This annotated bibliography lists research related to mathematics teaching and learning which was published in the United States during 1973. The listing covers the levels K-12, and is divided into three major sections. The first section lists research summaries which review groups of research studies. The second section contains research reports which appeared in journals during 1973. The final section includes dissertations announced in "Dissertation Abstracts International." (JP)
RESEARCH ON MATHEMATICS EDUCATION (K-12) REPORTED IN 1973

By Marilyn N. Suydam
J.F. Weaver

The ERIC Science, Mathematics and Environmental Education Clearinghouse and the Center for Science and Mathematics Education
The Ohio State University

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Research on Mathematics Education (K-12) Reported in 1973

Marilyn N. Suydam
The Ohio State University

J. F. Weaver
The University of Wisconsin-Madison

ERIC Information Analysis Center for Science, Mathematics, and Environmental Education
400 Lincoln Tower
The Ohio State University
Columbus, Ohio 43210

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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 of the American Educational Research Association, 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.
Preface

This annotated bibliography lists research related to mathematics teaching and learning which was published in the United States during 1973. The listing covers the levels from kindergarten through grade 12, and is divided into three major sections. The first section lists research summaries which review groups of research studies. The second section contains research reports which appeared in journals during 1973. The final section includes dissertations announced in Dissertation Abstracts International. (To conserve space, this reference is referred to as DAI in the listing.)

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
Associate Director for Mathematics Education

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Research Summaries

Articles which summarize research findings or list research reports are included in this section.


Studies related to types and factors of mathematical ability, the meaning and measurement of creativity, heredity and development in mathematical abilities, psychosocial factors, and education for mathematical creativity are reviewed.


Findings from SMSG research and development efforts are discussed, under the headings of objectives, teachers, curriculum, instructional processes, students, class size, cultural differences, student attitudes, and further observations.


Research on the use of mathematics laboratories is reviewed; it is suggested that laboratories be considered one approach to be used to meet individual needs.


Findings from research with mentally retarded children are discussed and instructional practices are suggested.


The rationale for the Paradigms Project is given, with an overview of the mode-of-representation, structure of curriculum hierarchy, and choice-behavior studies which have been conducted.

Research on attitudes is reviewed, with the conclusion that "there is general agreement that a child's attitude toward learning arithmetic is important, but measures of general attitude have not been found to be causally related to arithmetic achievement."


One hundred dissertations were classified as elementary: 48, junior high: 55, secondary: 84, college and adult: and 58, teacher education (some duplicate listing).


This annual annotated listing includes 13 research summaries, 71 journal-published reports, and 335 dissertations.


Cagne's studies on hierarchies and several others (not all on mathematics) are reviewed; the weakness of the evidence is discussed and a more rigorous model is proposed.
Seventy-six articles which were published in 19 journals are listed.


Children were surprised at color change at lower MAs than they were surprised by quantitative change. Length and number conservation preceded quantity conservation for both normal and retarded children. (MA 6)


Scores of both teachers and instructor using a developed observation scale correlated highly with rank ordering of intuitive judgments. (elementary in-service)


Training individuals in five methods of doing multiplication with fractions facilitated transfer performance, as did training pairs with a single method. Conversely, training individuals in the single method inhibited performance, as did multiple-method training of pairs. (grade 5)


Procedures are presented from two research studies in which more than half of the students not only achieved mastery on the post-test of equivalent fractions but also passed a generalization test. (grades 5, 6)
No significant differences between groups having immediate or delayed knowledge of results were found in means on one-hour tests; on the final examination, differences significantly favored immediate reinforcement. (Junior high, college)


Transfer from single- and multi-configurations was found to occur. (grades 9, 10)


Conservers of number and substance scored significantly higher than non-conservers on a reading readiness test. (grade 1)


Teachers were more consistent in producing achievement gains within arithmetic and language arts than across them. Language arts tests correlated higher with arithmetic concepts and problem solving (which involve reading) than with computation. (teachers in grades 2, 3)


No significant differences in computation achievement were found between students using braille or large type. Means for groups using various materials are given. (grades 4, 6, 8)


Retarded children performed on the conservation measures like normal children of the same mental age but less well than their normal chronological-age peers. Bright children did not perform as efficiently as their normal mental-age peers but more like their chronological-age peers. (age 6)

Task-analysis procedures were found to be effective for students' learning of a mathematical task. (grade 6)


A consistent pattern of matched-ratio predictions was found, rather than the expected even-level predictions. (ages 4-6)


Students in grades 8 and 10 consistently had significantly higher mean scores when selecting drawings for designated cross-sections than did sixth-grade pupils. Girls had lower scores than boys did, and low-ability students did less well than middle- or high-ability students. (grades 6, 8, 10)


Using the game EQUATIONS and teams resulted in more peer-tutoring and other affective benefits. (grade 7)


Teachers generally thought criterion referenced assessment for mathematics was more helpful for instructional planning than was norm-referenced testing. (elementary in-service)


Each of the three item formats was susceptible to the special instruction specifically directed toward it, with complex or novel formats more likely to be affected than the straightforward format. (grade 12)

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


Groups having reviews retained significantly more than a group having no reviews. Time of review was not a significant factor when only one review was given; reviews after 1 and 7 days were better than reviews after 1 and 2 days. (grades 7, 8)


Data resulting from use of Distar materials with nine pupils are briefly presented. (kindergarten)


For open subtraction sentences of the form $x + \_ = y$, a model which assumes that pupils increment or decrement depending on which is quickest was found to give the best account of success latencies. None of the three models evaluated gave an adequate account of latency data for sentences of the form $\_ + x = y$. (ages 6-9)


For the Piagetian tasks used (including some mathematics-related ones), no socioeconomic effects were found; verbal ability and age-grade level were significant on most of the tasks. (kindergarten-grade 4)

The four teachers studied differed in the percent of discourse coded managerial, convergent, reinforcement, and questions. Memory was the most frequently coded inferred cognitive process; the semantic mode was the most frequently used. (teachers in grade 8)


For both CAI students (who had used a remedial drill-and-practice program in basic arithmetic for one or two years) and non-CAI students, the computer had a more favorable image than the teacher, textbooks, and TV news. (grades 7-9)


Fulfilling the antecedent requirements was apparently not enough to imply the respective consequent objective in most cases. (grade 4)


Language stimulation and schooling did not seem to play a major role in the development of logical operations (including classification and conservation of quantity and volume tests). (ages 7-9)


Significant correlations were found between scores on the developed scale and ten of 18 demographic-biographical, cognitive, and affective variables. (grade 7)

Mastery attained as a result of explicit instruction on either a main objective or its inverse did not imply achievement on their related transfer object. (grade 5)

Hosford, Philip L. The Right to Figure. *Contemporary Education* 44: 262-266; April 1973.

