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ABSTRACT
                 Designed to assist teachers in identifying quality
software, this guide provides software evaluation forms and
associated evaluation criteria to aid in completing the forms. The
two-part instrument is used in the evaluation process conducted by
Alberta Education, which involves the Program Development Division
and the Computer Technology Project's Clearinghouse. A brief overview
describes this process and the instrument itself, which consists of a
program evaluation form and a disk evaluation form. Specific
instructions and criteria are then provided for completing each
section of the form. Under program evaluation, subsections cover
program objectives, contents, instructional design, and technical
design. The disk evaluation form includes source information,
required hardware and software, management system, and ease of use.
Also included are guidelines for making recommendations, the
necessary features of tutorial/drill programs, definitions, and a
glossary of terms. (LMM)

EVALUATOR'S GUIDE

FOR

MICROCOMPUTER-BASED

COURSEWARE

DEVELOPED BY THE

PROGRAM DEVELOPMENT DIVISION

OF

ALBERTA EDUCATION

11160 JASPER AVENUE

EDMONTON, ALBERTA

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I INTRODUCTION

A. PURPOSE

Except in instructional situations where student programming is the
primary activity, microcomputers can be used to assist the instructional
process effectively only to the extent that quality software is available.
This Evaluator's Guide and the associated evaluation forms have been
designed to assist teachers in identifying such software.

The development of the guide and the evaluation instruments have been
based on the philosophical approach that description and evaluation of
courseware should be separated. This has been done in the three major
sections of the instrument - CONTENT, INSTRUCTIONAL DESIGN AND TECHNICAL
DESIGN.

B. PROCESS

The process of evaluation conducted by Alberta Education involves the
Program Development Division and the Computer Technology Project's
Clearinghouse. As priorities are identified by the Program Development
Division, the Clearinghouse solicits courseware from publishers for
evaluation. It then has the materials described and assessed by
teachers who have the appropriate knowledge in the subject area under
consideration and who have received training in the use of the evaluation
instrument.

These evaluations result in one of three decisions:
- a. The material is identified as worthy of further evaluation.
- b. The material is identified as having limited use in the classroom
  (Supplementary).
- c. The material is rejected.

Courseware identified in "a" is evaluated further by the Program Develop-
ment Division for congruency to the program of study and may be designated
as a "Prescribed", "Recommended" or "Supplementary" learning resource
for Alberta schools. Prescribed and Recommended materials are acquired
and distributed through an agency identified by Alberta Education. All
courseware evaluations are filed in the Clearinghouse and results are
made available to Alberta schools.

C. DESCRIPTION OF THE INSTRUMENT

Courseware currently being published may come in a number of configurations.

    a. A disk may contain a number of "stand-alone" programs. For
        example, programs on spelling, identification of capital
        cities and review of basic number facts may be available
        all on one disk.

    b. A disk may contain a number of programs tied together under
        the same basic goals but each having different objectives.
        For example, a disk may have four programs - addition,
        subtraction, multiplication and division of decimals.

    c. A disk may contain one main program, for example, a
        simulation of a scientific experiment.

    d. Two or more disks may be tied together into a package or
        series. For example, six disks reviewing arithmetic
        fundamentals, may be combined together into a single package
        with a management system.

As the basic item of purchase is the disk, IT IS THE DISK which has
been made the basis of evaluation of this instrument.

There are two parts to the evaluation instrument - the PROGRAM
EVALUATION FORM and the DISK EVALUATION FORM.

A PROGRAM EVALUATION FORM is generally completed for each stand-alone
program on the disk. The form has descriptions and evaluations of a
program's intents, content, instructional design and technical design.
Each stand-alone program on the disk receives an evaluation that is
independent of other programs on the disk.

A disk containing a number of programs tied together under a common
goal will generally have each of the programs evaluated separately.
However, when the programs are designed in such a manner that the
only noticeable difference is the content and all other factors of
instructional design and technical design are identical, one Program
Evaluation Form may be used for all the programs.

A DISK EVALUATION FORM is used to evaluate the overall DISK. It
contains the identification of the disk (title, publisher, etc.),
and a description and evaluation of any management system that may
exist. It also contains a summative evaluation of the disk's entire
contents, instructional design and technical design. A summational
statement and a recommendation are at the end of the form.

