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ABSTRACT

Microcomputer software can provide excellent drill and practice, simulations, and problem-solving. Yet, software developers often have designed elaborate graphics and unique characters in lieu of sound instructional programming. Many instructional programs for learning-disabled students do not provide appropriate reading levels, the opportunity to make decisions, logical and detailed instructional formats, correction procedures in the case of error, recordkeeping options, or imaginative programming. The following essential features should be included: immediate reinforcement of student responses, individual pacing, non-emotional input during needed repetitions, undivided attention during input, reduction of distractions, nonjudgmental responses, intrinsic motivation, and student control as well as computer control. An evaluation screening tool is presented that can quickly and successfully determine the usefulness of a software program through examination of its instructional content, educational quality, and general quality. Suggestions are offered for encouraging software development by companies, institutions of higher education, and computer-user groups. A list of 28 software evaluation sources and directories is presented. The report concludes with a list of 69 software programs recommended for use with the learning-disabled, in the areas of microcomputer instruction; typing; quiz or lesson generators; word processing/integrated programs; cognitive, perceptual, spatial skills; mathematics; language arts and reading; and teacher utility programs. (JDD)

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Software Programs for Learning Disabled Students:

Second Report

by
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1988

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Microcomputers are now an integral part of the technology utilized in schools and special education programs. When used appropriately, microcomputer software can provide excellent: 1) drill and practice; 2) simulations; and 3) problem solving. Word processing and programming software also provide unique opportunities for the development of thinking and creativity. Yet, research regarding instructional software is inconclusive. Teachers and administrators are left with the difficult task of identifying appropriate software. Often software developers have designed elaborate graphics and unique characters in an effort to create highly motivational programs. Unfortunately, this is often done in lieu of sound instructional programming. Many existing programs do not reflect careful consideration of the reading levels of students or the variety of decisions which would be appropriate for students to make. In addition, existing software often seems rather linear and representative of activities which could just as easily be included in texts or workbooks. Developers have not always sought to create a special purpose or role for educational software distinct from other educational materials.

The difficulties are magnified when considering instructional software for learning disabled individuals. The very nature of learning disabilities, and the myriad forms in which these conditions may exist also hampers software development. Major software-producing companies are not attracted to creating programs for this population. Monetary rewards for generating such software are not as great as in some other areas (i.e., general entertainment games). Hence, the majority of existing educational software programs simply do not meet the specific needs of this population. Many programs do not provide students with: 1) appropriate reading levels; 2) the opportunity to make decisions; 3) logical and detailed instructional formats; 4) elaborate correction procedures in the case of error; 5) record keeping options; and/or 6) imaginative programming.

The U.S. Department of Education provided grants in the mid-1980's to contractors to adapt and write courseware for the general special education population. Yet, despite this increase in government aid for the development of appropriate software, no great flood of programs specifically for the learning disabled population appeared. This trend implies that those teachers

who want to begin using microcomputers for persons with learning disabilities will have to turn to existing software programs, whether or not the software has been designed for this population. In some cases, this situation is not a critical obstacle because the essential methods and techniques for instruction that work with all students presumably work with learning disabled students as well. Some of these features include: 1. immediate reinforcement of student responses, 2) individual pacing, 3) non-emotional input during needed repetitions, 4) undivided attention during input, 5) reductions of distractions, 6) nonjudgemental responses, 7) intrinsic motivation, and 8) student control as well as computer control. These possible strengths make the microcomputer a compelling teaching device and one that warrants careful consideration when selecting educational software for learning disabled students.

In order to select the most appropriate software programs, a system for evaluating and selecting microcomputer courseware should be in place. There are several sources (see Table A) that offer courseware reviews and/or identify available software (Roberts, 1983; Hoffman, 1983; Uslan, 1983; Ostertag, 1984). The U.S. Office of Special Education and Rehabilitation Services offered a toll-free access to software and hardware information. Though now discontinued, data bases of software reviews were generated and are available through LINC Resources.