Teachers selected basic skill objectives when asked to focus on essentials for both high-school and elementary-school programs. For talented students, preference was indicated for independent study which might focus on the meanings of computation. (secondary in-service)


The generality of an algorithm was apparently not considered important by fifth-graders when choosing between two algorithms for solving a problem. The preferred algorithm will probably be the one learned second. (grade 5)


Positive instances with no common irrelevant attributes and positive and negative instances lacking one common attribute resulted in better performance than other instances. (grades 7, 8)


Students using a wanted-given approach or general problem-solving techniques did not score significantly higher than control groups when number of correct answers was the criterion, but did use a correct procedure significantly more often, especially with a wanted-given approach. (grade 5)

The procedure for developing the materials (using the iterative curriculum development model) was presented. Sixth graders were able to understand the theorems and learn the proofs. (grade 6)


Five textbook series being considered for adoption were used in 10 classes per grade level; achievement data and teachers' evaluations were used to narrow the choice to two series. (grades 1-6)


It was concluded that if explicit instruction is provided on one of two paired objectives, then achievement on the other can be expected. (grade 5)


Significant differences were found favoring the groups taught a partition approach to the standard division algorithm over the subtractive approach to the Greenwood algorithm, for total score and unfamiliar computational problems. (grade 4)


The percentage of mathematical symbols ranked as the best predictor of both explanatory and illustrative passages. Three of the four best predictors were the same for both types of material. (grade 9)


On a 16-item test, pupils on the average were able to work two less problems at the beginning of fifth grade than they could work at the end of fourth grade. (grades 4, 5)

Performance on conservation of area tasks was superior at both age levels to performance on conservation of quantity and matter, perhaps as a function of stimulus familiarity. (ages 5, 7)


A mathematics course in which students worked in groups under group leaders resulted in better-than-expected achievement. (elementary pre-service)


Skills needed by vocational students, skills lacked by students, and skills needing remedial attention were listed as they were ranked by teachers. (secondary in-service)


Both normal and EMR children in the transitional stage conserved number at a low level of stimulus intensity but failed to conserve at a higher level of intensity. (kindergarten, grade 1, EMRs)


Although pupils whose teachers were told that they had academic potential tended to make greater gain scores, no significant differences were found in arithmetic grade and other measures. (grade 1)


Kindergarten conservers and non-conservers attended to height most frequently; minimal attention was given to width or quantity. Third-grade conservers attended to quantity more often. (kindergarten-grade 3)

Observable surprise at violations of expectancies concerning conservation of weight was infrequent in all groups. Changes in conservation judgment were frequent. (grades 2, 3, 5)


No significant interactions were found between aptitude and treatment (area or unit-of-area approach to unit-of-length concepts). Significant main effects were found favoring the higher aptitude level and the treatment emphasizing the unit. (grades 2, 3)


Pupils in classes of 1, 2, or 5 students displayed significantly greater attainment on an exponential unit than did pupils in a class of 23. One-to-one instruction was significantly superior to one-to-five instruction. (grade 4)


Less than one-third of the girls had attained "the conception of conservation of volume". (grade 8)


A measure of adjustment derived from semantic differential self-concept responses was significantly related to mathematics performance after the effects of anxiety and intelligence were partialled out. (grade 7)

Classes having expository teaching achieved significantly better in computation; classes in another school having discovery teaching scored significantly better on the retention test of applications. Attitude improved more for those taught by the discovery method. Some interaction effects were also found. (grade 4)


Data suggested that Zulu youths who grow up in town and attend school from an early age proceed to a Euclidean concept of space, while others are likely to retain topological ideas usually associated with much younger groups. (ages 11-20)


Transfer without explicit instruction was found in many instances. (grades 9, 10)


Conjunctive expressions were readily understood by young children, but understanding of disjunction and implication relationships was relatively poor until middle adolescence. (grades 2, 5, 8, 11)

Peterson, John C.; Thomas, H. Laverne; Lovett, C. J.; and Bright, George W. The Effect of Organizers and Knowledge of Behavioral Objectives on Learning a Mathematical Concept. *Journal for Research in Mathematics Education* 4: 76-84; March 1973.

In only one instance (in three independent replications) was a significant interaction found between advanced and post organizers. (grade 8, elementary pre-service)

An 11-level hierarchy for rational-number addition was constructed and tested; pass-fail relationships were analyzed using various validation processes. In a subsequent study, no procedure was found to be consistently superior, though efficiency of learning can be affected by sequence manipulation. (grade 4)


Most-recent-teacher-attitude toward arithmetic was found to be significantly related to student attitude toward arithmetic, but not significantly related to student achievement in arithmetic. Type-of-teacher-attitude for two or three of the past three years was significantly related both to student attitude and achievement. (grade 7, teachers in grades 4-6)


Tasks where number and length covaried were easier than those where they did not covary. Some results, such as the use of one-to-one correspondence, did not agree with Piaget's predictions. (ages 2-5)


The correlation between achievement scores immediately after learning and scores obtained four weeks later was .78. (grade 6)


Providing a cognitive set was found to be facilitating, and either an advance or a post organizer was facilitating, but not both used together. (grade 11)

Significant relationships were found between reading achievement and auditory perception, and between arithmetic achievement and visual perception. (grades 1, 2)


The research design and questions were presented, but no results were reported. (elementary)


Short, frequent exercises in mental computation resulted in more favorable attitude scores, though no significant differences in achievement were found. (grade 5)


An instrument to be used in categorizing questions of teachers is presented.


Geometric concept areas were classified into seven levels of difficulty. (grade 6)


Black children did not appear to profit from a single year of prekindergarten activities involving seriation and classification, but did benefit from a program extending from ages 2 to 5. White children profited from both programs. (ages 4-6)

Children given training on class inclusion improved significantly while the control group did not change. Scores increased from first to second posttest. (age 6)


Teachers felt that pre-service programs should include two content and two methods courses. The amount of time a teacher spent in teaching mathematics seems to reflect how she felt about her mathematics courses. (elementary in-service)


Students having problems with accurate pictorial representations scored significantly higher than students having no diagrams, who in turn scored significantly higher than those having distorted diagrams. (grade 10)


Boys talented in mathematics or English did not differ in levels of responsibility or mean levels of anxiety. Those talented in English were considerably more sociable than boys talented in mathematics. (grade 12)


Attitudes in the non-CAI group were stable from pre- to posttest, while the CAI students (using a drill-and-practice arithmetic program) had considerably less stable attitudes. (grades 7-9)


A mastery test and five diagnostic tests (r = .53 to .93) were ped; five difficult skills were noted for low and highers. (grade 2)

Effects of success/failure on measures of mathematics test anxiety and performance were not significant. Test anxiety was found to be a marginally significant factor in mathematics learning. (grade 8)


Methodological issues in validating branching hierarchies were discussed, with the use of validated hierarchies in constructing criterion-referenced placement and diagnostic test batteries considered. (pre-kindergarten-grade 1)


Performance on addition and subtraction sentences appeared to be related to grade level, operation, the position of the placeholder, and the existence or nonexistence of a solution within the set of whole numbers. Interactions were found between certain of these factors and open-sentence form. (grades 1-3)


At all grade levels 4 through 7, pupils exhibited very little sensitivity to use of distributivity in solving examples varied in context, form, format, and number. (grades 4-7)


No significant differences in overall performance were found between groups taught addition and subtraction of two-digit numbers as a single process or sequentially. Some differences in performance on operations significantly favored the sequential group. (grade 2)

Changes in correlations of arithmetic and six other scores are noted. (grades 3, 6)
Dissertation Abstracts

The 299 dissertations listed in the following section were completed at 87 institutions.


In grades 1-3, but not in grade 4, pupils using the PLAN system achieved as well on a mathematics test as did students in a non-PLAN school. (grades 1-4)


Only one-third of the teachers had had a graduate mathematics content course and only one-fourth had had a graduate mathematics methods course. Other information on background and needs was cited. (elementary in-service)


Students who received instruction on questioning techniques asked more convergent, divergent, and evaluative questions and fewer cognitive-memory and managerial questions. (secondary pre-service)


No significant difference in achievement was found between classes having geometry for 90 periods of 110 minutes or 180 periods of 55 minutes. They preferred the double period. (grade 10)

The hypothesis that requiring a student to verbalize a newly discovered mathematical concept interferes with his ability to use that concept was not confirmed. (elementary pre-service)


A collection of 30 items of mathematical art was considered to have some potential for use as a teaching aid. (secondary, college)


A significant difference was found in pupils' ability to classify five fractions by lengths, continuous and discontinuous regions, sets, and numeration; either type of region was more difficult for them to use. (grades 3-6)


The continuous-progress program was as effective as a traditional program for increasing arithmetic-concepts knowledge but not computational skills. (grades 1, 3-8)


Pictures elicited more ideas and more fluency in problems than did written stimuli. (grades 4, 5)


A curriculum sequence was developed in which graph skills were matched with related mathematics skills. (kindergarten-grade 9)

Mean gain scores on an arithmetic test were significantly higher for EMR pupils when they used the developed IPI program. (primary EMRs)


No significant difference was found between levels of self-concept and mathematics achievement. (grades 7, 9)


Support was indicated for Piaget's contention that topological aspects precede Euclidean aspects in the development of spatial concepts. (ages 4-5 1/2)


Deaf students developed selected concepts of money, measurement, and other non-mathematical topics differently than did hearing students, with knowledge increasing as a function of age in both groups. (ages 10-20)

Backman, Margaret Esther. Relationships of Ethnicity, Socioeconomic Status, and Sex to Patterns of Mental Abilities. (Columbia University, 1970.) DAI 33B: 4988; April 1973.

