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ABSTRACT

This report describes one of a series of pilot studies that were conducted to evaluate the instructional effectiveness of the Harcourt Math Program. Harcourt School Publishers (HSP) contracted with the Educational Research Institute of America (ERIA) to conduct a series of independent pilot studies to evaluate the effectiveness of the Harcourt Math Program. HSP sought out volunteer teachers to participate in the study, the Harcourt Department of Test Services scored the standardized tests, and ERIA conducted the study and analyzed the data that were collected. The study described in this report was conducted during the spring of the 1999-2000 school year. Research questions included: (1) Is the Harcourt Math Program instructionally effective?; and (2) Do selected chapters significantly increase students' understanding of key math skills, concepts, and strategies as measured by the program's chapter tests and by standardized achievement tests (i.e.; Stanford)? A total of three teachers from grades 2, 5, and 7 volunteered to participate in the study. A quasi-experimental pretest-posttest design was used. Before instruction began, students were administered two pretests. The increase in test scores on the nationally standardized tests, the Stanford Achievement Tests, and on the Harcourt Math Assessment were both positive and statistically significant for all subtests and total test scores at grades 2, 5, and 7. (ASK)

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A Summary Report of the Instructional Effectiveness of the *Harcourt Math Program*

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A Study of the Instructional Effectiveness of the Harcourt Math Program

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This report describes one of a series of pilot studies that were conducted to evaluate the instructional effectiveness of the *Harcourt Math Program.*

Background Information

Harcourt School Publishers contracted with the *Educational Research Institute of America* (ERIA) to conduct a series of independent pilot studies to evaluate the effectiveness of the *Harcourt Math Program.* Harcourt School Publishers sought out volunteer teachers to participate in the study; the Harcourt Department of Test Services scored the standardized tests; and ERIA conducted the study and analyzed the data that were collected. The study described in this report was conducted in the spring of the 1999-2000 school year.

Research Questions

The following research questions guided the design, procedures, and data analysis of the pilot study:

> *Is the Harcourt Math Program instructionally effective? Do selected chapters significantly increase students' understanding of key math skills, concepts, and strategies as measured by the program's chapter tests? As measured by standardized achievement tests (Stanford)?*

Design and Procedures of the Study

This study included grades 2, 5 and 7.

Teachers who volunteered to participate in the study had not used the program previously. The teachers were encouraged to select one cluster of chapters to pilot over a 6-week period. They also agreed to administer data collection instruments before beginning instruction and again after completing instruction.

A total of 3 teachers volunteered to participate in the study: 1 each at grades 2, 5, and 7. The participating teachers came from 3 different schools in New Jersey.

A quasi-experimental pretest-posttest design was used. Before instruction began, students were administered two pretests. The classroom teachers administered all tests. Table 1 summarizes the data collection instruments that were used.

TABLE 1
Data Collection Instruments

Grade	Pretests	Posttests
2	• *Harcourt Math Program* Chapter Tests • Math Subtests of the *Stanford Achievement Test, Ninth Edition, Level P2*	• HACOURT MATH *Program* Chapter Tests • Math Subtests of the *Stanford Achievement Test, Ninth Edition, Level P2*
5	• *Harcourt Math Program* Chapter Tests • Math Subtest of the *Stanford Achievement Test, Ninth Edition, Level I2*	• *Harcourt Math Program* Chapter Tests • Math Subtest of the *Stanford Achievement Test, Ninth Edition, Level I2*
7	• *Harcourt Math Program* Chapter Tests	• *Harcourt Math Program* Chapter Tests

Teachers selected the cluster of chapters appropriate for their class. Following the pretests, teachers taught the selected chapters using the resources and procedures contained the *Harcourt Math Program.* Teachers also received training from experienced consultants in methods of implementing and using the program. While each cluster of chapters took 6 weeks to teach, most teachers started the pretests in February and completed the posttests in May. Instruction included a broad sample of math skills from the strands of problem solving skills, figuring change and time, using graphs and tables, understanding fractions, and study skills.