After identifying programs that appear to meet the general needs of a learning disabled population, it is crucial to apply a formal evaluation tool. An evaluation screening tool that has proven useful in this capacity is a hybrid scale developed by the authors and based upon several existing software evaluation scales (see Table B). This quick evaluation tool has been successfully utilized by approximately eighty (80) teachers in graduate-level college courses and their own special education classes using a 1-5 point rating scale. Minor modifications to the evaluation scale were employed for teacher utility and integrated programs. As with any screening device, the benefits of its brevity also tend to negate some positive factors a more lengthy evaluation process might develop.

Scoring the device is as follows:

1) Evaluator obtains a sum of the scores (ΣX);

2) all items *except* for "Not Applicable (zero scores)" are tallied as the number of cases (N);

3) obtain the average ($\overline{X}$) score by dividing the sum by the number of cases ($\overline{X}=\Sigma X/N$). Compare the resultant score with the qualitative key legend.

Example: An evaluator rates a software program. A total sum of scores of fifty-five ($\Sigma X=55$) is achieved. In the process, five (5) items have been assigned "Not Applicable" scores of zero (0); therefore the actual number of items given a numerical tally equals fifteen (N=15). This number of cases was obtained by subtracting "Not Applicable" ratings (5) from the total of items possible (20). So:

$$\overline{X} = \Sigma X/N = 55/15 = 3.7 \text{ Rating}$$

So the qualitative program rating (see key in Table B) would equal, "Good. Consider Purchasing."

The majority of the software evaluated was originally designed for general education; scores have fallen in the low 3.0's and many programs have not wholeheartedly been recommended. Only some teacher utility, integrated programs and word processing systems received very favorable reviews. The major problem with most rejected software centered on the high readability skills required of the user to follow directions. This was true even on supposedly remedial-skill programs. The reviewer consensus was that a reading level of high-third grade or better was necessary for a user to function independently with current software programs. A heterogeneous peer-teaming, aide or teacher supervision was deemed necessary to allow low reading level students to appropriately utilize the majority of this software.

There was a great deal of commonality between reviewers regarding the features they demanded from computer-assisted instructional software. First, the reviewers looked for the educational soundness of the material. Next, they wanted user-friendliness; this included ease of use for the novice computer user and clear, readable directions (3rd grade reading level or less).

Reviewers also preferred software to be flexible. Due to the expense of most commercial software (public domain software was excluded from teacher review), teachers wanted versatile software that could be used more than once with a pupil. They requested software which would allow for the teacher input of problems, spelling words, etc. and which could be used for a variety of subjects. Reviewers also wanted software programs that would be adaptable for student input of problems, materials, and so on. The concept of using software in a peer-teaching process was strongly endorsed.

Software programs found to be useful with learning disabled students are listed by recommended category (Table C). It is important to note that the evaluators' subjectivity varied based upon the needs and abilities of their own students or situation. Teacher utilities, integrated programs, and word processing systems received the best overall teacher evaluations. The versatility of these programs for a variety of instructional purposes was a major factor in their selection. Next, the evaluators rated mathematical programs as being more successful with learning disabled students than the currently available reading or language arts programs. The top seven rated programs were: 1) *Appleworks* (teacher utility/integrated program); 2) *Magic Slate* (word processing); 3) *Bankstreet Writer III* (word processing); 4) *The Print Shop* (Cognitive spatial/teacher utility); 5) *Arcademic Drill Builders* (math and reading); 6) *Crossword Magic* (lesson generator); and 7) *Compuscore: Woodcock-Johnson Psycho-Education Battery* (teacher utility). All programs were reviewed on Apple IIe (64-128K) microcomputers and are not inclusive of all available software in the field of education.

A relatively new phenomenon in educational software is the addition of synthesized speech as part of a program. For example, several recently released word processing/language arts programs enable the student to hear, as well as see, the typed word. This inclusion of sound offers some obvious advantages to learning disabled students. Unfortunately, because of the newness of many of these programs, a thorough rating by at least twenty evaluators was not possible. However, initial reaction to these programs has been favorable. Among the programs previewed were Houghton Mifflin's *Sound Ideas* and *Spelling Speakware*, Hartley's *Dr. Peet's Talk/Writer* and *My Words*, and Scholastic's *Talking Textwriter* and *Talking Text*

Speller. The addition of a speech synthesizer to an Apple computer is a prerequisite to the use of these programs.

