This annotated bibliography lists research related to mathematics teaching and learning published in the United States in 1971. Each annotation gives major results and appropriate level of the study. The first section (Research Summaries) lists research summaries which review groups of research studies or basic research techniques. The second section (Journal-Published Reports) contains research reports which appeared in major journals in 1971. The third and final section (Dissertation Abstracts) covers dissertations announced in DISSERTATION ABSTRACTS INTERNATIONAL. (Author/JM)
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RESEARCH ON MATHEMATICS EDUCATION (K-12)
REPORTED IN 1971
by
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Science and Mathematics Education
1460 West Lane Avenue
Columbus, Ohio

March, 1972
Mathematics Education Reports

Mathematics Education Reports are being developed to disseminate information concerning mathematics education documents analyzed at the ERIC Information Analysis Center for Science, Mathematics, and Environmental Education. These reports fall into three broad categories. Research reviews summarize and analyze recent research in specific areas of mathematics education. Resource guides identify and analyze materials and references for use by mathematics teachers at all levels. Special bibliographies announce the availability of documents and review the literature in selected interest areas of mathematics education. Reports in each of these categories may also be targeted for specific sub-populations of the mathematics education community. Priorities for the development of future Mathematics Education Reports are established by the advisory board of the Center, in cooperation with the National Council of Teachers of Mathematics, the Special Interest Group for Research in Mathematics Education, the Conference Board of the Mathematical Sciences, and other professional groups in mathematics education. Individual comments on past Reports and suggestions for future Reports are always welcomed by the editor.
This annotated bibliography lists research related to mathematics teaching and learning which was published in the United States during 1971. The listing covers kindergarten through grade twelve levels and is divided into three major sections. The first section lists research summaries which review groups of research studies or basic research techniques. The second section contains research reports which appeared in major journals during 1971. The final section (Dissertation Abstracts) contains brief annotations of dissertations announced in Dissertation Abstracts International. (To conserve space, this reference is referred to as DAI in the listings.)

The ERIC Information Analysis Center for Science, Mathematics, and Environmental Education is pleased to make this annotated bibliography available as a Mathematics Education Report.

Jon L. Higgins
Editor

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I. Research Summaries


The relationship of mathematical ability to reading ability and general intelligence, reading instruction and mathematics learning, and student and teacher verbalizations were discussed. (kindergarten-grade 12)


Research findings on general versus specific mathematical factors, age and sex differences, verbal and other abilities, and mathematical ability and method of instruction are discussed, with 60 references cited. (kindergarten-grade 12)


Findings from eight studies on vocabulary were discussed to support the contention that children must be helped to read mathematics materials. (grades 1-12)


The place of manipulative activity in the instructional sequence and their value in promoting learning were discussed.
Mangrum, Charles T., II and Knight, Carlton W., II. Doctoral Disserta-
tion Research in Science and Mathematics Reported for Volume 29 of
Dissertation Abstracts. *School Science and Mathematics* 71: 203-
225; March 71. (ERIC Document No. EJ 037 158)

Forty-four elementary school mathematics dissertations were listed,
32 on secondary school mathematics, 14 on teacher education, and 23
on college and adult mathematics education. (kindergarten-adult)

Metzner, Seymour. The Elementary Teacher and the Teaching of Arithmetic:
A Study in Paradox. *School Science and Mathematics* 71: 479-482;
June 1971.

That teachers like to teach arithmetic may be related to personality
structure; it does not seem related to their liking for mathematics.

Riedesel, C. Alan. Research Suggestions: Use of Time in Teaching
Elementary School Mathematics. *Arithmetic Teacher* 18: 177-179;
March 1971. (ERIC Document No. EJ 035 214)

Research findings on length of class period, use of time, the role
of homework, and retention were discussed. (kindergarten-grade 8)

Suydam, Marilyn N. and Weaver, J. Fred. Research on Mathematics Educa-
tion (K-12) Reported in 1970. *Journal for Research in Mathematics
Education* 2: 257-298; November 1971.

Fourteen summaries, 91 articles, and 223 dissertations were listed
with annotations. (kindergarten-grade 12)

Vance, James H. and Kieren, Thomas E. Laboratory Settings in Mathe-
matics: What Does Research Say to the Teacher? *Arithmetic Teacher*
18: 585-589; December 1971.

Research indicates that children can learn from and like mathematics
laboratory approaches.
II. Journal-Published Reports


The need for pre-service programs and in-service courses designed especially for junior high teachers was presented. (secondary in-service)


high school students who had twice the number of hours of instruction learned FORTRAN as well as college students did. (grades 11, 12, college)


The nine mathematics classes were characterized by high friction, favoritism, difficulty, cliqueness, and disorganization, and low formality and goal direction scores. They seemed to exemplify the student-centered activity approach to learning. (grades 10, 11)


Self-concept of ability appeared to contribute the most to the prediction of success in mathematics and English. Parental stress on achievement and on attending college were also factors, and student desire to obtain high grades was significantly related to mathematics achievement. (grades 7-12)


Subtraction test items written to meet behavioral objectives and under certain specifications were easier than those written under no specifications or for non-behavioral objectives. (grade 7, secondary pre-service)

No significant differences were found for groups receiving one, three, or five exercises per learning set or for either an informal inductive or formal deductive mode. (grade 7)


No reliable differences were found between maximal and intermediate guidance on programmed mathematics units. (grades 5, 6, 8)


Results confirmed Piaget's description of the sequential attainment of the three types of conservation. (grades 4-6)


Direct training of subordinate processes of categorization of size, form, number and other factors improved performance but did not generalize to higher level tasks. (nursery school)


The inverse operation method was significantly better than the common denominator or complex fraction method. (elementary)


It was concluded that girls favored social studies teachers, while boys had more favorable perceptions of science and mathematics teachers. (secondary)

The short number test was found to correlate about as well as longer tests with GPA. (grade 12)


Correct classification of cubes and rectangular solids was most difficult; cylinders, spheres, and ellipsoids were relatively easy. They associated solids equally well with photographs and drawings. (ages 3, 4)


For a lesson on number theory, the addition of television resulted in higher scores, but possibly not more effective than audiotape presentation. (secondary in-service)


Conservation responses increased with age. The eating and pointing responses were not significantly different, although performance with the pointing response decreased for age 3. (ages 2-4)


There was a tendency for reflective children to conserve more often than impulsive children, but differences were not statistically significant. (kindergarten, grade 1)


Twenty per cent of the students felt they disliked mathematics, 18 per cent were neutral, and 62 per cent liked it. These results were more positive than those obtained by using Dutton's scale. (grade 8)

Pre-measurement activities were successful in improving ability to compare lengths using "longer than", "shorter than", and "the same length as". (ages 4, 5)


No significant differences in achievement, retention, or transfer were found between groups using scrambled or ordered programs on fractions. (ages 15-20 [MR])


Arguments involving identity were the most common rationalizations for conservation, followed by arguments involving compensation and reversibility. Mode of rationalization was related to ability to conserve. (grades 2, 3)


A card-sorting task was found to be a plausible way to study students' categorization of certain principles, and thus to evaluate their conceptualization for a mathematics course. (grade 8)


Teachers did not produce multiple-choice geometry item distractors that were very similar to the discriminating errors students made using completion format. It was suggested that multiple-choice tests be developed after analysis of completion tests. (grade 10)

Arithmetic achievement of mentally retarded children was related to visual-motor impairment but not to impaired soft neurological signs. (MA 5-11)


Pupils who had not studied closed sentences were able to state whether they were true or false almost as well as they could complete open sentences. Girls scored higher than boys. (grade 1)


The reversibility-reciprocity training was most effective in improving conservation scores and social role-taking ability. (pre-school, ages 4-5)

Feldhusen, John F.; Treffinger, Donald J.; Van Mondfrans, Adrian P.; and Ferris, Donald R. The Relationship Between Academic Grades and Divergent Thinking Scores Derived from Four Different Methods of Testing. Journal of Experimental Education 40: 35-40; Fall 1971.