Girls performed better on language, perceptual, and memory factors, while boys were better on mathematics, visual reasoning, and verbal knowledge factors. (grade 12)
Bailee, James Mellon. A Comparison of Two Approaches Designed to Improve the Computational Skills of Pupils in Grades Five and Seven. (North Texas State University, 1973.) DAI 34A: 1576; October 1973.

A programmed-material device was effective in improving computational skills in grade 5 but not grade 7; mental computation materials were not effective at either level. (grades 5, 7)


No significant differences in achievement or attitude were found between classes having or not having individual contracts. (grade 9)


A teaching unit on the metric system was developed and taught to ascertain the appropriate grade level at which to teach specified content. (grades 3-6)

Barnard, James Allan. A Comparison of Two Approaches of Understanding Integer Addition by Prospective Elementary Teachers at Oregon College of Education. (University of Illinois at Urbana-Champaign, 1972.) DAI 33A: 5593; April 1973.

Students having a property approach to integer addition appeared to have better understanding immediately after instruction, while students having a theorem approach surpassed them after a retention period. (elementary pre-service)


No significant differences were found between students who used self-paced materials with explicit objectives and a smaller group having traditional instruction. (elementary pre-service)

Some differences in achievement and attitude favoring classes using various units for low achievers were found. (grades 7-9, 12)


Instruction using one, two, or three concrete embodiments of the concept of equivalent fractions had essentially the same effect on ability to generalize the concept. (grades 5, 6)


A significant difference in arithmetic achievement between initial testing and retesting was found only in grade 3. (grades 3-8)


Between 1966 and 1971, the laboratory approach was used, discussed, and advocated more than at any previous time. The need for research was noted. (elementary)


Characteristics of students nominated as potentially creative were determined in terms of those who were "high creative" and those who were "low creative". (secondary, college)

Students receiving instruction on coin, mixture, and uniform motion problems through programmed materials using only iconic and symbolic representations did not derive algebraic equations significantly better than those taught via videotape and programmed materials using enactive as well as the other modes of representation. (grade 9)


No significant differences in achievement were found between groups who used or did not use computer programming. The non-computer group scored significantly higher on three of four attitude measures. (secondary)


Gains in mathematics scores were significantly greater in the school using the Individually Guided Instruction Program. (elementary)


No significant differences in achievement were found between groups given varying amounts of drill. (elementary)


Groups having instruction on logic achieved significantly higher than groups not having such instruction. The order of difficulty of logical patterns was determined. (grades 7-9)
Broder, Cecilia Colette. The Application of Diagnostic Teaching and a Mathematics Laboratory to a Middle School Individualized Unit on Fractions. (University of Pittsburgh, 1973.) DAI 34A: 1579; October 1973.

An individualized unit on fractions, which incorporated diagnostic teaching and a mathematics laboratory, increased achievement, though students did not meet criterion. (elementary)


The use of a film and/or manipulative materials with the textbook resulted in higher achievement than use of the textbook alone. (grade 4)


Total arithmetic scores were at "expected" (norm group) levels. The most critical growth period appeared to be between grades 3 and 5. (grades 2-7)


Variability as well as patterns of use of number were noted. (ages 4-6)


Revised explanatory passages and one of two revised illustrative passages resulted in better comprehension. Readability of the revised versions (from SSMCIS) was significantly better than for the original. (grade 7)

The insertion of geometrical interpretations into algebraic instruction did not significantly affect problem-solving performance. (grade 8)


Pupils in self-contained classrooms achieved significantly better in mathematics in grade 4; no achievement differences were found in grade 3 or 5. (grades 3-5)


A method to determine the effectiveness of individual schools in promoting arithmetic and reading achievement was developed. (grade 6)


Significant correlations were found between arithmetic achievement and auditory-vocal association and auditory closure; seven other factors were correlated for an initial sample but not a replication sample. (age 7)


No significant differences between massed and distributed practice were found, though distributed practice resulted in slightly better retention. (grade 9)

Pupils who had a "developmental program" did not achieve significantly different scores on an arithmetic subtest (or on other measures) from comparable pupils not having such a program. (grade 1)


Tutoring or being tutored did not increase self-concept or achievement more than did working on individualized worksheets, nor did training tutors result in differences in scores. (grades 4, 6)


Use of field postulates and other properties of whole numbers in teaching addition and subtraction with fractions was found to be more effective than use of objects and the number line. (grade 4)


No significant differences in arithmetic achievement were found between Spanish-surnamed and white emotionally disturbed pupils. Type of class did not affect achievement. (ages 8-11)

Centrone, Joseph John, Sr. Teacher Sociocultural Awareness in Selected Schools in New York State Accountable for American Indian Education. (Syracuse University, 1972.) DAI 33A: 5596-5597; April 1973.

No difference in mathematics achievement of pupils in segregated or integrated schools was found. (grade 3)
Chatburn, Dean Nimrod. The Influence of Selected Kindergarten Programs on Pupil Achievement in Language, Social Studies, and Mathematics at the First Grade Level. (Utah State University, 1973.) DAI 33A: 6645; June 1973.

Pupils who had private kindergarten experience scored higher on mathematics tests than those with no kindergarten experience. Pupils in the Model Cities kindergarten program scored similarly to those not attending kindergarten. (grade 1)


Use of multimedia materials with correct-answer feedback was found to be more effective than either alone, especially with medium and low achievers, for a unit on integers using IPI materials. (grade 7)

Chiappetta, Eugene Louis. The Effectiveness of Verbal Label Training in Aiding Second Grade Pupils to Transfer Their Classificatory Skill. (Syracuse University, 1972.) DAI 33A: 5545; April 1973.

Pupils trained to use concrete (value) labels in classifying objects seemed better able to classify abstract materials than did pupils having no verbal label training. Training on abstract (attribute) labels did not appear effective. (grade 2)


Conceptual tempo was not meaningfully related to arithmetic achievement. (grade 4)


No significant differences were found between the limits of sequence, delta-epsilon, or neighborhood approaches. (grades 11, 12)

Students taught by large-group instruction made significantly more gain in content and attitude scores than those working in small groups. No significant differences were found in methods scores. (elementary pre-service)


Data on a taxonomy-type attitude scale (r = .91, .94) were reported. (elementary pre-service)


No significant differences in mathematics scores were found between students in bilingual or regular programs. (grade 9)


The developed unit, based on the incidence axioms of projective geometry, appeared feasible. (grades 9-12)


The dimensional analysis method was more effective than the "traditional" method on the immediate posttest, but no significant differences were found on retention tests. (grade 7)

Findings on the use and achievement of 23 mathematics items, rated by high school mathematics teachers and college science teachers, were reported. (secondary, college teachers)

Crowcroft, Harry Gordon. The Effect of Verbalization of Individually Derived Mathematical Generalizations on Transfer at Two Age Levels. (University of Maryland, 1973.) DAI 34A: 3233; December 1973.