Teachers of learning disabled students are unlikely to meet all pupil's microcomputer needs through currently available software; teachers will have to become involved in the development of appropriate software. Unfortunately, software programming is difficult and time-consuming. Most special educators do not have the programming expertise necessary to create even the simplest of programs. However, alternatives do exist. First, teachers must identify exactly what software needs exist for their particular situation. Second, they must objectify those needs. Third, special educators must determine priorities based on importance, overall class utility, and longevity of needs. Teachers must then identify community resources which are capable of developing software programs. Excellent sources are institutions of higher education (computer science majors are always looking for program ideas) and local computer-user groups. Educational software-developing companies continually seek ideas. Another important contact is the State Department of Education which may serve as a resource network for personnel involved in microcomputer centers, projects, and grants. The fifth step is to sit down with the identified programmer and explain exactly what is needed. Sixth, teachers will need to determine what type of program (simulation, drill and practice, etc.) will be developed. As a final step, teachers need to maintain constant communication with the programmer to ensure that proper educational methodologies, goals, reading levels, objectives, correction procedures, multi-modality approach, etc., are being fulfilled. The end result should be a useful software program appropriate for learning disabled students.

For those who wish to begin "yesterday" in providing microcomputer-aided lessons to learning disabled students, the recommended list of software should provide a base. Be aware that federal, state, and private concerns publish directories, magazines, and other resource for persons wishing to keep abreast of new software programs. Remember that microcomputer software is like any other educational tool: the selection and application must fit the needs of the individual learner. Choose software which is flexible and able to be adapted to meet those particular needs of the students.

Table A: Software Evaluation Sources and/or Directories

AEDS Bulletin
Association of Educational Data Systems
1201 Sixteenth Street, N.W.
Washington, D.C. 20036

Apple Journal of Courseware Review
Box 28426
San Jose, CA 95159

Atari Program Exchange
Atari, Inc.
P.O. Box 427
155 Moffett Park Drive
Sunnyvale, CA 94086

Classroom Computer News
Box 266
Cambridge, MA 92138

Closing the Gap
P.O. Box 68
Henderson, MN 56044

Commodore Software Encyclopedia
Commodore Business Machines
Software Group
681 Moore Road
300 Valley Forge Square
King of Prussia, PA 19406

Computer-Disability News
c/o Easter Seal Society
2023 W. Ogden Avenue
Chicago, IL 60612

Computers, Reading and Language Arts
Box 13247
Oakland, CA 94661

The Computing Teacher
Department of Computer Science
University of Oregon
Eugene, OR 97403

Courseware Report Card
150 West Carob Street
Compton, OR 90220

Directory of Microcomputer Software
Datapro Research
1895 Underwood Boulevard
Delran, NJ 08075

Educational Software Directory
Apple II Edition
Sterling Swift Publishing Co.
1600 Fortview Road
Austin, TX 78704

Electronic Education
1311 Executive Center Drive,
Suite 220
Tallahassee, FL 32301

Electronic Learning
Scholastic Inc.
P.O. Bo 645
Lyndhurst, NJ 07071-9986

EPIE Micro-Courseware Pro/Files
EPIE & Consumer's Union
Box 620
Stony Brook, NY 11790

Family Computing
P.O. Box 2512
Boulder, Co 80321

Table A: Software Evaluation Sources and/or Directories (continued)

Journal of Special Education Technology
Development Center for Handicapped Persons
UMC 68
Utah State University
Logan, UT 84322

LINC Resources, Inc.
Specialware Databases
91 Vine Street
Pawtucket, RI 02861

MicroSoft Reviews
Northwest Regional Education Laboratories
300 S. W. Sixth Avenue
Portland, OR 97204

