This annual listing of research in mathematics education contains annotated citations of research papers and monographs dated January 1997 through March 1998 and abstracted for the ERIC database. Journal articles focusing on the interpretation and implications of mathematics education research are also featured. An index of dissertations by institution and a list of journals searched are also included. (WRM)
Research in Mathematics Education

97

An Annotated Listing of Research in Mathematics Education Published During 1997

Edited by Douglas T. Owens & Michelle K. Reed
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- An outline of chapters and major sections.
- A 75-word abstract for use by reviewers for initial screening and rating of proposals.
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- A vita and a writing sample.

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PREFACE

The annual listing of research in mathematics education for many years was published as an issue of the Journal for Research in Mathematics Education, a publication of the National Council of Teachers of Mathematics. Two annual research listings for 1994 and 1995 were prepared by the ERIC Clearinghouse for Science, Mathematics, and Environmental Education (ERIC/CSMEE) with the financial support of NCTM. This is the second annual research listing prepared solely by ERIC/CSMEE.

This version is very similar to the last three versions listing the research reported in 1994, 1995 and in 1996. Each entry has been classified with Major and Minor codes and all entries are indexed by Major codes. Dissertation Abstracts which appeared in Dissertation Abstracts International during 1997 have been listed. Journal articles reporting research, as well as journal articles focusing on the interpretation and implications of research, have been included. Papers and monographs dated 1997 and abstracted for the ERIC database by the end of March 1998 are recorded. An index of dissertations by institution is provided. A list of journals cited is included.

As much as mathematics educators have valued the research listing in the past, with electronic databases becoming increasingly accessible, it is not clear in what format(s) future listings would be most useful. Though ERIC/CSMEE has the capacity to produce this listing, it is not clear the extent to which a single annotated listing of mathematics education research is still valued by the mathematics education community. We earnestly request feedback from you our reader, either in writing or by e-mail at the addresses listed below. This listing will become available through the ERIC/CSMEE World Wide Web site.

We sincerely hope you find this listing useful. Again, we solicit your comments and recommendations. You may contact ERIC/CSMEE by mail, ERIC Clearinghouse for Science, Mathematics and Environmental Education, 1929 Kenny Road, Columbus, OH 43210-1080; or by e-mail to ericse@osu.edu.

D.T.O.
M.K.R.
Key to Codes

The following topic codes have been used to indicate the major and minor emphases of each dissertation, journal article, and paper in this listing. Each entry has been assigned a minimum of one and a maximum of three major codes, and any number of minor codes. The combined topic index at the end of the volume reflects only major codes, with entries listed in 18 clusters of related topics.

The grade level or educational level of each study is indicated in parentheses after the topic codes. Please note that studies related to preservice or inservice teacher education are so indicated by the appropriate topic codes (Prsv, Insv). The level designated on teacher education studies refers to the grade level(s) at which the intern or teacher participants teach. Teachers as subjects were preceded with a level code. For example elementary school teachers were coded EL,TE. Teacher education students preparing to teach at the elementary level were coded TE,EL, for example.

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<tr>
<th>Code</th>
<th>Definition</th>
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<td>Equity</td>
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<td>Ethn</td>
<td>Ethnic, racial, cultural</td>
<td>RaPc</td>
<td>Ratio, proportion, percent</td>
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<td>Fractions, rational numbers</td>
<td>Pers</td>
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<td>Prob</td>
<td>Probability</td>
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<tr>
<td>Gift</td>
<td>Gifted (students)</td>
<td>PS</td>
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<td>Prsv</td>
<td>Preservice teacher education</td>
<td>Prf</td>
<td>Proof, justification</td>
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<tr>
<td>Insv</td>
<td>Inservice teacher education</td>
<td>RaPc</td>
<td>Ratio, proportion, percent</td>
</tr>
<tr>
<td>Prsv</td>
<td>Preservice teacher education</td>
<td>Rep</td>
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<td>Social factors, context, parents</td>
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<td>TBlf</td>
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<td>Anxiety (teacher’s)</td>
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<td>Tchr</td>
<td>Teachers (characteristics of)</td>
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<td>TChg</td>
<td>Teaching (role, style, methods)</td>
<td>Tech</td>
<td>Technology (general)</td>
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<tr>
<td>Whol</td>
<td>Whole numbers</td>
<td>Writ</td>
<td>Writing, journals</td>
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## Level Codes

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<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>EC</td>
<td>Early childhood, K-4</td>
<td>EL</td>
<td>Elementary, K-8</td>
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<td>MS</td>
<td>Middle grades, 5-8</td>
<td>SE</td>
<td>Secondary, 5-12</td>
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<td>HS</td>
<td>High school, 9-12</td>
<td>K-12</td>
<td>All school levels</td>
</tr>
<tr>
<td>PS</td>
<td>Post secondary, 13+</td>
<td>ALL</td>
<td>All student levels</td>
</tr>
<tr>
<td>TE</td>
<td>Teacher education, teachers</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9
This section lists 384 dissertations in mathematics education research that were abstracted in *Dissertation Abstracts International* during 1997. Each entry is coded (see Key to Codes) with one to three major topic codes (in bold type) and any number of minor topic codes, as well as the grade level code (in parentheses). Studies related to preservice or inservice teacher education are indicated by the appropriate topic codes (Prsv.Insv). The level designated for teacher education or teacher studies indicates the grade level(s) at which the intern or teacher participants teach, followed by the level code, “T” for teacher or “TE” for teacher education. All entries are indexed by major codes at the end of the volume (see page 85). An index of dissertations by institutions is included at the end of this section (see page 27).


Study of the data from the 1988 National Educational Longitudinal Study and followups found parental involvement in students' academic lives was a powerful influence on student mathematics achievement at eighth-, tenth-, and twelfth grades.

Ach, Soc (SE)


Although this case study indicated that remedial education was ineffective and that therefore an open admission policy is unjustified, the conclusion is considered tentative. Missing, incomplete, and inaccurate data diminished the utility of the college's information system.

D/R, Plan (PS)


Students' poor performance on achievement and proficiency tests in language and two content areas (including mathematics) suggests that there are serious problems related to teaching and testing methods currently utilized in Nigeria.

Lang, Ach (EC)


A substantial majority of elementary and preservice teachers (n=94) viewed “=” as a symbol associated with an operation rather than a relational symbol between two expressions. Views of “=” as relational were unstable.

TKnw, Prsv, Mscn (EL, TE)


Data from community college students (n=364) showed that women reported significantly weaker self-efficacy expectations than men.

Att, Gend (PS)


Questionnaires of (n=133) women about their experiences in college mathematics and science and their persistance in majoring in the subjects
found non-persisters were far more likely to choose pedagogical reasons as significant factors in their reason for leaving and were less likely to experience faculty contact outside the classroom.

Gend, Blf (PS)


Direct parental training in the area of at-home computational activities was compared to at-home activities without training and to a control group. Parental involvement was found to significantly affect the achievement of students in one of the three grade levels studied as was keeping a log book. Relationships were found between gender and engagement.

Soc, Ach, Arth, Gend (EL)


A group of sixth graders participating in a three-day activity of the videodisc adventure series, The Adventures of Jasper Woodbury, were separated into one group taught to tune their attention to information on key ideas of the problem and another group without such teaching. The experimental group scored significantly higher on some problems.

PS, Comp (MS)


A case study of one high school mathematics teacher found she held isolated clusters of beliefs unique to each of the two different social and mathematical cultures at her school.

Ethn, TBlf (HS, T)


This thesis describes an action research investigation into curriculum development in mathematics and the role of the mathematics coordinator in a large inner city model primary school in the late 1980's.

Curr, Tchr (EL, T)


Random assignment of (n=74) sixth-grade students to groups with either prompting or no prompting to involve students' families in homework found the families in the prompting groups were significantly more involved with mathematics homework.

Soc (MS)


Interviews of primary teachers and their students from three types of schools (traditional, innovative, and reformist) regarding assessment approaches found regularities shared by most of the teachers independently belonging to one or other kind of school.

Assm, Tchg, Writ (EL, T)


Questionnaires describing mathematical or physical science situations were given to (n=207) advanced mathematics secondary school students in order to analyze fallacies incurred by false intuition.

Styl, Mscn (SE)

This exploratory investigation observed the metacognitive strategies of adult learners in a developmental algebra class as they learned a new cognitive skill—factoring polynomials over the integers. A statistically significant relationship was found between their prediction of success and the accuracy of their answers.

*Mtg, Alg* (PS)


The study found that the strongest perceived implementation of the frameworks was in content at the district level for both mathematics and science. Technology was perceived as needing further implementation in both disciplines.

*Curr, Tech* (K-12)


Teachers (n=32) knowledge of assessment increased and teachers were more confident in their expertise as assessors, although their mathematics curricula lacked significant depth.

*Assm, Insv* (SE, T)


Qualitative data was drawn chiefly from a year of teaching and observing two mathematics classes in England and Wales. Among those topics studied was the relationship of understanding of variables to problem solving.

*Alg, Curr, PS* (SE)


Sixth-, ninth-, and twelfth-grade students (n=26) were interviewed using open-ended questions. Analysis of the responses indicated that the age of the students did not affect their success in formulating an appropriate strategy for solving the problems, but there were significant differences in probabilistic reasoning when examined by context (artificial vs. real-world).

*Prob, PS* (SE)


Community college students (n=2208) enrolled over a seven-year period were studied. No significant differences in the passing rate in credit-level mathematics between developmental and non-developmental students were found. Remediated students attended college significantly longer.

*D/R, Ach* (PS)


Focus groups with (n=7) senior female mathematics majors regarding their decisions about whether or not to continue on to graduate mathematics study found three factors affecting their decisions: confidence in their ability to do graduate-level mathematics, perceived usefulness of a graduate mathematics degree, and enjoyment in mathematics.

*Gend, Lrnr* (PS)

This work considers the analysis of mathematical activity as the first step in the study of didactic phenomena. More specifically, it refers to the Anthropological Approach of Didactics in which both mathematics and its teaching and learning are regarded as one type of human activity among many. An experiment is presented in which a group of (n=40) mathematicians and students solve elemental problems.


Seven teachers from community colleges or technical schools were studied. The race and gender of these teachers affected their teaching-learning environment. Their teaching practices focused on accessibility, equity, and the empowerment of learners.


An experimental and control group from a liberal arts college math course participated. Students in the experimental (writing) group showed significantly higher mastery of course content and proficiency in algebraic skills, as well as improved beliefs about the nature of math as a discipline.


Responses to a thirteen-item questionnaire were received from 272 school districts. Ninety-four percent of the districts indicated a revision in their mathematics curriculum in the past five years.


Scores on the mathematics and reading sections of the Test of Adult Basic Education were significantly different for (n=200) adult students using computer-assisted instruction versus those involved in traditional instruction. Ethnicity also had some influence on scores.


Interviews with (n=14) college students with a vision, hearing, or motor impairment majoring in science, engineering, or mathematics programs showed two commonalities: all were mainstreamed into regular schools—although many were originally denied access, and all had been undergoing an intensive search for answers regarding disability and beyond.


The teacher/researcher of this study used student evaluations of lessons to adjust activities based

Six students and their teacher within a heterogeneous third grade classroom were the focus participants in the study. Important relationships between students' learning and their role in the classroom community, the methods of instruction, and the influence of relationships outside the classroom are discussed.

**Tchg, Ethn** (SE, T)


Study of (n=129) U.S. and (n=130) Chinese high school students found that Chinese students more highly valued the topics and activities included in the school mathematics curriculum, and perceived higher expectations and more support in mathematics study from parents. U.S. students felt more confident in their mathematics ability and had less mathematics anxiety. Female students held attitudes toward mathematics as positive as the males.

**LD, Lrng** (EC)


Study of (n=129) U.S. and (n=130) Chinese high school students found that Chinese students more highly valued the topics and activities included in the school mathematics curriculum, and perceived higher expectations and more support in mathematics study from parents. U.S. students felt more confident in their mathematics ability and had less mathematics anxiety. Female students held attitudes toward mathematics as positive as the males.

**LD, Lrng** (EC)


This study investigated the use of two algebra I classroom environments: textbook and computer. Results indicated that students in the CAI-Algebra Environment asked more questions than students in the TXT-Algebra Environment on the four combined categories of high-level and low-level subject matter questions to teacher and to student.

**Comp, Alg** (HS)


Qualitative study of the use of a dynamic computer software tool with secondary students found four learning states which were hierarchical and played the role of a bridge between the van Hiele levels of geometric thought. There also was consistency between the van Hiele levels of geometric thought and students' problem-solving ability.

**Geom, Comp, PS** (SE)


Students who had initially failed the test were studied to determine variables that differentiated between those who eventually passed and those who never passed. An equation consisting of six variables was found to predict the pass/fail outcome at a rate of 92% accuracy.

**Assm, Ach, Ethn, Gend** (HS)


An evaluative instrument was designed to measure the extent to which reform ideas were represented in the curricular materials. P.A.S.S. materials from 1995 were found to be measurably improved upon similar materials from 1989.

**Curr, Ethn** (K-12)

This research studied the incidence of computer programming activities in Logo, based on the learning of elementary geometrical notions. Programming in Logo in geometry lessons produced a positive effect on the geometrical concepts of students.

Comp, Geom (HS)


Questionnaires regarding the concerns, knowledge levels, and instruction and training needs of (n=320) K-8 mathematics teachers with reference to the implementation of the NCTM standards found that these teachers were typical nonusers of the Standards, but have a general understanding of problem solving as described in the Standards.

Curr, TAtt (EL, T)


Relationships between seventh and eighth grade students' informal classroom conversations while in small work groups and their subsequent formal written accounts of their mathematical understandings were investigated. Regression analysis indicated that an individual's presence at high-quality conversations affects the production of written communication.

Comm, Eqty, Grpg, Writ (MS)


Students in grades 8 and 9 (n>100) had rather fragile and unstable ideas of covariance, but they did have an intuitive notion for multiple patterns of covariation. Three levels of student thinking are identified as students' understanding of covariation matures.

Alg, Lrng (SE)


Students surveyed (n=148) had positive attitudes in the areas of confidence, usefulness, and anxiety. Attributions for success in electronics or mathematics varied, but students agreed that teacher explanations were important.

Att, Tech, Aff, Anx (PS)


Logistic regression and chi square tests were applied to students enrolled in developmental mathematics at a community college (n=584). Results showed little predictive accuracy of achievement in current college placement practices. The analysis could be used to make "probability of passing" forecasts for students and advisors.

Assm, D/R, Ach (PS)


Ethnographic techniques of participant observation were employed to investigate a family of five for 21 months. After tutoring by the researcher, a better match was found between parents' and childrens' levels of representation, as formulated by Bruner.

Soc, Rep, PS, Lrng (EL)

Study of attributional beliefs of low SES African American mothers and their sixth-, seventh-, and eighth-grade children showed that mothers and children generally explained the children's mathematics success as a result of effort. For mathematics failure, mothers emphasized lack of effort, whereas children emphasized lack of home training and lack of effort.

_Ethn, Soc, Blf_ (MS)


Evidence from observation and interviews suggested that an atmosphere of challenge, a sense of community, and the patterns of interaction among members of the classroom interacted to affect students' responses to the study of mathematics.

_Soc, Clln, Grpg_ (SE)


Textbooks, work of individual researchers, and institutions that have implemented these reforms are surveyed. The author's own attempts at integrating history and writing in calculus and other courses are also described, and two instructional units written by the author are included.

_Curr, Writ, Calc, AdvM_ (PS)


Instruction in the use of graphic organizers in conjunction with analytic reading skills resulted in significantly higher adjusted post-mean scores for sixth graders when compared to the group that received no treatment.

_PS, IC_ (MS)


Multilevel structural equation modeling was applied to a subsample of students from the first follow-up study of the National Education Longitudinal Study of 1988. Indicators affecting student learning of one skill level were found to not necessarily have the same effect on learning other skill levels.

_Ach, Assm_ (ALL)


An investigation of types of computer feedback strategies found significant interaction effects between learner characteristics and feedback strategies. Individual ability and locus of control were found to have substantial effects on learning achievement.

_Lrnr, Comp, Arth_ (PS)


Group work and cultural markers were incorporated in an effort to increase academic success and retention rates. Contextualized problems appeared to motivate culturally connected American Indian students. Teachers were placed in the position of having to legitimate (or not) minority cultural knowledge.