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II PROGRAM EVALUATION FORM

A. INTENTS

OBJECTIVES   List the objectives that the program is intended to
                    achieve and indicate if they are stated or inferred.

                    Objectives are the behaviours that the learner manifests
                    as a result of involvement with the materials. The
                    evaluator should ask himself what it is the learner
                    will be able to do after using these materials?

                    Examples of objectives: Learners will be able to add
                    fractions with common denominators; learners will be
                    able to recognize the names of the capital cities of
                    Canada; learners will be able to identify the correct
                    use of "their, there and they're"; learners will be
                    able to identify the chemical elements given the
                    abbreviations of the elements.

B. CONTENT

PROGRAM   Describe the educational contents of the program
CONTENTS   (topics, skills, concepts).

                    1. What are the topics/skills/concepts covered in
                        the program? (range)

                    2. What is the progression of the presentation?
                        How are the units ordered? (sequence) /

                    3. How intensively is each dealt with? What does
                        the treatment include? (explanation, rules,
                        examples, illustrations, drills, tests, etc.)

                    Example: This program covers three types of addition
                    of fractions. Students begin with addition of common
                    fractions with the same denominators, proceed to
                    addition of fractions where one fraction has a denom-
                    inator that is a factor of the other (2 and 6, 3 and
                    12) and finish the program with addition of fractions
                    with completely different denominators (3 and 4, 5
                    and 7). Improper and mixed fractions are not included
                    in the program. The presentation of each topic includes
                    one page of introduction, two examples and a brief
                    drill. A statement of rules is available. The program
                    ends with a test on all three skills.

Example: This program covers three types of improper
word usage:

1.   there/their/they're   2.   too/to/two   3.   good/well

Each example is presented through the use of a rule,
one example of correct usage and one example of
incorrect usage. A drill of all three types is
included at the end of the programs.

USER
SUPPORT
MATERIALS

User-support refers to STUDENT support materials.

1.   Describe the extent of any <u>student</u> materials
such as pre-instruction activities, work sheets
and follow up activities that are included with
the disk.

2.   Indicate if the materials are integral to the
design of the package or if they are optional.

CONTENT
EVALUATION

Write a narrative statement which will evaluate the
content described earlier. Some questions to be
addressed include:

Range

1.   Is the range of the content appropriate for the
target audience?

2.   Is the range of the content effective in achieving
the intents of the program. Is sufficient content
covered? Is too much covered?

Sequence

3.   Is the sequence of presentation appropriate for
the target audience? Is the size of the increment
appropriate?

4.   Is the sequence effective in achieving the intents
of the program?

Depth	5.	Is the depth appropriate for the target audience?
	6.	Is the depth effective in achieving the intents of the program?

- Is the material presented in sufficient depth and intensity so that learning will take place?

- Are definitions and explanations available where necessary?

- Are sufficient examples and illustrations used?

- Is sufficient practice available?

Accuracy	7.	Is the content accurate? Does it contain factual errors, an invalid model in a simulation, an oversimplified model or series of examples, inaccurate graphs or displays?
	8.	Is the content current?
Clarity	9.	Is the content presented in a clear and concise manner which is appropriate for the target audience?
Bias	10.	Does the content include biased information?

- e.g. improper language usage?
- e.g. ethnic or social class references?
- e.g. references to violence?
- e.g. references to sexual or social roles?
- e.g. age portrayals?
- Does it contain Canadian data where relevant?
- Is content metricated?

Curriculum	11.	Is the content appropriate to the Alberta curriculum?
User Support Materials	12.	Are user support materials appropriate for the target audience?
	13.	Are user support materials effective?

- Do they contribute to the learning process?
- Are these materials sufficient?

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C. INSTRUCTIONAL DESIGN

INSTRUCTIONAL
TECHNIQUE

Check the appropriate box(es). A definition of
terms is included at the end of the guidebook.

STUDENT
INTERACTION

Describe the student interaction that is required
in the program.