Upon completion of the selected chapters, students were administered the posttests. All data collection instruments were returned to the *Educational Research Institute of America* where they were processed. The *Stanford 9 Achievement Tests* was scored at the Harcourt Educational Measurement Scoring Center. The *Harcourt Math Program* chapter tests were scored at ERIA, and all of the data were analyzed by ERIA.

Findings

Results of the study and the descriptions of each of the assessments are reported in this section of the report.

TABLE 2
Learning Goals for Grade 2 Chapters 6-9

Grade 2 Chapters 6-9
To *count on* to identify amounts of money using coins
To act out and solve problems by using coins
To use coins to show amounts to .99
To count coins and identify objects that can be bought with that amount
To figure change by *counting on* with pennies
To tell time to the hour, half-hour, 5 minutes, and 15 minutes
To solve problems using elapsed time
To read and use a calendar
To use clocks and elapsed time to solve problems
To sequence a series of events
To use a schedule to solve problems

Grade Two Test Results

Table 1 summarizes the Pretest and Posttest means and standard deviations for the Grade 2 Math.

TABLE 3
Grade 2 Results (N=25)

Grade 2	**Math (14 test items)**			
	Lowest Score	**Highest Score**	**Mean Score (% correct)**	**Standard Deviation**
Pretest	3	14	9.84 (70%)	2.61
Posttest	10	14	12.75 (91%)	1.26

A paired t-test for the mean Harcourt Math Assessment showed that the scores improved significantly after instruction ($t=6.87$; $p<.0001$).

TABLE 4
Grade 2 Results Stanford Achievement Test (N=23)

Grade 2	Stanford Achievement Tests: Grade 2			
	Lowest Score	**Highest Score**	**Mean Score (% correct)**	**Standard Deviation**
Pretest: Procedures	11	20	16.83 (84%)	2.93
Posttest: Procedures	13	20	18.04 (90%)	1.74
Pretest: Problem Solving	12	28	22.17 (74%)	3.88
Posttest: Problem Solving	19	30	25.26 (84%)	3.05
Pretest: Total Math	26	47	39.00 (78%)	6.09
Posttest: Total Math	36	49	43.30 (87%)	3.84

A paired t-test for the two subtests and the total test score on the *Stanford Achievement Tests: Grade 2* resulted in a significant increase (Procedures: t=2.48; p<.01); (Problem Solving: t=4.75; p<.05); (Total Math: t=5.20; p<.0001).

Grade Five Test Results

TABLE 5
Learning Goals for Grade 5 Chapters 15-18

Grade 5 Chapters 15-18
To identify, read, and write fractions
To identify, read, and write mixed numbers and rename fractions greater than 1 as mixed numbers
To compare fractions with unlike denominators
To order fractions and draw a diagram to solve problems
To find the greatest common factor of two numbers
To find equivalent fractions
To find the simplest form of a fraction
To add fractions with like denominators
To use least common denominator to add fractions with unlike denominators
To subtract fractions with like denominators
To use the least common denominator to subtract fractions with unlike denominators
To subtract fractions of an inch on a ruler

Table 6 summarizes the Pretest and Posttest means and standard deviations for the Grade 5 Math.

TABLE 6
Grade 5 Results (N=46)

Grade 5	**Math (20 test items)**			
	Lowest Score	**Highest Score**	**Mean Score (% correct)**	**Standard Deviation**
Pretest	1	16	6.30 (32%)	2.56
Posttest	8	20	14.07 (70%)	3.42

A paired t-test for the mean Harcourt Math Assessment showed that the scores improved significantly after instruction ($t=15.25$; $p<.05$).