No significant differences were found between students who verbalized or did not verbalize generalizations for arithmetic and geometric tasks. (grade 10, college)


Instruction in logic significantly improved logical reasoning and critical thinking abilities. Instruction in set theory did not further improve scores. (grade 12)


Pupils in grade 3 who were below the grade median in IQ had significantly better conservation responses after use of materials plus the textbook than did those who used only the textbook. In grade 4, the high IQ group using materials had better conservation of length. No achievement test differences were found. (grades 3, 4)


No significant differences in mathematics achievement were found between EMRs taught in resource rooms or self-contained classrooms. (middle-school EMRs)

Increases in professional and personal status, teaching qualities, leadership activities, and knowledge of and confidence in teaching of mathematics were reported. (secondary in-service)


The three-year multimedia program resulted in significant gains in arithmetic achievement and study skills in grades 3-8. (grades 1-12)


Programming achievement and attitude toward mathematics significantly increased following lessons requiring computer use. (elementary and secondary pre- and in-service)


It was concluded that the developed materials were effective. (grade 6)


Students in Title I schools performed at significantly lower levels in arithmetic and reading than did students in non-Title I schools. (elementary)


No significant differences in self-concept were found between high and low achievers. When achievement was dichotomized into computational and reasoning ability, actual distributions did not match hypothesized distributions. Correlations between the two aspects were .71 at grade 3 and .81 at grade 6. (grades 3, 6)

Pupils taught bilingually achieved significantly better on Spanish items and as well as the monolingual group on English items on a mathematics test. (grade 1)


Students having homework achieved better than those not having homework. Students with high locus of control scores achieved better than those with low scores. (grade 4)


No significant achievement differences or aptitude interactions were found between groups given deductively or inductively developed materials. (grade 8)


No significant differences in attitude were found between students using a computer-managed instructional program for geometry or having "traditional" instruction. (grade 10)

Earnshaw, George Livingston. Open Education as a Humanistic Intervention Strategy. (Syracuse University, 1972.) DAI 34A: 1175; September 1973.

Pupils in the open-education program did not score as well as pupils in a regular program on standardized tests of mathematics and reading. (grade 2)

A significant interaction was found between aptitudes (spatial visualization or general reasoning ability) and treatment (analytical or graphical). The treatments did not result in differences in transfer scores. No advance-organizer effects were found. (grade 10)


Analytic and reflective cognitive style were found to be positively related. Both analytic and reflective pupils tended to exhibit a focus strategy in demonstrating concept attainment. (grade 3)


Improved mathematics achievement did not result from a program of remedial perceptual-motor activities. (junior high MRs)


Teachers viewed the state assessment favorably and thought test results would be useful in planning instruction. (teachers in grade 6)


"Flexibility of closure" did not appear to be systematically related to teaching behavior. (elementary pre-service)
Eudy, Elaine Holland. The Effectiveness of a Mathematical Device Called a Tryab on the Arithmetic Achievement of Primary Students. (The University of Mississippi, 1973.) DAI 34A: 1479-1480; October 1973.

Use of the pegboard-flannelboard-chalkboard device did not result in higher arithmetic achievement than when the device was not used. (grade 1)


No significant difference in mathematics achievement was found between students in zoned schools and those attending the same school by choice. (grade 9)


Pupils in the structured program achieved significantly higher than pupils taught by an incidental approach. (kindergarten)


Pupils using the learning system had significantly higher mathematics concept achievement than did pupils not using the system; no differences were found in computation, problem-solving, attitude, or adjustment. (elementary)


No significant differences in achievement or attitude were found between groups taught by a diagnostic or a textbook approach, though significant gains were made. (grade 6)

Students who had a high school or college geometry course, a mathematics content course, or a methods course achieved better on a developed geometry test. (elementary pre-service)


Students who had an alternative form of instruction on graphs as remediation achieved significantly better than those receiving additional practice items as remediation. (grade 8)


Some significant differences favoring the groups using mathematics laboratory activities were found. (grade 9)


No significant differences in achievement were found between students using the computer-managed units or having the "traditional" geometry program. (grade 11)


An instrument to measure "mathelation", a component in the problem-solving process, was found to have a reliability of .83. (elementary pre-service)

No significant difference in problem-solving score or time was found between students who were required to verbalize and those who remained silent, nor between "physical" and "verbal" problem solvers. (secondary)


Developmental level was found to be a factor in the child's ability to learn and use some concepts of computer programming; it was a better predictor than IQ and achievement test scores. (grade 4)


No significant differences were found between students who solved non-routine problems with or without computers and/or flow charts as aids, though some selected aspects of problem-solving were improved when aids were used. (grade 8)

Fowler, Mary Anne. *The Effectiveness of Methods Courses as Evaluated by Beginning Elementary Classroom Teachers.* (Loyola University of Chicago, 1973.) DAI 34A: 3203-3204; December 1973.

About one-third of the teachers indicated that an arithmetic methods course had been more effective than courses in three other subject areas. Comments on various needs are included. (elementary in-service)


Some correlations between mathematics and cognitive style scores were reported. (grade 6)

The median percentages of questions asked by teachers teaching a geometry theorem were: memory, 23; comprehension, 56; application, 18; higher-level, less than one per cent. (teachers in grade 10)


Groups in which pupils knew teacher-aims or set their own aims and charted their own scores made significantly greater gains on timed mathematics tests than did groups not knowing aims or progress. (elementary)


Significant differences were found between emotionally disturbed and normal boys on six factors. (ages 8-11)


The unit on topology appeared to result in satisfactory achievement and attitude scores. (elementary pre-service)


A significant difference in computation scores was found, favoring the groups receiving more indirect teacher influence; differences in reasoning, concepts, and understanding scores were not significant. (grade 6)

A significant gain in scores on attitude toward mathematics items was found after a language arts-mathematics block course. (elementary pre-service)


The hypothesized developmental sequence was confirmed. Copying of angles and parallel lines was also ordered. (elementary)


Instruction using one, two, or three enactive and/or iconic embodiments of a concept had essentially the same effect on ability to operate with a symbolic embodiment of the concept. (grades 5, 6)


Sixth graders were superior to third graders on the classification tasks; specific aspects were reported. (grades 3, 6)


No significant differences in mathematics achievement were found, but attitude and adjustment scores were higher for pupils in the individualized program. (kindergarten, grade 1)

Teachers made two-thirds of all moves, making almost all initiatory, soliciting, and structuring moves. Simpler cognitive actions were likely to be stated in operational language. (grade 1)


Preoperational children did not increase their rate of categorical choices with a reduction of stimulus domination, while transitional and concrete operational children did. (ages 3-12)


Evaluation of a laboratory program indicated that it "was contributing to the improvement of attitudes and achievement of quite a few mathematically-deficient students." (elementary)


Training resulted in peer managers for programmed mathematics instruction groups whose behaviors approximated teacher performance. Written work of students was better with trained managers than with untrained managers or teachers. (elementary)


The fourth-grade group having peer-tutors gained significantly more in computation than the group not having tutors. No differences were found in concepts or applications, nor were any differences found in grade 3. Tutors learned at least as well as tutees. (grades 3, 4)

No significant differences were found between groups receiving or not receiving token reinforcers. (ages 11-17, EMRs)


Ability appeared to be more related to achievement at various cognitive levels than was grade placement; other factors were noted. (grades 4, 6, 8)


Participants generally achieved satisfactorily and responded well in the developed course. (secondary in-service)

Haile, James Benjamin, Sr. A Study and Analysis of the Relationships Between Selected Intelligence Factors, Selected Achievement Factors, and Academic Achievement Grades of a Selected Group of Developmentally and Functionally Retarded Junior-High-School Age Children. (The American University, 1973.) DAI 34A: 3189; December 1973.