1. How much student interaction is there?

2. What type of student interaction is there?
   (multiple choice entry, input of answer, "press
   return", etc.)

   Example: Student interaction in this program
   consists of "press space bar" instructions at
   the bottom of each page (approximately 25) and
   the input of the number of the correct response
   (1-4) in the drill section. (5 questions)

   Example: Student interaction in this program
   consists of selection in the menu, page turning
   devices and input of answer in the drill section.
   In the menu, the student is asked to enter the
   name of the program section desired. During
   the explanation, (10 pages), the student can go
   forward or backwards by using the right or left
   arrow keys. The drill questions require the
   student to enter the correct answer along the
   % sign.

FEEDBACK
TECHNIQUES

Describe the feedback techniques. Some questions
that may be answered are:

1. When is feedback provided? (after all user
   responses, when user response is wrong, randomly
   on correct responses, etc.)

2. What type of feedback is provided? (e.g. graphics,
   text, audio, combinations, etc.)

3. What content is included in the feedback? (e.g.
   general message, specific hints depending upon
   the error, the correct answer, a restatement of
   the correct answer, explanation of incorrect
   response, etc.)

4. What is the extent of the variety of the feedback?
   (e.g. the same phrase "try again" is used after
   each incorrect response)

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5. Is quantitative feedback provided? (You got
    9 questions correct out of 20)

    Example: There are two types of feedback
    employed. On inputting a correct answer, the
    student receives a brief congratulatory message
    chosen randomly from approximately 10 statements.
    If an incorrect response is entered, the student
    is first told to "try again". If, on the second
    attempt, he is still wrong the correct answer is
    given. Quantitative feedback is available at the
    end of the drill.

    Example: Graphical and audio feedback are employed
    throughout the program. Correct answers are
    rewarded with a complicated graphical picture
    (4 pictures available). Incorrect answers are
    punished by a large X which flashes on and off
    the screen. At the same time, a loud buzzing
    noise advises the user that a mistake has been
    make.

EVALUATION TECHNIQUES

Describe the evaluation techniques that are used to
determine the student's success in the program?

1. Is there a pre-test or a post test?

2. What are the criteria for success? Who sets the
    criteria?

Note that within this context, a drill is not a test.
A drill presents questions, often in a structured way,
to give the user practice in a particular skill.
Often, more than one attempt at a question is given
and hints may also be provided.

A test determines if the practice of the skill, the
involvement of the student in the program, has been
or is likely to be successful. Questions are not
structured to lead a student towards more difficult
questions, only one chance is given and feedback is
limited to an indication of right or wrong.

BRANCHES

Describe the branches that exist within the program.
What types of branches are available to the user?
Is the program linearly sequenced or is there pro-
vision for review, remediation, enrichment, help, etc.?

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TYPES OF CONTROL

Describe the type of control that is used with each of the following: Sequence, Rate and Amount.

There are three types of control - PROGRAM, TEACHER and USER. Program control is based on pre-set criteria built into the program while teacher and user controls are based on entries made during the operation of the program by either the teacher or the student (user).

Sequence refers to the order of the presentation, the path of the user through the branches described above. Under what circumstances does the user enter these branches? For example: Sending a student to a remedial loop automatically if he makes a certain number of errors is program control. User control gives the student the opportunity to go to a particular part of the program, e.g. skip the explanation and go straight to the drill. Teacher control allows the teacher to specify, before a student begins the program, what parts of the program he is to do.

Rate refers to the pace of the presentation, the time allowed to read each display and to answer questions.

Amount refers to the amount of material that is presented in any one branch and how it is controlled. For example, the number of questions done, the number of examples seen, the number of pages read or re-read.

Example:

Sequence-User: The student may elect to skip the instructions and go directly to the drill.

Rate-User: The pace is controlled by pressing the space bar.

Amount-Program: All students do 20 questions in the drill. If the instruction section is chosen, all students see the same number of examples and the same number of pages.

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INSTRUCTIONAL DESIGN EVALUATION.

Write a narrative statement which will evaluate the instructional designs described earlier. Some questions to be addressed include:

Instructional Technique

1. Is the instructional technique appropriate for the target audience?

2. Is the instructional technique effective? Is it appropriate for the intents of the program and the composition of the content?

