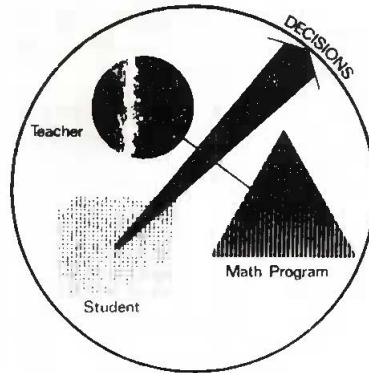


A Guide For Evaluating School Mathematics Programs and Textbooks



- Irvin K. Burbank

This guide is intended to assist school personnel in assessing and selecting elementary mathematics programs that will best meet their educational needs. It is designed to evaluate mathematics programs by rating desirable features within each of the following categories:

- A. Content
- B. Teacher's Edition
- C. Manner of Presentation
- D. Organization
- E. Physical Characteristics

The evaluator rates the program from 0 to 5 as it meets the desired specifications of each item:

- 0 - missing
- 1 - poor
- 2 - fair
- 3 - good
- 4 - very good
- 5 - excellent

An importance factor, ranging from 1 to 4, is attached to each item. It merely evaluates the significance of the concept or idea being reviewed.

Example:

	Importance factor	Rating	Points
The teacher's edition provides suggestions for flexible use of the program to meet individual needs.	3	2	6

In the example, the item has an importance factor of 3. (Importance factor X rating = points.) The evaluator gave the program a rating of 2, resulting in 6 points.

NOTE -

1. The value of the importance factors is only a suggestion. If the evaluating

team feels the factor should be greater, or less, they may change it to satisfy their judgment.

2. The evaluating team may delete any item they feel does not apply or is not important. Space is left at the end of each category for the evaluators to add items considered to be important.

3. If the evaluating team has a minimal mathematics background and the period for evaluation and decision making is short, it may be more expedient to start the evaluation at Category B, "Teacher's Edition," and leave Category A, "Content," to the last.

Text Being Evaluated

Publisher

A. CONTENT AND SCOPE OF THE PROGRAM

I. Numbers and Operations

Goal: The learner will understand the structure of number systems and will be able to effectively use the four fundamental mathematical operations in the analysis and solutions of mathematical problems.

The program includes:

- A-1. The development of number concepts, counting and order through investigation of one-to-one correspondences between sets of objects.
- A-2. The number line and plane to be used as model for developing understanding of numbers and operations on numbers.
- A-3. The properties of closure, commutativity, associativity, distributivity, inverse and identity elements as an integral part of the understanding and development of each number system. The concepts of "less than" and "greater than" as they relate to whole numbers and fractional numbers.
- A-4. Development of the four fundamental binary operations of addition, subtraction, multiplication, and division and their interrelation.
- A-5. Exposure of the multiplication structure of numbers such as factoring and prime numbers.
- A-6. Ratios, rates and percent as special use of rational numbers.

Importance Factor	Rating	Points
4		
4		
4		
4		
3		
4		

A-7. The development and expansion of the number systems from the naturals to whole to the rationals to the reals.

A-8. A sound development of place value in the decimal numeration system, with a brief exposure to other numeration systems for further understanding of the decimal system.

A-9.

A-10.

Importance Factor	Rating	Points
3		
4		
Numbers and Operations Subtotal		

II. Geometry

The content includes:

A-11. An informal intuitive development of geometric concepts of point, line, space, and shapes.

A-12. An introduction of geometry in the primary grades through the use of manipulative aids and physical objects and figures.

A-13. Classification of geometric shapes and configuration based upon a variety of attributes and the development of short chains of deductive reasoning.

A-14. Introduction of similarity and congruence.

A-15. Geometric constructions and drawings.

A-16. The development of coordinate geometry through the use of games and activities, growing into the graphing of simple mathematical relations.

A-17. Metric geometry relationships involving activities of measurement of length, area, volume, and angles.

4		
4		
4		
3		
3		
3		
3		

- A-18. Concepts of inside, outside, or the boundary of a region of simple closed curves.
- A-19.
- A-20.

Importance Factor	Rating	Points
4		
Geometry Subtotal		

III. Measurement

Goal: The learner will develop an understanding that measurement is a process of comparing a common attribute of two objects.

The content includes:

- A-21. The development of concepts of measurement through student activities involving measuring processes.
- A-22. Activities of gathering, recording and manipulating data from our physical world.
- A-23. The development of measurement as a function of comparing the attributes of two objects and assigning numbers to the objects which reflect the attribute.
- A-24. The development of units of measurement from choice of units to the introduction of arbitrary units to the development of standard units of measurement.
- A-25. Exposure to both English and metric system of measurement.
- A-26. Experiences of estimating and understanding the approximate nature of measurement
- A-27. Development and use of measurement formulas for determining volume, area, length.
- A-28. Activities bridging the measurement and geometry strand.
- A-29.