Differences were found between developmentally and functionally retarded students on several measures (one of which was mathematics achievement). (grade 7)


No significant differences in achievement or attitude were found among given written comments of a content or a personal nature or no comments on daily assignments. (grades 8, 9)

Training was found to be effective; support was inferred for the point of view that "communication difficulties" can account for nonconservation responses. (age 5)


Significant differences in scores on a mathematics test were found between teachers with specified professional interests. (secondary in-service)

Harbeck, Sister Carol Ann. Experimental Study of the Effect of Two Proof Formats in High School Geometry on Critical Thinking and Selected Student Attitudes. (The Ohio State University, 1972.) DAI 33A: 4243; February 1973.

Groups using a flow-diagram format had significantly more favorable attitudes toward that format; they tended to achieve higher than groups using the statement-reason format. (grade 10)


The IPI program appeared superior to the teacher-developed and textbook programs. (grades 4, 5)


Higher accuracy and rate of performance were correlated with use of peer tutors. Relatively few pupils finished homework assignments; achievement was not affected. The use of behavioral consequences resulted in better performance. (elementary)

A set of 25 tautologies, selected from two algebra textbooks, appeared to be adequate for the proofs of propositions in grade 11 and 12 courses. (grades 11, 12)


Middle-track students achieved better when they were aware of objectives, but achieved lower with programmed cassette tapes than students in the traditional program did. No significant differences were found for top-track students. (grade 11)


The patterning treatment appeared to have some positive effects on achievement during the year. (kindergarten)


While attitudes and achievement of pre- and in-service teachers were significantly related, experienced teachers scored higher on applications and attitude measures. (elementary pre- and in-service)

Higdon, Gene Harold. A Comparative Study of the Achievement in Mathematics of Sixth Grade Students According to Type of School Organizational Pattern and Selected Teacher Variables. (McNeese State University, 1973.) DAI 34A: 2918; December 1973.

Students of black teachers with masters degrees achieved better than students of other teachers. (grade 6)

Students in an open-concept thermal-controlled school generally achieved better in arithmetic than did students in a conventional non-thermal-controlled school. (grades 3-6)


The guided discovery group had significantly higher achievement and transfer than either of two individualized instruction groups. (grade 11)


It was concluded that geometry should be taught as an integrated course including vector, transformation, and coordinate methods. It should not be primarily a vehicle for teaching axiomatics. No justification was found for teaching geometry (and no other mathematics) in grade 10. (secondary)


Teacher-pupil transactions were identified and coded on five dimensions. (teachers in junior high schools)


The system, for classifying messages in text according to content and mode and for analyzing the information, appeared valid and was used with a satisfactory level of interrater reliability. (grades 4-12)

The Head Start group scored higher in arithmetic application than the group not having Head Start. (kindergarten-grade 4)

Houde, Richard A. The Effectiveness of Positive and Negative Instances on the Attainment of the Geometric Concept of "Similarity" by Sixth Grade Students at Two Intelligence Levels. (The University of Tennessee, 1972.) DAI 33A: 3955; February 1973.

Alternating positive and negative instances or providing all positive instances was significantly better than giving all negative instances or no instances. IQ was related to performance. (grade 6)


It was possible to predict both general and mathematical self-concept scores from a combination of selected characteristics of the learning environment. (grade 9)


Performance on both a classification task requiring measurement and a "landscape" problem improved significantly with age. Measurement ability appeared present before the ability to attend simultaneously to two dimensions. (ages 3-4, 6-7, 9-10)


Groups using the lattice method were able to compute in significantly less time and more accurately than groups using the distributive method. No significant differences in understanding or attitude were found. (grade 4)

On six pupil-reaction factors, mathematics teachers were ranked lowest. Mathematics teachers receiving high pupil ratings were placid, relaxed and low in anxiety. (secondary in-service)


No significant differences were found between the two strategies studied, though both were effective. (grade 9)


The experimental rapid-acquisition algorithm produced "a quick, strong increase in computational power"; conventional practice resulted in some improvement; non-treatment had little effect, and an alternative experimental algorithm was debilitating. (grade 5)

Ibe, Milagros Dimal. The Effects of Using Estimation in Learning a Unit of Sixth Grade Mathematics. (University of Toronto (Canada), 1971.) DAI 33A: 5036; March 1973.

The groups taught to estimate had significantly higher scores for achievement, transfer, and estimation. (grade 6)


Matrix sampling appeared feasible for estimating mean achievement in the two test domains studied (arithmetic computation and word knowledge) for both disadvantaged and non-disadvantaged pupils. (grade 4)

Pupils had lowered perceptions of the computer's expertise after using the CAI programs on logic or drill-and-practice. (grades 5, 7, 9)


Students understood the transformation approach as well as the wrapping function approach. (grade 11)

James, Jerusha Ann Cobb. A Study of the Effects of Problem-Solving Strategies Developed in Teacher In-service Workshops on Fourth and Fifth Grade Childrens' Achievement. (Wayne State University, 1972.) DAI 33A: 6649-6650; June 1973.

The developed in-service program and procedures for the study were presented; no results were cited. (teachers in grades 4, 5)


Parents and students coded 71 per cent of textbook content as "neutral", 14 per cent as "masculine", and 6 per cent as "feminine". Instances of sex bias are noted. (grades 2, 4, 6)


Low correlations were found between creativity and aptitude scores, and between creativity and achievement. Girls scored higher than boys on the creativity measure. (grade 6)


Little relationship was found between attitudes and achievement in arithmetic, reading, or spelling. (elementary)
Students having advanced organizers for materials on transformational geometry scored significantly higher than students having post organizers or no organizers. Students given several concrete models achieved higher than those given only one model. (grade 4)


No significant differences were found between pupils heterogeneously grouped by stratification for arithmetic or in a non-stratified group. (grade 1)


Differences were found between mathematics/science teachers' and language arts/social studies teachers' perception of learning opportunities, and between teachers' and students' perceptions. (grade 5, teachers)

Keane, Dorothy Louise. An Exploration and Analysis of the Nuffield Mathematics Teaching Project with Reference to its Current Use in Selected British Schools. (Wayne State University, 1973.) DAI 34A: 3029; December 1973.

The development, implementation, and evaluation of the program; the role of teacher centres; and perceptions of teachers involved in the program are among the factors discussed. (ages 5-13, teachers)


Increasing sex-typing in mathematics and science ability was found over time, preceded by greater sex differences in concrete skills. Skills in reading comprehension and writing ability appeared to be related to decreases in mathematics and science abilities. (grades 5, 7, 9, 11)

Students who used the programmed unit where eight subtasks for solving ax + b = c were sequenced according to a consistency ratio did better in terms of immediate achievement than did students having different random orders of the subtasks; retention was not significantly different. (grade 7)


Counting ability was strongly affected by variations in the similarity and contiguity of objects in an arrangement. The contiguous arrangement of subgroups facilitated perceptual grouping of objects, which aided counting the total. (ages 3-5)


Students had difficulty performing Euclidean transformations, compositions of transformations, and inverse transformations in all modes of testing. Sixty-five per cent of all errors on the task were failures to conserve length. (ages 9, 11, 13)


Two computer programs were developed for use in predicting achievement and classifying into groups. (grades 4-8)


Deductive reasoning and problem-solving scores were significantly correlated. Problem-solving ability was not affected by the two-week unit on deductive reasoning. (grade 7)

Under both daily and weekly pay-off conditions, the group contingent pay-off system was as effective in controlling student behavior while doing mathematics skill sheets as was the individual contingent condition. (mean CA 10.3, EMRs)