For mathematics achievement, correlations obtained under a game-like method of testing were lower than under standard, prior practice for creativity, or take-home procedures. (grades 5, 8, 11)


No significant differences were found between gifted students at any anxiety level taught a unit on vector geometry by programmed or regular instruction. (grades 10-12)

Few additional schools added calculus courses after teachers participated in an institute, but 12 per cent added calculus to existing courses. (secondary in-service)


Use of familiar situations and manipulative materials resulted in a mean score of 14.75 on a 20-item test on decimals. (grade 2)


The group of behavior problem children given a remedial program with response-reinforcement made significantly greater gain scores in arithmetic fundamentals. (grades 2-6)


The use of introductory sentences (existential quantification) and different names for subsets (superordinate set identification) did not significantly affect problem solving scores, but extraneous information did affect performance. (age 12)


Correlations between mathematics subtests of the MAT and SAT ranged from .45 to .53. (grade 7)


No significant differences were found when students were given three or no homework assignments per week. (grade 6)

Previous achievement was a prime predictor in equations for use at the end of grades 7, 8, or 9. (grade 11)


Multiple-choice items in which students selected what was given and what was proved or selected the "reason" were recommended over items which merely required the student to note whether a statement could be proved. (grade 10)


The correlation of two mathematics subtests on the SAT decreased when Guttman weights were used to correct for guessing. (grade 12)


Successfully choosing the more favorable odds did not necessarily give an index of probability knowledge. (ages 4-13)


Reinforcement with liked activities after completion of a specified portion of programmed materials resulted in increased response rate. (grade 1)


Only nine per cent of the teachers had less than two years of college preparatory mathematics, but 90 per cent had less than six hours of college mathematics and 60 per cent had no hours. Only one teacher had met CUPM minimum recommendation of 12 hours. (teachers in grade 6)

Completing in-service programs had a positive effect on the concept scores of pupils who had one year of instruction in modern textbooks, but a negative effect on those with two or three years of modern instruction. There was no effect on problem solving scores. (teachers in grade 6)


The complex fraction method appeared to be more effective than a procedure using the associative property. (grade 6)


Training on shape and color and extended training including shading and addition also were found to result in significant learning and transfer to various types of classification tasks. (grade 1)


Only correlations on arithmetic concepts subtests for the two lower social classes were significantly different. (grade 7)


No significant differences in IQ, achievement, students' grades or behavior, or teacher behavior were found when teachers were told these students were capable of greater intellectual growth. It was found that teacher expectancy had frequently not been modified. (grades 1, 2)
Kauffman, James M.; Payne, James S.; and Ensminger, E. Eugene. Quantita-
tive Judgments of Culturally Advantaged and Disadvantaged Preschool

Conservation-like cognitive operations may be affected by difficulty
of the discrimination task, cultural disadvantage, and age. (ages
2-4)

King, William L. A Nonarbitrary Behavioral Criterion for Conservation of
Illusion-Distorted Length in Five-Year-Olds. Journal of Experi-

Choice of correct stick provided a behavioral criterion for con-
servation, which was achieved by the majority of the children.
(ages 4-6)

Klein, Stephen P. and Neidermeyer, Fred C. Direction Sports: A Tutorial
Program for Elementary-School Pupils. Elementary School Journal

A program involving chalk talks on whole number and decimal computa-
tion resulted in significant gains in achievement and self-concept.
(ages 11, 12)

Kneitz, Margaret H. A Study of Secondary Mathematics Teachers: What
Influences Them to Leave the Profession? American Mathematical

Eighty-five per cent of the sample felt that their mathematics
courses had prepared them adequately or better; 72 per cent felt that
a methods course had been adequate. Almost half of the graduates
were not teaching. (elementary and secondary pre- and in-service)

Lackner, Lois M. A Pilot Study on Teaching the Derivative Concept in
Beginning Calculus by Inductive and Deductive Approaches. School

The inductive approach appeared to be more satisfactory than the
deductive approach. (grade 12)

Graphic and pictorial context combined with a weight cue resulted in faster acquisition of the coefficient rule. Weight and context cues each facilitated learning of the intercept rule. Effects decreased when applied to a complex linear function rule task. (grade 4)


Correlations for the algebra test ranged from .70 to .77, and from .60 to .78 for the geometry test. (grades 8-10)


Pupils evidenced conservation of number and continuous quantity at the same age as American and other African children. Performance was similar with familiar and alien materials. (ages 3-8)


The environment was found to account for a large percentage of the variance in both number and verbal ability, and some in reasoning ability, but less in spatial ability. (age 11)

Meeker, Mary and Meyers, C. E. Memory Factors and School Success of Average and Special Groups of Ninth-Grade Boys. *Genetic Psychological Monographs* 83: 275-308; May 1971.

The auditory-backward recall of digits was related to arithmetic achievement. (grade 9)


Hyperactive children did not score significantly lower than other children on arithmetic tests. (age 12)
Mood, William B.; Abell, Roberta; and Bausell, R. Barker. The Effect of Activity-Oriented Instruction Upon Original Learning, Transfer, and Retention. *Journal for Research in Mathematics Education* 2: 207-212; May 1971.

No advantages for activity-oriented instruction were observed on learning, transfer, or retention when compared to rote procedures. (grade 3)


Eye movement patterns of conservers and non-conservers were substantially different. (ages 6-10)


Pupils aged 7 to 8 scored significantly higher on conservation of quantity tasks than those younger than 7. (ages 5-7)


On the Buswell-John Vocabulary Test, 1968 pupils achieved higher scores on 74 of 100 items in grade 4, 59 items in grade 5, and only 48 items in grade 6. On a test of contemporary terms, mean scores were 49.34 for grade 4, 57.87 for grade 5, and 64.02 for grade 6. Girls achieved higher scores than boys did. (grades 4-6)


The order of acquisition of quantity was: qualitative identity, quantitative identity, and equivalence conservation. No significant difference was found for justification and no justification conditions. (ages 4-6)

Procedures used in the IEA and data on tests and scales were presented. Among the many findings were: (1) age of entry in school was not an important variable in mathematics achievement; (2) type of school affected the achievement of 13-year-olds; (3) correlations between achievement and attitude were small. (grades 8, 12)

Proger, Barton B.; Mann, Lester; Taylor, Raymond G., Jr.; and Morrell, James E. Test Anxiety and Defensiveness Experimentally Induced by Four Conditions of Testing Arousal. *Journal of Experimental Education* 39: 78-83; Summer 1971.

Students who had daily tests achieved the highest arithmetic scores, followed by daily practice, alternate-day test, and weekly test groups. All four induced comparable degrees of anxiety and defensiveness, as well as comparable decreases in manipulatable anxiety during the study. (grade 6)


No significant differences on the inventory were found between non-Negro and Negro children entering integrated schools, but both groups scored significantly higher than Negro children entering all-Negro schools. (kindergarten)


Specific data on knowledge of children in each of the four areas were presented. Use of an informal but planned sequence of experiences was recommended. (kindergarten)


Test reliability was found to range from .78 to .88. (grades 7-9)

No significant differences in arithmetic scores were found for students having team teaching or traditional instruction. (kindergarten-grade 6)


Fifth grade Negro students were roughly one year behind white students in mathematics achievement, and the gap widened significantly as the students advanced in grade. By grade 11, the Negro students were two to four years behind. (grades 5-11)


Mathematics was the second most cited answer to the question in the title, after "to learn" and followed closely by "to read". (grades 1-6)


Students using IPI materials were more positive toward mathematics than non-IPI students. (grades 4-6)


Attitude subtest scores were found to predict mathematics achievement only for girls. (grade 6)

Sherrill, James M. In-Service Mathematics Education as Viewed by Elementary School Teachers. *School Science and Mathematics* 71: 615-618; October 1971.

Teachers preferred (1) in-service programs to summer school, (2) equal presentation of methods and content, and (3) involvement of both university and school personnel. (elementary in-service)

The use of negative instances with content in geometry, exponents, and operations resulted in higher achievement than the use of only positive instances. (grade 8)


Girls had higher scores for both reading and arithmetic than boys, as a total group and at most grade levels. Boys made significantly greater gains than girls did in grades 3, 4, and 9. (ages 5-16)


The composite readability scores for sixth grade textbooks ranged from 5.0 to 5.8. Analysis of selections indicated a range of below grade 4 to grade 8. Tests ranged from below grade 4 to grade 6. (grade 6)


Pupils needed about three to six instances to form generalizations of the sort tested. Only rarely were generalizations formed after six unsuccessful instances. (grades 4-7)


The group using the SCIS program achieved significantly higher scores on conservation tasks than the group using a textbook series. (grade 1)


Described action did not differentially affect problem solving performance on the four basic problem structures studied. Mean scores for problems of the type \( a + b = \square \) were higher than for other problem types. (grade 1)

Age and SES affected pupils' responses to conjunction, disjunction and negation commands. Conjunction was easiest, followed closely by "exclusive-or"; disjunction was most difficult. Negation substantially increased the difficulty of commands. (nursery school, kindergarten)


Student reactions to the six-week program were highly favorable. (grades 5-12)


Mathematics ranked third of four curricular areas rated by Negro, Mexican-American, and Indian pupils. (grades 6-8)


Children who had been in the "village" did better on later achievement tests than children who had been in other nursery school programs. (pre-school, kindergarten)


On an inventory involving 20 open-sentence types, achievement increased from grade to grade. At each grade level, differential achievement effects were observed for particular combinations of open-sentence types. (grades 1-3)

Culturally deprived groups scored lower on classification tasks than middle-class groups. (kindergarten, grade 2)


Disturbed children made good arithmetic achievement gains in a special class. (grades 4-6)


Piagetian tasks were found to be helpful in evaluating the ability of nine children. (ages 6, 7)


Most of the children (86) formed an equivalent set by perceptual one-to-one correspondence; eight maintained equivalence after perceptual correspondence was destroyed. Implications for mathematics education were stated. (kindergarten)


A total of 473 technical words was found in 24 textbooks, with frequency ranging from 1 to 5,995. Seventeen words were repeated more than 1,000 times, but most were used less than 25 times. (grades 1-3)

When the data from an earlier study were reanalyzed with the unit of analysis changed from pupil scores to class means, no significant differences were found between expository and discovery strategies. (grades 5, 6)


With the "symptom" response to inequality tasks, age groups 5-7 differed significantly from age groups 3-4. Using the verbal response, differences were found between age groups 6-7 and 3-5. (ages 3-7)
III. Dissertation Abstracts


Linear ordering ability was found to follow sequential stages of development, and was slightly increased through training. (age 5)


No significant difference in achievement resulted from use of special instructional materials for arithmetic, but teachers indicated a preference for the developed materials over a non-systematic approach. (elementary)


The number of frames to the left of the equals sign and the arrangement of operators affected time needed to solve problems, but number of possible solutions did not significantly affect time. (grades 4-8)


Indiana attending segregated reservation schools scored significantly higher in arithmetic achievement than those attending integrated schools in grade 3, but not in grade 6. No significant achievement differences were found between boys and girls. (grades 3, 6)


The self-perception inventory scores were found to be significantly related to arithmetic achievement. (grades 1-3)

A program involving television and home visits was significantly more effective than use of television alone in teaching mathematics to preschool Appalachian children. (ages 3-5)


Most teachers indicated that they felt confident to teach junior high school mathematics, but wanted to take more work in mathematics or mathematics education. (secondary in-service)


Increased readiness instruction did not result in a significant change in level of understanding of conservation or in arithmetic achievement. No significant correlation was found between ability to conserve and IQ, age, family constellation, or nursery school experience. (kindergarten)


Group contingent reinforcement procedures were effective in significantly raising the level of task-relevant behavior for students in a remedial summer program. (junior high)

Atwood, Marjie Henrietta. Teacher Effectiveness in Writing Terminal Objectives as Measured Through Student Participation in a Preschool Readiness Program. (United States International University, 1971.) DAI 32A: 1835; October 1971.