_Ethn, Curr, Ach, Grpg_ (HS)
Atkinson, Costner, Herman, & Reed


Active learning environments were compared to passive ones (n not given). Growth in subjects' critical thinking skills did not occur in the predicted direction. These findings may not detract from the ecological validity of the study.

Calc, PS, Curr (PS)


Extended time for study (three semesters instead of two) and implementation of a mastery learning concept proved effective. The principal's role as leader was emphasized.

Alg, Lrng (HS)


A treatment group (n=75) that received the supplement significantly outscored a control group (n=75) on an intuition posttest, probability test, and statistics test. Treatment students interviewed were found to have a more sophisticated understanding of posttest questions than control students (n=12).

Prob, Knw, Stat (SE)


Instruction incorporating algebra tiles resulted in higher scores than traditional instruction (teacher explanation) alone (n=247). Higher scores were seen in terms of common factors, correct selection and placement of signs, exponents, and application to equations.

Alg, Manp (HS)


Activities recommended to integrate science and mathematics were found to be optional and, relative to other optional activities, occurred infrequently. Only two process-oriented characteristics, collecting and organizing data and interpreting data, were adequately represented in the manuals.

IC, Matl, Stat (EL)


Analysis of standardized test scores showed that: (a) low passing percentages for all ethnic groups who received remediation suggest a need for additional strategies; (b) remedial students who passed the pretest did not show gains in the posttest; and (c) self-paced learning modules, writing activities, group techniques, and manipulatives were identified as potentially beneficial strategies.

D/R, Ethn (PS)


Mathematics teachers were surveyed to determine the extent to which communication activities were being used and which ones were most favored. Writing and reading activities were used less frequently and rated lower.

Comm, Writ, TAtt (T)

In Phase I, second grade students demonstrated that they had no connections between the equal sign and the conception of equality. In Phase II, a teaching experiment helped students to incorporate conceptions of equality into their descriptions of the equal sign, and helped them restructure their knowledge by connecting their conceptions with the symbol.

Patt, Mscn, Lang (EC)


The strategy of making predictions before using a computer simulation was found not to influence achievement on statistics concepts. There was also no significant relationship between the amount of manipulation of the computer simulations and achievement (n=48).

Comp, Stat (PS)


Although pairs of students tended not to discuss problem structure or analyze potential strategies, pairs were still more successful in solving a given set of problems than students who worked alone. Increased success of pairs was due to increased persistence, leadership by the more able partner, increased oral rehearsal, and correction of minor errors.

PS, Grpg, Alg (PS)


An overall program evaluation of UCSMP materials included quantitative and qualitative data from teachers, principals, district administrators, and school board members. Central administration expressed a need for leadership from teachers on developments in mathematics education, while teachers expressed concern...
about low evaluations from administrators who did not understand the new directions in mathematics education.

**Curr, TBIf** (K-12, T)


Interpretive analysis of qualitative data revealed five major themes: preservice teachers' prior beliefs and experiences; increased understandings about themselves as learners of mathematics; new learning about mathematical pedagogy; new or different ways of learning mathematics; and anger about their previous mathematics experiences.

**TBIf, Prsv, Lrng** (EL, TE)


Students (n=27) used software and guided discovery lessons to investigate rational functions for 3 days. Findings include: students did not naturally see asymptotes, they became better at symbolization than graphing, they did not develop generalized procedures, and they tended to create concept definitions according to concept images and visual reasoning.

**CAI, Alg** (PS)


Students (n=59) were found to score higher on contextual than on procedural problems when both had difficult solutions, and they scored higher on procedural than on contextual problems when both had easy solutions. They used a greater number of nonalgorithmic solutions on contextual problems. In general, students did not prefer procedural problems over contextual problems.

**PS, Rep** (PS)


Results showed that fourth grade textbooks were similar to proficiency assessments, but eighth grade textbooks were significantly different from proficiency assessments, and implied a need for alignment between textbooks and assessment instruments.

**Matl, Assm** (EL)


A pretest and posttest of students (n=84) aged 11 to 12 showed they gained more understanding from contextualized problems on decimal fractions than on purely numerical problems. Much of their learning seemed to result from reconsidering their views after a conflict between expectations and results.

**Decm, Rep, Lrng** (MS)


Students who made less than a B in their previous mathematics course and (n=29) were taught using modules of the CORD Applied Mathematics program scored lower on a state algebra 1 test than did (n=70) students who were taught traditionally.

Kindergartners' (n=207) use of money was influenced by their number concepts and knowledge of coins' names and values. No relationship was found between parents' number practices and kindergartners' number learning, nor between parents' monetary practices and kindergartners' monetary use.

*Soc, NSns (EC)*


Field data and interviews were used to explore (n=2) preservice teachers' experiences with mathematics. Results suggest that teacher education should provide opportunity for preservice teachers to deconstruct negative beliefs, and should provide an environment in which preservice teachers can practice positive views of (and alternative methods of) teaching mathematics.

*TB1f, Prsv (TE)*


A rubric was developed that would assess the process of creating a model, provide formative assessment information to students as models are created, and allow a variety of teachers to assess models objectively. Student improvement within a semester showed that formative feedback was being provided, and consistent scoring proved possible with a variety of teachers.

*Assm, Rep (PS)*


Students in schools where AP Calculus AB was taught in (n=252) one semester scored significantly lower on the AP exam than (n=355) students in schools where the course was taught in two semesters.

*Calc, Ach (HS)*


Cues and scaffolds were provided in interviews with (n=16) children to support their construction of meaning within their 'number construction zone' and towards the outer limits of their understanding. Results highlight specific conceptual, procedural, functional, and affective characteristics that most directly affected children's capacity to make sense of number situations.

*NSns, Lrng (EC)*


This study focuses on the development and presentation of a relevant and applicable curriculum for high schools in postapartheid South Africa.

*Curr, Soc, Lrng (HS)*

Kristjanson, Cheryl Roberta. (1996). *Voices from the other side of the room: A study on changing teaching strategies to include girls in math, science and technology* (The University of Manitoba). DAI-A 58(04), p. 1192, Oct 1997. [AAT NN16182]

Teachers in this project focused on adapting their teaching strategies and classroom environment in order to establish connections with their female students and between the subject and the student's real world. The results were an improvement in young women's enrollment, achievement, and attitudes toward mathematics, science, and technology.

*Tchg, Gend (SE)*

Study of learning disabled high school students (n=76) taught word problem solving using either traditional textbook instruction or a cognitive strategy method found no significant differences.

LD, PS (HS)


Six clustering scales (concepts, approach, teaching, assessment, technology, and access) were developed to analyze data from surveys of site liaisons and instructors at institutions implementing calculus reform. Eight types of interpretation and implementation of reform were identified. Faculty members were found to emphasize different aspects of reform depending on the context of their situations.

Calc, Curr, Teach, Assm, Tech (HS, PS)


Nontraditional students (n=5) in college algebra were found to be serious learners who come into the course with high expectations. Those who have difficulties experience a mismatch between their expectations coming into the course and the new learning experience. They expected to be able to use the same study approaches they had in the past.

Lrnr, Styl, Alg (PS)

Case studies of two high school mathematics departments found that the characteristics necessary for a department to be a professional community that enables the transition to student-centered practice include: (a) open department borders, (b) collective responsibility for the program, and (c) using guiding principles for practice and decisions.

Tchr, Tchg, TBIf (HS, T)


Fourth graders (n=60) in Taiwan showed that the number of relational sentences with inconsistent structure increased the difficulty of two-step compare problems, and that problem structure was a major variable in deciding appropriate operations.

PS, Lang (EC)


This analysis of students’ understanding of the concept of slope revealed that transfer is not a decontextualized ability, independent of context. The findings also supported a breakdown of the classic distinction between surface and structure features in the traditional transfer paradigm.

Lrng, Alg (HS)


Qualitative and quantitative data showed that the curriculum did change as a result of legislation. Instruction and student achievement gains were noted for the first five years, but not the last four years. Some intended aspects of reform, such as incorporation of higher order thinking skills, did not occur.

Curr, Ach, P/S (HS)

Successful performance by first-year calculus students on geometric related rate problems included the following steps: implicitly differentiate, substitute and solve, and solve an auxiliary problem. Results suggested that understanding of related discrete changes may be connected to the ability to solve problems relating continuous changes.

Calc, Geom (HS, PS)


Classroom interactions were found to be regulated by the teacher, or the teacher with the students. Development of discourse was linked to the development of the student as learner and as a participant in the mathematics community, choice of mathematical tasks, students' social and mathematical roles, and classroom environment.

ClIn, Oral (MS)


Technology, including satellite instruction, helped students increase application skills without losing ability to do routine computations. Implications are that “at-risk” students and lower achieving students could be helped by technology and satellite instruction that uses a nonconventional approach.

Comp, MMed (HS)


Results suggest that mathematics anxiety is negatively correlated with mathematics course grade (high anxiety decreases likelihood of high grade) and that age is positively correlated with mathematics course grade (likelihood of high grade increases with age).

Anx, Aff (PS)


College students majoring in mathematics education were found to spend more time when the graphing calculator was available, and used it differently in each problem, with the type of problem being the greatest influence on how the graphing calculator was used.

GCal, PS (PS)


This dissertation studied the implementation in a precalculus course of a model for the development of mathematical thinking involving the abstract-concrete cycle, the conceptual-procedural cycle, and the seminar-intense individual effort-collaborative work cycle. Results showed the experimental group outperformed counterparts.

Calc, Lrng (PS)


The rationale behind this semi-structured interview study is equitable transfer of course credit. There were more similarities than differences in the comments among and between the groups. The analysis resulted in the identification of eight
categories of characteristics defining college-level course work.

Plan, Curr (PS)


Data from two questionnaires administered to high school algebra and geometry students showed various relationships between attribution of success and failure with use of resources, ability, effort, and achievement.

Blf, Ach, Alg, Geom, Gend (HS)


This study explored what mathematics topics taught by the mathematics department were being duplicated in courses taught in other academic departments, why these departments preferred to teach their own courses, and what could be done to reverse this trend.

Curr (PS)


Ten types of interventions were attempted with a 12-year-old student with learning difficulties, four of which had significant effect on school grades. Integral to success of these interventions was the clinical interview, which helped identify appropriate interventions. The study supports the desirability of using multiple approaches in a given situation.

LD, Lrng, Lang (MS)


A computer-administered software program, the Moody Test for van Hiele Geometry Levels, was constructed to investigate the discreteness of each student level, as defined by the van Hiele theory. The study concluded that the van Hiele levels do exhibit discrete intervals of student understanding of geometry. Approximately 82% of (n=76) females and 95% of (n=78) males were determined to fit the van Hiele model.

Geom, Assm (HS)


Students with graphing calculators had higher scores on a posttest and major differences with better reasoning about functional representations compared to students without graphing calculators.

GCal, Alg (PS)


This research investigated the use of a study guide for statistics containing examples that adults might find in their everyday lives and employed other adult-specific strategies recommended by the literature. Over 75 percent of the (n=48) adult students found the study guide ‘quite useful’ in their study of statistics.

Stat, Matl (PS)


This qualitative study of three teachers and classrooms found four major themes common to the use of children’s literature for mathematics
instruction: interests, curriculum choices, teacher knowledge, and constraints. Appropriate choices of literature were found to depend on teachers' content knowledge in both mathematics and literature, and curricular choices were dependent on system curriculum and textbooks.

Lang, IC, Tknw, Curr (EC)


Third-grade students in multi-age classes achieved significantly higher scores in reading, mathematics, and writing on a state-level standardized test than students in single-age classes. Multi-age classes are therefore a viable alternative to single-age classes, with no detrimental effects in the multi-age classes.

Ach, Grpg, Gend, Eth, Soc (EC)


Teachers (n=84) enrolled in an in-service teacher training program at The National Taipei Teachers College in Taiwan evaluated the technical quality and presentation, instructional quality, and pedagogical content of software using a new instrument labeled IECES. IECES was found to be appropriate, uni-dimensional, reliable, and easy to use.

Tech, Matl, CAI, Insv (EL, T)


A moderate reflection of reform (in terms of curriculum, materials, administrative support, and professional development) was found in the mathematics education of deaf and hard of hearing students.

Curr, Lrnr (K-12)


A statistically significant difference was found between the mean Missouri Mastery and Achievement Test mathematics scores for two groups of second- through fifth graders, one group participating in free or reduced-fee lunch program and one not participating.

Soc, Ach (EL)


College students' (n=3) believe that classroom mathematics has no connection to the real world and they desire to know of applications. Students also expressed that instruction should actively involve them. Recommendations for teachers and researchers are given to address these issues.

Blf, Aff, Tchg, D/R (PS)


Data in this causal-comparative study were collected on three dependent variables: (1) attendance rates, (2) student reading scores, and (3) student mathematics scores. Substantial increases in these three measures of students attending Schoolwide Project schools was expected. However, data indicated that Schoolwide Project schools (n=5) performed similarly to Chapter I Basic schools (n=6).

Curr, Ach (EL)

Propositions regarding teachers' involvement in state-level policies and influences of school professional communities were examined. Conclusions indicate positive contributions of both strategies to teacher learning and implementations of 1992 Framework ideas.

Curr, Lrng (T)


Results of data on (n=210) seventh graders indicated that teachers' responses on the Vandalia-Butler Advanced Mathematics Placement Teacher Checklist and students' responses on the 'willingness to engage in problem solving' section of the Indiana University Student Attitude toward Problem Solving Inventory were significantly related to student success.

Ach, Alg (MS)


The Performance Assessment Validity Baseline Criteria was developed to examine the validity of the Second Grade Primary Mathematics Performance Assessment. Seven defined validity principles were investigated, yielding mixed results for the validity of the assessment. Factor analysis, t-tests, and correlation analysis as other means for examining the validity of the assessment did not allow for a robust interpretation.

Assm, Matl (EC)


Findings of this study on the effects of tutoring showed that students who received tutoring in labs in mathematics had the highest semester grade point averages, and females earned higher course grades in mathematics, regardless of whether they were tutored or not.

Grpg, Gend (PS)


The interactive relationship between a new mathematics textbook and (n=2) fourth-grade teachers' thinking about, and teaching of, mathematics was analyzed in order to develop a model of teachers' curriculum development activities.

Matl, Tchg, Curr, TBIf (EL, T)


Innovations reported by district-level mathematics coordinators (n=245) included reforms in mathematical content, instructional strategies, and the learning environment. Obstacles and strategies to overcome them are discussed, revealing some powerful options which have been used with success by those attempting to facilitate or support innovation in mathematics education.

Curr (Not given)


Students (n=78) who participated in the Twenty-first Century Mathematics Center for Urban Schools (The Center) were compared to students (n=78) who did not. A significant difference in mathematics achievement between the groups was detected. There was evidence of a positive effect on mathematics attitude for participation in the Center. The relationship that age, gender,
grade, and race have on achievement and attitude was also explored.

Ach, Att, Gend, Ethn (HS)


Students reacted positively, and performed as well as a control group, when taught mathematics using MathCAD engineering software.

Comp, Curr, Att (PS)


The Information Processing Theory of automaticity was examined in relation to solving simple linear equations and the mathematical ability level of the student (n=66). The results of this study did not demonstrate automaticity in solving linear equations. As automaticity was not demonstrated in this study, it follows that no significant relation between automaticity in solving linear equations and mathematical experience occurred either.

Lrng, PS (PS)


Questionnaires sent to (n=60) mathematics department chairs of higher education institutions in Georgia found that computers and graphing calculators were not viewed as essential for introductory courses, although reform documents from professional mathematical societies were supported. No state-wide pattern of curricular change and instructional reform was found.

Comp, GCal, Curr (PS)


Sixth graders (n=1,680) were given two test forms consisting of 20 stem-equivalent items using either a single- or multiple-choice response format to measure computation, pattern recognition, problem solving, and geometry. Findings indicated that there were no differences between the correlations of the response formats and the three external measures of student achievement.

Assm (MS)


Ethnographic observations of two successive review sessions in math in a classroom of students who are deaf were conducted, and teacher-student dialogues were transcribed and analyzed. Findings suggest that reviews are prolonged discourses between teachers and students who undergo negotiations between questions and answers, and are an extension of teaching, helping to solidify student mastery of lesson materials.