Microprocessor Software
D.A.T.A. Book
D.A.T.A.
P.O. Box 26875
San Diego, CA 92126

Popular Computing
70 Main Street
Petersborough, NH 03458

Radio Shack TRS-80
Applications Software Sourcebook
Box 17400
Fort Worth, TX 76102

School Microware
Dresden Associates
P.O. Box 246
Dresden, ME 04342

Software and Services Sourcebook and Supplement
Information Sources, Inc.
1807 Glenview Road
Glenview, IL 60025

Special Education Software Review
c/o Drive One Publishers, Ltd.
3807 N. Northwood Avenue
Peoria, IL 61614

SpecialNet Edutech Bulletin Board
National Association of State Directors of Special Education
1201 - 6th Street, NW
Washington, D.C. 20036

The SpecialWare Directory
LINC Associates, Inc.
1875 Morse Road
Columbus, OH 43299

Teaching and Computers
c/o Scholastic, Inc.
P.O. Box 645
Lyndhurst, NJ 07071-9986

Table B: Microcomputer Software Evaluation Scale for Special Students

SUBJECT AREA/TOPIC: **DATE PUBLISHED:**
TITLE: **DATE EVALUATED:**

ABILITY LEVEL: Pre K 1 2 3 4 5 6 7 8 9 10 11 12 Adult Other_____

INTEREST LEVEL: Pre K 1 2 3 4 5 6 7 8 9 10 11 12 Adult Other_____

SOFTWARE MEMORY: 8K 16K 32K 48K 64K 128K Other_____

HARDWARE NEEDED: Apple Atari Commodore IBM Macintosh Other_____

TRANSFER MEDIUM: Tape Cartridge Disk: 3 1/2" 5 1/4" 8" Other_____

SUPPLEMENTAL REQUIREMENTS: Audio Color Two Drives Joystick/Paddle
Speech Synthesizer Pad Light Pen Printer Mouse Other_____

COST:

PUBLISHER:

REPRODUCTION PERMITTED. Yes No **BACK-UP AVAILABLE:** Yes No

TYPE OF PROGRAM: Authoring System Word Processor Diagnosis/Assessment
Drill and Practice Teacher Utility Integrated Program
Problem Solving Simulation Tutorial
Game Other _____

MENU DRIVEN: Yes No **MANUAL:** Yes No **RECORD-KEEPING:** Yes No

KEY:

Excellent	Good	OK	Poor	Not Useful	Not Applicable
5	4	3	2	1	0

CONTENT:	5 4 3 2 1 0	1. Content based on stated behavioral terms
	5 4 3 2 1 0	2. Content accurate and consistent
	5 4 3 2 1 0	3. Content presentation clear and logical
	5 4 3 2 1 0	4. Racial, ethnic and sexist stereotypes avoided
EDUCATIONAL QUALITY:	5 4 3 2 1 0	5. Directions clear
	5 4 3 2 1 0	6. Text at intended conceptual level
	5 4 3 2 1 0	7. Text at intended reading level
	5 4 3 2 1 0	8. Purpose of material defined

Table B: Microcomputer Software Evaluation Scale for Special Students (continued)

EDUCATIONAL QUALITY (CONT'D)	5	4	3	2	1	0	9. Program objectives met
	5	4	3	2	1	0	10. Appropriate feedback for incorrect responses
	5	4	3	2	1	0	11. Functions at user's pace
	5	4	3	2	1	0	12. Size of printer clear & well-spaced
	5	4	3	2	1	0	13. Multi-sensory approach used
	5	4	3	2	1	0	14. Material relevant to user needs
	5	4	3	2	1	0	15. Program motivating
	5	4	3	2	1	0	16. Skills taught transferable to other situations
GENERAL QUALITY:	5	4	3	2	1	0	17. Program operation uncomplicated
	5	4	3	2	1	0	18. Support materials effective & comprehensive
	5	4	3	2	1	0	19. Program reliable in operation
	5	4	3	2	1	0	20. Material effective with individual learning styles

PROGRAM RATING (Add Items 1-20. Divide total by items not rated as "0" to obtain an average score.)

$$\bar{X} = \frac{\sum X}{N} \text{ or } \frac{\text{Sum Total}}{\text{Items Except '0'}} = \text{Rating}$$

5.0 - 4.5 = Excellent. Recommend without hesitation.

