The ERIC Center Science, Math, and Environmental Education Information Reports have been developed to disseminate information concerning documents analyzed at the ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, Columbus, Ohio. This annotated bibliography lists the most significant documents that have been published dealing with science and mathematics for disadvantaged children. (CP)
SMEAC/SCIENCE, MATHEMATICS, AND ENVIRONMENTAL EDUCATION
INFORMATION ANALYSIS CENTER

...an information center to organize and disseminate information and materials on science, mathematics, and environmental education to teachers, administrators, supervisors, researchers, and the public. A joint project of The Ohio State University and the Educational Resources Information Center of USOE.
SCIENCE AND MATHEMATICS FOR DISADVANTAGED CHILDREN: AN ANNOTATED BIBLIOGRAPHY

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SPECIAL BIBLIOGRAPHIES - SCIENCE

Special Bibliographies are being developed to announce availability of documents in selected interest areas. These bibliographies indicate documents considered to be useful to teachers, curriculum development personnel, and research personnel. They are aimed primarily, however, at teachers and curriculum personnel.

The bibliographies are developed in areas of demand as indicated by communications received at the ERIC Center for Science, Mathematics, and Environmental Education. We invite your suggestions for areas to be included in this series.

Stanley L. Helgeson
and
Patricia E. Blosser
Editors

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SCIENCE, MATHEMATICS, AND ENVIRONMENTAL
EDUCATION INFORMATION REPORTS

The Science, Mathematics, and Environmental Education Information Reports are being developed to disseminate information concerning documents analyzed at the ERIC Information Analysis Center for Science, Mathematics, and Environmental Education. The reports include four types of publications. Special Bibliographies are developed to announce availability of documents in selected interest areas. These bibliographies will list most significant documents that have been published in the interest area. Guides to Resource Literature for Science, Mathematics, and Environmental Education Teachers are bibliographies that identify references for the professional growth of teachers at all levels of science, mathematics, and environmental education. Research Reviews are issued to analyze and synthesize research related to science, mathematics, and environmental education over a period of several years. The Occasional Paper Series is designed to present research reviews and discussions related to specific educational topics.

The Science, Mathematics, and Environmental Education Information Reports will be announced in the SMEAC Newsletters as they become available.

Purpose of study: to assess the viability of the Appalachia Preschool Education Program as a means of providing sound preschool math experiences.


One finding: Advantage classes, as compared to inner-city classes, were exposed to more verbal cognitive interaction and less verbal-procedural interaction.


An illustrated plan, listing materials and activities, and listing skills to be developed.


Discusses a series of 45 supplementary science exercises developed by the author and designed for duplication and distribution to each student for classroom use.


Ss: 50 G1 students: 25 white middle class and 25 black lower class.

One result: The closer a task gets to the biological basis for behavior, the more alike the two populations appear.


Describes a workshop held at the University of Nebraska in 1968.

Includes a listing of suppliers of free math materials.


Explores the feasibility of science education and the identification of possible developmental programs of science concepts (scope and sequence) for the educable mentally retarded.

According to the author, a psychologist, the child with math difficulties may be dyscalculic.


Students in experimental classes were provided with a science program with emphasis on concrete objects, events and circumstances.


Describes in detail a demonstration-research project aimed at motivating underachieving inner city junior high school students to turn on to school again through science. Graphs and charts.


Designed to investigate the relative value of verbal rewards and punishments in facilitating a discrimination learning problem.


Some conclusions: Bilingual science education for G7 students of Hispanic background resulted in student science achievement significantly different from that of comparable students in the conventional program, but the bilingual program obtained superior results only when conducted by fluent Spanish-speaking science teachers.


The material developed in this program revolved around four major items: fundamental skills, measurement, expression of mathematical ideas, and problem solving.


Discusses the value of a science program for deprived young children.

One conclusion: A relationship between achievement level of tutor and scores of tutees on certain tests was revealed and warrants further study.


Purpose of study: to determine the effects of expressing course objectives in specific behavioral terms (performance objectives) on the achievement levels of low-achieving pupils.


Lists a number of activities to acquaint the students with probability through the use of already familiar opinion polls. Illustrated.


Ss: G9 students classified as low achievers in math.

One finding: Ss who had not had instruction in conditional reasoning made significantly more errors on the fallacious arguments than on the valid arguments.