Lrng, Tchg (Not given)


An analytical framework for understanding classroom mathematical activity as well as a description and analysis of one model of NCTM-prescribed reform in practice in a seventh-grade mathematics course are provided. Implications for students and teachers are discussed.

Curr, Phil, Tchg, Lrng (MS)


This research considers the practical purposes which speakers achieve by means of vague
utterances in context. The claim is that vagueness can be viewed and presented, not as a disabling feature of language, but as a subtle and versatile device which speakers can and do deploy to make mathematical assertions with as much precision, accuracy or as much confidence as they judge is warranted by both the content and the circumstances of their utterances.

Oral, CIIn (MS)


This study attempted to uncover what motivated one teacher to persist in learning new ways to teach mathematics. Findings indicate that this teachers’ efforts to implement a reform mathematics curriculum faced many impediments.

Curr, TBIf, Tchg (T)


This study provides elements for analyzing the teaching of the notion of function as well as for evaluating the pupils’ conceptions. The research has led, on the one hand, to detecting several inconsistencies in the pupils’ knowledge, and on the other hand, the determination both of didactic obstacles, due to the way the education system functions, and obstacles at the level of the pupils’ knowledge.

Alg, Mscn (SE)


No difference in achievement levels were found for senior high school students involved in a distance-learning advanced mathematics course versus a traditional course. Constraints to effective interactions in distance education were the different mode of communication, limited access by students to the instructor and lack of visual link between students and instructor.

MMed, CIIn, Lrng (HS)


This study investigated (n=101) college students’ understanding of some selected aspects of mathematical proof. Results include the finding that many students did not distinguish between an explanation and a formal mathematical proof and also did not see any need to prove a mathematical statement they intuitively considered to be obvious.

Prf, Att (PS)


An investigation of (n=22) fourth graders found that the majority of students were able to construct their knowledge of fractions through the use of writing. Most of the students felt that documenting written information in a variety of ways was beneficial for learning.

Writ, Frac (EC)


Teachers (n=10) in Western New York school districts designed and used performance based assessments in their classrooms, based on the curriculum provided by the state. The assessment instruments reflect that teachers have linked their instruction and assessment to try and help
students gain knowledge over the course of instruction. Conclusions provide support for the current reform taking place in the mathematics community.


The purpose of this study was to investigate one teacher’s thought processes when teaching the concept of limit as it occurs in a classroom setting during the instruction in an introductory calculus course, and selected students’ cognition and understanding of the concept of limit in this context.


The study investigated the factors that contributed to the success of Black students who persisted in advanced mathematics classes, versus the factors that contributed to the lack of success of Black students who did not persist in advanced mathematics classes despite their above average achievement test scores.


A variety of patterns were found relating to the emotional arousal experienced by students causing them to ignore or abandon difficult problems. The teacher became the primary intervention agent between students and problem solving activities by responding in certain ways to the students’ emotional status. Appropriate intervention strategies are identified and suggested.


General concepts that are particularly problematic for students include operating with variables to simplify expressions, cancellation, solving equations, and function. Regardless of achievement level, New York City students (n=40) have misconceptions in areas of the abstract notation of “variable” and its uses. Students with lower achievement hold more misconceptions described in the study.


This dissertation investigated the role of content knowledge in teaching under conditions in which teachers’ abilities are taxed in two ways: the teachers use a novel curriculum, and the subject matter is complex.


This study identified common themes, patterns, characteristics, and unique differences among selected fifth-grade students related to their beliefs about mathematics as a discipline, how mathematics is learned, how to determine when or if they understand a mathematical concept, and the student’s and the teacher’s role in the mathematics class.

Community college mathematics classes were used to enhance students' work and study habits and improve their concentration skills. On top of good results in mathematics, students' reading comprehension scores greatly improved, showing that mathematics can be a universal educational tool.

**Phil, Lrng (PS)**


Statistically significant differences were found among treatment conditions for probes, posttests, and length of tutoring sessions. Third grade student performance improved under all conditions, but correct responses on probes and posttests were consistently highest under the multiple immediate practice with two delayed practice trials error correction procedure.

**M/D, Grpg (EC)**


A case study of a sixth-grade teacher indicated that four factors included in the NCTM Standards (task selection and formulation, classroom discourse, classroom environment, and analysis of teaching and learning) do highlight key aspects of teaching and learning mathematics. Several recurring tensions remain: what constitutes valid and worthwhile mathematical knowledge, decisions associated with planning, and the social contract in the classroom.

**Tchg, Curr (EL, T)**


Study of fourth graders' attitudes toward mathematics in classrooms integrating children's literature found positive changes in student attitudes toward mathematics resulting primarily from the use of children's literature in a majority of the fourth grade mathematics experience. Storybooks were found to be helpful in their problem solving efforts.

**IC, Att (EC)**


Types of assessment practices being used by teachers were examined and found to be somewhat in harmony with NCTM standards. However, tests administered by the Georgia Department of Education did not involve extensive use of multiple modes of assessment.

**Assm, Curr, Tchg (EL, T)**

The levels of understanding determined by students’ written performances on a Derivative Test were comparable to the levels of understanding determined by their verbal performances in interviews within some, but not all, problem categories. Relationships depended upon the type and presentation of problems.


By teacher interviews (n=23), assessment methods were examined as a factor in the concern about educational crises in the U.S. The focus was how to accurately assess the educational achievements of students. Issues addressing reform are discussed.


An in-depth case study of two teachers’ knowledge and classroom practices as they attempted to reconstruct their teaching in the presence of Mathematics in Context materials, shows the influence of reform material and of the researcher on change in teaching practice. The finding that text and materials alone are not enough to bring about reform is supported.


This collaborative action research study investigated three elementary mathematics teachers’ awareness of pedagogical practices that impeded or advanced gender equity within their classrooms. The author found that the number and quality of teachers’ interactions may be influenced more by explicit pedagogical considerations than by gender factors.


Responses of students on the Critical Incident Technique show that teacher personality and traits was the single most specific influential element on enrollment in mathematics classes. High school course selection was also important. A register of potential approaches in the development of mathematics programs is given.


Observations of and interviews with two middle school mathematics teachers found that teachers’ concerns about time constraints and epistemological responsibilities in the face of their students’ seemingly errant explorations, seem to be the biggest reason there is little significant change in practice.


Exploration of the concept of slope of (n=18) preservice and (n=21) inservice secondary mathematics teachers found that their understandings were dominated by geometric representations and that inservice teachers gave more responses, made more references to specific courses, and had greater understanding of the trigonometric representation of slope.

Objectives of this research were to identify causal factors regarding minority-student attrition, identify successful retention practices and programs, and develop a retention framework for administrators and practitioners to utilize during the planning and implementation stages of program development.


The present study investigated how (n=291) fifth graders' agency beliefs and means-ends beliefs for ability, effort, powerful others, and luck at the start of the academic year: (1) predicted mid-year task engagement; (2) related to their concurrent control beliefs; and (3) predicted their end-of-year achievement, after controlling for prior achievement.


The primary purpose of this study was to determine if there was a relationship between school enrollment size and mathematical achievement of students in grades 4, 7, and 10. There seemed to be little reason to believe that school enrollment size was closely related to mathematics achievement.


Results of this study suggested that (n=625) second-grade children taught arithmetic based on the Cultural Conceptual Learning Teaching Model performed higher on the School Achievement Tests than control group children.


A comparative study focuses on (a) content analysis searches for similar and different expectations of curriculum standards, (b) pedagogical analysis is based on how mathematics should be taught. It was found that Thai mathematics curriculum documents for Grade One do not reflect the NCTM curriculum standards.


Teaching and learning styles were studied, especially in relation to each other, using two variables of learning style theory: brain dominance and perceptual modality. Significant associations and differences are discussed.


This study analyzed the effect of technology on the formation of emotions, attitudes, and beliefs of (n=213) seventh graders. Students observed failed to demonstrate competency in basic skills and found little enjoyment in mathematics. The
author draws implications for increased use of calculators in mathematics.

Calc, Aff, Blf (MS)


The academic performance of students who took developmental classes (n=91) was compared with that of students who did not (n=91) to find effects on the students' subsequent undergraduate academic performance. Findings indicate that developmental classes in the basic skills do help students overcome lack of preparedness for college-level work.

D/R, Ach (PS)


No significant differences were found in the performance of students identified by test scores as requiring a developmental algebra course as compared to students in the same course who were not required to take the course.

Alg, D/R, Assm (PS)


The current study evaluated the effects of behavioral momentum on task initiation, math performance and problematic behaviors of (n=4) residential youth ages 13 to 14. While some subjects clearly benefited from the momentum training, one subject found the addition of praise to the high-probability sequence punishing.

Soc, Aff (SE)


The 'common core' entry-level mathematical related knowledge, skills, and abilities needed by manufacturing technicians in west central Ohio were found to be: interpreting drawing specifications, applying drawing specifications, and reading drawings with rectangular coordinates.

Soc, Arth (PS)


Students (n=6) were taught to use four general-to-specific self-instructional steps that were built into a computer program to solve missing-addend problems. Following training sessions, students demonstrated competence to solve problems at a high level of accuracy, both on computer-based and on paper-and-pencil tasks.

LD, CAI, Arth (EL)


Students (n=18) were observed to see how they interpreted and selected scales of graphs when using a graphing calculator. Strategies used to obtain appropriate viewing windows and misconceptions about the calculators are identified.

GCal, Mscn (HS)

This study examined perceived factors associated with college success by black students enrolled in science, engineering, mathematics, and technology undergraduate programs. The study compared perceptions of higher and lower achieving students across institutional enrollment types with regard to institutional features and personal behaviors associated with college persistence and achievement.

**Ethn, Soc (PS)**


Perceptions of African-American students (n=18) and factors that contribute to their experiences in classes were addressed. The findings revealed gender differences in learning preference, study orientation, faculty/student interaction, attitudes toward mathematics, and academic performance in mathematics.

**Ethn, Gend, Styl, Att (PS)**


Administration of the Myers-Briggs Type indicator to (n=42) high school juniors and seniors found students’ psychological types did not significantly influence their persistence to graduation. No significant relationships were found between race and persistence nor gender and persistence.

**Styl, Ethn, Gend (HS)**


Conjoint behavioral consultation (CBC) was used as an intervention strategy for at-risk students (n=6). During treatment, completion of homework rates improved for some students and accuracy rates increased but not substantially. At follow-up, some students maintained or improved gains made during treatment.

**Soc (MS)**


Two theoretical positions were tested to explore how arithmetic facts are stored and retrieved in memory. Performance of a brain-damaged patient was found to be incompatible with a phonological storage hypothesis. However, Semantic Network Retrieval Theory is supported.

**Lrng, Arth (Not given)**


Subjects (n=962) of this study were enrolled in community colleges as first-time, full-time students. Academic achievement was employed as the criterion variable for the three hypotheses of this study as measured by student performance on the mathematics portion of the TASP.

**Ach, Assm, Ethn, Soc, Gend (PS)**

Wilder, Margaret Ramsey. (1994). *The effects of a simulation test model of the General Education Development (GED) program as compared to the effects of a drill and practice, both computer-based and workbook-based on GED. Mathematics scores, retention, and time* (Grambling State University). DAI-A 57(07), p. 2808, Jan 1997. [AAT 9639896]

This study examined the effects of a computer-based instructional (CBI) simulation-test (simulation) treatment to a CBI drill and practice (drill) treatment. The traditional drill and practice (workbook) served as a baseline for this study.
The findings support the use of computer-based instruction in adult education classes.

**Curr, Comp** (PS)


An investigation of (n=404) students’ college calculus achievement found that the variables ACT mathematics scores, high school rank, age, and high school mathematics grade-point-average produced a statistically significant predictive model for academic achievement in college calculus.

**Calc, Ach** (PS)


Five measures of classroom experiences associated with the development of students’ (n=1327) higher-order thinking skills (HOTS) were investigated in terms of their validity as indicators of classroom opportunity-to-learn (OTL) and found to be useful. Classroom OTL was found to have a direct additive relationship with average student proficiency of HOTS.

**Curr, PS** (HS)


Study of (n=178) business and education students in graduate statistics courses found that mathematics preparation, perception of mathematics ability, proficiency in calculator use, and gender were statistically significant predictors of statistics anxiety.

**Anx, Stat** (PS)


An integrated mathematics and science course was developed and its effect on students’ (n=94) performance was investigated. Significant results suggest that the most effective approach to teaching mathematics and science for below average students maybe an integrated curriculum and an “experimental methodology.”

**IC, Curr, PS** (HS)


This study examined what and how a prospective elementary teacher learned about teaching mathematics for understanding during student teaching in a professional development school. The study has implications for the kind of student teaching that teachers and teacher educators need to construct for novices.

**Tchg, Prsv** (EL, TE)


The results of two-year junior college students’ (n=521) performance in calculus and on-time graduation were analyzed and correlated. It is suggested that two-year junior college curriculum standards in Taiwan be reformed to emphasize basic rudimentary courses.

**Curr, Calc, Ach** (PS)

A treatment group (n=53) was taught a unit of instruction beginning with a cognitive structure facilitator based on the advance organizer. Results failed to show that the instructional unit had an effect on the cognitive obstacles formed by students. However, the treatment group results did indicate an improvement in the application of unitizing.

Alg, Tchg, Lrng (HS)


A number sense test, mental computation test, and written computation test given to (n=115) sixth-grade and (n=119) eighth-grade Taiwanese students found that students who could correctly carry out exact computations by paper-and-pencil were not necessarily successful in applying these skills in non-computational situations.

NSns, Arth (MS)


A reformulation of the old-time problem of widespread failure in elementary mathematics and what may be done about it was proposed. Elements of the critical sociology of education, didactic contract theory, didactical transposition, child-centeredness, progressivism, and constructivism are discussed and critiqued.