Student Interaction

3. Is the student interaction appropriate for the target audience?

   - Is the type of interaction appropriate?
   - Does the time required to complete the program exceed the attention span of the intended users?

4. Is the student interaction effective?

   - Is there sufficient interaction to meet the intents of the program? Does the student participate or just watch?
   - Is a consistent type of interaction used?

Feedback Techniques

5. Is the feedback appropriate to the target audience?

6. Is the feedback effective?

   - Are user inputs accurately evaluated as right or wrong?
   - Does the feedback distinguish between a wrong answer and the wrong format?
   - Is the feedback non-threatening, immediate and positive?
   - Is the feedback corrective when necessary?
   - Is the feedback relevant to a student's responses?
   - Are traps set to catch potential errors of any kind?
   - Does the feedback explain why a response is wrong?
   - Are cues or prompts used after a wrong response?
   - Is the feedback to a wrong response unnecessarily attractive?
   - Can the user or the teacher control the feedback (e.g. type, amount, when given)?

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Evaluation
Techniques

7. Is the evaluation technique appropriate to the target audience? Are the criteria for success appropriate for the ability/skills of the intended user?

8. Are the evaluation techniques effective?

   - Is the absence/presence of a post test appropriate to the intents of the program?

   - If present, does the test measure the user's achievements on all the intents?

   - If present, does the test content accurately reflect the content of the material presented?

Branches

9. Are the branches appropriate to the target audience?

10. Are the branches effective in accommodating individual differences? Should there be more? less?

Types of
Control

11. Are the types of control appropriate to the target audience and are they within their capabilities?

    - sequence?
    - rate?
    - amount?

12. Are the types of control effective? Does the user have control of the program when necessary? Can the teacher control the program when necessary?

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D. TECHNICAL DESIGN

COLOUR, SOUND
GRAPHICS

Describe the extent to which colour, sound and graphics are used. (Indicate if the evaluation was done without a color monitor)

TECHNICAL DESIGN
EVALUATION

Write a narrative statement which will evaluate the technical quality of the program. Some questions to be addressed include:

Displays

1. Are displays appropriate for the target audience?
   - Are vocabulary, sentence structure, sentence length, character size and general readability appropriate?

2. Are displays effective?

   - Are they free from grammar, spelling, punctuation and hyphenation errors?
   - Is the amount of material presented at one time appropriate?
   - Is the material clear and easy to read? Is text material too lengthy or wordy? Is there adequate spacing for clarity?
   - Do message design principles place emphasis where the important concepts are? Is scrolling used appropriately so that pertinent information is retained on the screen?
   - Is the transition from display to display smooth, well paced and unobtrusive? Is the user given too little/too much time to read and absorb the information given in each display?

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PROGRAM NAME(S):

INTENTS
    OBJECTIVES: _____ Stated _____ Inferred   Describe the objectives
                                                (Guidebook, page 3)

CONTENT DESCRIPTION
    Describe the program contents: (Guidebook, page 3)

    Describe user support materials (if any):   (Guidebook, page 4)

CONTENT EVALUATION   (Guidebook, page 4)

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INSTRUCTIONAL DESIGN DESCRIPTION

Check the appropriate instructional technique(s) used and comment if necessary:
_____ Drill and Practice _____ Tutorial _____ Simulation _____ Game
_____ Other (specify)

Describe the student interaction in the program: (Guidebook, page 6)

Describe the feedback techniques used in the program: (Guidebook, page 6)

Describe the evaluation techniques used in the program: (Guidebook, page 7)

Describe the branches available in the program: (Guidebook, page 7)

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DISK EVALUATION FORM

DESCRIPTION

Disk Title: _____   Version: _____
Series Title: (if applicable) _____   Cost: _____
Producer: _____
Address: _____   **Programs Included in this Evaluation**
_____   _____
_____   _____
_____   _____
Telephone No.: _____   _____
Subject Area: _____   _____
Topic(s) _____   _____
_____   _____
_____   _____
_____

Specified Users: _____   **Other Components Included in Package:**
_____   _____
Required Hardware and Software: _____
(in addition to an Apple II, 48K, Applesoft,   _____
1 Disk Drive, DOS 3.3, B&W Monitor)   _____

_____   **Available in Languages other than English?**
_____   __ No __ Yes - (specify)
_____   _____

MANAGEMENT SYSTEM DESCRIPTION (Guidebook, page 14)

Is a management system available on this disk? ____   on another disk? ____
Describe the functions available: (if any)

EASE OF USE

Describe any special prerequisites:

How difficult/easy is it for a teacher to use the disk?