4		
3		
4		
4		
3		
2		
3		
2		

A-30.

Importance Factor	Rating	Points
Measurement Subtotal		

IV. Application

Goal: The learner will be able to recognize (identify) and abstract the mathematical features in problems which arise in a context of some natural event, and fit these features into (a) mathematical model(s).

The content includes:

A-31. Application of mathematical principles and concepts to the real world, both physical and social.

A-32. Open-ended application for the encouragement of divergent things.

A-33. Application of real problems as seen by the student.

A-34.

A-35.

4		
3		
3		
Application Subtotal		

V. Probability and Statistics

Goal: Given specific types of data, the learner will be able to make intelligent assessment of the information collected/derived therefrom.

The content should include:

A-36. Experiences in collecting, organizing and interpreting data.

A-37. Development of the concepts of measures of central tendency as models for interpreting data.

A-38. A basic exposure to variance and deviation as aids to interpret data.

A-39. Experiences of making predictions from data.

4		
2		
2		
3		

- A-40. Development of concepts of elementary probability as they pertain to chance.
- A-41.
- A-42.

Importance Factor	Rating	Points
3		
Probability and Statistics Subtotal		

VI. Sets

Goal: The learner will be able to use sets and set notation to aid mathematical communication and to gain clarity, precision and conciseness.

The content includes:

- A-43. An informal introduction and development of set concepts.
- A-44. Activities and situations where sets and set concepts are used as physical models as a basis for understanding number concepts.
- A-45. The terminology of sets, developed and used when appropriate in facilitating the learning of other mathematical concepts.
- A-46. Activities involving set operation of union, intersection, cross-product, and differences.
- A-47.
- A-48.

3		
4		
3		
3		
Sets Subtotal		

VII. Functions and Graphs

Goal: The learner will be able to determine how a given data is related to another data.

The content includes:

- A-49. Activities and common situations which serve as models and illustrations of function and relation concepts, i.e., number patterns.
- A-50. Development of concepts of function through activities involving measurement.
- A-51. The various ways in which a function can be expressed, i.e. graphs, tables of value, ordered pairs and equations.
- A-52. Construction and interpreting information expressed in graphs.
- A-53.
- A-54.

Importance Factor	Rating	Points
4		
4		
3		
4		
Functions and Graphs Subtotal		

VIII. Logical Thinking

Goal: The learner will be able to organize his thought processes in solving problems.

The content includes:

- A-55. Development of informal logic concepts through the process of decision making such as in classification of objects according to attributes, i.e. using such words as and, or, some, all, none, etc.
- A-56. A development of logic from an informal decision making to arguments in the form of short chains of deductive reasoning to a semi-formal treatment at the upper elementary level.
- A-57. The meaning and power of the little words such as and, or, all, none, some, if, then, not, etc., as they are used in decision making and problem solving.
- A-58. Development of elementary deductive reasoning skills.
- A-59. Development of elementary deductive reasoning skills at the early grades by drawing generalizations based on study and observation of models, patterns and relations.

4		
3		
3		
2		
2		

A-60.

A-61.

Importance Factor	Rating	Points
Logical Thinking Subtotal		

IX. Problem Solving

Goals: The learner will be able to:

1. Identify problems
2. Select Pertinent information
3. Translate into mathematical language
4. Select an approach (or approaches)
5. Perform mathematical calculations
6. Interpret solution in terms of the conduct of the problem
7. Develop strategies (models) for future problems

The content includes:

- A-62. Practice exercises for continuous reinforcement of problem solving skills.
- A-63. Development of a variety of problem solving strategies and tactics.
- A-64. Problem solving situations that are meaningful and of interest to the student.
- A-65. Situations which stress the process as well as the product of problem solving.
- A-66. Open-ended problem which would challenge and encourage the student to carry on further investigation.

A-67.

A-68.

4		
4		
4		
3		
4		
Problem Solving Subtotal		

B. TEACHER'S EDITION

Inasmuch as the elementary teacher is required to be knowledgeable in a number of subject areas, it is suggested that the mathematics program adopted be one which would be the best aid and helper to the teacher.

The teacher's edition contains:

- B-1. Adequate information about the mathematical background underlying each mathematics lesson.
- B-2. Lists of concepts and skills presented at each grade level and pages and lessons where they are taught.
- B-3. A summary of the scope and sequence of the entire elementary mathematics program.
- B-4. Glossaries, indices and answers in a format convenient for the teacher's use.
- B-5. Reproduction of pages of student text material.