Phil, Lrng (EL)
# Dissertations and Theses by Institution

## Canada
- **Simon Fraser University**
  - Nguyen; Hammill
- **University of Alberta**
  - Barnes
- **University of British Columbia**
  - Kelleher; Ma; Nicol
- **University of Calgary**
  - Maers
- **University of Manitoba**
  - Kristjanson
- **University of Regina**
  - Kang
- **University of Toronto**
  - Tiessen; McCaul; Nocente

## Finland
- **Jyvaskylan Yliopisto**
  - Risku

## Netherlands
- **Technische Universiteit Te Delft**
  - Smid

## New Zealand
- **University of Auckland**
  - Irwin

## South Africa
- **University of Pretoria**
  - Kriek

## Spain
- **Universidad De Granada**
  - Contreras; Estepa; Ruiz

## Sweden
- **Goteborgs Universitet**
  - Ekeblad
- **Lunds Universitet**
  - Engstrom
- **Stockholms University**
  - Chen

## United Kingdom
- **Open University**
  - Atkinson; Bills; Jennings; Rowland

## United States
- **American University**
  - Hare
- **Arizona State University**
  - Ong
- **Auburn University**
  - Bass
- **Ball State University**
  - Gardner
- **Baylor University**
  - Price-Baugh
- **Boston College**
  - Armstrong; Jones
- **Boston University**
  - Century; Martin; Snook; Sokolowski
- **Central Michigan University**
  - Baez
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Dissertations Produced in 1997

North Carolina State University
Bragg; Coulombe; Haynie; Hollar; Lawrence; Sakshaug

Northern Arizona University
Meeks; Nichols

Northern Illinois University
Covalt; Harris; Klanderman; Slaughter; Wyllie

Nova Southeastern University
Shaw

Ohio State University
Doenges; Fitzsimmons; Good; Ou-Yang; Watson; Walder

Ohio University
Al-Natour; Almeqdadi; Jones; Ryan; Saeed; Yousef

Ohio State University
Cox; Sallee

Oregon State University
Hale; Utter; Wohlhuter

Pacific Lutheran University
Van

Purdue University
Gregg; Kao; Petty

Rutgers University - New Brunswick
Debellis; Hammett; Passantino; Ramus

Saint Louis University
Smith; Ware

Seton Hall University
Chinni; Burke; McGeehan

Southern Illinois University at Carbondale
Conway; Pineda

Southern Illinois University at Edwardsville
Lockart

St. John's University (New York)
Verna

Stanford University
Bushey; Cossey; Krohn; Lieberman; Perry

State University of New York at Albany
Lowinger; Gau; Pulver; Salmon

Temple University
French; Jackson; Riley; Sottile; Wilburne

Texas A&M University
Ache

Texas A&M University - Commerce
Grant; Smith; Steward; Whitus; Wilhite

Texas A&M University - Kingsville
Camacho

Texas Southern University
Washington

Texas Tech University
Lin

Texas Woman's University
Smith

United States International University
Rader

University of Akron
Klein

University of Alabama
Boggs; Earhart; Harris; Nolan

University of Alabama at Birmingham
White

University of Arizona
Miller; Uecker

University of Arkansas
Moody

University of California, Berkeley
Chiu; Lobato; Sherin

University of California, Los Angeles
Cohen; Kennedy; Stone; Wellman; Wilkins

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Moore

University of California, Santa Barbara
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University of Pennsylvania
Rothschild; Stengel

University of Pittsburgh
Magone

University of Rhode Island
Hayden

University of Rochester
Armstrong

University of South Alabama
Ellingwood

University of South Carolina
Kinard; Manuse; Snead

University of South Florida
Peretz; Smith

University of Southern California
Belonia

University of Southern Mississippi
Bullock; Johnson; Rushing; Webb; Wilson

University of Tennessee
Bailey; Brown; Winstead

University of Texas at Austin
Beauford; Hanna; Leake; Ruddock

University of Toledo
Chen. Culbertson

University of Utah
McCormick; Weiner

University of Virginia
Ensign; Perdue; Ward

University of Washington
Chappell; Stimpson; Yates

University of Wisconsin - Madison
Drexel; Jung; Long; Shew; Spence; Uen

Utah State University
Rowley

Vanderbilt University
Bowers

Virginia Polytechnic Institute and State University
Addington; Miller

Walden University
Conger; Saunders

Washington State University
Tusgate; Gupta

Wayne State University
Arnold; Gunasekera; McMann

West Virginia University
Goodwin; Othman; Pyzdrowski; Vavra; Yang

Western Michigan University
Emerson; Royer; Vunovich

Wilmington College (Delaware)
Dudderar; Joyner

Yale University
Ben-Zeev
Research Articles in Mathematics Education Published in 1997

Hea-Jin Lee & S. Asli Özgün-Koca, The Ohio State University

This section lists 282 articles in mathematics education research that were published in 1997. Each entry is coded (see Key to Codes) with one to three major topic codes (in bold type) and any number of minor topic codes, as well as the grade level code (in parentheses). Studies related to preservice or inservice teacher education are indicated by the appropriate codes (Prsv, Insv). The level designated for teacher education or teacher studies indicates the grade level(s) at which the intern or teacher participants teaches, followed by the level code, “T” for teacher or “TE” for teacher education. All entries are indexed by major codes at the end of the volume (see page 85). A list of the journals searched and the number of articles included from each is provided at the end of this section (see page 70).

This study describes how using spreadsheets helped seventh-grade algebra students develop problem solving skills.

PS, Comp, Alg (MS)

This study identifies concerns of beginning science and mathematics teachers about being a new teacher and their perceptions of the effectiveness of their preservice program in relation to their concerns.

Prsv, Tchg, Aff, Curr (T, TE)

Describes a study that examined three areas (oral interactions, observations, and problem solving investigations) of student assessment in a college algebra classroom before and after the use of graphing calculators in class activities.

Alg, GCal, Assm, PS (PS)

This study investigated differences in performance when sixth graders were presented with fractions in three contexts: understanding the meaning of fractions, computation with fractions, and solving word problems with fractions.

Frac, Ach, Curr, Ethn, Tchg (MS)

This article presents a study of 12 special education teachers who had a high acceptance of curriculum-based assessment and 9 teachers who had a low acceptance. Results showed that they differed on two of five implementation measures.

Curr, Assm, D/R, Ach, TAtt (EL)

This study explores mathematics and parent-child interactions in a group of 21 parents and their four-year-old children. Findings indicate a wide range of mathematics displayed, with counting being the most prevalent activity. All parents succeeded in injecting some mathematics in most sessions.

**Soc, Tchg, Knw, Oral (EL)**


A survey of 185 secondary mathematics teachers investigated their perceptions of expertise and curricular justifications for the classroom use of databases, spreadsheets, Logo and BASIC. The study determined that teachers who used software regularly tended to have shorter lengths of service, better qualifications, and were more likely to be male.

**Comp, TKnw, Tchg (TE)**


This study proposes using the reform documents from the National Council of Teachers of Mathematics (NCTM), a theory based multi-dimensional assessment framework, to help expand the scope of assessment in mathematics.

**Assm, PS, Curr, Lrng (ALL)**


This study examines classroom situations which allow for learning of rules of mathematical reasoning. Findings indicate that debate about mathematical rules can be generated amongst students aged 12 to 13 through the study of a mathematical problem.

**PS, Lrng, Mtcg (MS)**


Twenty-seven seventh-grade students of varying ability were observed working in small groups. The results provided insights regarding the ways that beliefs, emotions, and attitudes of students of varying ability influenced their own and their peers’ metacognitive behaviors within their respective groups.

**PS, Grpg, Mtcg, Blf, Soc (MS)**


An experimental course used increased computer programming activities and other exercises designed to give students the opportunity to build experiences.

**Alg, Curr, Comp, Tchg (PS)**


This study focused on the nature and development of college students’ mathematical knowledge about derivative. A revised epistemological analysis for the graphical understanding of the derivative based on the results of the data was proposed.

**Lrng, Calc (PS)**


This study examines the possibility that at times imagery might be a disadvantage in certain tasks and describes one calculus student’s images supporting high levels of mathematical functioning which occasionally became so powerful as to obscure more than to explain.

**Calc, Vis, Lrng (SE)**

This study describes a Standards-based high school mathematics curriculum that involves application, technology, cooperative learning, and open-ended problem solving and compares student attitudes and achievement with a traditional class.

IC, Att, Ach, PS, Tech, Grpg (HS)


This case study focused on the challenge of learning what students know. The author recommends that knowing students is a domain worthy of development which promises increased understanding and consequently new challenges.

TAtt, TKnw (SE, TE)


To improve science, mathematics, and technology education, Israeli high school teachers received inservice training. Surveys, reports, observations, meetings, and student achievement tests indicated that the program was useful for teachers who had acquired basic knowledge in their disciplines.

TKnw, Insv (TE, SE)


The main goal of this research was to determine the effect of the implicit combinatorial model on pupils' combinatorial reasoning before and after instruction. This study gives an analysis of variance of the answers from 14-15 year-old students (n=720).

PS, Prob, Rep (SE)


Author reviews the four sections of the two-volume set, *International Handbook of Mathematics Education*, with specific comments on various chapters contained therein. Author suggests that this handbook be used as a general resource for specific topics.

Tchg, Revw, Tchr, Matl (ALL, TE)


This is a study of preservice teachers (n=30) that provides confirming evidence that students usually use two rational number operator constructs. Authors discuss the cognitive models of the students' strategies and the notational system used as an analytical tool.

Prsv, Frac, TKnw, Lrng (PS)


A study of two adolescents with behavior disorders examined the effects of a sequence of three, single digit multiplication problems on the latency to initiate multiple digit multiplication problems.

D/R, M/D, Assm (SE)


Scoring accuracy and item functioning were studied for an open-ended response type test in which correct answers can take many different surface forms. Results with 1,864 graduate school applicants showed automated scoring to approximate the accuracy of multiple choice scoring.

Assm, PS, Comp (PS)

A computer-delivered problem solving task based on cognitive research literature was developed and its validity for graduate admissions assessment was studied with 107 undergraduates. Findings supported use of the test, which asked examinees to sort word problem stems by prototypes.

**PS, Assm, Lrng (PS)**


This study examines the theoretical framework of psychologist Lev Vygotsky with regard to communication tools, cognition, and socio-cultural effects on these tools by adapting Luria's instruments for alternative assessments to study students' word meanings of division.

**Ethn, Lang, M/D, Soc, Assm, Lrng (ALL)**


A study of how student characteristics, self perceptions, academic skills, and course-taking patterns can predict academic achievement showed that students have unrealistic perceptions of their own academic competency and that mathematics skills are a stronger predictor of academic achievement than verbal skills.

**Ach, Att, Assm, D/R (PS)**


This study reports on the development and psychometric properties of a new 87-item Mathematics Information Processing Scale that explores learning strategies, metacognitive problem-solving skills, and attentional deployment.

Results with 340 college students support the use of the instrument.

**PS, Mtcg, Styl, Rsch (ALL)**


Questionnaires (n=198) given to find reasons for students choosing A-level mathematics and the relationship between gender and A-level choices found a highly significant difference between boys and girls in why they choose mathematics.

**Gend, Att, Curr (ALL)**


The agreement of diagnostic classifications from two parallel subtests assessing a mathematics skill was studied with 431 Arab Israeli 10th graders. Even when parallel form reliability was high, less agreement was apparent when performance is evaluated at the micro level.

**Ethn, Assm, Rsch (HS)**


This study emphasizes that a project-based approach produced equity between girls and boys whereas a textbook approach prompted many of the girls to underachieve.

**Eqty, Tchg, Gend, Matl (ALL)**


Case study data from two British schools for grades 9 through 11 (160 students and 109 students) shows the way in which girls link their mathematics underachievement to the type of mathematics that is commonly taught in the United Kingdom.

**Gend, Ach, Curr, Ethn (HS)**

Examined the change process experienced by 14 third-grade teachers participating in the University of Colorado Assessment Project, which helped teachers design and implement classroom-based performance assessments compatible with their mathematics and literacy instructional goals.

*Tatt, Assm, NSns, InsV (EL, TE)*


A qualitative analysis of the responses revealed that students did not use materials in solving problems. The increased processing load caused by concrete representations is hypothesized as a reason.

*Matl, Rep, Alg, PS (SE)*


The sequence of time acquisition in the ability to read and record analogue and digital times proposed in this study was confirmed for grades 1-3 (n=67) while irregularities occurred with grades 4-6 (n=66).

*Tchg, Meas (EL)*


Success in a new program in computer science and engineering, heavily based on applied mathematics and only open to women, required considerable interest in mathematics and curiosity about computer science among female students at the secondary level.

*Gend, Comp, Att, Ethn, Curr (ALL)*


Treatment students were more successful in representing and solving a function word problem and were better at problem representation tasks such as translating word problems into tables and graphs than were comparison students.

*Alg, Lrng, Rep (HS)*


Data were obtained from the 1987 and 1991 Longitudinal Study of American Youth. Beyond the expected effects of gender, socioeconomic status, reading ability, and prior achievement, homework effects were found for mathematics achievement.

*Ach, Soc, Assm (SE)*


This paper examines how abstract algebra students might come to understand binary operations, groups, and subgroups. Results suggest that the pedagogical approach of the study was reasonably effective in helping students to develop strong conceptions.

*Alg, Lrng, Tchg (PS)*


Investigation of students’ use of imagery in their mathematical activities found image formation was crucial in doing mathematics.

*PS, Lrng, Vis (EL)*

A study of women majoring in engineering (n=31) and mathematics education (n=43) showed the following variables distinguished between the two groups: success expectations for traditional and nontraditional occupations, self efficacy for traditional occupations, and outcome desirability.

Gend, Att, Blf (PS)


A partnership project, in which each fourth and fifth grade classroom of an elementary school had a “buddy class” at a neighboring middle school, increased students’ mathematics and science skills and self-esteem.

Lrng, Grpg, PS, Att (ALL)


This study analyzes the solution of additive problems involving negative numbers by prospective primary school teachers using surveys. Students felt no need to use negative numbers in the solution of additive problems.

A/S, TKnw, NSns (T, TE)


Fifth-grade students using Integrated Learning Systems in cooperative groups for mathematics instruction performed better and were more positive toward mathematics.

Ach, Comp, Grpg, Att (EL)


Chinese students were given items from the mathematics subtest of the Scholastic Aptitude Test found to produce the largest gender differences in American students. Results revealed no difference in performance on the test items between Chinese males and females.

Gend, CC, Assm (ALL)


The contributions of open-ended tasks in examining students’ mathematical performance were studied with 250 U.S. and 425 Chinese sixth graders. Open-ended tasks allow for analysis of student performance that cannot be assessed solely by percent correct or incorrect.

CC, Assm, Ethn (MS)


This study analyzes the responses of pre- and in-service teachers (n=136) to a series of graded questions about average by presenting information in graphical form requiring respondents to compare data sets.

TKnw, Rep, Stat, PS (PS, T)

CAI, Grpg (EL)

This article reports a study of how instructors in methods classes in mathematics, science, and technology addressed issues of gender equity. Results indicated that the teacher educators were interested but uninformed.

**Tchg, Gend, Eqty, TAtt (TE)**


This article reports the results of an investigation to provide insights into how high-performing college algebra students (n=30) develop an understanding of major aspects of the concept of function. High-performing students actually possessed weak understanding.

**Alg, Knw (PS)**


A study of social and metacognitive contributors to gender differences in 58 first-graders found girls were more likely to use overt strategies, while boys use memory retrieval, to solve addition and subtraction problems.

**Gend, Mtcg, Soc, A/S (EC)**


Only 2% third-grade Illinois students using the University of Chicago School Mathematics Project’s elementary curriculum, Everyday Mathematics, failed to meet state goals.

**Curr, Ach, NSns (EL)**


Classroom observation of primary students encouraged to develop computational procedures that are meaningful to them revealed most students capable of developing their own accurate solution procedures.

**PS, Lrng, Tchg (EL)**


This study used path analysis to examine effects of spatial skill, mathematics anxiety, and mathematics self-confidence as mediators of gender differences in mathematics Scholastic Aptitude Test (SAT M) in upper third of college-bound adolescents.

**Vis, Anx, Gend (HS)**


The performance of 76 students with learning disabilities (aged 10 to 15) on four tasks of addition, subtraction, multiplication, and division computation was examined. Tasks varied in difficulty level and number of strokes needed to complete all items.

**Arth, D/R (K-12)**


This study compares the public expectation of achievement in mathematics in England, Wales, and Bavaria.

**CC, Ach, Assm, Matl (SE)**
This study focuses on the nature and development of college students' mathematical knowledge about the chain rule. Proposed revised epistemological analysis of the chain rule based on the results of the data is presented.


Author investigates changing teacher roles associated with two sixth-grade teachers' use of innovative mathematics materials. One teacher demonstrated increasing comfort in posing non-routine problems to students.


This study found strong positive effects on the transformation of internalized images and initial gender differences in spatial thinking, but both boys and girls made substantial gains during instruction.


This study explores the relationship between classroom discourse and mathematical development in a first-grade classroom. It contrasts the analysis of reflective discourse with
Vygotskian accounts of learning that also stress the importance of social interaction and semiotic mediation.

**Oral, Tchg, ClIn, Lrng, Mtch (EL)**


This article reports findings from a study which applied the group project method to a college algebra class. The results showed that the experiment did not produce success for the group-projects approach.

**Grpg, Alg, Tchg (PS)**


This article describes an experimental study in which two sections of calculus were taught using the same materials, with one section was enhanced with the computer algebra system Mathematica. Students in the technology group had advantages to understanding certain key topics in calculus such as limits, derivatives, and curve sketching.

**Calc, Comp, Tchg, Curr (PS)**


The mathematical performance of (n=30) 18-20 year olds and (n=37) adult students studying elementary education was compared. Older students did slightly better; adults without a mathematics background or who had previous negative mathematics experiences did very well.

**Ach, Anx, Lrn, Prsv (PS)**


Reports the results of a case study at the Open University (Great Britain) which shows that the learning environment for distance education students of mathematics can be substantially improved by the use of electronic communication.

**Comp, Comm (PS)**


This article describes a volunteer tutoring program coordinated by associates of the Exxon Corporation to help middle and high school students with mathematics and science homework. The author enumerates the successes of the tutoring program.

**Soc, Tchg, Tech, Ach (SE)**


The cognitive effects of self referencing in mathematical word problems were studied in (n=100) third-, fourth-, and fifth graders solving compare unknown and referent unknown problems. In general, self referencing (referring to “you”) facilitated encoding processes in solving these problems.