4.4 - 3.8 = Very good. Worth purchasing.

3.7 - 3.0 = Good. Consider purchasing.

2.9 - 2.1 = Fair. May want to wait for something better.

2.0 - 1.0 = Poor. Do not recommend purchasing.

PROGRAM EFFECTIVENESS

Recommended for Special Students Usage: Yes No Educator: Yes No

Reading Level Required: K 1 2 3 4 5 6 7 8 9 10 11 12 Adult

Estimated Interest Level: K 1 2 3 4 5 6 7 8 9 10 11 12 Adult

ADDITIONAL COMMENTS:

Table C: Software Programs Recommended for Use With the Learning Disabled

PROGRAM	PUBLISHER
I. Microcomputer Instruction	
1. *Apple Keyboard*	Apple Computer Company
2. *Apple Presents Apple*	Apple Computer Company
II. Typing	
3. *Alphabetic Keyboarding*	Scholastic
4. *Mastertype*	Lightning Software
5. *Microtype: Wonderful World of Paws*	Scholastic
6. *Success With Typing*	Scholastic
7. *Typing Strategy*	Behavioral Engineering
8. *Typing Tutor III*	Scholastic
III. Quiz or Lesson Generator	
9. *BLOCKS*	San Juan Unified Schools
10. *Crossword Magic*	Mindscape, Inc.
11. *Game Show*	Computer Advanced Ideas
12. *Master Match*	Computer Advanced Ideas
13. *Mix and Matc*	Apple Computer Company
14. *Tic Tac Show*	Computer Advanced Ideas
IV. Word Processing/Integrated Program	
15. *Appleworks*	Apple Computer Company
16. *Bank Street Writer III*	Broderbund Software
17. *Magic Slate*	Sunburst Communications
18. *Milliken Word Processor*	Milliken Publishing Company
19. *Talking Text Writer/Speller*	Scholastic
V. Cognitive, Perceptual, Spatial	
20. *Add One Out*	Sunburst Communication
21. *Apple LOGO*	Apple Computer Company
22. *Delta Drawing*	Spinnaker Software Corp.
23. *Early Games for Young Children*	Counterpoint Software
24. *Facemaker*	Spinnaker Software Corp.
25. *Gertrude's Puzzles*	Learning Company
26. *Gertrude's Secrets*	Learning Company
27. *Getting Ready to Read*	Sunburst Communication
28. *Juggle's Rainbow*	Learning Company
29. *Kids at Work*	Scholastic
30. *Kindercomp*	Spinnaker Software Corp.
31. *Memory: The First Step in Problem Solving*	Learning Company
32. *Newsroom*	Springboard Software
33. *Print Shop*	Broderbund Software

Table C: Software Programs Recommended for Use With the Learning Disabled (continued)

