DOCUMENT RESUME

ED 295 788 SE 049 074

TITLE	Evaluation of Two Rough-Cut Programs from "Solve-It." Research Report Number 98.
INSTITUTION	Agency for Instructional Technology, Bloomington, IN.
PUB DATE	Mar 87
NOTE	19p.; Some illustrations may not reproduce well.
AVAILABLE FROM	Agency for Instructional Technology, Box A, Bloomington, IN 47402 ($2.50).
PUB TYPE	Reports - Evaluative/Feasibility (142) -- Reports - Research/Technical (143)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Educational Technology; *Educational Television; Elementary Education; *Elementary School Mathematics; Geometric Concepts; Mathematics Curriculum; Mathematics Education; *Mathematics Instruction; *Measurement; *Problem Solving; Tables (Data); Volume (Mathematics)

ABSTRACT

This report describes the evaluation of two video programs from "Solve It," a sixth-grade mathematics series. The 18-part series is designed to improve students' critical thinking and problem-solving skills in mathematics. The purpose of the evaluation was to determine the instructional effectiveness and appeal of two rough-cut programs, "Geometry and Measurement: Measuring Volume," and "Problem Solving: Drawing and Interpreting Tables and Diagrams." The programs were shown to fifth- and sixth-grade students at nine schools in Illinois, Indiana, New Jersey, and New Mexico. In nearly all cases, evaluators obtained both student and teacher comments and scores from tests given before and after viewing. Reviewers found "Measuring Volume" to be both instructionally effective and enjoyable to watch. Students had a hard time understanding certain parts of "Drawing and Interpreting Tables and Diagrams." Teachers and students found the information too technical to grasp in such a short time. (PK)

Research Report

Number 98

Evaluation of Two Rough-Cut Programs

from

Solve It

March 1987

agency for instructional technology
box a, bloomington, indiana 47402

Research Report #98

Evaluation of Two Rough-cut Programs from

Solve It

March 1987
Agency for Instructional Technology

Contents

Acknowledgements

The AIT evaluation team would like to thank all who participated in this evaluation. In particular, we would like to thank Elaine Harbison and Georgeann Burch (WILL-TV) for making all the necessary arrangements for AIT's evaluation of rough-cuts in the Champaign/Urbana, Illinois, area. Special thanks are also due Hilde Howden (Albuquerque, New Mexico), who conducted evaluations of rough-cuts in Albuquerque schools. Our thanks also go to Mary Lou Hamill and Stephanie Harakal (NJN, New Jersey) who organized and led evaluations in New Jersey.

Summary

This report describes the evaluation of two video programs from ***Solve It***, a sixth-grade mathematics series under development by the Agency for Instructional Technology in Bloomington, Indiana. The 18-part series, available in September 1987, is designed to improve students' critical thinking and problem-solving skills in mathematics. The purpose of the evaluation was to determine the instructional effectiveness and appeal of two rough-cut programs, "Geometry and Measurement: Measuring Volume" and "Problem Solving: Drawing and Interpreting Tables and Diagrams." To this end, the programs were shown to fifth- and sixth-grade students at nine schools in Illinois, Indiana, New Jersey, and New Mexico. In nearly all cases, evaluators obtained both student and teacher comments and scores from tests given before and after viewing.

Reviewers found "Measuring Volume" to be both instructionally effective and enjoyable to watch. At several schools, students commented that the program made learning about volume more interesting. Students liked the fact that the characters were near their own ages. Both students and teachers enjoyed the "real-life" example that explored the increasing volume of Utah's Great Salt Lake.

Students had a hard time understanding certain parts of "Drawing and Interpreting Tables and Diagrams." In the program, students in a school photography club discover the advantages of using tables to determine optimal shutter speeds and aperture settings. Teachers and students found the information too technical to grasp in such a short time (i.e., in the context of a 15-minute program). Similarly, students found the "real-life" segment on renovation of the Salt Lake City Courthouse to be overly technical and not very interesting.

Background

Solve It is the sixth-grade component of the elementary mathematics video series begun with ***It Figures*** and ***Math Works***. The latter two series, developed by the Agency for Instructional Technology (AIT) and consortia of state and provincial education agencies, are currently in use throughout the United States and Canada.