**PS, Lrng, Comm (EL)**


This study concluded that students who used an example generation learning strategy were more effective in attaining an initial understanding of a new concept than those using other strategies.

**Lrng, Ach, Tchg (SE)**


This study highlights the manner in which the teacher listens as a metaphoric lens through which to reinterpret practice, both as a practical basis for teaching action, and as a means of addressing critics’ concerns.

**Tchg, Tchr, ClIn (T)**

This study analyzed three children's initial mental representations, procedures, and reflections when presented with four different situations. The article discusses ways to improve children's understanding of problems involving combination and complementation.

**Styl, NSns, Rep (El)**


This article discusses an exploratory study that examined students' interpretation of remainders in division as applied to word problems in a restrictive school setting and in a real-world, out-of-school setting. This study concluded that students lack the ability to map computational results to the real-world context.

**M/D, PS, Soc, Assm, Styl (EL)**


Results suggested that mainstream students did better on the misconception task, but the advantage of the mainstream students was limited to mathematics. Factors of both mainstream and orthodox schooling may have contributed to these findings.

**Geom, PS, Ethn (K-12)**


This study investigated different types of procedures used by students (n=108) to simplify certain algebraic expressions. Findings indicated seven types of procedures including automatization, formulas, guessing-substituting, preparatory modification, concretization, rules, and quasi-rules.

**Styl, Alg, Ethn (HS)**


In a project involving student journal writing designed to examine middle graders' mathematical thinking and disposition, teachers gained insight into students' conceptual and procedural knowledge and attitudes toward mathematics.

**Writ, Att, Ach, Lrng, Curr (MS)**


This study examined the relationship between cognitive demands of instruction and student motivation in fifth-, sixth-, and seventh-grade mathematics classrooms and found through observation and survey data that sixth- and seventh-grade mathematics lessons were characterized by significantly fewer elements of higher-order thinking than fifth-grade mathematics lessons.

**Att, Tchg (MS)**


The Association for Women in Science, in conjunction with the National Coalition for Women and Girls in Education, published a report card on how women have fared over the past 25 years since the passage of Title IX. The report card gave mathematics and science a C+.

**Eqty, Gend (ALL)**


This study assessed the competence of children (n=215) between the ages of five and nine at addition by asking them to estimate answers to addition sums. Children at higher levels tended to produce more reasonable estimates than children at lower levels.

**Est, A/S (EC)**

This study examined whether students' prereading and prearithmetic test results varied as a result of the teaching strategy used. Subjects were (n=446) teachers and (n=5,490) children, 4-6 years old, from Dutch infant classes 1 and 2 of primary education. Socioethnic background was found to be more significant in explaining test results than teaching method.

Soc, Tchg (EC)


This study of students learning concepts of universal and existential quantification in undergraduate mathematics courses in which the instruction was based on previous research into what it means to understand this concept found that students tended to make more effective mathematical constructions in their minds.

Comp, Lrng, Tchg (PS)


This article studied the relationship between gender and mathematical problem solving in (n=83) male and (n=76) female high-achieving Canadian 12-year-olds. Gender differences were found on the Canadian Test of Basic Skills but not on the GAUSS assessment.

PS, Gend (MS)


This study examined effects of a self-regulatory teaching approach in a computer context on mathematics learning of at-risk preschoolers. Researchers found that computer-based contexts provided at-risk children with an effective context for learning mathematics.

Comp, Tchg, Ethn, PS, Soc (EC)


Author makes recommendations based on the Third International Mathematics and Science Study (TIMSS), focusing on insights that educators in the United States should glean from an examination of the study.

Assm, Ach, CC, Tchg, Curr, Revw (K-12)


This article presents a computerized bridging course in mathematics developed as part of an academic support program. The author discusses the didactical approach of the system—criterion-referenced or mastery learning—in which student progress depends strictly on proven mastery of the concepts.

CAI, Curr, Soc (PS)


This study investigated the extent to which children's number sense and novel problem-solving skills govern their problem-posing abilities in routine and nonroutine situations. Children who participated in the program appeared to show substantial developments in each of the program components in contrast to those who did not participate.

PS, NSns, Mtcg (MS)

This article describes a model for addressing prerequisite mathematics needs. A small set of prerequisite skills for the content course is identified, assessed, and students needing extra help are assisted. Targeted students include those with only marginal deficits rather than those needing full course remediation.


Results of three studies, involving (n=606) high school and college students, showed that the perceived randomness of a sequence is better predicted by its encoding difficulty than its objective randomness. Results imply that judging the extent of randomness of a sequence is based on the attempt to encode it.


Surveys of (n=24) secondary mathematics student teachers and follow-up interviews with (n=15) volunteers indicated that anchoring situations could be effectively utilized in overcoming probability misconceptions when the participants were engaged in a process of analogical reasoning.


The authors discuss the research questions addressed in a study set by the International Commission on Mathematics Instruction focusing on the role of the history of mathematics in improving the teaching and learning of mathematics.


This study analyzed the hypothesis that intuitions are always based on certain structural schemata. Authors conclude that intuitions, even when expressed as instantaneous guesses, are in fact manipulated behind the scenes by schemata.


This is a study that investigated probabilistic intuitions held by students (n=98) from grade 7 through college through the use of a questionnaire. Of the misconceptions that were investigated, availability was the only one that was stable across age groups.


This article provides a critical analysis of some of the social and political contexts of mathematics education in the adult and vocational education and training sectors with particular reference to gender issues.


Students in mathematics classrooms were asked to select cartoons that best depicted their visions of typical and ideal mathematics classrooms. Many students picked the model of teacher as sage-on-the-stage as ideal.

This article provides validity evidence for a new instrument that assesses career-related self efficacy intervention for Hispanic and Latino students and focuses on the broad area of career decision making and on mathematics and science tasks. Results indicated adequate validity of the instrument, particularly for women and minority students.

Blf, Soc, Rsch (MS)


This article describes an action research project conducted in eighth-grade algebra and pre-algebra classes. The author suggests ways in which students can use their creativity to progress from a simple solution method to a method that produces a generalization and a formula.

Lrng, Alg, Manp (SE)


This study explored the perceptions that children (n=36) have about what it means to engage in mathematics. The study took place in reform-minded classrooms and found that children have a variety of perceptions and most do not feel that success is determined by speed and accuracy.

Blf, PS, Tchg (EL)


This study explored methods for helping students generate conceptual mathematical explanations during peer-mediated learning activities and found that students with training in giving conceptual explanations had highest achievement levels.

Tchg, Grpg, Ach (K-12)


The effects of a task focused goals (TFG) treatment in mathematics were studied with low achieving students with or without learning disabilities. Results with 40 elementary classrooms showed that TFG students enjoyed the approach, but that increased effort was associated with greater learning only for those without learning disabilities.

Ach, LD, Curr (EL)


Twelve open-ended questions, administered to (n=28) experienced elementary teachers and (n=26) education majors, examined mathematical content knowledge and related pedagogical knowledge. Results suggest that pedagogical knowledge related to specific content is not necessarily acquired through teaching experience.

TKnw, Geom, Frac (EL, TE)


This report of a year-long classroom teaching experiments in two predominantly Latino low-socioeconomic-status (SES) urban classrooms sought to support first graders’ thinking of 2-digit quantities as tens and ones. Performance was substantially above that of some U.S. students of higher SES.

Ethn, Curr, PlcV, Rep (EC)


This study shows by means of a mathematical example how algorithmic thinking and
mathematical thinking complement each other. An algorithmic approach can lead to questions that deepen the understanding of mathematics material.

Alg, Lrng, PS (PS)


This study considers the results of a study supported by the American Educational Research Association (AERA) and the National Science Foundation (NSF) that focuses on the impact of different environments on students' abilities to learn calculus.

Calc, Soc, Ach, Att (PS)


This study examined (n=199) middle school students' understanding of percent, focusing on number sense. Students performed better interpreting a quantity expressed as a percent given a pictorial continuous region than when a pictorial discrete set of circles was given.

NSns, RaPc, Knw, Rep (MS)


This study explores the utility of L. S. Shulman's view of teaching as the transformation of subject matter in the context of a preservice secondary mathematics methods course. The paper elaborates Shulman's view, discussing the context of the study, then presenting a case study of a seminar on lesson planning.

TKnw, Tchg, Tchr (TE, SE)


Evaluation six months following metapragmatic training of (n=13) third-grade students found that students who had received training in explanation adequacy maintained their understanding of the inadequacy of providing only the answer when explaining mathematics problems.

Comm, Tchg, Mteg (EL)


This is a report on the responses obtained when the same mathematical modeling problem was presented to approximately 300 students with similar backgrounds and mathematical experiences. Findings indicate a variety of approaches and a tendency to consistently underestimate the solution to the problem.

PS, Lrnr (SE)


This study observed and interviewed four preschool teachers to identify contributions of child care experiences to young children's mathematics understanding. It found that programs did not differ in amount or content of mathematics presented to children.

Tchg, Curr (EC)


Secondary mathematics teachers participated in a problem-solving course in which technology became a means to improve as teachers and as problem solvers. Findings indicate a delineation between technical competence and metatechnology—thinking about how and when to apply technology to particular problems.

Insv, Tech, PS, Tknw (SE, T)

This study examined mathematics instruction and its intersection with culturally relevant teaching in an elementary/middle school in a Mexican-American community.

Ethn, Ach, Tchg (EL, MS)


This study focuses on reasons for the development of a mathematics test for admission of African students from grossly under-resourced schools as well as for placing students into a diversified first-year curriculum. This report highlights the process by which the test questions were developed and piloted.

Assm, Ach, Ethn, Rsch (PS)


This article describes a literature-based approach to helping primary students become more proficient problem solvers in mathematics. Literature-based activities were chosen to develop a sense of community in the classroom. This enabled students to develop the self-confidence to share thoughts and feelings while problem solving in small-group and class discussion.

Soc, PS, IC, Grpg, Tchg (EC)


The author observed that some second graders, when presented with the concept of an n-gon, gave persuading arguments containing a critical idea and the concept formation corresponding to a structure-preserved transformation in the diagram.

Geom, Lrng (EL)


This study examined how classroom-based factors can shape students’ engagement with mathematical tasks that encourage high-level mathematical thinking and reasoning. Among the factors found to influence students were classroom norms, task conditions, teachers’ instructional dispositions, and students’ learning dispositions.

Soc, Att, TAtt, Lrng (ALL)


Data from a national survey of high school students were examined to determine the effects of increased mathematics requirements on the kinds of mathematics students studied, dropout rates, achievement test score gains, and the association of socioeconomic status with test scores and dropping out.

Ach, Soc, Ethn (HS)


This study presents the view that deductive mathematical proof offers the purest form of how to distinguish right from wrong. The author investigates students’ understanding of proof and the proving process in mathematics.

Prf, Curr, Geom, Lrng (SE)


Comparison of gifted, average ability, and low ability sixth-grade students (n=208), in either homogeneous or heterogeneous instructional settings found a positive effect for achievement in mathematics for the gifted students in the homogeneous grouping.

Gift, Grpg, Att (MS)

For the teachers in this study, beliefs were linked to practices which may help to tie teachers to their culturally preferred method of mathematics instruction.

TBIf, Tchg, CC, Ethn (EL, T)


This study describes student historical research and student classroom presentation of the results of that research. Feedback from the student surveys verified that active learning mathematics history can motivate students to learn mathematics.

Lrng, Matl, Curr (ALL)


This study examined whether mathematics laboratory tutors at New York's Onondaga Community College have been able to adapt to the influx of developmental students over the past decade and indicates that, based on surveys of laboratory students, tutors have been able to provide quality assistance.

D/R, Curr (PS)


A pilot test of 700 students in grades three, four, and five, investigated the reliability of curriculum-valid mathematics survey tests.

Curr, Assm (EL)


This study presents a framework for assessing probabilistic thinking based on validated data obtained from (n=8) third-grade children who served as case studies. Levels of thinking appear to agree with the levels of cognitive functioning postulated by Neo-Piagetian theorists and provide a theoretical foundation for curriculum designers.

Prob, Curr, Assm (EL)


Second-, third-, and fourth graders in 12 classes were individually interviewed to investigate the effects of teaching computational algorithms or encouraging to invent their own procedures. It was found that those who had not been taught any algorithms produced significantly more correct answers.

Arth, Tchg, Lrng (EL)


Authors investigated number sense development of six primary teachers’ pre-service teacher education students at the commencement of a semester unit in mathematics education. Students had at least a limited development of number sense.

NSns, Prsv, Tchg (EL, TE)


Neglected or abused/neglected children (n=420) were compared with matched, normal-treated children on measures of school performance. Differences between the sexes in timing of academic difficulties was found for both mathematics and English.

Ach, D/R, Gend (K-12)


The results of this study suggested that simple multiplication problems may involve a short-lived activation in the left inferior parietal cortex, whereas complex problems may require longer
processing which also involves the homologous right area.

M/D, Lrng, Arth (ALL)


This study used data from a study of “goodness of fit” between preschool mathematical curriculum policy and the content framework in Scottish guidelines. The article outlines a tool and process for eliciting use of the mathematical frameworks managers in planning curriculum, and gives examples of frameworks produced by the tool.

Curr, Tchg (K-12)


This review considers studies of large scale systemic reform initiatives aimed at mathematics and science education. The implementation and effects of reforms can be understood in theoretical terms applied to the study of innovation and change.

Revw, Curr (ALL)


This study explored whether five-month-old infants (n=56) develop numerical or location based expectations by using a violation of expectation paradigm with possible and impossible events and reports that infants use a more abstract representation than object location, the numerical nature of which is discussed.

NSns, Patt (EC)


This study examined students’ mental models of an abstract mathematical concept regarding intuition. The author observes how students think reflectively on their mental models in a whole-class discussion in terms of logical thinking.

Mtcg, Comm (EL)


An exploratory factor analysis of the mathematics self efficacy scale, based on data from (n=522) undergraduates from three different colleges, indicated that the scale is a multidimensional measure of mathematics self efficacy with reliable subscales.

Att, Rsch (PS)


This study demonstrates the utility of a multidimensional representation of students’ mathematics achievement. Findings support a basic distinction between mathematical reasoning and mathematical knowledge.

Ach, Rsch, Impl (HS)


Author discusses two reports: (1) the National Research Council’s “From Analysis To Action: Undergraduate Education in Science, Mathematics, Engineering, and Technology”; and (2) the National Science Foundation’s “Shaping the
Future: New Expectations for Undergraduate Education in Science, Mathematics, Engineering, and Technology."

**Revw, Curr (PS)**


This article discusses how, despite changes in mathematics education, African American students continue to perform poorly in school mathematics. Possible reasons for this include a lack of continuity between students' home language and the perceived "precision" of mathematics, and the possibility that the content of school mathematics is divorced from students' everyday experiences.

**Ach, Ethn, Eqty, Curr, Soc, Revw (ALL)**


This research investigated the use of an interactive videodisk information system to help preservice elementary-school teachers expand their visions of teaching, learning, and assessment in mathematics. Teachers and lessons in the videos served as models for the preservice teachers and offered a springboard for student reflection and discussion.

**Prsv, Tech, TAtt, Tchg (TE, EL)**


This article describes a mathematics teacher's experience and change from a traditional behaviorist dispenser of knowledge to a constructivist facilitator of meaning during professional development.

**Insv, Curr, TBlf (SE, TE)**


This article discusses results obtained by students with A-level mathematics on Coventry University's diagnostic test in October, 1997. This article compares these results with those of students who entered the university in 1991.

**Ach (PS)**


This study evaluated a program of single-sex mathematics classes at one coeducational high school by focusing on parents' perceptions. Authors conclude that more parents supported the program than were opposed to it and support appeared to have waned over the three-year period of the study.

**Gend, Soc, Grpg (HS)**


This research, using an approach to teaching Logo programming that directly guided the student in the use of cognitive monitoring skills and the transfer of those skills, led to increased comprehension monitoring on both near transfer and far transfer tasks.

**Mtcg, PS, Comp (PS)**


How the organization of U.S. high school mathematics curriculum affects how much students learn was studied with data from 123 schools in the National Assessment of Educational Progress. Results indicate that students learn more in schools that offer a narrow curriculum of mostly academic courses.