Pupils of teachers who wrote terminal objectives tended to change more on measures of mathematical concepts (as well as other factors) than pupils of other teachers. (pre-kindergarten, in-service)

A markedly greater proportion of five-year-olds than four-year-olds met criterion on all transitivity of length tasks. Neither replicas nor symbols aided many children in making transitive inferences. (ages 4, 5)


Small group activity using productive-thinking materials on calculus was found to be feasible. (grade 12, college)


No significant differences in achievement, confidence, or interest were found between groups who selected their own activities and those who could select problems or had no choice. The low-achievers most frequently chose teacher-made assignments. (grade 9)


Scores on "operative", "figurative", and "traditional" tasks all increased linearly with age. "Traditional" Piagetian tasks appeared to be the most effective for assessing conservation. (kindergarten-grade 2)


No significant differences in achievement were found whether pupils or computer selected the problem type, with varied types of feedback. (grades 4-8, ages 8-13)

For the learning of "low-cognitive" mathematical material, a deductive-reception strategy was found to be more effective than an inductive-guided-discovery strategy; no differences were found for "high-cognitive" material. (grades 4-6)


Understanding of the concepts of enclosure and order, but not equivalence, increased significantly with age and was related to SES. (kindergarten-grade 2)


A creative classroom, use of creative problems, and a teacher who was a mathematics educator rather than a pre-mathematician each appeared to effect mean change in creativity ability. (elementary pre-service)


The model was successfully applied to a workshop on mathematics education. (elementary in-service)


The influence of faculty psychology, connectionism, Gestalt psychology, and developmental psychology were traced. SMSG and SSMCIS textbooks were analyzed to ascertain psychological orientation. (secondary)
Benner, Carl Virgil. Applying Paired Comparison Techniques to Determine the Relative Importance Assigned to Selected Mathematical Behaviors. (The Ohio State University, 1970.) DAI 31A: 4614-4615; March 1971.

A relationship was found between the rankings of 25 mathematical objectives for elementary pupils and teachers, but not for those at the secondary level. Consistency was significantly high. (grades 5, 8, pre-service)


Most colleges offered a course in topology, usually at the undergraduate level, but the course was not required for pre-service programs. (secondary pre-service)

Berrios, Jorge Efrain. The Effects of Departmentalization on Achievement in Reading and Arithmetic on Fourth Grade Pupils in Public Schools of Puerto Rico. (Lehigh University, 1970.) DAI 31A: 5023-5024; April 1971.

No significant differences in arithmetic achievement between classes having departmentalized or self-contained patterns, in either rural or urban areas. (grade 4)


In general, the teachers surveyed felt that too much attention in preparation programs had been directed toward content and too little toward classroom management. (secondary in-service)

Biancoviso, Anthony Nicholas. A Multiple Training Approach to Facilitate the Acquisition of Number Conservation in Children. (University of Kansas, 1971.) DAI 32A: 1911; October 1971.

Training with candy or buttons each facilitated the acquisition of conservation. No transfer from conservation of number to conservation of discontinuous quantity was found. (ages 5-7)

Thirty per cent of the schools offered technically-oriented computer-related courses; 20 per cent used computer time for enrichment and supplementary activities; only one school used the computer for tutorial instruction. Two-thirds of the colleges had a recommended computer-related mathematics course, but only one-fourth included computer-related topics. (secondary)


The passive use of manipulative materials appeared to be as effective as active use and better than non-use. (grade 5)


Students used library materials to a greater extent when the teacher referred to them more in his teaching. (grade 8)

Bobbe, Carol Norwalk. Sex-Role Preference and Academic Achievement. (Yeshiva University, 1971.) DAI 32B: 1818-1819; September 1971.

Girls judged arithmetic to be "feminine", while boys judged it to be for both sexes. A relationship was found between sex-typing and arithmetic achievement. (grades 4-6)


No significant differences between groups were found on tests of addition, subtraction, or multiplication with fractions. On post-tests on equivalent fractions, the groups using diagrams or paper folding scored significantly higher than those using the "property of one" procedure, while the paper-folding group scored significantly higher on this retention test and on an attitude measure. (grade 5)

The usefulness of simplex and scalogram analysis for determining hierarchical relationships in (TI) mathematics materials was demonstrated. (elementary)


Creativity was found to be related to arithmetic achievement, while pupils classified as close-minded scored lower than other pupils, in both "New School" and other classes. (grades 4-6)


A unit on logic was judged to be appropriate, and trial use resulted in satisfactory scores. (grade 10)


There was some agreement by instructors and supervisors that methods courses were less than adequate, but that specified objectives were appropriate. (secondary pre-service)


Implication-reasoning abilities were found to increase with age, and were affected by propositional semantics and syntax. Conservation improved with age, with differences in attainment of different types of conservation noted. (ages 8-9, 11-12, 14-15)

For three games, the distribution of strategy evaluations was ordered in decreasing frequency of occurrence as Pattern, Memory, Operator, and in decreasing efficiency as Operator, Pattern, Memory. (secondary)


Those tutored had a slightly higher mean mathematics score than those not tutored in mathematics, but the difference was not significant. (pre-school, ages 9-12)


Absenteism was significantly related to teachers' marks but not to standardized achievement test scores. (grade 11)


Students given individually prescribed work through independent study, small-group discussions, large-group activities, and teacher-led discussions achieved significantly higher in skills and concepts than those taught by a traditional, textbook, class-group method. (grade 4)


A total of 743 terms were tabulated; only 10 were common to all 15 textbooks. (grades 4-6)
Bryne, Mary Ann. The Development of a Measure of the Familiarity of Mathematical Terms and Symbols. (Purdue University, 1970.) DAI 31A: 5222-5223; April 1971.

A measure of the familiarity of 1,165 terms and 153 symbols was developed. (grades 7, 8)


Ten of eleven major algebraic concepts received average or above average emphasis by the teachers surveyed. (teachers of grade 9)


The mean score of classes taught by the individualized method was significantly higher than that of classes taught by the traditional method. Classes taught in the seventh period scored significantly higher than those taught in the first period, but there was no interaction effect between method and time of day. (grade 10)


Teachers and teacher educators considered applications a necessary part of secondary school mathematics, and indicated that a mathematical model could be used in teaching applications. (secondary in-service)

Byars, Jackson Abbott. The Relationship Between Teacher Conformity to a Model of Teaching Behavior and Student Achievement and Student Attitude in a First Course in Algebra. (The University of Nebraska, 1970.) DAI 31A: 5264; April 1971.

Student attitude and achievement were not significantly different among teachers who rated high or low on the developed instrument; it was therefore revised. (grade 9)

Significant gains on three of six conservation tasks were made, although differences between trained and untrained groups were not significant. (ages 3-5)


Arithmetic achievement equaled or excelled reading achievement at each age level; a linear relationship between scores and age was significant. Arithmetic achievement was positively related to fathers' love, while lower achievement was related to mothers' rejection, neglect, and casualness. (ages 7-13)

Calloway, Elwayne. Required Mathematical Topics for Prospective Junior High School Mathematics Teachers at the University of Arkansas. (University of Arkansas, 1971.) DAI 32A: 2521; November 1971.

There was general consistency between the content of textbooks and college course content, except for too-extensive inclusion of calculus in the courses. (secondary pre-service)


Conservation of number levels was found to be significantly related to memory drawings, but conservation of length was not. (kindergarten-grade 2)


No significant differences in achievement or attitude were found between classes where content from elementary school textbooks was or was not included. (elementary pre-service)

The group using semi-concrete materials scored significantly higher than the symbolic group on a numeration test; no significant differences were found between groups using concrete or semi-concrete materials. The groups using materials scored higher on tests of transfer. (grade 6)

Carr, Donna Humpherys. The Development of Number Concept as Defined by Piaget in Advantaged Children Exposed to the Bereiter-Engelmann Pre-school Materials and Training. (University of Utah, 1970.) DAI 31A: 3947-3948; February 1971.