The remedial program was found to be effective in three of four mathematics courses. (secondary)


Although a measure of non-cognitive variables contributed to the prediction of mathematics problem-solving scores for both boys and girls, and to computation and concepts scores for girls, increases were not significant. (secondary)


The domain-referenced tests had higher content validity than the norm-referenced tests. Scores on the two forms correlated highly. (grade 6)


The developed scale was found to have a reliability of .92, with five subscale reliabilities ranging from .67 to .84. (middle- and high-school)

The activity-oriented approach resulted in significantly greater achievement and a more positive attitude toward mathematics than the lecture-discussion method did. (elementary pre-service)


Achievement on the developed unit was satisfactory and attitudes were positive. (elementary pre-service)


Problem-solving ability was found to increase with age, but certain aspects of proof could be taught in upper elementary grades. (grades 1-12)


Of four variables, only achievement level consistently played a significant role in the relationship of pupil-attitudes and perception of those attitudes. (grades 6-8)


A significant difference in mathematics achievement favoring students in racially-mixed schools was found at ninth-grade level, but the difference was not significant in grade 10. (grades 9, 10)

Extending time limits on standardized tests aided some slow-responding pupils. On the computation subtest, almost all pupils finished within the standardized time limit. (grade 3)

Linton, Thomas, Jr. The Effects of Grade Displacement Between Student Tutors and Students Tutored. (University of Cincinnati, 1972.) DAI 33A: 4091-4092; February 1973.

Tutors from grade 12 were more effective for helping eighth graders in mathematics than were tutors from grade 8 or 10. (grades 8, 10, 12)


Both blind and sighted children made significant gains after instruction on conservation of substance, and evidenced transfer to conservation of weight. Differences between blind and sighted children were also significant. (ages 5-6, 8-13)


Some significant change-scores were noted immediately after instruction on equality and inequality concepts, but no differences were found on the retention test. Results do not support the grade placement of the advanced program. (grade 3)


At the algebra II level, lessons based on the limit of real-valued sequences produced significantly better achievement than those based on the real-valued function. No differences were found in the analysis class. (grades 11, 12)

The UNESCO texts used a modern approach while Iraqi texts did not.


Significant differences in achievement and attitude favoring students using a teacher-developed program over a traditional program were found at grades 7 and 9 but not grade 8. (grades 7-9)


Use of the instructional module resulted in achievement gains and changes in attitude. (elementary pre- and in-service)


The greatest increase in per cent correct for pupils working on arithmetic problems occurred for the divergent-feedback-plus-reinforcement group. (elementary)


Figural elaboration and IQ scores contributed best to the prediction of concepts and problem-solving scores; figural originality and IQ best predicted computation scores. (ages 10-11, EMRs)


Each of six conservation tasks was significantly correlated with tests of developmental age. (ages 5-8)
McDaniel, Roland. The Identification and Description of Changes in Mathematics Programs in the Secondary Schools in Tennessee Which Have Used NDEA Title III Funds. (The University of Tennessee, 1972.) DAI 33B: 5395-5396; May 1973.

Teachers and supervisors from schools having four or more projects indicated that they observed improvement in students and teachers as a result of use of Title III-funded materials and equipment. (secondary)


Pupils given instruction on attribute blocks, pictorial logic, or set theory scored higher on logic and classification tests than pupils not having logic instruction. (grades 2, 3)


Divergent-thinking ability and performance on both open- and closed-ended laboratory activities were found to be independent, and no association was found between divergent-thinking ability and attitude toward mathematics. (elementary pre-service)


The in-service program was successful in helping most teachers to implement an activity-oriented program. (teachers in kindergarten, grade 1)


No significant differences in learning, retention, or transfer were found for students who used individual materials for a unit on non-decimal numeration with or without a physical model. Success could be predicted with selected mental factors. (grade 7)

Parents' attitude toward school and student confidence level of academic ability were significantly related to indices of student achievement including mathematics percentile scores. (Intermediate)


Stimulus intensity and color were found to affect conservation responses of both normal and retarded children. (Elementary, EMRs)


Students learned the concept of variable through computer programming. No differences were found between three methods of teaching programming. (Grade 5)

Mitchell, Bruce Alex. The Effect of a Teacher-Developed Unit in Hyperbolic Geometry on Structural Objectives in Tenth Grade Geometry. (The Ohio State University, 1972.) DAI 33A: 5978-5979; May 1973.

Classes using the developed unit on non-Euclidean geometry reverted to use of Euclidean geometry. (Grade 10)


In only two of the ten years were scores in mathematics and reading above expected norms. (Grade 6)


Actual criterion levels differed from levels indicated by the program-developers. (Elementary)
Montgomery, Mary Eleanor. The Interaction of Three Levels of Aptitude Determined by a Teach-Test Procedure with Two Treatments Related to Area. (The University of Wisconsin, 1972.) DAI 33A: 4068-4069; February 1973.

No significant interactions were found between pupils at two aptitude levels given units differing in emphasis. (grades 2, 3)


Students with non-Spanish surnames achieved significantly higher scores in arithmetic achievement than did students with Spanish surnames. Sensitivity to Problems scores were highly related to arithmetic achievement for advantaged students. (grade 6)


Significant differences in achievement on arithmetic concepts were found between ethnic groups in segregated or non-segregated schools over a six-year period. (grades 3-8)


Instructional costs were not significantly related to achievement on mathematics and reading tests. (grade 3)


Pupils who scored high on a psycholinguistic abilities test made greater gains on a numbers subtest regardless of whether or not they had Bereiter-Engelmann arithmetic training, while low-scoring pupils showed gains as a function of training. (age 5)

Significant sex differences were found for Kenyan pupils on mathematics achievement measures. (grade 7)


In two brief studies, (1) lessons emphasizing relevant attributes did not benefit "global" students more than "analytic" students and (2) expository lessons did not benefit impulsive students more than reflective students. (grade 7)


Instructors disagreed on the emphasis to be given various objectives, but generally agreed on which objectives were appropriate for a given course. (elementary pre-service instructors)


Family characteristics, the presence or absence of a father, and crowding produced no systematic effect on the performance of students on geometry materials. (junior high)


No significant differences in arithmetic concepts and skills were found between boys in single-sex or both-sex classes. (grade 4)

No significant difference in achievement was found between groups who had two weeks of skills tests and other activities via a computer or had regular classroom instruction. (grade 9)


Little learning seemed to be taking place in the EMR junior high classroom and even less at the secondary level. Students progressed an average of one month in computational ability for each year in special education. (grades 7-12, EMRs)

Olson, Arthur H. The Relationship Between Achievement Motivation of Students and Their Academic Achievement During the High School Years. (Northern Illinois University, 1972.) DAI 33A: 4248-4249; February 1973.

For tenth-grade boys only, a significant negative correlation was found between achievement motivation score and an arithmetic score. (grades 10-12)

Otillar, Doris M. The Effects of Systematic Consultation on Teacher Behavior and Student Achievement in Rural Deprived Elementary Schools. (The University of Wisconsin, 1973.) DAI 34A: 3067; December 1973.

Teachers exhibited significantly more attending and approval behaviors after an in-service program. Their pupils made greater gains in mathematics and other areas than did a control group, but gains were not significant. (elementary in-service)


Predictors of achievement on the developed materials were found. The unit was considered satisfactory. (elementary pre-service)
Owens, Douglas Timothy. The Effects of Selected Experiences on the Ability of Disadvantaged Kindergarten and First Grade Children to Use Properties of Equivalence and Order Relations. (University of Georgia, 1972.) DAI 33A: 5042; March 1973.