**Ach, Curr, Eqty, Lrng (HS)**

This study examined adults from China and Canada solving single-digit multiplication problems and reports that Chinese adults were faster and made fewer errors than Canadian adults, and Chinese adults made more errors that reflect verbal production processes.

CC, M/D, PS, Arth (PS)


Three studies found that parents endorsed many reform practices. However, in a comparison of word problem scaffolding, parents gave more direct forms of assistance than did teachers.

Soc, Tchg (K-12)


Authors investigated the effects of learning mathematics in a cooperative small-group setting on different types of student interactions in low-level ninth grade classes. Findings indicate an increase in students' activity, a shift toward on-task verbal interaction, and various opportunities for students to receive help.

Grpg, ClIn (HS)


This study examined whether global academic self-concept and academic self-efficacy beliefs that vary in domain specificity/globality represent distinct or common underlying dimensions. Results based on (n=205) university students revealed that each of the variables represented separate, though related, latent dimensions of self-perception.

Att, Blf, Lrng (PS)


This study analyzes students' productions, taking affective and social factors into account. This study uses the technique of virtual monologue to reproduce the student's voice in order to describe as vividly as possible what might be going on in the student's mind during such situations.

Aff, Soc, Lrnr (SE)


This report describes a three-tiered teaching experiment in which teachers were studied over a protracted period of time as they attempted to understand and improve their approaches to one-to-one tutoring. It documents the initial and revised strategies of the teachers.

Tchg, Tchr, Grpg, TKnw (TE)


This article discusses four experiments with high school students designed to study the cognitive load consequences of learning from equations and words.

Lrng, Alg, PS (HS)


This article describes an examination of arithmetical problem posing designed to examine the behaviors of (n=63) prospective elementary school teachers. Findings indicate the test effectively evaluates arithmetic problem posing.

Arth, PS, TKnw (T, EL)

This study describes the solution to a geometric problem by two ninth-grade mathematicians using The Geometer's Sketchpad computer software program. The solution yielded two constructions, one a GLaD construction and the other using the Fibonacci sequence.

CAI, Geom, PS (HS)


This study tested path models of academic interest and performance that were derived from social cognitive theory. Results supported a model in which ability helps determine self efficacy.

Att, Soc, Aff, Lrng (HS)


This study investigated the hypothesis that preservice teachers specializing in science and mathematics will score significantly higher on spatial-ability tests than other preservice teachers. Also it investigated gender-related differences in spatial ability.

Gend, Vis, Prsv (SE, T)


Authors examined the success level in standardized mathematical testing and awareness regarding control processes during the test execution of third-grade (n=397) and fourth-grade (n=394) children and concluded that numerical and geometrical problem-solving abilities are most strongly related to metacognitive capabilities.

Mtcg, PS, Styl, Geom (EL)


This article describes the results of a classroom trial activity to encourage communication in mathematics. The activity revealed creativity and allowed the teacher to determine how well students understood the concept.

Comm, Assm (SE)


This study examined reciprocal relationships between attitude toward mathematics and mathematics achievement. Results indicated that reciprocal relationships existed, suggesting that the reciprocal nature between attitude and achievement can substantially modify their causal relationship.

Ach, Att, Ethn (SE)


This study was designed to assess the magnitude of the relationship between attitude toward mathematics and achievement in mathematics. The study employed meta-analysis to integrate and summarize the findings from 113 primary studies.

Revw, Att, Ach (SE)


Based on a systematic search of literature published from 1988 to 1995, 20 mathematics interventions for secondary students with learning disabilities were identified and analyzed. Effective methods include teacher-directed instruction, instructional design curriculum variables, three-term contingency trials, strategy instruction, self-monitoring strategies, contextualized word problems, and cooperative homework teams.

LD, Tchg, Revw, Grpg (SE)

This study investigated the cognitive and linguistic demands of learning algebra and explored students’ understanding of algebraic notation. Findings indicate specific origins of misinterpretation such as intuitive assumptions and pragmatic reasoning about a new notation, interference from new learning in mathematics, and the effects of misleading teaching materials.

**Alg, Lrng, Mscn (SE)**


This study focused on the development of combinatorial reasoning of a 14-year-old child, who investigated binomial coefficients and combinations in relationship to the binomial expansion and the mapping of the binomial expansion to Pascal’s triangle.

**Matl, Alg, Lrng, Patt (MS)**


This study examined the interaction effect of teachers’ mathematics preparation and the thinking level of mathematics problems on student performance. Results indicated that students performed better on higher-level thinking tasks when teachers had advanced certification in the subject.

**TKnw, Ach, Prsv, Tchg (SE)**


This study involved aspects of the defining process in a geometrical context using the theory of ‘figural concepts’.

**Geom, PS (MS)**


This experiment, in which Algebra I students (n=181) learned to translate word problems with two unknowns, found that students who had learned to solve equations with the new method scored higher than those students using the traditional method.

**Alg, PS, Curr, Lrng (SE)**


This study investigates students’ conceptions and misconceptions relating to the construction of graphs. Qualitative analysis of students’ responses identified three main alternative conceptions.

**Mscn, Rep, Lrng (SE)**


Analyses of fifth- and sixth graders’ challenge seeking during project-based mathematics instruction indicated two patterns: “challenge seekers,” who self reported a tolerance for failure,
and learning goal orientation; and "challenge avoiders," who self-reported a higher negative affect after failure, a more performance-focused goal orientation, and lower self-efficacy in math.


This article discusses gender differences in mathematics among Jewish and Arab youth in Israel by presenting research done in four Jewish and two Israeli Arab coeducational schools. The factors influencing the degree to which high school students in the Jewish and Arab sectors anticipate a mathematically-based profession in the future were examined.


This study examined Australian students' conceptions of ordering decimals. Secondary students (n=50), studied over a 12-month period, showed little change in their misconceptions. Whole number misconceptions are important in earlier years but disappear with time. The fraction misconception persists however, being displayed by approximately 20% students.


The present study examined differential effects of whole-class discussion beginning with a problem, with and without answer alternatives, on its developments and cognitive consequences in the case of adding fractions with different denominators. Fourth- and fifth-graders (n=289) from six elementary schools were used as subjects.

The performance of children in different grades was examined as they attempted to solve simple equations involving addition and subtraction of integer numbers. The extended task involved creating a story that matched the equations.

**Lrng, Arth, Nsns, IC (EL)**


The authors investigated the calculation strategies used by female students in grades two and three to solve word problems. Findings indicate that students used three main intuitive models: direct counting, repeated addition, and multiplicative operation.

**PS, Knw, M/D, Gend (EC)**


This study investigates the use of infinities and limits during the first 12 years of schooling while a secondary study presents ideas and comments on the observations that were made during the primary study.

**NSns, Lrng, Calc (ALL)**


This article reports efforts to produce a socially-transformative multicultural mathematics curriculum for grades K-6. Described are the perplexity of issues related to the definition of multicultural and mathematics curricula for social transformation, the complexities of group deliberation, and the demands involved in the teacher-research process.

**Ethn, Curr, Rsch (EL)**


Instruction designed to facilitate planning was provided to (n=12) mathematics students with learning disabilities to determine if there would be differential effects on individual students. Teaching control and regulation of cognitive activity was beneficial for all students but was especially helpful for those with poor planning skills.

**LD, Plan, Tchg (EL)**


This study evaluated the validity and reliability of performance portfolios in a preservice elementary mathematics/science methods class, assessing students' domain strategic and general learning strategic knowledge.

**Assm, Prsv, TKnw (TE, EL)**


This study aims to establish a theory for planning and practicing mathematics instruction that enables children to actively construct mathematical knowledge. Four types of constructive interactions are recognized on the basis of teaching practice.

**Lrng, Knw, Tchg (EL)**


This case study describes a high school student use of a computer-based tool, the Contour Analyzer, to create graphs of height versus distance and slope versus distance for a flat board positioned with different slants and orientations.

This article presents a comparative study of the effects of feedback on students who learned to solve algebraic factorization problems in an intelligent learning environment. The study concluded that when the same error comments were used in both experiments, similarities were observed in the learning paths of the respective student groups.


Following a week-long institute on using graphing calculators, a physics teacher became an advocate of calculator use and his algebraic thinking progressed as he realized the importance of functions.


This study explored the relationship between learners' actions, visualizations, and the means by which these are articulated. This article presents a case study of two students using Mathsticks, designed to help students construct mathematical meanings by forging links between visual and symbolic representations.


This study analyzes the problem-solving process and presents the dominance of the conjecture or theoretical aspect as a subtle relation between the data and the conjecture. The author argues that conjectures are not necessarily subordinate to the data but play active roles in mathematical problem solving.


This article presents a study aimed at using qualitative research paradigms to examine the nature and etiology of statistics anxiety among graduate students (n=21) from various non-statistical disciplines.


This study shows that it is necessary to spend time to teach students how to read their mathematics
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textbooks and that instruction related to skills and strategies for reading students' mathematics textbook aided students in their ability to complete homework assignments.

Lang, Matl, Lrng (HS)


The mathematics self efficacy and problem solving performance of (n=327) middle school students were assessed with multiple choice and open-ended methods. No differences in self efficacy resulted from the different forms of assessment, although those who took the multiple choice test had higher scores and better calibration of ability.

Assm, Att, PS (MS)


This study describes a 7-year-old whose classroom mathematical performance embodies much of what is important according to NCTM Standards. Authors conclude that changes in curriculum and classroom instruction require changes in assessment that recognize complex behavior.

Tchg, Assm, PS, Curr, Lrng (EL)


This study explores why girls successful in mathematics choose advanced courses in upper secondary school less than boys. Findings indicate that in the case of word problems and calculation without calculators, boys are significantly better than girls. This article reports that the boys showed stronger self-confidence than the girls.

Gend, Att, Eqty, Ach (ALL)


This study explored forms of passive behavior in unsuccessful mathematics students (n=20). Two forms of passive behavior are discussed, one concerning encoding new knowledge and the other involving risk-taking in unmastered tasks.

Anx, Lrnr, Ach (EL)


This article presents a study examining whether different types of counterexamples exist and the extent to which counterexamples generated by mathematics teachers and pre-service teachers for a hypothetical audience of students have an explanatory nature.

Tehr, Tchg (T, TE)


This research attempts to shed some light on the relationship between parents and mathematics teachers by examining the role that parents play in mathematics education reform at eight high schools and one laboratory school.

Curr, Soc, PS, Tchg (HS)


This study sought to ascertain children's perceptions of the value and usefulness of mathematics. Findings indicated that children at the kindergarten through third-grade levels are positive about mathematics and their abilities to do mathematics.

Att (EL)

Phillips, Meredith. (Winter, 1997). What makes schools effective? A comparison of the

The article used hierarchical modeling to compare the merits of two theories of school effectiveness. Analyses of longitudinal data of three cohorts of students indicated that communal organization was not related to mathematical achievement or attendance. Academic press, on the other hand, was positively related to both mathematics achievement and attendance.

Ach, Lrng (MS)


This article presents a project that explored student choice of solution method for quadratic inequalities. Students were first instructed in the use of the case, critical-number, and graphical methods using the graphing calculator. The majority of students chose graphical methods of solution.

PS, GCal, Alg, Rep (HS, PS)


This article presents the results of a case study which looked at the mathematics classroom of one teacher trying to teach mathematics with meaning to pupils of lower ability at the secondary level.

Tchg, Rep, Alg (T, SE)


Authors observed several regular error patterns when a group of seven-year-old Italian children transcoded Arabic numerals to verbal numerals. Included is an explanation of the development of transcoding ability by an asemantic model using production rules.

Arth, Mscn (EL)


This case study describes two experienced teachers’ attitudes and actions during implementation of a new mathematics curriculum in California and focuses on their attentiveness to learners’ needs.

TAtt, Curr, Tchg (EL, T)


This research investigated current beliefs and practices of elementary and secondary teachers regarding the use of writing to teach mathematics. Teachers indicated strong beliefs in the benefits of using writing to teach mathematics, yet actually used writing activities less than once a week.

Writ, TAtt, Tchg (K-12)


This study examined the impact of the first two units of a sixth-grade curriculum module implemented in a public school during the 1993-94 school year. This article describes the underlying rationale and content of the entire nine-unit module and focuses on area and volume.

Curr, Geom, Lrng, Meas (MS)


The research values of examining thoughts through visual representations is demonstrated through the context of a qualitative study of relationships between mathematics beliefs and practice in which concept mapping played key and multiple roles.

Att, Rsch, Vis (ALL)
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This study investigated the relationship between a beginning elementary school teacher’s beliefs and mathematics teaching practices. The teacher’s practice was more closely related to beliefs about mathematics content rather than beliefs about mathematics pedagogy. Beliefs about mathematics content were highly influenced by personal experiences as a student.


This paper reports research on a pilot project in Western Australia in which single-sex science and mathematics classes were begun in 10 coeducational secondary schools.


This study examined students’ perceptions of learning settings in single-sex and mixed-sex mathematics classes and teachers’ responses to those different classroom contexts. Single-sex classrooms provided a more supportive environment for girls but a significantly less supportive environment for boys.


This research explored the construction of mathematical proofs through a hidden figure task and a variant of the Mastermind game with children 7-12 years old. Older children were better able to distinguish necessary moves and to recognize sufficient evidence.


This article presents results from two skills surveys of Build a Book (BAB) classes, in which students learn geometry by writing and editing their own textbook. Students who had BAB classes in prior years could identify important areas of learning in addition to geometry.


A two-year study randomly assigned kindergarten through second-grade children with advanced mathematical skills (n=276) to two groups, an intervention group reflecting a constructivist approach or a control. Boys gained more than girls on quantitative and visual-spatial measures in the control, whereas the intervention group made greater gains in quantitative measures.


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Gift, Tchg, Vis (EC)


Four ninth-grade mathematics teachers in Canada were studied over one year as they implemented destreaming (detracking), which was an externally-induced reform in their school system. Implementation of the destreaming had an immediate negative effect on teacher expectations of their own efficacy, but their beliefs rebounded over the year.

Testing of junior and senior business students on algebra, calculus, and statistics problems revealed they retained little of what was covered in basic quantitative courses. Emphasis on student evaluation of teachers may create incentives for instructors to avoid challenging students in these courses.

**Alg, Calc, Ach, Assm, Stat (HS)**


This study examined the arithmetic calculator as a cognitive tool to support the amplification or reorganization of systems of thought.

**Cltr, PS, Arth, NSns (EL)**


This study examines the long-term influence of the Calculator-Aware approach to numbers on the mathematical attainments and attitudes of pupils in the primary phase. The Calculator-Aware approach had no long-term influence on outcomes.

**Cltr, NSns, Att (EL)**


Motivational influences on help-seeking behavior in mathematics were studied with (n=203) seventh-and eighth graders. Perceived benefits and threats were important influences on avoidance of help-seeking behavior, but only benefits predicted adaptive help seeking.

**Att (MS)**


An analysis of selected first-grade mathematics textbooks used in Japanese and American schools focused on size and volume, repetition, length of explanations, mathematics content, gender issues, and the relevance of the pictures to the mathematics content.

**Matl, CC (EL)**


Five classroom situations in Japanese elementary schools are described and interpreted from the perspective of the first four standards in the National Council of Teachers of Mathematics’ Curriculum and Evaluation Standards.

**Curr, Ethn, PS, Soc (EL)**


This article discusses the difficulties observed in the transition from teaching arithmetic to teaching algebra. Future teachers (n=164) were questioned regarding to what extent they were able to shift back and forth between teaching methods within the context of problem solving.

**Alg, Tchg, Arth, TKnw, PS, Prsv (PS)**


This study attempted to document and characterize the state of U.S. mathematics and science curricula, textbooks, and teaching practices and place them in a cross-national context.

**Curr, CC, Assm, Tchg (ALL)**

This study used a research simulation that had prospective elementary teachers role play as researchers and respondents. The simulation encouraged beliefs to become explicit and promoted opportunity for reflection about the implication of those beliefs for prospective teachers.

**TBlf, Prsv** (TE, EL)


This study explored one example of open learning environment created by combining mathematics and design activities in a “mathematics studio.” Results show that expressive activities are a powerful context for learning and students are able to think about mathematical ideas in an expressive way.

**Vis, IC, Blf** (SE)


Classification of arithmetic disorders is predicated on neuropsychological features and associated learning disabilities. Authors assess the compatibility of these classifications on a non-referred, population based cohort of children (n=139) with developmental dyscalculia.