No significant differences on four Piaget-type tests were found between kindergarten groups who used Bereiter-Engelmann materials for two, one, or no years. The program was more effective for kindergarten children than for pre-kindergarten children. (pre-kindergarten, kindergarten)


"Sesame Street" viewing had a measurable achievement effect on the two mathematical goals tested. Parental and teacher reactions were favorable. (kindergarten)


No significant differences in total scores were found between students who had or had not had the logic instruction, but those taught improved significantly on the converse argument and on the "misleading" content dimension. (grade 9)

Previous level of arithmetic achievement, intelligence, and reading ability had the greatest effect on success in the CAI drill-and-practice program. (Specific correlations for many variables were cited.) (grades 4-6)


Mathematics, reading, language arts, and social studies led in the number of innovations reported. (in-service in kindergarten-grade 12)


Students in both organizational patterns made achievement gains, with those in the middle school showing more gain, particularly in arithmetic. (grade 5)


Significantly more errors were made on mirror-image problems than on others. Spatial distance did not affect the number of orientation errors. (pre-school)


No significant differences in achievement were found between groups of disturbed children who were given operant (mini-reward), contingency (school activities), or no special reinforcement. (elementary)

Eighth-grade girls who had better family relationships performed better in mathematics achievement than those who were less well adjusted at home. No differences were found for eighth grade boys or twelfth graders. (grades 8, 12)


No interaction effects were found between level of anxiety and level of feedback on achievement tests. (grade 11)

Clough, Roger Anthony. An Analysis of Student Achievement in Mathematics When Individually Prescribed Instruction (IPI) is Compared to the Current Instructional Program. (The University of Nebraska, 1971.) DAI 32B: 2849; November 1971.

Students using IPI appear to make greater mean gains than those using a traditional program. (grades 1-3)

Coblentz, Dwight Oliver. An Analysis of the Practices Carried Out by Cooperating Teachers in Supervising Student Teachers in Mathematics as Perceived by Student Teachers. (Northwestern University, 1971.) DAI 32A: 3133-3134; December 1971.

Activities of supervising teachers were rated satisfactorily, though a list of inadequate practices was presented. (secondary pre- and in-service)


There did not seem to be a measurable difference in arithmetic achievement when instruction in arithmetic computation was omitted for six weeks. (intermediate EMR's)
Students who used the SCIS science program for five years scored higher on mathematics applications, but not on concepts or reasoning, than those having a regular program. (grade 5)

Students taught conventionally achieved significantly more than those taught with laboratory activities. A few changes in attitude were noted. (grades 7, 8)

Areas of relative strength and weakness were cited. Few correlations were predictive. (grades 7-11)

CAI was effective in improving computational skills in whole numbers, fractions, decimals, and per cent. (grade 9)

Either a list of specific objectives or diagnostic-progress tests was found to be sufficient for a significant increase in mastery of objectives with seventh graders; eighth graders also profited from alternate resources. Type of grading did not affect scores. (grades 7, 8)

No significant differences on standardized tests were found for students taught by CAI or conventional instruction. The groups each scored higher on certain content areas. (grade 9)


Students only questioned about the attributes and design scored significantly better than those told the organizing principle or given attribute cues. (grade 1)


The reliability of the test (composite score) was found to be .85. (secondary pre-service)


Students taught by traditional instruction achieved significantly more than those taught by individualized instruction. No difference was found in work study skills nor for ability level, but individualized instruction took more time. (grade 8)


Attitudes supportive to the development of 14 "deterrents to pupil progress" were found to exist at both teaching levels. (in-service in elementary and secondary)

It was found that difficulty of multiplication problems could be predicted by problem characteristics such as order, digital, or process variables. (grade 5)

Curry, Richard Dean. Arithmetic Achievement as a Function of Concrete, Semi-Concrete, and Abstract Teaching Methods. (George Peabody College for Teachers, 1970.) DAI 31A: 4032-4033; February 1971.

Methods providing concrete materials or pictures resulted in greater computational achievement and understanding of properties than did a verbal method. (ages 8-10)


No significant difference in time to complete a unit was found between students having independent study or lecture-discussion instruction. (elementary pre-service)


Attitude toward arithmetic was not found to be significantly related to achievement, nor was there a significant relationship between teachers' and students' attitudes. A significant decrease in students' attitudes across grades 3, 5, and 6 was found. (grades 3, 5, and 6)

Del Gaudio, Jerome. A Study of the Academic Achievement of Pupils Exposed to Departmentalized and Non-Departmentalized Instruction in Grades Seven and Eight in Selected Inner City Elementary Schools in St. Louis, Missouri. (St. Louis University, 1970.) DAI 32A: 696; August 1971.

No significant difference was found in the arithmetic achievement of students taught in departmentalized or non-departmentalized classes. (grades 7, 8)
Denoyer, Richard Armand. A Study of the Effect of Age and Sex on School Achievement in Grades Three, Six, Seven and Nine. (Southern Illinois University, 1970.) DAI 31A: 3950; February 1971.

The sex of a student was found to have a definite effect on arithmetic achievement in grades 6 and 9. Factors such as race, IQ, and SES also had an effect on achievement in general, but age did not. (grade 9)


Pupils with kindergarten experience achieved significantly more on mathematics tests in grades 1 and 3. (grades 1-3)


Characteristics of teachers who are more successful at writing prescriptions were identified. (elementary in-service)


Teachers were able to use the verb list in analyzing textbooks. (grades 5, 6)


Teachers who had a course in Mathematical Analysis had a better understanding of elementary school mathematics than those who had taken Intermediate Algebra. (elementary in-service)

Among the characteristics of successful problem solvers were high scores on reasoning tests, good spatial relations ability, ability to discriminate critical elements, divergent thinking, low test anxiety, and a positive attitude toward mathematics. (grade 10)


No significant differences in achievement were found on the standardized test, between students who were given diagnostic activities or textbook materials. The activities group scored higher on the concept section of the experimenter's test, while the textbook group scored higher on computation. (grade 4)

Earle, Richard Allen. The Use of Vocabulary as a Structured Overview in Seventh Grade Mathematics. (Syracuse University, 1970.) DAI 31A: 5929; May 1971.

Students who used a structured overview learned more about vocabulary relationships, but mathematical achievement and retention were not affected. (grade 7)


Students felt that of greatest importance in the program were the faculty, the intellectual challenge, and stimulating contacts with leaders and peers. (secondary)

Eddleman, Virginia Kincaid. A Comparison of the Effectiveness of Two Methods of Class Organization for Arithmetic Instruction in Grade Five. (Northeast Louisiana University, 1971.) DAI 32A: 1744; October 1971.

No significant difference in achievement was found between pupils grouped homogeneously or heterogeneously. SES affected achievement, but there was no interaction effect with method. (grade 5)
Eisenberg, Theodore Allen. The Integration of Modified Learner-Generated Sequences into the Development of a Behaviorally Stated Learning Hierarchy, as Applied in Mathematics Curricula Construction. (University of Maryland, 1970.) DAI 31A: 4033-4034; February 1971.

A learning hierarchy developed by students was found to be successful with other high-achieving students but not with low-achieving students. (elementary pre-service)


The special class teachers were found to rate arithmetic skills and problem difficulty less accurately than did regular teachers of low ability pupils. (secondary in-service)


The classes in which tutoring was used made greater achievement gains than those in which it was not used, with tutees gaining more than tutors. (grades 9-11)


Significant differences were found between children who attended or did not attend Head Start classes on arithmetic achievement in grade 2, and marks in grades 2 and 3. (pre-school, grades 1-3)


The group using audio-tutorial materials achieved more than the conventionally-taught group. A significant correlation between attitude and achievement was found only for the conventionally taught group. (elementary pre-service)

Students working in small groups to solve problems made greater individual gains in problem solving than did students who worked alone. (elementary pre-service)


The youngest children preferred the topologically most accurate copies of model figures, while the oldest children preferred those geometrically most accurate. No other evidence was found that children aged 4 to 6 understood topological ideas well enough to complete simple topological tasks successfully. (ages 4-8)


The four scales had intercorrelations ranging from .59 to .83, indicating that a common construct was sampled. Grade and concept effects were found to be significant. (grades 4, 6)


The mastery of antecedent objectives apparently did not induce mastery of consequent objectives for which no explicit instruction was provided. The order of acquisition of antecedent objectives did not significantly affect the implicit mastery of consequent objectives. (grade 5)


The group having short quizzes had greater achievement than those having longer tests on more material. (elementary pre-service)

Numerical task performance (adding and/or subtracting three numbers) was not significantly affected by five intensities of physical exertion. Speed scores were significantly lower following the two highest levels of exertion. (ages 9-11)


Desirable characteristics and training needs of mathematics specialists were ascertained from a survey of teachers, supervisors, and principals. (elementary in-service)

Forhetz, John Elbert. An Investigation of Test Anxiety as Measured by the TASC in Content Areas Ranked Difficult and Easy with Fourth and Sixth Grade Students. (Southern Illinois University, 1970.) DAI 31A: 5124; April 1971.

Pupils who ranked mathematics as difficult showed more test anxiety before a mathematics test than before a test in easy-ranked spelling. (grades 4, 6)


There were no apparent relationships between the NCATE and non-NCATE institutions in regard to the degree of inclusion of 31 CUPM-recommended topics. More of the number system topics were included, but few of the algebra and geometry topics. (elementary pre-service)

Francies, Hallie Davis. Arithmetic Attitudes and Arithmetic Achievement of Fourth and Sixth Grade Students in Urban Poverty-Area Elementary Schools. (Case Western Reserve University, 1971.) DAI 32A: 1333; September 1971.