In the experimental program, there was an attempt to counterbalance the anticipated ineffectiveness of external motivation with disadvantaged children by capitalizing on the learners' competency drive and on the intrinsic motivation of success and of structured learning.


Presents the rationale for and the content of a mathematics program written for and taught to a group of Mexican-American disadvantaged first-graders. Bibliography.


Describes a set of new instructional materials developed by the National Council of Teachers of Mathematics, designed to help low achievers learn mathematics. The project is known as Experiences in Mathematical Ideas.

Vacant city lots are a good resource for inner city science teachers. Author constructed a vacant lot laboratory block, a series of investigations tied together with a discussion of the organisms involved and the ecological roles they play in a vacant city lot.


Purpose of the study: to seek definite relationships between interaction patterns followed in the classroom and the acquisition of science knowledge by slow learners taught by means of a curriculum especially designed for them. Graphs. Tables.


Objectives of study: to use results of Part I of the study in a research design that would (1) test whether constant patterns of teaching of various types over an extended period could affect concept-formation, problem-solving and total achievement and (2) test whether the achievement trends of Part I could be reversed in these areas.


Results of this study indicated a significant deficiency in auditory discrimination among the economically disadvantaged group.


Discusses the special needs of the aggressive child as a basis upon which to structure the teaching of science.


Comparison of mean differences between groups with respect to understanding of concepts showed little difference, but a marked difference in favor of the control group was revealed with respect to computation ability.

The arithmetic section of the Wide Range Achievement Test was used as a pre- and posttest and was judged not to be the best assessment instrument.


One finding: One-third of all the textbooks used in the schools were listed as "modern" by the Louisiana State Department of Education.


Describes in detail a method referred to as the DPPC method (standing for "direct," "pure," "piecemeal" and "complete"), the key feature of which is its concrete translation of all facts. Includes drawings, classroom samples and a translation test.


A complete, illustrated lesson plan in primes for low achievers.


The 1959 recommendations of the Commission on Mathematics were used as a criterion measure.

The Exceptional Parent. P.O. Box 101, Back Bay Annex, Boston, Mass. 02117. Started publication in late June of 1971. Aims to provide "practical guidance for the parents of exceptional children." Published by Dr. Lewis Klebanoff, director of the Mass. Dept. of Mental Health; Dr. Stanley D. Klein and Dr. Maxwell J. Schleifer, both of the U. of Mass. Published six times a year. Introductory price: $10.


A series of standardized conservation tasks, including the conservation of area, number, continuous and discontinuous quantity, weight and mass, were administered to 126 SES Indian, Negro and white children in Gr-3.


The skill differences seemed to depend on the economic background of the children.


A discussion by Dr. Glasser of his techniques for success-orientation in the schools, adapted from a talk he gave at a science teachers' workshop at Stanford University in the summer of 1970.


S: 110 pre-K disadvantaged New York City children. The Marianne Frostig Developmental Test of Perception was used in its entirety to obtain all testing results. Study suggests that trained children's performance surpasses their non-trained counterparts.


"The need to teach concepts related to the regularities of time is fairly obvious — less obvious, however, is the need for specialized approaches which involve presenting these concepts to the lower class child in meaningful ways." Suggests activities.


Some conclusions: (1) Schools furnished very few materials for teaching mathematics to culturally disadvantaged children. (2) Schools tended to furnish more materials to lower grades than to upper grades.

G3 and 6 Appalachian-Caucasian-American, Indian-American, Mexican-American and Black-American males were compared on the game 20 Questions to middle-income Caucasian-American males.


Purpose of study: to write a seventh-grade general mathematics course of study for urban ghetto students using non-standard English and also incorporating the customs and general background of the students.


Two findings: (1) Disadvantaged and underachieving children will respond in a positive manner to the "concept" method of instruction in mathematics as evidenced by gains on an achievement test. (2) Disadvantaged and underachieving children will tend to show a positive relationship between attitude toward mathematics and achievement in mathematics.


Discusses the Acoupedic Method of "auditory bombardment" for preschool education of hard-of-hearing. Suggests activities.


Evidence indicates that learning of mathematics by pupils living in disadvantaged areas may be significantly improved when a specifically designed program is utilized.


Suggests that problems without numbers be used for initial instruction in reading math problems. Includes detailed chart of "Completed Steps of Problem Analysis."