PROGRAM	PUBLISHER
VI. Mathematics	
34. *Arcademic Drill Builders in Math Series*	DLM/Teaching Resources
35. *Basic Living Skills Series*	Love Publishing
36. *Basic Skills in Math Series*	Learning Company
37. *Bumble Games*	Learning Company
38. *Bumble Plot*	Learning Company
39. *Calendar*	Hartley Courseware
40. *Challenge Math*	Sunburst Communication
41. *Clock*	Hartley Courseware
42. *Division Skills*	Milton Bradley Company
43. *Elementary Math*	MECC
44. *Fastmath*	NTS Software
45. *Getting the Basics*	NTS Software
46. *Math for Everyday Living*	Educational Activities
47. *Mathematics*	MECC
48. *Math Maze*	Designware, Inc.
49. *Survival Math*	Sunburst Communications
50. *Teasers by Tobbs*	Sunburst Communications
51. *Telling Time*	Hartley Courseware
VII. Language Arts and Reading	
52. *Arcademic Drill Builders in Language Arts*	DLM/Teaching Resources
53. *Capitalization Plus*	CBS Interactive Learning
54. *Dragon Games*	Educational Activities
55. *Dragon's Keep*	Sierra On-Line
56 *Elementary #7*	MECC
57. *First Categories*	Laureate LearningSystems
58. *Magic Spells*	Scholastic
59. *Sentences*	Micro Power and Light
60. *Spellcaster*	NTS Software
61. *Spellicopter*	Designware
62. *Spell It!*	Davidson and Associates
63. *Spelltronics Series*	Educational Activities
64. *Sticky Bear ABC Series*	Xerox
65. *Word Families*	Hartley Courseware
66. *WordFlash*	Ideatech
67. *Wordmaster*	NTS Software
VIII. Teacher Utility	
68. *Compuscore: WJPEB*	DLM/Teaching Resources
69. *Talley's Goals and Objectives*	Curriculum Associates

Table D: Software Publishers

Apple Computer Company, Inc.
20525 Marianna Avenue
Cupertino, CA 95014

Behavioral Engineering
230 Mount Herman Road
Suite 207
Scotts Valley, CA 95066

Broderbund Software
1938 Fourth Street
San Rafael, CA 94901

CBS Interactive Learning
Microcomputer Workshops
Courseware
One Fawcett Place
Greenwich, CT 06836

Computer Assisted Ideas
1442A Walnut Street
Suite 341
Berkeley, CA 94709

Counterpoint Software, Inc.
4005 W. 65th Street
Minneapolis, MN 55435

Curriculum Associated, Inc.
5 Esquire Road
North Billerica, MA 01862-2582

Davidson and Associates
3135 Kashiwa Street
Torrence, CA 90505

Designware, Inc.
185 Berry Street
San Francisco, CA 94107

DLM/Teaching Activities, Inc.
One DLM Park
Allen, TX 75002

Educational Activities, Inc.
P.O. Box 392
Freeport, NY 11520

Hartley Courseware, Inc.
Box 431
Dimondale, MI 48891

Houghton Mifflin, Inc.
2225 East Randol Mill Road
Suite 530
Arlington, TX 76011

Ideatech Company
P.O. Box 62451
Sunnyvale, CA 94088

Laureate Learning Systems, Inc.
110 E. Spring Street
Winooski, VT 05404

Learning Software
4370 Alpine Road
Portola Valley, CA 94025

Lightening Software
P.O. Box 11725
Palo Alto, CA 90436

Love Publishing Company
1777 South Bellaire Street
Denver, CO 80022

MicroSoft Corporation
10700 Northrup Way
Bellevue, WA 98004

Table D: Software Publishers (continued)

Milliken Publishing Company
1100 Research Boulevard
Box 21579
St. Louis, MO 63131-0579

Milton Bradley
443 Shaker Road
East Longfellow, MA 01028

Mindscape, Inc.
3444 Dundee Road
Northbrook, IL 60062

Minnesota Educational Computer
Consortium (MECC)
2520 Broadway Drive
Highway 280 & Broadway
Saint Paul, MN 55113

MUSE
347 North Charles Street
Baltimore, MD 21201

NTS Software
680 North Arrowhead Avenue
Rialto, CA 92376

San Juan Unified School District.
3738 Walnut Avenue
Carmichael, CA 95608

Scholastic, Inc.
2931 East McCarty Street
P.O. Box 7501
Jefferson City, MO 65102

Sierra On-Line, Inc.
Sierra On-Line Building
Coarsegold, CA 93614

Special Times
Cambridge Development
Laboratory
42 4th Avenue
Waltham, MA 02154

Spinnaker Software Corp.
215 First Street
Cambridge, MA 02142

Springboard Software, Inc.
7807 Creekridge Circle
Minneapolis, MN 55435

Sunburst Communications, Inc.
P.O. Box 40
Pleasantville, NY 10570

Xerox
Computer Software Division
246 Longhill Road
Middletown, CT 06457

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