Attitudes of medium-achievers were significantly more positive than the attitudes of low-achievers. Significant differences were also found between grade levels, but not sexes. (grades 4, 6)

No significant differences in achievement were found between groups who used worksheets for subtraction which varied in type of feedback, number of problems and color of paper, although some interaction effects were significant. (ages 9-16, MR's)


Students using guided discovery units completed their objectives more quickly and with greater independence than those using individualized booklets, but achievement and attitude were not significantly different. (intermediate)


Pupils in grades 5 and 6 scored as high as tenth graders on the coordinate geometry test, but lower than ninth graders. (grades 5, 6, 9, 10)

Gareulo, Raymond J. A Field Study to Effect Changes in Academic Achievement Levels of Underachieving Seventh-Grade Students. (The University of New Mexico, 1970.) DAI 31A: 5931-5932; May 1971.

The group taught in an open classroom reading program made expected growth in arithmetic concepts, but not in arithmetic reasoning. (grade 7)


There was little difference in mathematics achievement between IPI and non-IPI groups. (grades 1-3)

Significant differences were found between Negro and Indian/white groups in the age of attaining conservation, with Negro and/or the entire low SES group at least a year below "norm" groups. (grades 1-3)


No significant difference in achievement was found between students identified as having inductive or deductive learning styles on programs developed inductively or deductively. (grade 8)


All review groups retained significantly more than the no-review group on a rule-learning task. No differences were found for review after one day of review at various intervals, but an early and a delayed review was found to be effective. (grades 7, 8)

Genkins, Elaine Frances. A Comparison of Two Methods of Teaching the Concept of Bilateral Symmetry to Young Children. (Columbia University, 1971.) DAT 32A: 1355-1356; September 1971.

The paper-folding method was more effective than the mirror method for kindergarten children, but the mirror method was effective in helping second graders to discriminate more types of figures. (kindergarten, grade 2)


A reality-based counseling approach resulted in more arithmetic homework being turned in. (grade 5)

It appeared that students two or more years overage and/or at the low remedial level in both English and mathematics have little chance for success in a standard high school program. (secondary)


The SAM films were found to have instructional value, but SAM pupils did not achieve higher than non-SAM pupils. (grade 4)


Increased time for the study of algebra did not increase students' success. (grade 9)


Achievement gain for students taught under the supervised study plan was significantly more than that of students taught under the daily recitation plan. No significant difference in change in attitude between the two groups was found. (grade 9)


No significant differences in achievement were found between groups given differentiated, textbook, or no homework. (grade 5)


Students' "subjective expected value" predictions accounted for their choice of arithmetic problems to work. (elementary)

The NSF Institutes were considered worthwhile in increasing knowledge and status of participants. (secondary in-service)


Mathematics achievement as measured by a standardized test was found to consist of several empirically defined clusters of items, which varied from grade to grade. The meaningfulness of the total score was questioned. (grades 2-5)


Children performed better when given the rule about the relationship among geometric figures than when not given the rule. Kindergarteners and second graders performed similarly, and better than nursery school children. (ages 4, 6, 8)


More than 100 geometric topics were identified in elementary school textbooks. Teachers need to know language as well as concepts. (elementary pre- and in-service)

Grumbling, Betty Lou Nowlin. An Experimental Study of the Effectiveness of Instruction in Mental Computation in Grade IV. (University of Northern Colorado, 1970.) DAI 31A: 3775-3776; February 1971.

The group having mental computation lessons made a significant increase in arithmetic achievement and was better able to solve problems mentally than was the group in which mental computation was not stressed. (grade 4)

Algebra was taught successfully with an audio-tutorial system. (grade 9)


High-ability ninth graders and all in grade 10 were able to learn the vector concepts. Advance organizers had some facilitating effect. Use of pictures was as effective as were concrete materials. (grades 8-10)


Ways of using computers for instruction were studied, and a course of study recommended. (secondary)


Training with special play materials was found to be effective in improving understanding of number concepts. Transfer to tests involving logical class relationships was limited. (primary)


The materials using non-standard English were as effective as regular text materials. (grade 7)


Students in colleges and universities had a better mathematics background than those in junior colleges. Methods courses in universities appeared to be better than those in colleges. (elementary pre-service)
Hall, Cynthia Tuttle. Determining Some Validities of the Test of Quantitative Judgment (Form T). (University of Massachusetts, 1970.) DAI 31A: 4382; March 1971.

The test on judging quantitative real-world situations was found to have a reliability of .78. (grades 4-6)


Five exercises were found to be not as beneficial as 15 or 30 exercises. When 30 exercises were used, feedback on all appeared helpful. (grade 6)


Mean scores of white pupils aged 5 to 7 were found to be significantly higher than mean scores of black children on tests of conservation; no difference was found at age 8. Much variability was noted. (ages 5-8)


"Leadership" and "teacher" factors appeared to have the greatest influences on the teaching of geometry. (secondary in-service)


Religious attitude did not appear to be strongly related to mathematics aptitude or achievement. (grade 10)


Verbal ability was found to be a stronger variable in discriminating conservation than was SES, but had less effect as age increased. (kindergarten-grade 4)
Hankins, Ben Albert. *The Effect of a Controlled Classroom Environment on Student Performance.* (The University of Tennessee, 1971.) **DAI 32A:** 2343-2344; November 1971.

No significant differences in arithmetic computation scores were found between students in rooms in which heating and lighting were controlled or marginal. *(secondary)*

Haven, Elizabeth Wright. *Selected Community, School, Teacher, and Personal Factors Associated with Girls Electing to Take Advanced Academic Mathematics Courses in High School.* (University of Pennsylvania, 1971.) **DAI 32A:** 1747; October 1971.

Liking and finding mathematics interesting, together with its usefulness in future study or job, were the main reasons girls took advanced mathematics courses. *(grade 12)*

Heiman, Marcia Bernice. *Individualized Instruction in the Classroom.* (The University of Michigan, 1970.) **DAI 31A:** 3956; February 1971.

Student performance rates increased more when teachers had feedback on pupils' success in an individualized instruction program. *(elementary)*

Heintz, Ruth Euller. *Goals in the Cognitive and Affective Domains and a System of Instruction for the Pre-Service Training of Teachers of Elementary School Mathematics.* (State University of New York at Buffalo, 1971.) **DAI 32A:** 819-820; August 1971.

A guide for teaching a one-year sequence of mathematics for elementary teachers was developed; utilizing objectives at various taxonomy-levels. *(elementary pre-service)*

Hershberger, Lotus Dean. *A Comparison of Two Methods of Teaching Selected Topics in Plane and Solid Analytic Geometry.* (The Florida State University, 1970.) **DAI 31A:** 4622-4623; March 1971.

No significant difference in immediate achievement or retention was found between groups using vector or non-vector approaches, but the vector-group scored significantly higher on a transfer test. *(grade 12)*

The developed test was found to measure certain mathematical thinking abilities not measured by standardized tests. Ninth graders did as well as twelfth graders on non-routine problems. The divergent thinking ability of sixth graders did not differ significantly from that of ninth graders. (grades 6, 9, 12)

Hill, Warren Henry. The Effect of Set Theory Instruction Upon the Ability of Children to Recognize Conclusive and Inconclusive Inferences in Sequential Logic. (George Peabody College for Teachers, 1970.) *DAI* 31B: 5024-5025; February 1971.

Training on classification skills and the meaning of conditional statements was more effective than training only on classification skills for increasing performance on sentential logic tests. (grade 3)


No significant differences in achievement on printed tests were found between groups of Spanish-speaking pupils taught in both English and Spanish or English only. When test items were presented orally, those taught in Spanish scored significantly higher. (grade 1)


The group using the drill-and-practice materials improved in computational skills more than a group not using them. (grade 6)


Six of the nine classes mastered each of the cognitive objectives set in a chapter for talented students. (grade 7)

No evidence was found that use of the computer significantly affected generalization skills or achievement, except for certain simple analysis skills. (grade 11)


Certain structure-of-intellect factors were found to be useful in predicting algebra success, especially when used with eighth grade marks. (grade 9)


Equivalence conservation was found to be more difficult than identity conservation. Age, but not the degree of physical transformation, was significant. (kindergarten-grade 2)


Evidence was obtained that the algorithm (for determining equivalent fractions) learned last was the one preferred. Scope of applicability did not affect preference. (grade 5)


Basic elements which appeared important in perceptual encoding of geometric figures were the parallel sides of the square, the "corners", and the diagonals. (elementary)

A PERT-analysis indicated that there is sufficient time in the curriculum to complete the network of K-9 mathematics objectives. (teachers in kindergarten-grade 9)


The 50-item test was found to have "satisfactory" reliability and validity. (elementary and secondary pre-service, college, grade 12)


Habitual errors in arithmetic computation were related to IQ and mathematical understanding. Errors due to problem difficulty and fatigue were more related to carelessness and lack of persistence than to mathematical background. (elementary)


A unit in logic was found to be successful, with pupils able to detect mathematical inconsistencies in a problem solving situation better than those who did not have such a unit. (grade 6)


Activity-oriented instruction did not appear to be more effective than instruction with little or no emphasis on activities for units in number theory, geometry and measurement, and rational numbers. (grade 7)

