase price of the actual program. Naturally if you do not buy the program you still have a disk that can be reused as you wish.

Software Awareness

While it is best to choose educational software on the basis of evaluations like those just described, it will be difficult to have them for all relevant programs. In addition, a significant lag time will always exist between the availability of the software and the availability of software evaluations. The following paragraphs describe sources for software awareness.

Computer searches of data bases focused on educational software are just appearing. RICE was described above. My present project (also mentioned above) focuses on *biology* software awareness and evaluation. It will be in cooperation with *The American Biology Teacher's* Computer Center department.

Directories of educational software published periodically include the *Dresden School Microware Directory* (address given above; two numbers per year; $25 per year). Its Fall 1982 issue contained notices of 1,800 products, with the total increasing 300 more

with every issue. Other directories include educational programs but are not limited to them. An example is *The Software Catalog* (Elsevier Software Database, 52 Vanderbilt Ave., New York, NY 10017). Cost per issue is about $70.

The Index to Computer Based Learning (Educational Communications Division, The University of Wisconsin-Milwaukee, Milwaukee, WI 53201) was published in 1981, with a revised edition scheduled for 1984. Available on microfiche, it contains the results of questionnaires distributed to known producers of programs.

EPIE and Consumers Union plans to publish in 1984 a book, *Education Software Selection*, with annotated descriptions of 5-6,000 products. The book will cost about $49.

Directories of education programs also are available for specific computers. They often can be purchased in the stores that sell those brands of computers. Similarly, persons with specific network systems may find directories of compatible software. One is available from the Corvus Systems (2029 O'Toole Ave., San Jose, CA 95131).

Perhaps the most common sources of software awareness are publishers' catalogs, and companies that do not produce their own software but market others. Examples include Carolina Biological Supply, Cambridge Development Labs, and Queue. Queue (5 Chapel Hill Drive, Fairfield, CT 06432) also offers free software review sessions at their site. Educators can review programs from many vendors in one day.

Readers also may wish to attend day or week-long workshops. For example, in those I conduct, over 50 biology programs from many vendors are available for review.

Concluding Remarks

Software evaluation and awareness are essential tasks for educators. They have been difficult tasks, and still are. But they are not impossible, if the methods and sources described here are used. In addition these tasks will get easier, because the need is there and it is important and economically attractive enough to expect expanded government and commercial involvement.

One valuable result of software awareness and review should not be overlooked. It increased meaningful interactions among educators at the department, school, school district, and national levels. It has fostered a sense of positive camaraderie that we educators can use in this time of complaints about the quality of science education. Let's make it even more meaningful by focusing and working together to develop a register of *biology* courseware!

References

CROVELLO, T.J. 1982a. Computers in biological education. *American Biology Teacher* 44:476-483.

_____. 1982b. Computer software evaluation: Who, when, where, why? *American Biology Teacher* 44:429.

_____. 1983. Educational computing systems: The COMPEACE guide to evaluation of their hardware, software, and people. Notre Dame, Ind.: COMPEACE.

HECK, W.P., JOHNSON, J., and KANSKY, R.J. 1981. *Guidelines for evaluating computerized instructional materials.* Reston, Va.: National Council of Teachers of Mathematics.

ICCE. 1982. *Evaluator's guide for microcomputer-based instructional packages.* Eugene, Ore.: Dept. of Computer and Information Science.

LATHROP, A., and GOODSON, B. 1983. *Courseware in the classroom: Selecting, organizing, and using educational software.* Menlo Park, Calif.: Addison Wesley Publishing Co.

ROSE, S.Y., and KLENOW, C. 1983. The DISC model for software evaluation and support material design. *The Computing Teacher* 11(1):32-33.

The COMPEACE Register of Computer Programs, Program Packages, and Data Bases for Biology Education.
Created and Maintained by
COMPEACE℠
(COMputers for Education, Justice, and PEACE)

Theodore J. Crovello

Director, COMPEACE	Professor and Chairman
COMputers for Education	Department of Biology
Justice, and PEACE	The University of Notre Dame
BOX 554	Notre Dame, IN 46556
Notre Dame, IN 46556	Phone (219) 239-7496

The COMPEACE Register is a single source for information on computer programs, program packages, and data bases for bioeducation. Most of its entries are based on information supplied by a program's author, the organization which distributes it, or cooperating bioeducators. Much of the information on each entry is maintained in a computer-based system. This permits focused customized searches to be performed quickly.

By submitting a completed Registration Form for each program, package, or data base, you will be contributing to bioeducation at the national and international levels. By knowing what programs exist, other bioeducators will save countless hours in trying to find them among the many vendor catalogs and other sources, or trying to create them on their own!

While fully completed questionnaires are most valuable, if your time is limited, please complete what you can, even if it is just to alert us to a program's existence (items 1-7 and 16).