The elementary mathematics projects grew out of recommendations made by the National Council of Supervisors of Mathematics (NCSM) and the National Council of Teachers of Mathematics (NCTM). The following three concerns were deemed critical.

1. Problem solving must be the focus of school mathematics in the 1980s.
2. The concept of basic skills in mathematics must encompass more than computational facility.
3. Mathematics programs must take full advantage of the power of calculators and computers at all grade levels.

Both ***It Figures*** (fourth-grade) and ***Math Works*** (fifth-grade) have as their central goal the development of particular problem-solving skills. These skills include using a table, drawing a picture of a problem, using mental computation, using estimation, and recognizing necessary information. The application of problem-solving skills to real-life situations is the main emphasis of the instructional materials in ***It Figures***, ***Math Works***, and now in the sixth-grade project, ***Solve It***.

Each of ***Solve It***'s 18 programs illustrates different techniques and skills for problem solving. The programs are designed to cover the range of mathematical skills represented in the most recent NCSM list.* Specifically, the programs guide students by showing first a real-life situation in which some problem is present, and then demonstrating appropriate techniques for finding a solution.

Methodology

Formative evaluation of individual programs from ***Solve It*** began in August 1986 when the first scripts were sent to the field for review. To date, scripts for 17 of the 18 programs have been evaluated by consortium representatives, content experts, and teachers.

Near the end of January 1987, rough-cut versions of "Measuring Volume" and "Drawing and Interpreting Tables and Diagrams" were shown to classes in nine schools throughout Indiana, Illinois, New Jersey, and New Mexico. A team of two AIT evaluators presented the programs in Indiana and Illinois schools. Evaluations in New Jersey and

* National Council of Supervisors of Mathematics. "Position Paper on Basic Mathematical Skills", 1976. Reprinted in *Arithmetic Teacher*, October 1977, 25:18-22; *Mathematics Teacher*, February 1978, 71:147-152.

New Mexico were conducted by ITV coordinators and assistants. (A list of participant schools appears in Appendix A.)

Each evaluation involved 1) a pretest, 2) pre-viewing discussion, 3) viewing of the program, 4) a posttest, and 5) classroom discussion. The pretest was given to students by their teachers three to five days in advance. Questions were based on concepts and information from the program. (A copy of each pretest/posttest appears in Appendices B and C. Pretest and posttest scores are listed in Appendix D).

The purpose of pre-viewing discussion was to get students to feel comfortable talking Students were asked what sorts of television shows they enjoy, what they think of instructional television they have seen, and so forth. During the discussion, evaluators asked students to be "TV critics" and to be honest in their reactions.

Each of the two ***Solve It*** programs was approximately 15 minutes long. During viewing, evaluators tried to make themselves inconspicuous while noting students' reactions (e.g., inattention and boredom). After each program, the posttest was administered.

Next, evaluators discussed the program with students. Several general questions were considered: "What did you like about the program?" "What didn't you like about the program?" "Did you like the characters?" "Was the program interesting?" "Do you think the program helped you learn about the intended topic?" Students were encouraged to elaborate on their responses.

Comments on 'Measuring Volume'

The majority of students liked this program very much. Many commented that they could identify with the main characters, who seemed to be near their own ages. Some liked that the program was "up-to-date" (i.e., contemporary clothes, etc.). Others said they thought the humor was good.

A number of students thought "Measuring Volume" made studying volume more interesting. Some comments were, "I liked it very much....It made the subject more interesting"; "I liked the film and think that people who don't know what volume is will

learn from the program"; "I thought...it was easy to understand and it had different ways of showing how to use volume."

Students were asked to comment specifically on the different segments. In the first story, the main character needs to buy a new aquarium and is trying to decide how big it should be. She must compare the volume of two aquariums, each with a different shape. The second story illustrates the concept of cubic units. A young person working in her father's sporting goods store has to determine how many cases of baseballs to buy to fill a certain amount of shelf space. Her solution is to measure the amount of space in terms of "cubic baseball boxes." In the "real-life" segment, a narrator considers the problem of the steadily increasing volume of Utah's Great Salt Lake.