The students taking arithmetic scored greater mean gains on an arithmetic achievement test than did those taking algebra, but scores of those taking algebra were higher. (grade 8)


A high degree of concreteness resulted in higher mean achievement and retention scores. (grades 4-6)


The best single predictor of success in graph reading was a pretest on graphs. (grades 4-6)


Topics were selected to emphasize fundamental concepts. The axiomatic method was stressed. (grade 12)


Matching skills but not copying skills improved when children had plastic numerals available for free-play use. (ages 4-6)


The square root algorithm appeared to be the most preferred method, and the divide-and-average method the least preferred. (grade 8)

No significant difference in achievement was found between use of problems written by children and textbook problems. (grade 5)


Correlations between the conservation concept test and standardized tests were significant. The highest correlation, .81, was with arithmetic concept scores. (grades 2, 3)


Fewer than one-third of the pupils achieved any of the conservation or measurement tasks. No significant differences were found between groups having AAAS, Cuisenaire, or "limited" experiences. (grade 2)


No significant differences in achievement were found between pupils using guided discovery or expository programs. (ages 6-10)


The more effective method of computer utilization appeared to be program-writing with no direct computer-access. (grade 11)

Virginia teachers were found to have a better knowledge of the geometry in elementary school textbooks than with the geometry recommended by CUPM, SMSG, and CEEB, but they are weak in at least ten areas. (elementary in-service)


No significant differences in retention of concepts of vectors were found, whether interpolated content was on related or unrelated material. (grade 11)


Significant correlations were found between scores on the test developed to elicit mathematical statements and both marks and standardized test scores. (grades 4-9)


Students in Berkeley (studying modern mathematics) scored higher than those in Lahore (studying traditional mathematics) on reasoning, understanding, and application subtests, but not on computation. (grade 6)


No significant differences in attitude or achievement were found between groups taught with micro-teaching or lecture methods. (elementary pre-service)

Students studying the infinite systems scored significantly higher on understanding and appreciation objectives, while those studying finite systems scored significantly higher on the search-for-patterns objective. No differences were found on two other objectives. (grade 6)


The method in which randomly selected individuals were observed, rather than the whole class, was found to be more efficient for observing activity-type behaviors in an individualized classroom. (grade 5)


A procedure was developed to prepare and classify objectives. Hypotheses were tested and conclusions reached, but the abstract does not indicate whether this was theoretical or empirical. (7)


Both teacher-demonstration and student-activity modes with either blocks or sticks resulted in significant gains in achievement, but not changes in attitude. (grade 2)

Knight, Genevieve Madeline. The Effect of a Sub-Culturally Appropriate Language Upon Achievement in Mathematical Content. (University of Maryland, 1970.) DAI 31B: 7433-7434; June 1971.

Pupils taught and assessed using a sub-culturally appropriate language in a unit on non-metric geometry performed more successfully than those taught and assessed using standard language. (primary)

The course in which methods and content were integrated was found to be more effective than separate courses. (elementary pre-service)


Students who were instructed via ETV learned geometric concepts and had higher scores than those not having such instruction. (grades 3, 4)


Professional knowledge of in-service teachers and college seniors was significantly higher than that of college freshmen. Mathematical concepts were not significantly different among these groups and high school sophomores. (elementary pre- and in-service)


Transformation geometry resulted in greater retention of congruence, similarity, and symmetry, but no greater overall retention or transfer than with non-transformation geometry. (grade 11)


Visual judgment of equivalence of amount was found to develop independently, antededing haptic judgment. Arithmetic achievement and counting ability had virtually no correlation with the capacity to judge amount. (ages 7-11)

When ten variables were considered, three were good predictors of readability regardless of the purpose of the material. Mathematical symbols accounted for 20 per cent of the variance in both illustrative and explanatory material. (grade 9)


No significant differences were found among groups given immediate, delayed, or non-systematic feedback. (grade 7)

Laing, Robert Andrew. Relative Effects of Masses and Distributed Scheduling of Topics on Homework Assignments of Eighth Grade Mathematics Students. (The Ohio State University, 1970.) DAI 31A: 4625; March 1971.

No significant differences in achievement and retention were found between groups in which practice on a topic was massed in one homework assignment or distributed over several. There was a consistent trend favoring distributed practice. (grade 8)


Models for predicting achievement were developed, and used to classify mathematics and English students. (grade 9)


The Solutions group achieved lower scores than the groups having Hints, Answers, or no assistance. (grade 10)

Practice materials for subordinate skills were developed. No difference in means was found between groups using card or mimeographed forms. (grade 9)

Lawrence, Otis O'Neal. The Effect of the Utilization of Selected Mathematics Concepts and Skills on Achievement in High School Chemistry by Students from Two Different Populations. (The University of Oklahoma, 1971.) DAI 32A: 2404; November 1971.

Using mathematics concepts to teach certain chemistry concepts did not significantly affect chemistry achievement, but a significant correlation was found between mathematics achievement and chemistry achievement. (grade 12)


Peer acceptance and acceptability were each significantly related to mathematics achievement. (grades 5, 7, 9, 11)


No significant difference was found in the mathematical achievement of students who had come from hill or coastal regions of Puerto Rico. (secondary)


Significant grade level differences favoring seventh graders were found on both Proverbs and Logic Tests. (grades 4-7)

Mathematical "confidence" and competence of participants in the in-service institute significantly increased. (Secondary in-service)

Libeskind, Shlomo. A Development of a Unit on Number Theory for Use in High School, Based on a Heuristic Approach. (The University of Wisconsin, 1971.) DAI 32B: 3504; December 1971.

A unit on number theory including a sequence of ten theorems taught students to reproduce the proofs, understand the meaning of the theorems, and apply the method to new problems. (Grades 9-11)


Students' mathematical achievement (from NLSMA data) across clusters was not the same after adjustments were made for differences in aptitude and initial understanding of mathematical concepts. (Grades 7-9)

Lockwood, James Riley. An Analysis of Teacher-Questioning in Mathematics Classrooms. (University of Illinois at Urbana - Champaign, 1970.) DAI 31A: 6472-6473; June 1971.

Sixteen cues and 17 factors were identified in an analysis of questioning strategies, and relationships among them conceptualized. (Teachers in grades 7-11)


Four variables were identified which significantly affected the difficulty of problems: number of operations, sequence of problems, complexity, and conversions. Verbal clues, order of operations, and number of steps had little effect on difficulty. (Grade 6)

The material in which explanation followed definition was not as effective as explanation-definition, explanation preceding definition, or definition alone. (grade 10)


No significant differences in mathematics or science achievement were found between groups studying the ISCS program with or without audio tapes. (grade 7)


No significant differences in achievement were found between groups holding up slates and those using paper-and-pencil, but the group using slates without holding them up achieved significantly higher than the paper-and-pencil group. (grade 5)


Descriptive language accounted for 45 per cent of the interactions, "instance moves" for 41 per cent, and comparative actions for 11 per cent. (elementary pre-service)


Sequences for drawing and interpreting line graphs (for science) were determined. Most of the tasks were associated with concrete and formal thinking levels. (ages 9-14)
Malcolm, Susan Vanderwal. A Longitudinal Study of Attitudes Toward Arithmetic in Grades Four, Six and Seven. (Case Western Reserve University, 1971.) DAI 32A: 1194; September 1971.

Attitudes toward arithmetic decreased with grade level. (grades 3-7)

Marchal, Jack ego. Comparison of Selected Piagetian Tasks with the Wechsler Intelligence Scale for Children as Measures of Mental Retardation. (University of California, Berkeley, 1970.) DAI 31A: 6442; June 1971.

Retardates followed a similar sequence in the acquisition of mass, weight, and volume as postulated for normal children. The ability to conserve was not affected by sex, race, SES, or language, but was related to IQ. (ages 7-16)

Martin, Joanna May. The Effects of Rote and Discovery Teaching Methods of Fifth, Seventh, and Ninth Grade Students of a Low and Middle Socio-Economic Background. (Oklahoma State University, 1970.) DAI 31A: 5941; May 1971.

No significant differences were found for pupils taught a mathematics concept by rote or discovery at either middle or low SES level. (grades 5, 7, 9)


No significant difference was found in the critical thinking skills of students using ledger or flow proof methods of structuring proofs. (grade 10)


The correlations of four attitude scales with grade and sex were analyzed. Scores on two scales correlated significantly with achievement. (grades 3, 5)

Tutors were not found to differ from non-tutors in achievement or attitude, but tutoring did significantly affect the arithmetic skills of first graders. (grades 1, 12)


The differentiated instruction plan appeared to be effective for achievement gains, anxiety reduction, and positive attitudes. (elementary pre-service)


There was some evidence that "cognitive dissonance" and verbal training were effective in developing conservation of length on tests of equivalency. (ages 6-9)


The inventory appeared to be a valid measure of attitude toward mathematics. Mathematics aptitude was found to be a strong predictor of attitude. (elementary pre- and in-service, grades 9, 12)


There were no significant differences between groups, but the behavioral objectives groups made greater progress than the groups using the standard textbook approach. (grade 9)

Disadvantaged children using the activities (which included number concept development) made significantly greater gains than a comparable group not using the activities. (age 4)


Significant positive relationships were found between creativity and IQ, and creativity and arithmetic scores. (ages 9-14, MR's)

McGannon, Thomas Herbert. A Comparison of Two Methods of Teaching Calculus with Special Inquiry Into Creativity. (Northwestern University, 1970.) DAI 31A: 3785; February 1971.