TABLE 7
Grade 5 Results Stanford Achievement Test (N=45)

Grade 5	**Stanford Achievement Tests: Grade 5**			
	Lowest Score	**Highest Score**	**Mean Score (% correct)**	**Standard Deviation**
Pretest: Procedures	3	19	10.18 (51%)	3.51
Posttest: Procedures	3	20	11.67 (58%)	4.70
Pretest: Problem Solving	7	27	19.13 (64%)	4.31
Posttest: Problem Solving	8	30	21.62 (72%)	5.40
Pretest: Total Math	14	46	29.31 (59%)	7.02
Posttest: Total Math	13	48	33.29 (67%)	9.61

A paired t-test for the two subtests and the total test score on the *Stanford Achievement Tests: Grade Five* resulted in a significant increase (Procedures: $t=2.64$; $p<.0001$); (Problem Solving: $t=4.68$; $p<.0001$); (Total Math: $t=4.10$; $p<.0001$).

Grade Seven Test Results

Descriptions of each of the assessments used in the study and the assessment results are reported below:

TABLE 8
Learning Goals for Grade 7 Chapters 14-17

Grade 7 Chapters 14-17
To draw a diagram to solve problems using ratios
To use rates, ratios, and proportions to compute unit rates and prices to solve problems
To use tables and graphs to show rates
To use proportions to identify the Golden Ratio
To change ratios to percents
To find the percent of a number
To find what percent one number is of another number
To find a number when the percent is known
To identify similar figures and use scale factors to make similar figures
To use proportions to find unknown lengths of sides of similar figures
To use scale factors and proportions to relate area or volume of similar figures
To use measurement and scale factors to draw similar figures
To read and made scale drawings
To use similar figures to measure lengths and distances indirectly

Table 9 summarizes the Pretest and Posttest means and standard deviations for the Grade 7 Math.

TABLE 9
Grade 7 Results (N=20)

Grade 7	**Math (24 test items)**			
	Lowest Score	**Highest Score**	**Mean Score (% correct)**	**Standard Deviation**
Pretest	7	20	15.53 (65%)	3.56
Posttest	16	24	21.50 (90%)	2.21

A paired t-test for the mean Harcourt Math Assessment showed that the scores improved significantly after instruction ($t=8.72$; $p<.05$).

Summary of Results

- The increase in test scores on both of the nationally standardized tests, the *Stanford Achievement Tests* and on the Harcourt Math Assessment are both positive and statistically significant for all subtests and total test scores at both grades 2, 5, and 7.
- The gains on both the instructional assessments and the nationally standardized tests were significantly different. The instructionally sensitive chapter tests showed greater improvement than did the national standardized test. However, the scores on the national standardized tests did improve statistically significantly.
- Gains of this magnitude for such a brief period of instruction are quite remarkable considering that the teachers volunteered to teach the units and did not receive any extra training.
- Some of the results may have shown even greater gains. However, there was a ceiling effect for some of the Harcourt Chapter tests. (Students scored perfect or almost perfect scores on the posttests thus limiting the gain scores.)
- It is also significant that no test scores stayed the same. They all increased. In a short-term study of this sort it is not uncommon to note some test scores that do not increase at all.

The percent of gains on each of the tests is shown in Table 11:

TABLE 11
Summary of Test Score Increases

	Percent Correct on Pretest	**Percent Correct on Posttest**	**Percent Gain from Pretest to Posttest**
Grade/Test			
Grade 2: Harcourt Math Assessment	70%	91%	21%
Stanford Achievement Test Grade 2: Procedures	84%	90%	6%
Stanford Achievement Test Grade 2: Problem Solving	74%	84%	10%
Stanford Achievement Test Grade 2: Total Score	78%	87%	9%
Grade 5: Harcourt Math Assessment	32%	70%	38%
Stanford Achievement Test Grade 5: Procedures	51%	58%	7%
Stanford Achievement Test Grade 5: Problem Solving	64%	72%	8%
Stanford Achievement Test Grade 5: Total Score	59%	97%	8%
Grade 7: Harcourt Math Assessment	65%	90%	25%
Averages	64%	82%	15%

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