In general, students liked all three segments. They especially enjoyed the Great Salt Lake and baseball box examples. Students commented that the illustrations approach volume in slightly different ways, helping them understand how volume is a measure of space. The Great Salt Lake example was appealing to students because it included topics that normally would not be presented in a math lesson (e.g., how the volume of the lake changes over time, problems created by the lake's increasing volume).

After viewing, several different classes responded with the correct formula for volume (length x width x height). Most classes responded correctly on the posttest that volume is a measure of space. One student recalled during post-viewing discussion that volume is measured in cubic units.

The dialogue at the beginning of the program seemed artificial to some students, "like the actors were just reading their lines." One boy said it was unrealistic that the boy in the baseball segment "just happened" to be carrying a calculator with him. According to one class, the hosts were "stiff." Another class said the hosts "talked too fast."

The only other negative reaction concerned the mechanics of the production. Even though students were reminded that the program was in rough form (i.e., numbers on the screen, extraneous noises and comments, no music, etc.), they still were bothered by it. In particular, they found the blank screens for graphics inserts distracting.

Comments on 'Drawing and Interpreting Tables and Diagrams'

Students and teachers did not like this program as much as "Measuring Volume." They did like the characters and one of the segments, but found two of the segments overly technical.

One story line, divided into two parts, runs through this program. A school photography club has received a donation of photography equipment. The students have everything they need to set up a darkroom and start taking pictures; however, not one of the students knows anything about photography. The teacher suggests that they work in two teams, one to set up the dark room, the other to learn about taking pictures. The first team discovers that making a diagram will help them set up the darkroom. The other team learns that, to take good photographs, it is useful to make a table to keep track of shutter speeds and aperture sizes.

In general, students found these examples helpful in showing how and when to use tables and diagrams to solve problems. Students said they liked the characters, particularly because they seemed to be near their own ages. Both teachers and students liked the way the characters worked together to solve problems; students singled out the episode in which characters use a diagram to fit a table and counter into a bathroom/darkroom. One class said the use of a mathematical table in the shutter speed/aperture example was a good illustration of when to use a table and how to set it up.

The idea of shutter speed needed clarification, students said. Moreover, they found there simply was not enough time to absorb the information presented in the photography segment (i.e., shutter speed and aperture size and how both of these factors relate to taking a good picture). Some students thought more explanation was needed for the concepts to be clear, while others were bothered by "too much detail." Students said too much time was spent on the technical aspects of photography and not enough on using tables and diagrams.

The documentary segment on the courthouse renovation didn't appeal to students. One boy commented, "Windows aren't really very interesting unless you're an architect or you're an adult building your own home." The discussion in this segment was hard for students to understand; many said the example seemed aimed more at adults than at young people. They also found the diagrams hard to see.

Some students didn't understand what was happening at the beginning of the program. They commented that it would be better to show more clearly that this was a school photography club and that the photography equipment had been donated.

Several students seemed confused about the notion of a "school club" (i.e., a group of students with a common interest led by an interested teacher). Mr. Sanchez's character seemed "weak" to some students because he did not know anything about photography.

Because the rough-cut was chopped at the end, students and teachers did not know how the last segment ended. In general, viewers said the program would be much more appealing when the "finishing touches" were added (i.e., music, sound, ending, etc.).

Summary of Pretest/Posttest Results

As a means of measuring the instructional effectiveness of the two programs, a pretest/posttest was developed for each (see Appendices B and C). The pretest was given to students several days in advance. Students took the test with no specific instructions except that their scores would not go to their teachers and they were not being graded. Students were made to understand that *they* were the critics.

The test on "Measuring Volume" had six questions on which scores were based; the test on "Drawing and Interpreting Tables and Diagrams" had nine. Test results for "Measuring Volume" were significant (see Appendix D). On the pretest, the average score of students in eight schools combined was 3.2 out of 6, or about 50 percent. The average on the posttest was 4.7 out of 6, or about 80 percent. There also was a significant jump in score in each school—the smallest increase was just over one point (Leal Grade School), and the largest almost two points (Ridge Avenue Middle School).