DISK CONTENT EVALUATION   (Guidebook, page 4)

DISK INSTRUCTIONAL DESIGN EVALUATION   (Guidebook, page 9)

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DISK TECHNICAL DESIGN EVALUATION   (Guidebook, page 11)

DISK EVALUATION: SUMMATIONAL STATEMENT: MAJOR STRENGTHS AND WEAKNESSES

RECOMMENDATION

I recommend that _____ this disk be evaluated further to determine the full nature of its use. (Prescribed or Recommended)

_____ this disk be considered for supplementary use in the classroom.

_____ this disk be rejected.

I agree that the copywrite to this report rests with Alberta Education and confirm that no attempt was made to copy or modify the program or the accompanying documentation.

Check here if observations   Name of evaluator: _____
of student use were
incorporated into this   Signature: _____
evaluation _____.

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Describe the capacity:

MANAGEMENT SYSTEM EVALUATION (Guidebook, page 14)

Describe the types of control in the program: (Sequence, Rate, Amount)
(Guidebook, page 8)

INSTRUCTIONAL DESIGN EVALUATION   (Guidebook, page 9)

TECHNICAL DESIGN DESCRIPTION
    Describe the use of colour, graphics and sound in the program: (Guidebook, Page 11)

TECHNICAL DESIGN EVALUATION   (Guidebook, page 11)

ADDITIONAL COMMENTS

Colour   3. Are colour, graphics and sound appropriate
Graphics   for the target audience?
Sound

                4. Are colour, graphics and sound used effectively?

                   - Are they used appropriately for the content
                     material?
                   - Is there an option for the use/non-use of
                     sound? Will the sound distract others in
                     the classroom?
                   - Are they appropriately mixed with text so
                     as to give variety to the presentation?
                   - Are the graphics boring? repetitive?
                     too slow?
                   - If colour is present, will the program be
                     effective on a non-colour monitor?

Ease of Use   5. Can the intended user easily and independently
                   operate the program?

                   - Does the operation of the program interfere
                     with the user's concentration?
                   - Is it possible to get lost in the program
                     with no way out?
                   - Are instructions available at likely points
                     and are they appropriate for the target
                     audience?
                   - Can the user exit the program, return to
                     the menu or move to another section easily
                     when necessary?
                   - Is the program reliable and bomb-proof
                     under normal use?

III DISK EVALUATION FORM

A. DESCRIPTION

This section will be completed by the Clearinghouse. Some of the sections are described below.

Series Title
If the disk being evaluated is part of a series, the name of the series will be entered here (e.g. Milliken Math Sequences).

Version
Version number or date of publication.

Cost
The most recent cost as provided by the publisher. This is subject to change without notice by the publisher.

Publisher
Address
Telephone
The original source who produced the package. A telephone number is provided (if possible) so that schools may contact the publisher in order to determine if there is a Canadian distributor.

Specified Users
Grade level, grade range or other ability level indicators for which the package has been specifically intended.

Required
Hardware &
Software
Hardware or software beyond the standard package of 48K, 1 disk drive, 3.3 DOS, B&W monitor.

Programs
Included
A list of titles of each program on the disk. One Program Evaluation Form will generally be completed for each title.

Other
Components
Other components which are included in the package such as a management system, student workbooks or a teacher guide.

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B. MANAGEMENT SYSTEM

FUNCTIONS
DESCRIPTION

Describe the functions available in the management system. These may include:

Class lists: e.g. initiating, maintaining, adding to, deleting from;

Reports: e.g. by individual student, by class, by specific unit;

Prescription: e.g. prescription of specific assignments or a range of assignments for individuals or for the class;

Diagnosis: diagnosis of a student's weaknesses; and

Security: passwords, etc.

CAPACITY

How many students can be kept in one class? How many scores can be kept for one student? Hcw many classes can be kept?