It was concluded that the treatment was not effective in improving ability to conserve matching relations. (kindergarten, grade 1)


No significant differential effects were found in learning specific terminal objectives according to different methods of hierarchy generation and sequencings of subordinate tasks. (grades 5, 6)


The process of developing curriculum materials on metric measurement was recorded and analyzed. (grade 1)

Paul, Oliver Daye. The Relationship of Student-Teacher Compatibility on Student Achievement in Algebra. (Auburn University, 1973.) DAI 34A: 1180; September 1973.

A positive relationship was found between some measures of teacher-pupil compatibility and student achievement. (grade 9)

Pendleton, Julieanne Marie Kesmodel. Mathematical Concept Attainment of Sixth Grade Students in Relation to Their Cognitive Styles. (The University of Texas at Austin, 1972.) DAI 33A: 5043; March 1973.

Reflective pupils tended to use focussing strategies while impulsive pupils tended to use scanning strategies. (grade 6)


Both mental age and cue-word-form-class influenced the selection of computational operation for problems. The percentage of correctly read cue words was greater than the percentage of correctly selected operations. (MA 7-10, MRS)

Differences in the effect of visual factors were found between rural and urban samples. (grade 2)

Peterson, Gary Davis. The Preparation, Administration, and Interpretation of an Achievement Test in Geometry for Fourth, Fifth, and Sixth Grades. (University of Kansas, 1973.) DAI 34A: 3242; December 1973.

A potentially reliable geometry achievement test was constructed. No difference in achievement of boys and girls was found. (grades 4-6)


A relationship was found between mathematics computation scores and ability to conserve mass, weight, or volume, but not between conservation and mathematics concepts or total mathematics scores. (grade 5)


The history, general structure, models for development, and analysis of trigonometry were presented, for use in teacher education programs. (secondary pre-service)


Grouping on the basis of personality characteristics was found to be feasible, but factors differed for boys and girls. (grade 6)

A program of individualized instruction for mathematics education students had a significant positive effect on students' attitudes toward individualized instruction. (elementary pre-service)


Performance on tests using physical and pictorial aids was significantly higher than when only symbolic aids were used. (grades 4-6)


Achievement and attitude differences were found between students in the two- or three-semester course, with some variance in different tests. Teacher preference was related to what they had taught. (grade 9)


It was concluded that increased use of manipulative activities was feasible. (grade 7)


A variety of transfer effects were achieved through non-didactic teaching of classification and related tasks. (grades 1, 2)

The conventional discrimination index appeared to be a moderately valid measure of item quality for two forms of an arithmetic test, though a substantial amount of inter-rater variability remained unexplained. (elementary)


Quantitative and verbal variables contributed significantly to prediction, but achievement differences between groups using books differing in the amount of verbal explanation were not found. (grade 9)

Rathmell, Edward Cary. The Effects of Multibase Grouping and Early or Late Introduction of Base Representations on the Mastery Learning of Base and Place Value Numeration in Grade One. (The University of Michigan, 1972.) DAI 33A: 6071-6072; May 1973.

No significant differences were found between using various bases or only base ten in grouping objects. The group having reading and writing experiences before grouping experiences achieved better than the group given grouping experiences first. (grade 1)


The teaching packages appeared to be effective, though no differences in achievement were found after control groups were given an unspecified treatment. (elementary)


Children classified as reflective scored higher on mathematics tests than did children classified as impulsive. (grades 2-4)

The DOT overlay technique was found to be effective. (ages 8-12, EMRs)


Students in algebra 2 classes (before geometry) scored significantly higher on a test of conditional reasoning than did students in geometry classes (before algebra 2). For all students, scores were higher for test items written in the geometric rather than the algebraic content area. (grade 10)


More peer-tutors attained conservation of substance than did the pupils they taught. No difference was found between taught and untaught pupils. (grades 1, 2)


Time devoted to study of a second language did not affect the mathematics achievement of non-Hispanic pupils, while it aided the Hispanic group. (grades 3, 5)


Only on subtraction subtests were significant differences found between groups given verbal, verbal plus physical, or regular reinforcement; verbal reinforcement was favored. (grade 3)

Good problem-solvers had significantly higher scores on IQ, reading comprehension, arithmetic concepts and problem-solving, and self-esteem measures, and were less test-anxious. More impulsive pupils were poor problem-solvers, while more reflective pupils were good problem-solvers. (grade 6)


Conservers of area and volume scored significantly higher than non-conservers on a standardized test; no differences were found for conservation of number and mass. (grade 3)


No significant differences were found between groups taught with an applications approach or "traditionally". The role of applications in secondary school mathematics is discussed. (elementary pre-service; secondary)


No significant differences in problem-solving skills or achievement were found between laboratory and non-laboratory groups. (grades 2, 6)


Positive correlations were found between pupils' achievement in angle measure and ranks on three Piagetian angle tasks. (grades 4-6)

School mobility was found to be related to lowered scores on arithmetic and reading performance, as well as four adjustment variables, if four or more schools had been attended. (grades 5, 6)


Differences were found between the ways teachers of differing personality types reacted to four teaching strategies. (secondary pre- and in-service)


Twenty video-tape clips and accompanying lesson materials were developed to illustrate seven ways in which teachers might begin lessons. Evaluation with students is reported. (secondary pre-service)


Two hierarchies were found to be valid for teaching ideas about one- and two-dimensional figures. (elementary pre-service)

Ryoti, Don Eino. Student Responses to Equivalent Inference Schemes in Class and Conditional Logic. (University of Illinois at Urbana-Champaign, 1972.) DAI 34A: 624; August 1973.

For fourth graders, differences between mean scores on the class and conditional logic items were not significant, but some inference schemes were significantly different at both fourth- and ninth-grade levels. (grades 4, 9)

Students in the control schools scored significantly higher on mathematics tests in grades 7 and 9 than did students in the comprehensive school. (grades 7-9)


Most pupils increased their rate of progress when free time was contingent on that rate. (elementary)


The most widely used strategy was Logical Analysis. Creative Thinking was most successful but was seldom used. (grade 4)

Schenck, Betsy Roberts. Teaching Correlates of Number Conservation to Very Young Children. (University of North Carolina at Greensboro, 1973.) DAI 33B: 4550-4551; March 1973.

Two 15-minute lessons were not effective in teaching conservation of number. (ages 3-6)

Schloff, Charles E. An Exploratory Study of Teachers' Application of Inductive Approaches in Developing an Awareness of Geometry with Fifth and Sixth Grade Children. (Wayne State University, 1972.) DAI 33A: 6076-6077; May 1973.

Pupils whose teachers attended three in-service seminars learned the geometric ideas studied. (teachers in grades 5, 6)


Task analysis was applied to eleven algebra tasks, using two treatments of algebra, and definitions of five organizational goals were applied. (grade 9)

The activity-oriented integrated content-methods course concurrent with clinical experience had a significant positive effect on achievement and attitudes. (elementary pre-service)


Three experiments were reported in which varied rates of reinforcement were used on mathematics worksheets. A fixed ratio of seven with a bonus contingency appeared effective in terms of rate and accuracy. (elementary)


The "correspondence" method was more effective in all grades than the "number line" method. (grades 3-6)


From their oral and written reactions and observations of their teaching, the conceptual frameworks of four student teachers were analyzed. (secondary pre-service)

Shumaker, James E. A Comparison of Study Habits, Study Attitudes, and Academic Achievement in Mathematics in Junior High School of Students Taught by Individually Prescribed Instruction and Students Taught by Traditional Methods of Instruction in Elementary School. (University of Pittsburgh, 1972.) DAI 33A: 6657; June 1973.