318 G9 Ss were used. On the basis of this study, it appears that more appropriate curricula should be provided for lower socioeconomic students in the ESCP.

Research implication of the study: The study indicated that if the schools' classification of the "slow learner" is used, then these students show a greater gain in achievement in the "new" math when the pace of instruction is less rapid.


Hypothesis: Spanish-speaking first grade students taught math by a method employing Spanish as well as English would attain a greater measure of achievement in math when tested in English than the achievement of similar students taught in English only.


A study designed to investigate the extent to which a policy existed regarding the evaluation by a team of evaluators from the Center of Study for Evaluation of Instructional Programs of 13 teachers participating in an experimental mathematics program at three Demonstration Math Centers in Southern California.


Purpose of study: to determine how experiences, especially prepared for these children and provided in a mathematics laboratory, affect his achievement, self-concept, attitude toward arithmetic, social development, behavior and attendance.


Science programs, in order to be successful, must be able to change the intellectual environment of the student and free him to see a different, more comprehensive world in which he can live a fuller and more complete life. Such a program is described.


Purpose: to investigate the basic mental operations of young children which allow them to organize the sensations received from their environment, and the differences and similarities of children from differing SEC backgrounds in their ability to perform these organizations.

A conceptual framework for a preschool curriculum is indicated that is particularly geared to the needs of disadvantaged children leading to the development of logical thinking and creativity.


The experimental program proved to be significantly more effective in promoting intellectual functioning, language abilities, perceptual development and school readiness.


A thoughtful, informed article which includes detailed suggestions for presentation of math concepts and structure and control in the urban classroom.


Describes a study in which the majority of the subjects were 15 year olds in grade ten. The case study technique was used.


Describes a two-year preschool program for disadvantaged children. Children in program experienced IQ rise of 14.6 points over the two-year period compared to an average gain of 4.0 points in the control group.


Purpose of study: to determine if children from three socio-economic groups differed in their understanding of selected science concepts and in the methods they would suggest to find answers to questions associated with the concepts. G3 Ss used.


Paper presented at the March 1970 annual convention of the National Association for Research in Science Teaching — based on the author's doctoral research. (See Klein, above.)

Detailed lesson plans, filmstrips, video tapes, and other specially prepared materials were furnished to four instructors who conducted experimental programs over a five week period to a total of 80 second-semester low SES kindergarten children.


Describes a four-week summer animal study project for children of low socioeconomic backgrounds.


Piagetian tests used in this study are tasks of conservation of continuous substance, discontinuous substance, number, length and area. Only significant difference found between the three levels of social status was on the task of conservation of continuous substance.


Includes a 30-entry listing for elementary science and a 54-entry listing for elementary mathematics. Purchase information given. Not annotated.


Includes sections on elementary science and mathematics. Ordering information given. Not annotated.


Procedure: A mathematics concept was taught by two methods (Discovery and Rote) to two groups for a period of one week. On the final day, the Lomarke-Concept Test was given.

A vital part of this program is a special room set apart for individualized study.


One finding: Where evidence of science achievement required the child to verbalize — such as naming an object — the lower class child did not do as well as the middle class child.


Purpose of study: to examine the effectiveness of a selected number of skill-building activities on a group of educationally disadvantaged preschool children. Some skills tested: color naming and associations, number concepts, visual-form discrimination.


Questionnaire data from parents, students and the teachers indicated that potential philosophical objections to paying students for learning did not materialize with this sample.


The author discusses various uses of games, charts, newspapers and films as aids in teaching math to slow learners.


Describes the silent teaching method and its use with children who are language deficient or hyperactive.


This was a quasi-experimental study using two different rural Junior High Schools, one as an experimental school and one as a control school.


Includes a listing of aims and concepts and lesson structures for a G9 activity-centered, Title I-funded science program.


One finding: The teacher-text approach was more effective in the area of achievement. An analysis of the time spent on the lessons also indicated that this approach was more efficient.


It is suggested that the weaknesses of the educational establishment present a greater problem than the child's cultural disadvantage.


Discusses the role of mathematical readiness activities in preschool programs for disadvantaged children.


One result of study: Mathematics achievement can be predicted with considerable more accuracy than achievement in reading.