**D/R, Arth** (K-12)


This study indicates that a computer algebra system is a very effective teaching tool for the developmental mathematics program and that students who took the traditional Intermediate Algebra course did not do as well in subsequent courses as students who took the technology-based course.

**Comp, Alg** (PS)


The degree to which an undergraduate mathematics curriculum matched the item difficulty levels of representative mathematics problems based on that sequence was studied with 62 items and (n=423) undergraduates and (n=937) high school seniors. Results suggest congruence between curriculum sequence and item difficulty levels.

**Curr, Rsch, Assm** (HS, PS)


This study compared the use of microcomputers, providing either substantial or minimal scaffolding, to traditional resources on preschoolers’ cognitive development over eight weeks. The researchers found that computer assisted instruction software increased verbal and language skills, but not mathematics skills, and only as a function of substantial scaffolding.

**Comp, Curr** (EC)


This article provides details of a study of mathematics learning that applies Bruner’s concept of format of interaction which is employed in language acquisition theory and in understanding mathematical augmentation.

**Lrng, CIn, Alg, Curr** (PS)


This study examined the influence of ethnic background, socioeconomic status, and gender on mathematical ability and confidence in urban high school students. Interviews with 100 students
revealed African-American youth do have academic self confidence, males sought more mathematics education than females, and that minority youth are not easily discouraged by low achievement.

**Ethn, Gend, Att, Ach, Soc (HS)**


This study examined how some teachers used graphing calculators in their instruction of mathematics, and how their views of mathematics were manifested in the ways in which they chose to use this technology.

**GCal, TAtt, Tech, Tchr (T)**


This study compiled teachers' impressions of the barriers and/or incentives associated with the use of graphing calculators on classroom dynamics, curriculum and evaluation, training, support, and overall attitude. Teachers' perceptions of the advantages appeared to be instructionally related whereas perceptions of the disadvantages appeared to be primarily logistical in nature.

**TAtt, GCal, Tchr, Tech (T)**


While the two-hour Algebra I block had a higher failure rate than the traditional 50-minute algebra class, the block classes were comprised of students who have traditionally struggled in mathematics.

**Curr (HS)**


Differences between and interrelationships among reading and mathematics achievement test scores for 269 students with learning disabilities were investigated to determine whether previous findings were replicable.

**Ach, LD, Rsch (K-12)**


This review of literature connects multicultural education with mathematics and analyzes how teachers view multicultural education and the impact of multicultural education staff development on mathematics teaching.

**Soc, TBlf, Revw, Insv, Tchg (TE)**


Author argues that a major difficulty in learning how to do mathematical modeling is in the first independent run through the modeling cycle. This case study of mathematical modeling presents conclusions in three sections: the choice of task, the presentation of the task, and tutor intervention and support.

**Rep, Lrng, Revw (EL)**


This investigated how applied mathematicians and biologists collaborate in developing dynamic population models.

**IC, Rep (PS)**

Sophian, Catherine; Chang, Chuan; Garyantes, Danielle. (September, 1997). When three is less than two: Early developments in children's understanding of fractional quantities. *Developmental Psychology, 33*(5), 731-744.

Four experiments examined young children's understanding of the inverse relation between the number of parts into which a quantity is to be divided and the size of each part.

**Frac, Lrng, Revw (EL)**

This research found developmental changes in children's preferences for part-part versus part-whole relations. However, there was no evidence to suggest that part-part reasoning preceded part-whole reasoning developmentally. Instead, seven-year-olds reliably identified part-whole but not part-part matches, and younger children did not perform above chance on either type of match.

**Frac, Lrng (EC)**


A recent survey questioned whether mathematics teachers in Arizona view mathematics content as dynamic or process oriented. Less than half used state curriculum guidelines, and few reported knowledge of NCTM emphases on mathematical processes related to problem solving or reasoning.

**TBlf, TKnw, Tchg (TE)**


Authors discuss the implications of a research study of more than 2000 11- to 15-year-old students that explored why students interpret algebra in particular ways. They recommend strategies that can help teachers deal with prior knowledge that students may bring to their study of algebra.

**Alg, Soc, Mscn (SE)**


Thirty-eight sixth graders were trained in fraction calculation through progressive transformation dialectics (PT) whereas a control group of 38 was taught through a traditional mathematics education framework. The PT group, encouraged to form network type knowledge representations, performed better on problems that required more than mere algorithmic calculations.

**Tchg, Frac, Knw (MS)**


This article describes a study which concluded that in order to restructure the mathematics curriculum, modification of existing teaching practices is required. Authors recommend that practices be modified to enable students to construct effective knowledge bases and become active learners.

**Curr, PS, TKnw, Prsv (EL, TE)**


This article describes the results of a teacher's exploration of the effects of using graphing calculators in calculus instruction in sections other than those that are experimental. This study included two experimental and two traditional sections of Calculus I and II participated in the study.

**Calc, GCal, Matl, Tchg (PS)**


This study of girls' attitudes, toward themselves and their classmates, and girls' behavior in a girls-only mathematics classroom found girls were more likely to ask and answer questions in the mathematics classroom than in coeducational classes, and that the girls-only setting enhanced their ability to learn. The girls-only environment was overwhelmingly preferred.

**Gend, Att, Soc (MS)**

Suggate, Jennifer; Aubrey, Carol; Pettitt, Deirdre. (1997). The number knowledge of four to five year olds at school entry and at the end of their first year. *European Early Childhood Education Research Journal, 5*(2), 85-101.
This study examined the change in number knowledge and number strategies from school entry to year end among kindergartners. Many children displayed considerable numerical competence at school entry, and most displayed marked improvement over the year, whereas a small minority made very limited progress.


This study examined the effects on instruction of an intervention program designed to enhance teachers' knowledge of geometry and their knowledge of research on student cognition in geometry. Findings indicate significant gains in content knowledge and in van Hiele level, and marked changes in what was taught, how it was taught, and the characteristics teachers displayed.


This study examined the impact of Scotland's national curriculum for students aged 5-14 on teachers' constructs of their teaching, assumptions about students' learning, and interpretations of and accommodations for student differences.


This article discusses a framework for assessing middle school students' thinking in conditional probability and independence. Students (n=15) from grades 4-8 were interviewed. Profiles revealed that levels of probabilistic thinking were stable across the two constructs.


The Aiken Attitude to Mathematics Scale (L. Aiken, 1974, 1979) was administered to (n=430) adult students in a tertiary preparation program and the factorial validity of the scale was investigated through exploratory factor analysis.

Socially-assisted group learning was evaluated in terms of its effectiveness in promoting fourth-grade students' solution of complex two-step word problems. Students in the socially-assisted learning condition used labeled representations in problem solving more effectively.

**PS, Grpg, Soc (EL)**


This article discusses the results of research which examined the perceptions of teachers as they initially engaged in instruction using graphing calculators. Participant views changed significantly overall in favor of viewing the graphing calculator as a thinking tool to enhance conceptual understanding and to expand exploration of topics.

**Gcal, TAtt, TBlf (T)**


This study concludes that teachers at the middle school level need to be better prepared in classroom management. Specifically, if preservice middle school math teachers were given training for managing classes at that particular level, their mathematics knowledge would be more fully and effectively communicated to their students.

**Tchg, TKnw, Prsv (MS, TE)**


This article presents case studies which indicating that the process of choosing subjects for the final years of schooling is part of the larger psycho-sociological process of identity formation for young adults.

**Blf, Soc (SE)**


This study examined role of linguistic demarcation of numerals on cognitive representations of numbers with Caucasian children, 5-7 years old. Results suggest that the task reflects children’s interpretations and misinterpretations of task demands.

**Lrng, Lang, NSns (EL)**


A pilot program studying the use of computer software to enhance spatial skills presumed to be related to success in calculus found that the combined effects of the computer, drawing and drafting, and gender variables explained 31% of the variance in test scores.

**Vis, CAI, Calc, Curr (HS)**


A study compared self ratings and undergraduate student ratings of graduate teaching assistants (GTAs) on nine factors of teaching effectiveness, examining how mathematics and science GTAs who speak English as their native language differ from their international counterparts. Overall, self ratings were consistently higher than student ratings.

**Lang, Ethn, Tchr (PS, T)**

The results of the statistical analysis in this study show that a problem-solving method using handout material can significantly help students understand and learn word problems.


The Third International Mathematics and Science Study (TIMSS) compared mathematics and science scores across 41 countries. American students performed well in science and mathematics in the fourth grade but fell behind their international peers by the eighth grade.


This study examined (n=56) elementary students' verbalizations to identify instances of self-instruction and self-monitoring during reading and mathematics. Results indicated that half of the verbalizations were self-instructive, and one quarter of those involved self-monitoring.


This study explored whether a system between written place value system and base-ten manipulatives helped children understand place value and found evidence that the intermediate system helped children differentiate between face values and complete values of digits in multidigit place value number representations.


Fourteen word problems were administered to 332 Belgian preservice elementary school teachers who also saw answers given by four students. Results revealed a strong tendency to exclude real-world knowledge from spontaneous solutions and appreciations of student supplied answers.


A teaching experiment was carried out to test the hypothesis that it is feasible to develop a disposition toward more realistic mathematical modeling in pupils. The learning and transfer effects of an experimental class of 10- and 11-year-old students compared to the results of two control groups support this hypothesis.


This paper describes two studies of mathematical problem solving using an episode from "The Adventures of Jasper Woodbury," a set of curriculum materials that afford complex problem solving opportunities.


Resilient students had greater involvement and satisfaction in their mathematics class, academic self-concept, and achievement motivation than nonresilient students, and were less likely to have repeated a grade level.

This study examined whether sixth- and eighth-grade students' motivation, anxiety, and classroom learning environment in mathematics differed significantly according to the degree of implementation of technology in the mathematics classroom.

**Tech, Anx, Soc, Att (MS)**


Authors studied the status of the mathematics reform effort in Ohio, specifically measuring the dissemination of the NCTM Standards and teachers' opinions of Ohio's Competency-Based Mathematics Model.

**TB1f, TKnw, Curr (T, MS)**


The 1993 Survey of Science and Mathematics Education, involving a national sample of 1,250 U.S. schools and 6,000 teachers, probed the status of science and mathematics education as they relate to NCTM and NRC standards. Although teachers reported instructional objectives consistent with reform goals, class activities were not well aligned with recommendations.

**Tchg, Curr (T, K-12)**


This article describes three transitional mathematics courses designed to upgrade high school mathematics courses and lure more low-achieving students into college preparatory mathematics courses. Transcript data from 4,800 students showed that students took more challenging and useful mathematics, learned more, and improved self esteem.

**Curr, Eqty (HS)**


Change over three years in the competence beliefs and subjective task values in the domains of reading, mathematics, instrumental music, and sports was studied with approximately 615 predominantly white, middle-class elementary school children. There was moderate to strong stability in their beliefs. Exceptions and gender differences are discussed.

**Att, Blf, Soc (EL)**


This article presents two case studies of learners attempting to understand the concept of normal distribution. Conclusions are drawn about a Connected Mathematics learning environment that enables confrontation with epistemological anxiety and the features of modeling languages that enable learners to successfully investigate probability.

**Stat, Anx, Prob, Lrng, Rep (SE)**


This article presents a study exploring the effectiveness and efficiency of Constant Time Delay and Sequenced Count-By procedures in the teaching of multiplication facts using children (n=43) from grades 3-6 having parents as tutors. Both procedures were effective.

**M/D, Soc, Curr (EL)**

This article details a study in which Grade 9 females were assigned to either an all-female or coeducational algebra class. Findings indicate that the all-female intervention group demonstrated a greater gain in mathematics scores between grades 8-11 than the nonintervention group.

**Curr, Gend, Plan, Ach, Assm, Alg** (HS)


This article presents longitudinal analyses of the mathematical achievement and beliefs of three groups of elementary pupils. Results indicate that the students with two years in problem-centered mathematics classes had significantly higher achievement.

**Ach, PS, Tchg** (EL)


A year-long study of an innovative approach to mathematics, which emphasized in-depth problem solving and achievement of automaticity through mathematical games, found such methods to be viable for students with average and above average academic abilities, but students with learning disabilities or at risk students needed much greater assistance.

**PS, LD, Tchg** (K-12)


A study examining performance differences on the Ohio Colleges Early Math Placement Test of students receiving algebra and geometry instruction in a traditional, year-long structure versus students in an intensified block structure found the traditional structure more effective.

**Curr, Tchg** (HS)


This study investigated psychological androgyny among (n=40) high school girls enrolled in either an upper-level mathematics class or a vocational-track cosmetology class. Results indicated that career choices are linked to sex role stereotypes.

**Gend, Att** (HS)


An experiment involving 14 small groups of 10-12 year-old Swedish students (usually three per group) showed that these students acting in groups and creating shared contextualizations were able to solve mathematics word problems calling for real-world knowledge. Research has shown students acting alone to have difficulty with the same types of problems.

**PS, Grpg, Soc** (EL)


This article reports the performance and strategies of children working in one of three gender pairs (girls, boys, or boy/girl) on Geo-Logo tasks. The case studies presented reveal that the children showed a high level of engagement and learning in the Geo-Logo environment.

**Comp, Meas, Tchg, Geom** (EL)

This report describes generalization activity as an opportunity to learn about seventh graders' understanding of functions. Findings indicate that the modeling efforts of students allowed them to analyze their understanding of representations of quantities, relationships among quantities, and relationships among the representations of quantities in both single- and multivariable functions.

Knw, Manp, Rep (MS)


This study used a software environment to examine algebra students' attempts to reformulate narratives using verbal and iconic lexical sets.

Rep, Alg, Comp (EL)


The activation of real world knowledge displayed by 91 Japanese fifth graders in solving school mathematics problems was compared to that of 75 previously-studied Belgian students. Children in both cultures had a similar tendency to neglect common sense knowledge and realistic considerations.

PS, CC, Knw, Ethn (EL)


This study attempted to reveal students' (n=800) misconceptions regarding quadratic functions and identified conceptual obstacles that may impede students' understanding. Findings indicate that the conceptual obstacles identified were fairly pervasive.

Mscn, Tchg, Alg (SE)


The authors investigated students' understanding of the basic concepts of introductory set theory: set, set element, cardinality, subset, and the empty set.
### Journals Cited

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Research Papers and Monographs in Mathematics Education Produced in 1997

Beth D. Greene & Gayle M. Millsaps, The Ohio State University

This section lists 91 papers and monographs in mathematics education research that were produced in 1997 and included in the ERIC database by the end of September, 1998. Each entry is coded (see Key to Codes) with one to three major topic codes (in bold type) and any number of minor topic codes, as well as the grade level code (in parentheses). Studies related to preservice or inservice teacher education are indicated by the appropriate codes (Prsv, Insv). The level designated for teacher education or teacher studies indicates the grade level(s) at which the intern or teacher participants teaches, followed by the level code, “T” for teacher or “TE” for teacher education. All entries are indexed by major codes at the end of the volume (see page 85).


This publication documents the North Carolina Mathematics and Science Coalition’s initial goals as a forum to stimulate and promote efforts to implement systemic reforms in mathematics and science education in North Carolina.

Insv, Plan, Soc (K-12, TE)


This document reports the performance of Scottish primary students in mathematics and science on TIMSS with sections addressing performance in mathematics and science, examples of mathematics and science test items, Scottish features, and international comparisons in mathematics and science.

CC, Assm, Ach, Impl (EL)


Using the fourth- and eighth-grade results of the Third International Math and Science Study, this publication examines the perspectives on some of the factors that are important in influencing students’ mathematics and science achievement.

Ach, Impl, CC, Curr (EL, MS)


This document is a feasibility report for establishing a Challenger Learning Center for Space Science Education to raise students’ expectations of success, foster long-term interest, and motivate pursuit of studies in mathematics, science, and technology in the city of Kenai, Alaska.

Plan, Att, IC, Curr, Tech (K-12)


This report documents the National Assessment of Educational Progress design, administration, and data analysis procedures for the State Assessment.

Assm, Impl, Curr, Revw (K-12)


This teachers’ guide explains and gives examples of Interdisciplinary Lively Application Projects (ILAPs). ILAPs are intended to integrate mathematics and other disciplines, to promote curricular reorganization by focusing on student growth in problem solving, and to promote faculty growth through ILAP development processes.