EVALUATION

Write a narrative statement which will evaluate the effectiveness and the ease of use of the management system. Some questions to be addressed include:

1. Do the functions work as described?

2. Is the system effective in meeting the needs of the teacher?

3. How easy is the system to set up and use?

4. Is the capacity sufficient?

5. Is data easily and effectively collected?

C. EASE OF USE

PREREQUISITES   Describe any <u>special</u> prerequisites that are required beyond the normal grade level skills.

TEACHER USE   Evaluate how difficult/easy it is for a teacher to use the package. Consider the amount of documentation and support that comes with the package both inside and outside of the program. Some questions to be considered are:

1. Can a teacher control the pace/difficulty if desired.

2. Do the students require a minimum amount of teacher supervision when using the program?

3. Are error handling and identification procedures sufficiently detailed so that a teacher can help a student?

4. Is the disk adaptable to a variety of classroom learning environments?

5. Does the disk require a minimal amount of equipment manipulation?

6. Can the disk be used by a teacher with a minimum of computer competency?

D. DISK EVALUATION

Evaluative statements in this section cover the entire disk. If there is more than one program on the disk and if two or more Program Evaluation Forms have been completed, this section will include summaries of the evaluative comments made on those forms. If only one Program Evaluation Form has been completed, the reader should be referred to evaluation statements made on that form.

Disk Content - see page four of this guidebook
Disk Instructional Design - see page nine of this guidebook
Disk Technical Design - see page eleven of this guidebook

E. SUMMATION

EVALUATION   Summarize the strengths and weaknesses of the disk.
SUMMARY   Considering the comments made in the sections above, what is your evaluation of the entire disk?

RECOMMENDATION   Check <u>one</u> recommendation. See the guidelines for making recommendations on page sixteen and the necessary features of tutorial/drill programs on page 18.

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IV GUIDELINES FOR MAKING RECOMMENDATIONS

There are no hard and fast rules with which to equate the strengths
and weaknesses of a disk to "the correct recommendation". Recommend-
ations are subjective and will vary from one evaluator to another.
We hope that the degree of variance will be small and that the process
of forming a synthesis from three evaluations will minimize any dif-
ferences that might occur.

However, to keep these variances small and to strive for consistency
across subject and grade levels, it would be advantageous to consider
some guidelines.

Within this instrument, there are two questions which have been addressed
in almost every evaluation section: 1. the appropriateness to the target
audience, and 2. the effectiveness in meeting the intents of the program.
A program that is ineffective should be rejected. On the other hand,
a program which is inappropriate to its target audience may still be
effective for another target audience and could be considered for
limited use (supplementary) in the classroom.

What makes a program ineffective or inappropriate? Certainly the
degree of the weakness has to be considered. A program should not be
rejected because of a minor flaw. The number of weaknesses should
also be considered and a program with 4 or 5 minor flaws may have
its use restricted because of the cumulative effects of small weaknesses.

Major flaws are those which seriously hinder the learning that is
supposed to take place in a program. They are generally in the areas
of "content" and "instructional design". Minor flaws are those which
may slightly detract from the programs effectiveness. They are gen-
erally in the area of "technical design" or are weaknesses in meeting
the needs of the specified users. One minor flaw by itself is not
necessarily cause for a lower rating. Several minor flaws should
result in a supplementary status and more than 5 (arbitrary figure
for the sake of establishing a line) should be cause for rejection.

Examples of major flaws:

1. The sequence of the presentation is ineffective. The program may
   "hop around" dealing with concepts in a disorganized fashion.

2. The sequence of the presentation may completely miss an important
   concept which makes all further explanations confusing to the
   student.

3. The depth of the content may be ineffective. Generally this will
   happen if the concepts are not g   sufficient depth of treat-
   ment, e.g. one page is given when   the necessary. As a
   result, the various topics are presented too rapidly and the user
   has too much material to assimilate at one time.

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4. The depth of the content does not include any (or sufficient) practice.

5. There is insufficient student interaction in the program. Generally the program is a "page turner" or it has limited student interaction even in the drill section.

6. The program accepts incorrect answers or rejects correct answers.

7. Feedback does not go beyond indicating if the answer is right or wrong. There is no explanation available as to why an answer may be wrong.