Importance Factor	Rating	Points
4		
3		
2		
3		
2		

-it provides suggestions for:

- B-6. Flexible use of the program to meet individual needs.
- B-7. Sources and use of instructional aids.
- B-8. Ways teachers may utilize natural, everyday situations and data in motivating students' interest and making the mathematics more meaningful.
- B-9. Avoidance of rigidity. This would help the teacher understand that mathematical symbols, notations and terminology sometimes have more than one interpretation, definition and use.
- B-10. Variety of approaches in teaching or presenting a given concept or skill.
- B-11. Evaluating pupil achievement at points throughout the mathematics program, i.e., review quizzes and cumulative review quizzes.
- B-12.
- B-13.

3		
3		
2		
3		
4		
4		

Teacher's Edition Subtotal

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C. MANNER OF PRESENTATION

Pedagogy

- C-1. The instructional materials should encourage and facilitate active involvement.
- C-2. Problems which are task-oriented and commensurate with students' maturity, should be provided at all grade levels.
- C-3. Self-checking devices, such as some answers or illustrations, should be provided to prevent reinforcement of errors.
- C-4. Correct mathematical vocabulary appropriate to the grade level is developed and used with understanding, but it is not to be unduly stressed.
- C-5. Exposition and vocabulary should be such that difficulty in language and reading skills does not extensively interfere with students' learning of mathematical concepts.
- C-6. Adequate problems and exercises should be included. Introduction, reinforcement, diagnosis, and reviewing in each area.
- C-7. Concept development generally moves from the concrete through semi-concrete to the abstract.
- C-8.
- C-9.

Importance Factor	Rating	Points
4		
4		
3		
4		
4		
4		
4		
Manner of Presentation Subtotal		

D. ORGANIZATION

- D-1. The mathematical concepts should be presented in a spiral organization throughout the entire elementary mathematics program and within the text of each grade level.
- D-2. Suggestions for introductory activities related to the Strands for initial learning, and reintroduitory activities for review and re-teaching are included in both teacher and student texts.

4		
4		

- D-3. Textbooks should provide learning situations whereby the Strands reinforce, complement and supplement each other.
- D-4. Practice activities should be appropriately spaced throughout the program to maintain skills and understanding of previous learning.
- D-5. Adequate practice activities (both written and oral) provided at each level, and related to prior learning.
- D-6. Vocabulary, symbolism and notation should be consistent throughout the program.
- D-7. Materials and activities should be provided and organized and presented in a way to meet individual differences.
- D-8. There should be a humanizing element in the program by making interesting historical references (where appropriate) to the development and uses of mathematical ideas.
- D-9. Student and teacher texts should include indices, tables of glossaries, tables of content and, where appropriate, cross-references.
- D-10.
- D-11.

Importance Factor	Rating	Points
4		
4		
3		
3		
2		
2		
2		
Organization of the Program Subtotal		

E. PHYSICAL CHARACTERISTICS

- E-1. Art and color is functional as well as motivating.
- E-2. Type size is appropriate for each grade level.
- E-3. Each lesson is self-contained on one page.
- E-4. Directions for student exercises are clearly and simply written.

- E-5. Format of each page is attractive and not unduly crowded.
- E-6. Illustrations are consistent with the content.
- E-7. The student text is a size and shape easily handled.
- E-8.
- E-9.

Importance Factor	Rating	Points
Physical Characteristics Subtotal		

SUMMARY

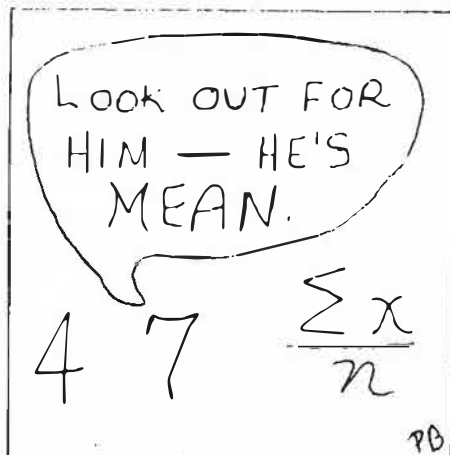
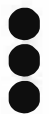
	Subtotals
A. Contents	
I. Numbers and Operations	
II. Geometry	
III. Measurement	
IV. Application	
V. Probability and Statistics	
VI. Sets	
VII. Functions and Graphs	
VIII. Logical Thinking	
IX. Problem Solving	
B. Teacher's Edition	
C. Manner of Presentation	
D. Organization	
E. Physical Characteristics	
TOTAL	

Text Title

NOTE:

The bulk of the information in this guide originated in the revision program of the California Elementary Mathematics Program, during which time the author was Mathematics Consultant for Los Angeles County Schools, and an advisor to the California State Curriculum Commission.

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