Test results on "Drawing and Interpreting Tables and Diagrams" were inconclusive; in individual cases, and as averages, pretest and posttest scores were nearly identical. Moreover, students got almost all of the questions correct on the pretest. These results suggest an innate difficulty in constructing a substantive test on this material.

Conclusion

Teachers and students found "Measuring Volume" to be more effective and appealing than "Drawing and Interpreting Tables and Diagrams." One primary reason for the difference was the documentary segment in each; the Great Salt Lake example intrigued students, but the courthouse renovation segment did not. The story lines in "Measuring Volume" were very clear, students said, but the vignettes in "Drawing and Interpreting Tables and Diagrams" were harder to follow. The technical nature of the dialogue in parts of "Drawing and Interpreting Tables and Diagrams" also was hard for students to understand.

Two other general observations apply to both programs. Students liked the characters very much (with some reservations about Mr. Sanchez and the heavy-set boy in "Drawing and Interpreting Tables and Diagrams"), particularly because they seemed to be near their own ages. All classes felt that both programs would be more appealing after the "finishing touches" were added.

Appendix A

Participant Schools

Illinois

Chenoa Grade School, Chenoa
Jefferson Grade School, Charleston
Leal Grade School, Urbana

New Jersey

Newbury School, Howell
Peter Muschal Elementary School, Bordentown
Ridge Avenue Middle School, Neptune

New Mexico

Hayes Middle School, Albuquerque
Truman Middle School, Albuquerque

Indiana

Marlin Elementary School, Bloomington*

* Students at Marlin did not take the pretests and posttests.

Appendix B

Pretest/Posttest for 'Measuring Volume'

School _____ _____

Grade _____

Solve It: 'Measuring Volume' Pretest/Posttest

Directions: Select the answer that is the best way to answer the question and place the corresponding letter in the blank on the left side of the page.

_____ **1.** Do you like math?

a. yes, a lot
b. yes, a little
c. no, not very much
d. no, not at all

_____ **2.** Volume is a measure of _____.

a. space
b. area
c. perimeter
d. diameter

_____ **3.** To calculate the area of a rectangle, you need to know its _____.

a. perimeter
b. surface
c. length and width
d. diameter

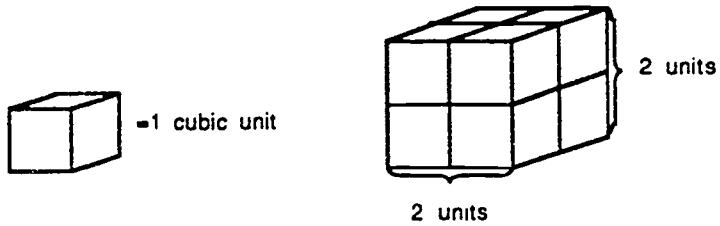
_____ **4.** Volume is measured in _____.

a. square units
b. linear units
c. cubic units

_____ **5.** What is the formula for calculating the volume of a box shape?

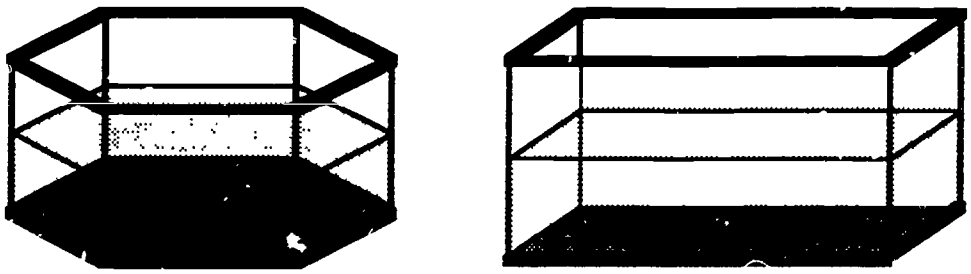
a. length x width x height
b. lenth x width
c. 1/2 x length x height

_____ **6.** What is the volume of the larger box shape?



a. 4 cubic units
b. 8 cubic units
c. 16 cubic units
d. can't tell

_____ **7.** How would you compare these aquariums to see which has more volume?



a. Use the formula for calculating the volume of a box shape.
b. Use a measuring cup to see which holds the most cubic centimeters.
c. You cannot compare the volumes of these two aquariums because they have different shapes.