Examples of minor flaws:

1. Material on the screen is cluttered, poorly displayed.

2. Minor spelling or grammatical errors.

3. Insufficient user support materials.

4. Student interaction is not consistent between pushing return or pushing the space bar.

5. Student is not able to control the number of questions in a drill.

6. Sound is distracting.

7. Graphic displays are too slow.

8. Definition of characters is hard for elementary students to read.

9. Language is too difficult for the intended users.

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V NECESSARY FEATURES OF TUTORIAL/DRILL PROGRAMS

The following should be considered as minimum requirements for tutorial and drill and practice programs. Except in exceptional cases, programs which do not have all seven features described below should be rejected.

1. Orderly Structure

   Questions should be posed in an orderly progression so that the student can learn from the drill. This may be achieved by formatting the material into distinct units or by leading the student through a steadily more difficult series of tasks. Drills which "hop around" or which have "quantum leaps" between the tasks should be rejected.

2. Randomization

   A student should be able to redo the drill a number of times. Ideally, the questions should be different each time. If the nature of the material is such that this is impossible, the questions should be drawn from a bank of questions and should be presented in random order.

3. Appropriate Interaction

   In a tutorial, there should be some interaction between the program and the user.

   In a drill, a user will be inputting answers but the type of interaction can limit a drill's effectiveness.

   a) Multiple choice questions can be ineffective if the user can easily guess the answer without having to do the question. For example, in the problem 10048 minus 2197, all alternatives should have a "1" in the last place. If only one answer does, it can be correctly selected without actually doing the question.

   b) Some interactions test the student's ability to type rather than knowledge of the material.

   e.g. having to type in long, complicated words; timed questions where words or long involved numbers have to be entered; allowing a user only one attempt at a question.

4. Immediate Feedback

   The student should be made aware immediately if he/she is right or wrong. Passing the student on to the next question in a drill after a correct answer has been entered is appropriate if the student is aware that this is how correct answers are treated. If an answer is wrong, there should be some immediate indication that the student's response was wrong.

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5. Accurate Feedback

    Programs should accurately assess the student's input. This includes
    giving the correct answer as well as correctly evaluating a student's
    input. Ideally the program should also distinguish between an
    incorrect response and an incorrect format.

6. Quantitative Feedback

    A program should give the student (and the teacher) the results at the
    end of the drill. Ideally, a user should also know how many questions
    there are in the drill and how many have been done.

7. Restructuring

    When an incorrect response or a sequence of incorrect responses has
    been entered, the student's path through the program should be
    restructured in such a way that he/she learns why the answer was
    wrong. This is a critical element in instruction and unfortunately
    it is often missing in the courseware currently on the market.
    Something more should happen than telling the student what the answer
    should have been. Examples of restructuring are:

    a) Corrective feedback; hints and cues which direct the student on a
    second attempt

    b) Availability of help pages

    c) Remedial loops; a student may be directed to a section of the
    program where further instruction is given (usually at a lower level)
    and/or where other drill questions lead the student through his/her
    weakness.

    d) The program may loop back to a previous page and the student then
    continues from that point. This is not necessarily effective as the
    original explanation may be the reason for the confusion.

    e) The level of difficulty may be changed. This can be effective if
    the student is brought back up to the desired level.

    f) The number of questions may be increased or decreased depending
    upon the student's achievement.

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VI DEFINITIONS

PRESCRIBED LEARNING RESOURCES are those "learning resources approved by
the Minister as being most appropriate for meeting the majority of goals
and objectives for courses, or substantial components of courses, outlined
in provincial Programs of Study".

Evaluators do not have to make this recommendation- it is made by the
Curriculum Committee. Evaluators just make the recommendation that the
courseware is worth looking at by the Curriculum Committee.

RECOMMENDED LEARNING RECOURCES are "those learning resources approved by
Alberta Education because they complement Prescribed Learning Resources
by making an important contribution to the attainment of one or more of
the major goals of courses outlined in the provincial Programs of Study".

As with prescribed materials, evaluators only recommend that specific
courseware be examined further. This examination may result in a prescribed
status, a recommended status or even a supplementary status.