There was no difference in achievement of groups using rigorous or intuitive calculus textbooks. Creative students achieved better with the intuitive textbook. (secondary)


No significant difference was found between classes taught with low-rigor or high-rigor approaches. (elementary pre-service)


The students who were taught by a hierarchy developed by other students did not achieve better than a group taught by an instructor-developed hierarchy. (elementary pre-service)


Most pupils in both grades were able to apply the concepts on the "likely" to "unlikely" continuum before instruction. No clear treatment effect was found for groups having laboratory participation, teacher demonstration, or no instruction. (grades 2, 4)

Monetary reinforcement resulted in significant achievement gains. (grade 6)


The films had no benefit for students having a pretest, but induced more positive attitudes in non-pretested students. (grade 7)


Mathematics teachers in large schools had a more extensive preparation in mathematics than did those in medium and small schools. Students from large schools scored significantly higher on an aptitude test. (grades 9-12)

Miller, Patricia Ann Hackney. Attention to Stimulus Dimensions in the Conservation of Liquid Quantity. (University of Minnesota, 1970.) DAI 31B: 6297; April 1971.

Kindergarten non-conservers based conservation beliefs more on height than width, while conservers attended to both. Third grade conservers preferred quantity responses. (kindergarten, grade 3)


Relevant-concept training was found to effect more transfer to number conservation than irrelevant-concept training and was generalized to liquid conservation. (kindergarten)

The programmed text and the audio-projected program were as effective as the lecture-demonstration mode. (elementary in-service)


Students who had aided in the development of an observation instrument did not score differently on the instrument than students who had not used it. (elementary pre-service)


It was possible to train coders to use the Method of Response List to analyze textbooks. (kindergarten-grade 6 textbooks)

Muckey, Roy William. Using Decimal and Non-Decimal Numeration Systems to Effect Change in the Ability of Beginning Second Grade Students to Add and Subtract in Different Bases. (University of Minnesota, 1971.) DAI 32B: 3510; December 1971.

No significant differences were found between groups studying base-ten only, non-ten bases, or many bases including base ten, in ability to add base ten numbers, but study of non-ten bases increased ability to add non-ten bases. There was little transfer from addition to subtraction. (grade 2)


Students who took the quantitative science course took more science and mathematics courses and achieved better than students in a non-quantitative course. (grade 9)

No significant differences in achievement and attitude were found between groups who were instructed with team-teaching or conventional methods. (grade 9)


Most teachers felt that more probability and statistics should be taught. No relationship was found between the extent to which these topics are taught and such factors as size of school. (secondary)


Analysis of lessons in mathematics, social studies, and science revealed that interaction patterns differ in individualized and lecture-discussion classes. (grade 6)


The multi-experience approach to problem solving was more effective than the verbal approach. (grade 4)


Classrooms identified as traditional tended to produce higher mean scores on the traditional test, while classrooms identified as modern tended to produce higher mean scores on the modern test. (grade 5)

The traditional school was significantly better than the transitional school on arithmetic subtests. (grades 5-9)


In general, students who had a traditional program scored higher than those who had a modern program. (grades 6, 8)

Nowak, Arlene Theresa. The Use of Time-Lapse Photography to Record Teacher-Pupil Contacts, Teacher Supervisory Behavior, and Teacher Travel in the Classroom. (Wayne State University, 1970.) DAI 32A: 310; July 1971.

During arithmetic instruction, teachers spent the greatest amount of time contacting pupils as a whole class. More time was devoted to supervisory behavior in arithmetic than in reading. (teachers in grade 4)


Both the linear-programmed-text group and the audio-taped program group achieved higher scores than the enrichment-textbook group. The use of audio tape also resulted in better retention. (grades 10, 12, college)


A model was developed and tested; it was found adequate to describe the difficulties in column addition. (elementary)
O'Flaherty, Helen T. The Developmental Significance of Pictorial Representation in Problem Solving. (Fordham University, 1971.) DAI 32B: 2382; October 1971.

The presence of black-and-white pictures did not affect problem-solving performance. When colored pictures were used, seventh graders solved more problems correctly than did fourth graders. (grades 4, 7)


Students used more non-substantive statements and asked more substantive questions in mathematics classes than in social studies classes. Mathematics teachers asked more elaborating and procedure-positive questions, but fewer divergent questions than did social studies teachers. (teachers in grade 8)


The unit on geometry with transformations appeared to be more successful for high-ability students. (grade 10)

Olson, Franklin Carl. The Effects of Pair Study on Student Attitude and Achievement in Plane Geometry. (The University of Nebraska, 1971.) DAI 32A: 840-841; August 1971.

Achievement and attitude were not significantly different in classes in which students studied in pairs or alone. (grade 10)


The teacher-text approach was found to be more effective than a machine-presented approach to materials on fractions. (grade 5)

Students who rewrote the question prior to answering it achieved more than those who answered it without rewriting it. (grade 7)


Significant differences between Title I and non-Title I pupils were found in attitudes toward arithmetic, with disadvantaged pupils having less positive attitudes. (grades 4, 6)


A significant difference in achievement favored the group taught a unit on probability and statistics with CAI. Attitudes were not different, but students preferred teacher-pupil interaction. (grade 12)


Piaget's theory was supported in regard to the sequence of development; the parallel development of conservation, seriation, and classification was only partially supported. (ages 6-14)


No significant differences were found on the language test or in number of mathematics problems solved, but students preferred the time-sharing mode to quick-batch and slow-batch modes. (secondary)
Page, Robert Leroy. An Experiment to Compare the Effectiveness of Instruction Versus Discovery in Generalizing the Strategy of a Simple Game. (The Florida State University, 1970.) DAI 31A: 4628-4629; March 1971.

The group which was told the counting-game strategy played significantly more perfect games than the group which had to discover the strategy. Ability to generalize was not significantly different. (secondary)


Certain characteristics of students in cooperative and competitive arithmetic game situations were identified. (grade 5)

Peck, Lawrence Keith. The Effect of Two Geometric Instructional Paradigms in Grades Four, Six, and Eight. (University of Missouri - Columbia, 1970.) DAI 31A: 3787-3788; February 1971.

Groups using conventional or imaginative terminology did not differ significantly in achievement, but ability to transfer certain concepts was significantly different. (grades 4, 6, 8)


Differences in arithmetic achievement favored pupils in suburban and rural-farm communities over those in center-city or rural-non-farm communities, but there were no significant differences between communities in predicting achievement. (grade 5)


Nine enrichment procedures used regularly were ascertained. (secondary)

Involvement in laboratory experiences was not sufficient to cause students to use the laboratory approach when teaching. On the average, nine-tenths of the time was devoted to teachers talking to the whole class. (elementary pre-service)

Steele, James Allen. Identification Classification and Characteristics of First Grade Students with Learning Disabilities in Reading, Writing and Mathematics. (Purdue University, 1970.) DAI 31A: 3094; February 1971.

Learning disabilities were found in 5.5 per cent of the pupils, with five factors identified as predictors. (grade 1)

Prather, Frank Peck. An Experimental Briefing-Teacher Aide Program with Professional Laboratory Experiences for Sophomore-Junior Level Pre-Service Mathematics Teacher Trainees. (The University of Nebraska, 1971.) DAI 32A: 825; August 1971.

No significant differences were found on most measures for students who served as teacher-aides with or without briefing sessions. (secondary pre-service)


Algebraic materials were developed following analysis of children's textbooks. (elementary pre- and in-service)

Puglisi, Donald Francis. The Differential Effects of Supplemental Self-Instruction on Student Achievement in Mathematics. (Lehigh University, 1970.) DAI 31A: 5043; April 1971.

No significant differences were found between groups who used pupil- or teacher-directed programmed materials or teacher-directed drill materials for mathematics. (grade 6)

Virginia teachers had a very favorable attitude toward the teaching of mathematics. Teachers trained specifically for elementary teaching and those with a strong mathematics background were likely to have favorable attitudes. (teachers in grades 3-6)


No significant differences in achievement, retention, or transfer were found between groups having advanced organizers, rote, or meaningful instruction. (grade 7)


No significant differences were found between groups using programmed or conventional textbooks. (elementary pre-service)


Scrambling learning sequences (on computing line slopes) appeared detrimental to learning, especially when sequences are long. Grade level, mathematics achievement, and test complexity did not interact with type of sequence. (grades 6-8)


Non-graded students achieved higher scores in mathematics and other subjects than did graded students. (grades 5, 6)

Achievement and attitude toward the developed unit were satisfactory. (elementary pre-service)


No significant differences in achievement or retention were found between groups using verbal or verbal-manipulative programs on reading a ruler. (grade 6)


Students in the didactic-instruction group generally had higher scores than those in discovery-oriented groups. (grades 4-6)


No significant differences in achievement or attitude were found between groups using dial-access equipment and those taught traditionally. The dial-access group completed the course in one-sixth the time, however. (grade 11)


Significant positive relationships were found between English language abilities, reading, and arithmetic. (grades 2, 5)


Boys scored significantly higher than girls on the test; scores were related to IQ and standardized achievement test scores. (grades 6-9)

Pupils in the expository group achieved significantly higher on computation tests, while those in the discovery group scored significantly higher on the retention test on applications. Attitudes were significantly higher for the discovery group. (grade 4)


Students who used a computer scored significantly higher on some (but not all) measures of achievement than those not using the computer. (grade 11)


Training on "more" or "same" concepts, designed to disassociate length and density from number, had little effect on children who could construct a one-to-one correspondence. The concept "more" was easier than the concept "same". Children who could not construct were able to discriminate one-to-one correspondence. (ages 3-8)


The course was developed for college-bound seniors with an interest and aptitude in mathematics. (grade 12)


The study of logic had little or no effect on students' ability to determine the validity of arguments or to prove theorems using inductive principles. (grade 12)

Pupils in the Follow-Through Program achieved significantly more than those not in the program on some arithmetic tests. Significant differences were also found favoring those who had had Head Start programs, although this was also evident when the effect of Head Start was held constant. (grades 1-3)


No significant differences in achievement were found between groups using materials developed for disadvantaged pupils or "regular" materials when factors related to mothers' background and attitude were considered. (grades 2, 4, 7)

Scott, Dorothy Marie. A Modern Mathematics Test to Evaluate Pre-Set Goals in a City School. (St. Louis University, 1970.) DAI 31A: 3791; February 1971.