A study of 100 disadvantaged children indicated that those who are at grade level in both, or above grade level in either reading or arithmetic on the Wide Range Achievement Test are more likely to show alpha blocking on the routine resting EEG than children who scored below grade level.

Purpose of this study was to gather data relative to effective planning for program development in the area of learning disabilities.


Presents general steps of solutions to be used for all problems: (1) symbols for the unknowns, (2) equation, (3) solution, (4) interpretation.


One conclusion: Improvements from teaching are not maintained without further practice but are immediately reactivated by appropriate cues after a period of no practice.


One conclusion: Emphasis is on teaching for understanding, but drill and incidental learning experiences are used to reinforce concepts and motivation.


Findings of study: Kindergarteners from an all Negro community were significantly below the mathematics achievement of both Negro and non-Negro kindergarteners from surrounding municipalities.


One finding: When sociocultural variables alone were used as predictors, the number of years' education of the subject's mother and the presence of younger siblings were the first and second most useful variables, respectively, in predicting performance on the total and verbal L-SCAT measures.


Describes a Master's degree program of the Department of Mathematical Education, Teachers College, Columbia University, for elementary school teachers who want to become specialists in mathematics and the many candidates in the program who direct their attention to the problems of teaching mathematics to disadvantaged children.

Some of the independent variables selected for the investigation: mother's education, occupation and evaluation of the local school system, independence training, and mother's emphasis on "mathematical learning" in the home.


Designed to explore relationships between high- (love and belongingness) and low-need (food and shelter) contents on arithmetic problem solving.


Major purpose of study: to determine the "amount" and "kind" of mathematical information possessed by children entering K.


A significant difference was found in attending behavior favoring use of the booths, and nonsignificant differences were found with academic behaviors, indicating that attending behavior was increased by utilizing cubicles, but academic rate was not so influenced.


Discusses the development of the child's intelligence using a step-by-step approach which facilitated the transition from sensory-motor to conceptual intelligence.


Includes guidelines for developing science and math concepts.


One finding: There was a significant difference in the development of the skill of manipulating variables favoring the experimental over the control group.

This article, part one of a projected series, defines the problem and the pertinent terms involved. Subsequent articles will show how the problem is being met.

Many aids to computation, such as tables, slide rules and calculators can be put to good use in the classroom. Computational skill may later be emphasized as the child experiences more success in mathematics.

One conclusion: First graders taught bilingually did significantly better in arithmetic fundamentals, but not in arithmetic reasoning, than did first graders taught exclusively in English.

The disadvantaged and non-disadvantaged subjects were equated in reading ability. It was found that culturally disadvantaged students scored significantly better than the non-culturally disadvantaged students in four of the six selected problem solving abilities.

Describes an approach which includes the structuring of a language arts experience based on a science activity. Includes purchase information for materials and supplies mentioned.

The findings of the study suggest that disadvantaged pupils understand and can communicate their understanding of science concepts when placed in situations requiring limited verbal response.

The study shows that background experience is a factor in science achievement, but not at a significant level.

Describes research with Science — A Process Approach. Tables.

References.


One finding: Classification instruction using pictured familiar objects resulted in more effective learning than the same instruction employing pictured geometric designs.


Elementary science can be an excellent medium for motivating and otherwise working with the special problems of disadvantaged children. Successful outcomes will be largely functions of the attitudes, creativity and understanding of the individual teacher.


Analyzes the results of a questionnaire sent to 200 leading mathematics educators, asking their opinion on what mathematics should be taught to low achievers in the junior high school.


Conclusion: These children were able to learn the basic concepts of linear measurement using a manipulative learning aid which reduced measurement abstractions to a level that enabled the child to see size and space relationships in concrete terms.


Describes a pilot project undertaken by the Science Education Center of Rutgers University in the summer of 1969 for the purpose of developing a model for science—mathematics education in urban elementary schools.

One finding: G7 control classes gained significantly more than the G7 experimental classes in achievement in mathematics concepts.

Young, Arnold, Ph.D. Problem Solving in Preschool Children as a Function of Motivation and Type of Reinforcement. Dissertation: Temple University, 1968. DA29:1500-B.

Ss for this study were lower socioeconomic class Negro preschool children.


One recommendation: Evidence indicates there is no reason why Science — A Process Approach should not be used with disadvantaged preschool children.