SUPPLEMENTARY LEARNING RESOURCES are "those additional learning resources
identified by teachers, school boards or Alberta Education to support
courses outlined in the provincial Programs of Study by reinforcing or
enriching the learning experience".

Teachers may identify supplementary resources but this category should
not be a dumping ground for all courseware that is less than "Recommended".
Courseware in this category should still be effective, it should meet the
needs of some target audience (perhaps not the target audience specified)
and it should support some of the goals of the curriculum. The range of
potential use of the courseware may be limited, but what it does cover,
it covers effectively.

VII GLOSSARY OF TERMS

In the fields of microcomputers and education, terminology can easily be
misinterpreted. So that everyone using the Guide will interpret words in
the same way, a brief glossary is provided below. Each definition conforms
to some standard use of the term but is not necessarily a composite of all
uses nor the most common use.

Content   Facts, terms, ideas, concepts, principles, theories and
                  contructs which make up the subject matter of an instructional
                  package.

Courseware   Software and printed materials which support instruction in
                  a complete course of study or a definite subset of a course.
                  In this sense, it is not required that all instructional
                  activities be supported by the package or that the tutorial
                  mode of instruction be employed. Even a 30 minute student
                  activity aimed at one objective can be courseware in this
                  definition.

Documentation   Written material for the teacher to use with the computer
                  program (also called a support booklet).

DOS   "Disk Operating System", an operating system which includes
                  the capability of controlling and coordinating the functions
                  of a disk drive within a computer system.

Drill &   A type of computer program which acts as drillmaster by
Practice Mode   providing repetitive practice on a skill or set of facts.
                  The mode assumes that instruction in the concept skill or
                  process has already been given. Ideally a drill and
                  practice program should: 1) provide random selection of
                  exercises; 2) record student progress; 3) tailor instruct-
                  ions, exercises and feedback to the individual; and 4) offer
                  corrective feedback upon the input of incorrect responses.

Games   Programs in the instructional gaming mode call upon the user
                  to apply one or more specific skills or concepts within a
                  "game" environment. The game dimension of the environment
                  includes the conditions of competition with self or others,
                  specific (if arbitrary) rules, the need to develop a winning
                  strategy and the introduction of random events to force
                  revision of strategies. The instructional dimension of the
                  environment demands that the development both of identifiable
                  subject matter skills or concepts and of general problem
                  solving skills be a goal of the exercise.

Graphics   Images displayed on a video screen or printer which are
                  generated by a computer program.

Hardware   Equipment, including computers; disk drives, cassette players,
                  cables and monitors.

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Materials   Books, folders, envelopes, worksheets and similar items.
"User Support Materials" are items which support the
activity of a person using a computer program.

Microcomputer   A computer system, including peripheral hardware such
as disk drive and monitor, based on a microprocessor
(or "chip") and having a typewriter-like keyboard.

Package   One or more computer programs with related materials and
the storage medium.

Problem Solver   A type of computer program which processes data for a
student defined problem.

Program   A computer program, written in Basic, Pascal, machine
code or other computer programming language. The routines
and operations which instruct the computer.

Simulation   Programs in the simulation mode attempt to represent key
aspects of some environment within which the user will
experience the necessity of making decisions and will be
informed of the results of his decisions without experi-
encing the real consequences of possible misjudgements.
The time required to develop and use simulations is
justified in situations where actual experience is ruled
out due to extreme expense, safety consideration or the
time required for the actual experience. Simulations
include problem solving tasks (e.g. diagnosis of illnesses,
genetic experiments, testing theoretical models),
procedural tasks (e.g. acid titration, blasting, breeding
of organisms), or performances (e.g. control of water
pollution).

Software   Computer programs, including courseware, operating systems
and languages.

Tutorial   For programs in this mode, the computer assumes the total
responsibility for instruction. Tutorials are characterized
by a dialogue between the student and the computer in which
the direction and the level of the dialogue are shaped by
the student's input. Ideally, tutorials should tailor and
present instruction to the individual, introduce new
concepts, provide exercises and tests, monitor student
responses, give immediate reinforcement and corrective
feedback, and keep records.

Some definitions in this glossary have been taken from Evaluator's Guide
published by MicroSIFT and The Computing Teacher.