★★★

1. PROGRAM TITLE: _____

2. PROGRAM AUTHOR (if available): _____

3. PROGRAM AVAILABILITY AND POLICIES
   Available from (Name, address, phone):
   Would supplier consider bartering this program for another?　YES　NO
   Price:　　　　　　　　Return Policy:
   Available on:　5" disk　Cassette　Listing　Other: _____
   Is demonstration disk available?　YES　NO

4. PROGRAM PURPOSES (1-5 sentences, including instructional objectives or value):

5. APPROPRIATE GRADE LEVELS (and thus an idea of general prerequisite skills—circle all that apply):
   K-6　7-8　9-12　Intro. College　Advanced Undergraduate　Graduate　Continuing Education

6. HARDWARE REQUIRED (fill in or circle whatever is applicable):
   Computer names and models: _____
   Minimum main memory: _____.　Number of disk drives needed: _____
   INPUT is via:　Keyboard　Game Paddles　Joystick　Graphics tablet or digitizer　Light pen
   　　Touch sensitive screen　　Cassette　Voice　Cards　Other: _____
   OUTPUT is via: Video display　Printer　Plotter　Sound　Voice　Other: _____
   Other hardware (e.g., special circuit cards, videodisc, lab apparatus): _____

7. LANGUAGE:
   BASIC　FORTRAN　Pascal　Other: _____

8. SPECIAL TOPICS THAT MAY DESCRIBE THIS PROGRAM (circle all that apply):
   Program free of racial, ethnic and sexual stereotypes or bias?　YES　NO
   Relevant to society　　Useful for value-oriented science education
   Interdisciplinary (involves more than the life sciences)

9. SPECIFIC TOPICS COVERED (place a check before all that apply):

Aging	Biocomputing	Chemistry
Agriculture, Pests, Weeds	Biogeography	Climate, Weather
Anatomy	Botany	Conservation, Nature Preserves,
Behavior	Cancer	Zoos, Museums, Gardens, etc.
Biochemistry	Cell Biology, Cytology	Developmental Biology

Diseases
Ecology
Equipment or Techniques
Evolution
Fisheries, Fishing
Forestry
Genetics
Geography, Geology
Growth
Histology
History
Horticulture
Land Use

Legislation, Government Policy
Limnology
Marine Biology
Mathematics, Systems Analysis
Medicine, Public Health
Metabolism
Microbiology
Molecular Biology, Molecular Genetics
Neurobiology
Organismic Biology
Paleontology, Palynology
Parasitology, Plant Diseases
Pest Management, Pesticides

Pharmacology, Drugs
Physiology
Population Biology
Population Genetics
Reproductive Biology
Resource Management
Soils
Statistics
Taxonomy, Systematics
Vector Biology
Wildlife Management
Zoology
OTHER: _____

10. LEVELS IN BLOOM'S TAXONOMY THE USER CAN ACHIEVE (check all that apply):

COGNITIVE GOALS
Knowledge
Comprehension
Application
Analysis
Synthesis
Evaluation

AFFECTIVE GOALS
Receiving
Responding
Valuing
Organization
Characterization

PSYCHOMOTOR GOALS
Observing
Imitating
Practicing
Adapting

11. INTERACTIVE STRATEGIES USED AND/OR CAPABILITIES (check all that apply):

Discovery Learning
Program Enhanced by Artificial
   Intelligence
Data Retrieval
Literature Retrieval
Drill and Practice
Control of Experiments or
   Equipment (laboratory or field)

Statistical Analysis
Graphics Analysis
Simulation, Modelling
Animation
Decision-Making
Word Processing
Authoring Language
Data Accumulation

Course Management (grades,
   other recordkeeping)
Instructional Support (prepare
   handouts, A/V directory, etc.)
Test Generation
Test Administration
Computer Assisted Career
   Guidance

12. GENERAL PROGRAM CHARACTERISTICS (circle all that the program possesses; some deliberately overlap others):

User helpful   User proof   Input/output protected   "Help" option   Program is menu-driven
Program's personality is positive and constructive.   Program prompts user if necessary
Abbreviations accepted   Synonyms accepted   High resolution graphics   Animation   Color   Music   Sound
Program uses different type fonts or print size   Several levels of difficulty or complexity of the topic are
selectable.   Average time for a student to complete the program: _____
User can easily switch to another part of the program at any time.
User can save results of one session to work on the next.
Several students can/must use program at the same time.

13. DOCUMENTATION (circle all that apply):
Instructor's Guide   Student Guide   Other: _____

14. CORRECTNESS OF SUBJECT MATTER, EQUATIONS, ETC.
Is program free of spelling, grammatical, and related errors?
Are statements of fact, answers to questions, etc. correct?
Are equations used to describe phenomena the most appropriate? Are literature references given to them?
Are calculations done correctly?   Is roundoff error a problem?
Have you verified correctness via sample data with known results?

15. EVALUATION AND DESCRIPTIVE LITERATURE (fill in or circle whatever is applicable):
Evaluations included approximately (give numbers): _____ students and _____ educators in _____ classes.
Results of evaluations are available.
Program is described and/or reviewed in the following publications (give author, data, title, citation): _____

16. PERSON FILLING OUT THIS FORM (circle one: AUTHOR   DISTRIBUTOR   OTHER? _____)
Your Name _____ Today's Date _____
Address _____

_____

Phone (____)_____

★★
Please return completed forms to: COMPEACE, Box 554, Notre Dame, Indiana 46556 U.S.A.

OUR STUDENTS THANK YOU!

(Use this space for suggestions to improve the Register, etc.):