Scores on the developed test correlated significantly with teachers' ratings of student achievement, and were significantly different from correlations of standardized test scores and teacher ratings. (grades 4-8)


Scores of students who were taught with a discovery method increased over time, while scores of students taught with an expository method decreased. (grade 6)


Area, set-subset, and combination representations of introducing rational number concepts appeared to be equally effective on tests using two types of pictorial models. (grade 2)

The logic program increased geometry students' understanding of previously learned concepts; algebra students also needed teacher encouragement. The logic program also facilitated the following work in geometry. (grades 9, 10)


The expository approach resulted in a more positive change in attitude than the guided-discovery approach; no achievement difference was found. (elementary pre-service)

Sherrill, James Malcolm.  The Effects of Differing Presentations of Mathematical Word Problems Upon the Achievement of Tenth Grade Students. (The University of Texas at Austin, 1970.) DAI 31A: 3427; January 1971.

Achievement with problems was affected by the presence of a pictorial representation of the problem situation, as well as by IQ, reading ability, and previous achievement. (grade 10)


Students talented in mathematics were not significantly different from those talented in English in sense of responsibility or anxiety level, but were less sociable. (grade 12)


Age was a greater factor in conservation than reflexive or impulsive cognitive style. (ages 6-12)

The mathematics compensatory education component was significantly associated with success in computation for fourth and fifth grade low IQ underachievers. (grades 4-6)


A course in which observational techniques were discussed resulted in different behaviors during student teaching from those used by students in a regular course. (elementary pre-service)


Boys with male teachers scored higher on mathematical problem solving than boys with female teachers, but not differently on computation. (grade 5)


Most teachers reported favorable attitudes toward mathematics. Their college courses had included much of the geometry recommended by CUPM, but little of the algebra. (elementary in-service)


The degree of task-attendance was found to vary from one achievement level to another according to the type of classroom organization. (grades 2, 4)

Teachers of mathematics and science reacted significantly differently from teachers of English and social studies to non-subject-oriented teaching situations. (secondary in-service)


Attitudes of groups studying transformations became more negative, while that of the groups studying traditional topics were unchanged. Attitude toward geometry was found to be significantly correlated to achievement in geometry. (grade 10)


Five conceptual styles were identified and related research summarized. (kindergarten-grade 12)

Stacy, Bobby Fant. A Comparison of Academic Achievement and Mental Maturity Test Scores of Negro High School Seniors in Predominantly White Schools with Academic Achievement and Mental Maturity Test Scores of Negro Seniors in Predominantly Negro Schools. (Mississippi State University, 1971.) DAI 32A: 1815; October 1971.

Negro students who transferred to predominantly white high schools achieved significantly more on mathematics and certain other tests than Negro students who remained in Negro schools. (grade 12)


No significant differences in achievement were found for groups receiving no, specified, or "free" comments. Girls scored significantly higher than boys. Mean attitude level increased for all groups. (grades 8-12)

Of 396 words identified, only 51 were used in both the reading and mathematics textbooks studied and only 161 were common to all four mathematics textbooks. (grades 1-3)


Significant differences in conservation, seriation, and classification abilities were found for different races, ages, and SES levels. (ages 5-8)


Teachers were found to have different perceptions and expectations for low- and high-ability classes, but differences in behavior were not observed. (teachers in grade 7)

Szetela, Walter Frank. The Effects of Test Anxiety and Success-Failure on Mathematics Performance in Grade Eight. (University of Georgia, 1970.) DAI 31A: 5949; May 1971.

Neither success nor failure experience affected mathematics achievement or anxiety. Test anxiety did appear to interfere with mathematics learning even at high IQ levels, however, and correlations for both test anxiety and mathematics anxiety were highly significant for boys. (grade 8)


A computer program was developed to analyze teacher-pupil language use in mathematics lessons. The instructional emphasis was almost exclusively on calculation, with teachers dominating all verbal activity. (grades 6, 7)
Courses and the amount of use of mathematics had a significant effect on students' attitudes. (elementary pre-service)

The SSNCIS was found to reflect three philosophic orientations in both planning and execution. (secondary)

The course in which small-group work was substituted for part of the lecture discussion did not result in significantly different scores, although they tended to be higher. (elementary pre-service)

More extensive development of the decomposition algorithm was found to be more effective than a procedure which included work with concepts and use of the number line before the algorithm was taught. (grade 3)

A significant difference was found in the ability of mentally retarded and normal children to recognize logical conclusions. (ages 6-11, MR's)

No significant differences between groups using individualized materials and groups taught by the teacher were found in achievement, and attitudes differed only in grade 2. (grades 1-6)

Urwiller, Stanley LaVerne. A Comparative Study of Achievement, Retention, and Attitude Toward Mathematics Between Students Using Spiral Homework Assignments and Students Using Traditional Homework Assignments in Second Year Algebra. (The University of Nebraska, 1971.) DAI 32A: 845; August 1971.

No significant differences were found between groups who used spiral or traditional homework assignments. (grade 11)

Vakil, Rama. Classroom Climate, Pupil Achievement and Attitude. (Case Western Reserve University, 1970.) DAI 32A: 1351; September 1971.

Pupils with non-rejective teachers learned arithmetic computation "more" than did pupils of non-integrative teachers. (grade 6)


A philosophical analysis of the laws of invariance resulted in the conclusion that "conservation" is neither "logically necessary" nor does it necessarily involve the concept of "quantity". "Conserving behavior" is shown to be basically a perceptual process, not involving "logical thought". (elementary)


The CUPM recommendation on the real number system was being implemented. Teachers had the conceptual background but lacked sound pedagogical preparation. (elementary in-service)

In general, students in traditional schools scored higher on tests of arithmetic skills than did students in individualized schools.

(Grades 2, 3)


Attribute block training was found to have a strong positive effect at both grade levels on logical and perceptual reasoning ability.


Certain therapy groups had a significant effect on arithmetic test scores.

White, Josie Nance. The Effectiveness of Purposive Teaching of Certain Reading Readiness Skills and Quantitative Concepts to Pre-School Children. (University of North Carolina, 1963.) DAI 31A: 4051-4052; February 1971.

Both younger and older pupils achieved significantly on tests of quantitative relationships following purposive instruction.

Winters, Wade Cooper Heins. Denotative Meanings Assigned Indefinite Number Terms by Children Varying in Intelligence and Age. (University of Georgia, 1970.) DAI 31A: 5893-5894; May 1971.

Children at different age and IQ levels responded similarly to terms such as "few", "many", and "lot". They assigned "some" and "few" equivalent meanings. (Ages 7, 9, 11)

Students using supplementary materials did not show a significant gain in attitude over those using a traditional method, but achievement increased in heterogeneously-grouped classes using supplementary materials. (grade 8)


No significant differences in achievement or attitude were found between groups using conventional instruction or either of two types of laboratory materials. (grade 6)

Williams, Peter Henry. The Effect of More Than One Teacher During a School Year on the Attitude and Achievement of Junior High Mathematics Students. (Indiana University, 1970.) DAI 31A: 5683; May 1971.

Average and above-average students gained significantly more than expected when they had four mathematics teachers during the year. In general, however, having four teachers did not significantly affect achievement or attitude. (grade 8)


The unit on transformational geometry resulted in significantly better achievement on geometry skills but not spatial ability. (grades 2, 3)


The development of classificatory behavior was found to proceed with age and experience from reliance on perceptual cues toward the use of intrinsic properties. The use of word-cues appeared to affect responses. (grades 5, 8, 11)
Woods, Margaret Christine. A Study of Expectations Held By Supervisors Relative to Teacher Aspirations Toward the Objectives in the Cognitive and Affective Domains in Selected Subject Areas. (The University of Wisconsin, 1970.) DAI 31A: 5261-5262; April 1971.

Supervisors preferred that teachers emphasize the cognitive over the affective domain in mathematics. (elementary in-service)

Yawkey, Thomas Daniel. A Test of Piaget's Notions of Conservation of Number on Tasks of Inequality. (University of Illinois at Urbana-Champaign, 1970.) DAI 31A: 4566; March 1971.

Children generally evidenced conservation by age 6 when responses were verbal, and by age 5 with "symptom" or pointing responses. (ages 3-7)