No significant differences in mathematics achievement, study habits, or study attitudes were found between students who had an IPI or a non-IPI program in elementary school. (grade 7)

Three motivational variables were significantly correlated with both reading and arithmetic performance for both cultural groups. (grades 2, 3)


Students taught by the lecture method scored as well or better on tests of understanding, computation, and transfer as did students taught through material-oriented units. Those taught with two or more embodiments scored as well or better than those taught with one embodiment. (elementary pre-service)


No differences were found between students taught by teacher demonstration or a self-paced module. The cognitive style of flexibility of closure was not useful as a predictor of achievement. (elementary pre-service)


Over 85 per cent of the students who had appropriate criterion competencies could respond correctly to corresponding transfer questions on SSMCIS content. (grade 9)


None of the estimated means derived from mini-tests of items randomly drawn from a standardized arithmetic achievement test were within one standard error of measurement of the total test means. (grade 2)

Using performance on Piagetian-based tasks as predictors of success in beginning addition and subtraction achievement was not supported. (grade 1)


On a convergent-thinking task (arithmetic problem solving), sociometric groups performed as well as randomly formed groups. (grade 5)


No significant relationship was found between teachers' judgment of student needs and mode of instruction received by the student in an individually diagnosed and prescribed mathematics program, nor was there any significant difference in the achievement of pupils who were matched or mismatched (in terms of judged personality) with instructional mode. (grade 8)


Mathematics teachers were found to have a personality-type distribution differing greatly from other people, including other teachers. Differences were also found between various categories of mathematics teachers. (secondary pre- and in-service)


The minicourse was found to increase EMR teachers' remedial mathematics tutoring skills; higher pupil achievement resulted. (teachers of EMRs)

Only 29 per cent of the variability of students on mathematics measures was accounted for by the factors studied. (grade 9)


The developed instrument was found to have validity in distinguishing teacher attitudes toward goals and textbooks. (elementary in-service)


A unit on insurance was as effective when slides were used as when they were not used. (grades 10-12)

Taloumis, Thalia. The Relationship of Area Conservation to Area Measurement as Affected by Sequence of Presentation of Piagetian Area Tasks to Boys and Girls in Grades One Through Three. (New York University, 1973.) DAI 34B: 775-776; August 1973.

Sequencing of the area tasks affected scores on tasks presented second in the sequence. (grades 1-3)


Factors which could be used to classify high and low achievers in problem solving with up to 95 per cent accuracy were identified. (grade 6)


No significant differences in arithmetic test scores were found between pupils having traditional or team-teaching in grades 4-6. (grades 4-9)

"Skill ventures" were analyzed and moves and strategies of observed teachers categorized. (secondary in-service)


Attainment on automaton variables and logical tasks were found to be related; overall findings support Piaget's theoretical conceptions. (grades 1, 2)


No significant differences in achievement were found between a class taught with manipulative materials and one taught by textbook-blackboard-flashcards. Pupils of above-average ability in computation were aided by manipulative materials, while those of below-average ability benefited more from the symbolic method. (grade 3)


The unit on transformational geometry was found to teach satisfactorily. (junior high)


No significant differences between homework and no-homework groups were found in attitude, reading, retention, questioning, or geometry achievement scores. (grade 10)


A significant difference in achievement favoring the group having a course using the Dienes multiembodiment approach was found. (elementary pre-service)

Over 1300 questions asked in arithmetic, reading, and social studies lessons were classified. Boys asked more questions than girls did, and older children asked more questions than younger children did. Overall, arithmetic pupils asked more questions about procedure than content. (grades 1-6)

Urbach, Donald Edward. A Comparison of Two Approaches and the Formalization of the Generalization of Formulas for Area Measure in Grade Five. (The University of Michigan, 1972.) DAI 33A: 5991; May 1973.

The "conventional" approach was better than the "sweep" approach. The non-verbal approach was better than the verbal. (grade 5)

Van de Walle, John Arthur. Attitudes and Perceptions of Elementary Mathematics Possessed by Third and Sixth Grade Teachers as Related to Student Attitude and Achievement in Mathematics. (The Ohio State University, 1972.) DAI 33A: 4254-4255; February 1973.

At third grade level, teachers' informal perceptions of mathematics and positive attitudes were associated with student comprehension; informal perceptions and negative attitudes were associated with student computation ability. No significant differences were found in grade 6. (teachers in grades 3, 6)


Participation in mathematics, science, and language courses on a pass-fail basis was ineffective in eliciting more positive attitudes concerning self, teacher, learning, and the subject. (secondary)


No significant differences in problem solving achievement were found on standardized tests between pupils given a list of behaviors, behavior instruction, or problems-only. Differences were found between some groups on experimenter-constructed tests. (grades 9-11)

Reflective pupils were significantly better than impulsive pupils at selecting the correct operation to solve a problem; differences on the estimation test were not significant. (grade 4)


A significant positive change in attitude was found after a methods course using activity materials; no change in understanding was found. (elementary in-service)


No significant differences in mathematics were found between students having modular or traditional scheduling. (grades 10, 12, college)


Twelfth graders achieved as well on the developed unit on functions as did college students. (grade 12, college)


Remediation did not result in a significant gain in arithmetic achievement scores. (grades 3-5)


Scores of seventh- and ninth-graders differed significantly on measures of formal operations. Some sex differences were found. (grades 7-9)

No significant achievement differences were found between pupils taught fraction algorithms by a strictly pattern or a strictly algebraic approach. Some evidence was found that teaching an algebraic followed by a pattern approach might be effective. (grade 5)


Changes in the content and methodology of Canadian-used textbooks were noted. (elementary)


Attitudes became more positive in the group taught by activity learning, but no significant differences in achievement were found between that group and one taught traditionally. (elementary pre-service)


Discrimination and reversibility training were equally effective; some interaction effects were found. (ages 4-5)


A significant increase in mathematical reasoning scores resulted from instruction on logical flowcharting and plane geometry. (grade 10)
Pupils having instruction in the "inquiry" method of problem solving achieved significantly better in general reading achievement and mathematical problem solving than did pupils having "conventional" instruction. Pupils using a "formal analysis" method scored significantly better than "conventional" groups only on general reading achievement. (grade 6)

No significant differences in arithmetic and vocabulary achievement were found after training on arithmetic or vocabulary related to structure-of-intellect factors. Boys scored higher than girls on the verbal measure and lower on the arithmetic measure. (grade 2)

Independent summer study of arithmetic resulted in higher achievement on fall tests. (grade 5)

"Direct" teachers became more "indirect" using observation analysis procedures. (teachers in grades 9-12)

A significant positive relationship was found between "postmathematical" attitudes and each of the other factors studied. The measures of modern mathematics skills and achievement and of prior attitudes contributed most to prediction of attitudes. (elementary pre-service)


Teachers felt that the primary area in which the school system should be held accountable is mathematics skills. (elementary in-service)


No achievement differences were found between IPI and non-IPI groups of EMRs on norm-referenced tests; differences favored the IPI group on four of 12 criterion-referenced tests. (grades 7-9, EMRs)


Characteristics of teachers and programs were cited. (secondary in-service)


No differences were found between groups who read a passage with questions of differing cognitive levels inserted. (grade 10)

The attitudes toward mathematics of the independent study group became slightly more unfavorable, while students in the control group evidenced a "very large" unfavorable change in attitudes toward mathematics. (secondary)


Few significant differences were found in this study on the effect of three rewards: marks, public recognition, or candy. (elementary)


No significant differences in self-concept were found between groups taught by a team or non-team approach. Two of three self-concept scores were significantly related to a mathematics test score. (grade 8)


Both age and social class differences were found in the development of time concepts. Training improved achievement of kindergarten children. (ages 3-8)


The groups which spent twice as much time on introductory work achieved better in the unit on exponents and logarithms. (grade 11)
### Journals Cited in 1973 Research Listing

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