Appendix C

Pretest/Posttest for 'Drawing and Interpreting Tables and Diagrams'

School _____

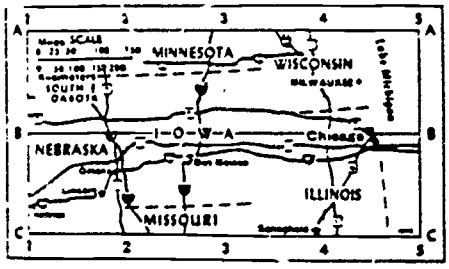
Grade _____

Solve It: 'Drawing and Interpreting Tables and Diagrams' Pretest/Posttest

Directions: Select the answer that is the best way to answer the question and place the corresponding letter in the blank on the left side of the page.

_____ **1.** The information below is in the form of a _____.

a. table
b. diagram
c. map



_____ **2.** The information below is in the form of a _____.

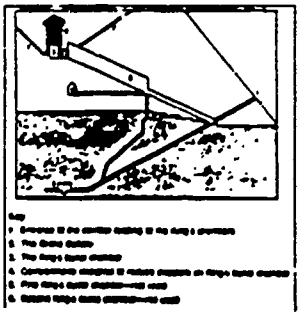
a. table
b. diagram
c. map

LIFE EXPECTANCY

ASIA		AFRICA		EUROPE		SOUTH AMERICA		NORTH AMERICA	
Bangladesh	38	Chad	32	Albania	66	Argentina	68	Canada	69
Burma	50	Egypt	53	Austria	72	Bolivia	47	Mexico	62
China	61	Kenya	49	Denmark	73	Brazil	59	U.S.A.	73
India	41	Mali	38	Netherlands	74	Guyana	61		
Israel	71	Togo	35	Poland	70	Paraguay	62		
Japan	74	Upper Volta	31	Sweden	75	Uruguay	68		
		Zambia	45						

_____ **3.** The information below is in the form of a _____.

a. table
b. diagram
c. map



_____ 4. Tables and diagrams are useful because they _____.

a. make information easy to understand
b. mix different kinds of information together
c. contain only the information we need

_____ 5. The information that consists mainly of pictures should be put in the form of a _____.

a. table
b. diagram
c. map

_____ 6. The information that consists mainly of many repeated items should be put in the form of a _____.

a. table
b. diagram
c. map

_____ 7. To put all the parts of a model airplane together correctly, we need a _____.

a. table
b. diagram
c. map

_____ 8. To find out the rate for making a long-distance call, we need a _____.

a. table
b. diagram
c. map

_____ 9. We use tables and diagrams when we _____.

a. have no information we need
b. can put the information we need on a piece of paper
c. try to solve a problem which is too confusing

End of Test

Appendix D

Test Score Data

Tables and Diagrams

	Pretest			Posttest		
Schools	**No. of Students**	**Raw Total**	**Average**	**No. of Students**	**Raw Total**	**Average**
Newbury	31	217	7.0	30	216	7.2
Peter Muschal	23	188	8.2	23	186	8.1
Jefferson	55	412	7.5	54	422	7.8
Chenoa	37	285	7.7	36	277	7.7
Leal	0	0	0.0	0	0	0.0
Truman	23	139	6.0	21	117	5.6
Ridge Avenue	26	202	7.8	26	211	8.1
Hayes	22	149	6.8	23	173	7.5
Totals	217	1,592	7.3	213	1,602	7.5

Measuring Volume

	Pretest			Posttest		
	No. of Students	**Raw Total**	**Average**	**Score Students**	**No. of Total**	**Raw Average**
Newbury	31	90	2.9	30	132	4.4
Peter Muschal	23	76	3.3	23	114	5.0
Jefferson	0	0	0.0	0	0	0.0
Chenoa	0	0	0.0	0	0	0.0
Leal	46	179	3.9	47	239	5.1
Truman	23	60	2.6	19	82	4.3
Ridge Avenue	25	78	3.1	25	127	5.1
Hayes	23	57	2.5	25	107	4.3
Totals	171	540	3.2	169	801	4.7

Together...serving education.

Printed in U S A