PS, IC, Tchg, Curr, Insv (K-12, T)

Astro Algebra software and teachers' guide of Edmark's Mighty Math Series, a comprehensive line of math software for kindergarten through ninth grade, is designed to help students make the connection between concrete and abstract mathematics as it introduces and reinforces algebra and pre-algebra concepts.

Matl, Alg, Comp, Tech, Curr (MS)


This kit provides communities with material needed to compare their local school with schools in other countries. Results from TIMSS are presented in a way to help improve educational programs.

Impl, CC, Curr, Plan, Soc (T)


This is a collection of activities designed by science teachers attending a mini-course on current trends and issues surrounding recycling. Activities are coded for grade level and discipline and can be integrated with other school subjects.

IC, Insv, Comm, Curr, PS (TE)


The essay reviews the most current data on women's progress in mathematics and science achievement, attitudes, course selection patterns, and college majors. Research suggests that the gender gap appears later in the United States, grade ten versus grade eight internationally, substantial gender differences exist in mathematical-sciences fields.

Ach, Gend, Revw, Att, Soc (ALL)


The purpose of this report is to assist state, national, and local policymakers and educators in making informed decisions. Indicators are provided to assess progress in improving mathematics and science education.

Curr, Assm, Plan, Impl (K-12)

Caldwell, Frank. (1997). Bring functions and graphs to life with the CBL. [SE061037]

This resource highlights the improvements in concept development possible when calculator-based laboratory systems and graphing calculators are used to teach the function concept.

GCal, M/CBL, Alg, Curr, Impl (SE)


This paper explores the nature and status of mathematics reform, the connection between the movement and constructivist epistemology, the development of an assessment tool for measuring the degree of reform present in a classroom, and the potential for investigating the relationship between the degree of reform and achievement.

Curr, Rsch, Styl, Assm, Lrng, Revw (SE)

Examining the major results from the 1996 National Assessment of Educational Progress science, mathematics, reading and writing long-term assessments, this report discusses overall patterns of performance for students at various ages drawn from information dating back to 1969.

Assm, Revw, Eqty, Ach, Impl, Soc (K-12)


This study suggests that mathematics skills developed in high school are more strongly associated with later earnings for both college and non-college bound students than science or writing skills, and that harder high school mathematics courses are more strongly associated with later mathematics skills than easier ones.

Impl, Soc, Curr, Lng (HS)


This book describes course and curriculum development projects in the subject areas of biology, chemistry, computer science, engineering, geosciences, interdisciplinary, mathematics, physics and astronomy, and social sciences that received awards in 1995 for their creativity, scientific and educational quality, and potential for utility at multiple institutions and national impact.

Curr, Plan, Inv, IC (PS)


This booklet gives a detailed explanation of the relationship between the Pacesetter mathematics program and the course through which it is implemented, Precalculus through Modeling, and the standards related to secondary school mathematics set forth in the NCTM Standards documents.

Curr, Rep, IC, Inv (SE)


This issue describes calculator-active materials in the Eisenhower National Clearinghouse (ENC) collection including the calculators and accompanying activity books. Among them are fraction calculators, graphing calculators, and calculators that perform symbolic algebraic, differential, and integral manipulations; data collection and statistical functions, and/or containing interactive geometry programs.

Cltr, GCal, Matl, Inv, Geom (ALL)


This report serves as a guide to instructional materials that utilize some form of alternative assessment and focus on mathematics, science, and integrated topics. The products included utilize one or more of the following means of student assessment: portfolios, journals, interviews, surveys, performance, and rubrics.

Assm, IC, Matl, Tchg (K-12)


This book describes 122 Summer Science Camps funded from 1992 to 1996 by the NSF as an early intervention strategy to enable students from underrepresented groups in scientific and technical careers to develop their interest in science and mathematics and to encourage their consideration of such careers.

Eqty, Soc, Att, IC (K-12)

This directory for students and faculty of extracurricular mathematics-based intervention projects sponsored by colleges and universities or conducted by other organizations provides information on the type of project, recruitment area, total students/grades, total staff, application deadline, project dates, cost to student, and stipend and scholarship availability.

Eqty, Curr, Soc, Ethn (SE, PS)


This directory lists the National Science Foundation Young Scholars projects scheduled for 1997 that take place at sites throughout the United States which are designed to stimulate and extend the interests in science and mathematics of students entering grades seven through twelve.

Eqty, Att, Soc, PS, Curr (SE)


In this monograph educational experts contribute their views on what the Basic Skills Testing Program (BSTP) results indicate about children’s learning and understanding of mathematics, with an emphasis on findings that will be of most significance to classroom teachers. Commentaries by practicing teachers are included.

Impl, Assm, Lrng, Gend (K-12)


This report compares tests developed by governmental agencies designed to mirror the basic curricula currently being offered to Japanese and American eighth graders, the expectations based on the curriculum, and student performance on the included items.

Assm, Curr, CC, Impl, Ach (K-12)


This collection of papers, selected by Project CLUME (Cooperative Learning in Undergraduate Mathematics Education), on the use of cooperative-learning activities in undergraduate mathematics courses is organized into categories around constructivism and the teachers’ role, research and effectiveness, and implementation issues, and includes commentaries and discussion questions.

Grpg, Tchg, Revw, Lrng, Insv, Rsch (PS)


Included are interdisciplinary activities that provide children with an understanding of the characteristics of organisms, outlining the life cycles of organisms, and showing how organisms relate to their environments. The unit interweaves life science with literature, mathematics, and physical sciences.

Grpg, IC, PS, Patt (EC)


This survey of the literature in mathematics education on trends in learning opportunities, objective selection, and evaluation procedures focuses on equity in curriculum, access to good teachers, and access to quality learning experiences.

Eqty, Gend, Impl, Curr, Phil, Assm (K-12)


This monograph presents findings from the Recording Reform in Mathematics Education project,
which was designed to assess the influence of, depth of knowledge about, and interpretation of the NCTM’s standards documents. The document cover the background, case studies, and conclusions drawn.

**Curr, Impl, Tchg**, Revw, TKnw (K-12, T)


These excerpts from the NCTM standards can be used in connection with the TIMSS Resource Kit to offer context for discussing the teaching of algebra and geometry.

**Insv, Styl, Tchg**, Alg, Curr, Geom (TE, K-12)


This is the second volume of Great Explorations in Math and Science, a collection of compelling and educationally-powerful cooperative logic activities for grades K-4.

**Comm, Grpg, PS, Matl, Nsns, Patt** (EC)


Thirty-one resources from the Eisenhower National Clearinghouse are presented as possible professional development opportunities. These entries can be used in settings such as self- and group study, consultation with peers and supervisors, inquiry into practice, or within an action research project.

**Insv, Tchg, Rsch, Curr** (TE)


Evaluation protocols were established and used to review the educational merit of software programs. Mathematics and science programs (n=127) were examined for their ability to meet national and state reform standards and promote problem solving and inquiry.

**Matl, Tech, PS, MMed, CAI** (EC)


This volume presents resources related to the integration of children’s literature with mathematics and science curriculums. One section of the book focuses on how to find information, the second presents and explains teacher resources, and the third lists and summarizes relevant literature.

**Curr, IC, Matl**, Lang, Soc (EC)


This book describes a consensus in mathematics education about the essential features of classrooms which encourage learning mathematics with understanding and provides examples of several classrooms that exhibit these features.

**Impl, Lrng, Tchg, Insv, Prsv** (TE)


This study examines the impact of hands-on activities in two middle school pre-algebra classrooms on mathematics scores, students’ opinions of mathematics, female students’ intentions of continuing higher mathematics classes in high school, and parental assistance on students’ homework.

**Manp, Soc, Alg**, Gend, Att, Lrng (MS)

This 9-12 teachers’ guide is designed to present mathematical problems and tasks that focus on the National Council of Teachers of Mathematics (NCTM) Curriculum and Evaluation Standards in the context of aerospace activities.

IC, PS, Matl (HS)


This K-6 teachers’ guide is designed to present mathematical problems and tasks that focus on the National Council of Teachers of Mathematics Curriculum and Evaluation Standards in the context of aerospace activities.

IC, PS, Matl (EL)


This overview helps educators and others in states, communities, and schools to use TIMSS as a starting point. The overview, key findings section, and supporting materials help communities and states use TIMSS to examine their own practices from an international perspective.

CC, Impl, Curr, Assm, IC, Insv (K-12)


This publication is intended to furnish K-12 teachers with both research-based rationale and recommendations for effective techniques to be applied in classrooms. Information was gathered on available resources, organizations, on-line offerings, and supplies.

Curr, Matl, Impl, Lrng, PS (K-12)


This teachers’ guide provides cooperative learning activities to complement an Algebra I program that are designed so that they can be augmented to suit the population of the class, the style of the teacher, and the locality of the school.

Grpg, Alg, Matl, Tchg (HS)


This study examined the relationship between procedural writing and mathematical writing of third- and fourth-grade students. The results were examined in terms of the implications for the use of student mathematical-writing products as a reflection of mathematical conceptual understanding.

Writ, Assm, Lang, Tchg, Impl (EL)


This book contains interpretive reports based on results from the mathematics assessments of the National Assessment of Educational Progress. The results are summarized for different grade levels and subgroups of students by gender and race/ethnicity.

Impl, Ethn, Ach, Blf, Att, Gend (K-12)


This teachers’ guide of informal geometry contains activities intended to provide students with opportunities to investigate the environment from a geometric perspective, to construct connections between related mathematics and other content areas, and to solve problems in a geometric context.

Geom, PS, IC, Meas, Rep, Matl (MS)


In addition to providing weekly planning resources and classroom activities, this teachers’ guide for teaching algebra includes algebra writing prompts that require students to identify real world situa-
tions or problems where algebra is an important
tool in their investigation and explanation.

Alg, Writ, IC, Matl (K-12)

boxes. Teacher's guide. Berkeley, CA: GEMS, Uni-
versity of California-Berkeley, Lawrence Hall of
Science. [SE060841]

This series of mathematical activities utilizing a
collection of small objects are designed to allow
students to observe, analyze, organize, communi-
cate, record, and draw conclusions in many math-
ematical areas including geometry, patterns, num-
ber sense, measurement, discrete mathematics, and
statistics.

Manp, Matl, Rep, Comm, Stat, Nsns (EC)

Krantz, Steven G., and others. (1997). Techniques of
problem solving. Providence, RI: American Math-
ematical Society. [SE060589]

This textbook on the basic principles of problem
solving addresses the topics of learning to translate
verbal discussion into analytical data, learning
problem solving methods for attacking collections
of analytical questions or data, and building a per-
personal arsenal of solved problems and internalized
problem-solving techniques.

PS, Tech, Lrng, Curr (ALL)

Lee, Patrick. (1997). A first year evaluation study of
integrated math and integrated science curricular
programs in an inner city high school. [SE060953]
The findings presented in this report focus on a
program to promote scientific literacy, critical
thinking, and communication through the integra-
tion of mathematics and scientific study.

Curr, IC, Revw, Att, Comm, PS (HS)

Local systemic change project directory. (1997). Ar-
lington, VA: National Science Foundation, Direc-
torate for Education and Human Resources.
[SE060749]

This is a directory of Teacher Enhancement Pro-
grams that provide K-12 school systems with the
tools to reform science, mathematics, and technol-
ygy education. Summaries of 47 projects in 23
states are included.

IC, Insv, TKnw, Curr, Tchg (K-12, TE)

Dan: Further adventures in recreational mathe-
matics. [SE060871]

This paper includes a collection of six activities for
mathematics classrooms that strengthen arithmetic,
modular arithmetic, limit cycles, graph theory, pair-
ings, combinations, cyclic groups, induction, and
sequences.

AdvM, Matl, Arth, Patt (HS, PS)

Mastering challenging mathematics by the end of
eighth grade. (1997). Washington, DC: Depart-
ment of Education (ED). [SE060979]

This pamphlet examines results from the TIMSS
report which show that United States students need
to progress to more advanced mathematics in
grades four to eight. Other findings and example
tasks are included to support the need for higher
mathematics literacy.

CC, Curr, Impl, Alg, Geom, PS (K-12)

Mathematics and science content standards and cur-
riculum frameworks: States progress on develop-
ment and implementation, 1997. (1997). Washing-
ton, DC: National Science Foundation. [SE060846]

From a study examining the content and quality of
state frameworks and standards, this report focuses
on current and emerging policy issues pertaining to
the implementation of standards-based reform.

Tchg, Curr, Impl (K-12)

McNeely, Margaret E. (Ed.), Blank, Rolf, Earle,
Janice, Nohara, David, Roseman, Jo Ellen, & Schmid-
cht, William. (1997). Guidebook to examine
school curricula. Washington, DC: Office of Edu-
cational Research and Improvement (ED).
[SE060943]

These five methods of analyzing school curricula
were designed for educators, but can be used by
community members. The methods were selected
because each reflect a unique framework and/or set
of standards and focus on how instructional materi-
als address all students’ needs.

Assm, Curr, Impl, Lmr, Matl (K-12)

Miller-Whitehead, Marie. (1997). An analysis of sci-
ence scale scores for grades 2-8 in Tennessee for
This research examined student science scores from mandated annual testing of all students in grades 2 through 8 in Tennessee to find evidence for meeting the stated goals of the Tennessee Education Improvement Act (EIA) of 1991 to engender equity and achievement for all students.

**Assm, Eqty, Ach (EL)**


This kit can be used to guide and plan inservice programs in order to examine and discuss the TIMSS results. Included is a videotape of sample lessons from various countries, frequently asked questions, background information, and other materials.

**Insv, CC, Impl, Alg, Geom, Tchg (TE, MS)**


This study compared two types of vocabulary instruction, one of which was an integrated model combining a modified Concept of Definition organizer with the Frayer discussion model. This approach proved to be an effective method for teaching mathematics. The second was a definition-only model.

**Lang, Oral, Styl, IC, Meas (EL)**


This book provides a framework for organizing study groups to help teachers build their expertise in judging children's mathematical work based on the findings of a project study group of elementary teachers and principals on alternative mathematical assessment in the elementary school.

**Insv, Assm, Grpg, Tchg (TE, EL)**


This study examined how the type of instruction affected the ability of middle school students (n=27) to work with algebraic variables and their notations. The results indicate that the group receiving the experimental curriculum were more likely to demonstrate algebraic reasoning.

**Alg, Curr, Tchg, Rep (MS)**


This publication documents The University of North Carolina (UNC) Mathematics and Science Education Network (MSEN) vision, mission statement, and long-range goals toward applying the resources of UNC to strengthen mathematics and science education in K-16 schools throughout the state.

**Insv, Plan, Rsch (T, ALL)**


This booklet illustrates how the different types of information found in the international reports can provide a springboard for in-depth reflection about the strengths and weaknesses of the education efforts in the United States at the national, state, and local levels.

**Ach, Assm, CC, Curr, Impl, Revw (K-12, T)**


The 40 activities in this book were designed to persuade students to think critically and creatively using E. Paul Torrance's creative thinking abilities.

**Comm, IC, Styl, Curr, Lrng, PS (EC)**


The activities in this book were designed to encourage students to perceive what is going on around them, to be both receptive to and critical of the ideas of others, to analyze problems, to elaborate
upon ideas, to explore possibilities, and to see relationships.

Comm, IC, PS, Curr, Plan (MS)


Findings of the NAEP panel's seventh report showed a need to set tougher standards comparable to the best in the world, align education system with the standards, and strengthen teacher knowledge and skills.

Curr, TKnw, Impl, Assm, Lng, Sty (K-12)


This report is the seventh in a series designed to measure the amount of progress made by the nation and the states toward the eight National Education Goals. The report showed that American students continue to improve, but a problem area exists with eighth-grade mathematics.

Ach, Assm, CC, Impl (K-12)


This report describes the methods the National Network of Eisenhower Regional Consortia and National Clearinghouses use to attain their objectives. Topics include: collaboration and communication, programs and curricula, professional development, curriculum frameworks, technology, equity, informal education entities, community outreach, and access information.

Insv, IC, Tech, Curr, Eqty (TE, K-12)


This teachers' guide contains activities that allow elementary students to collect, display, and interpret data using glyphs (pictorial representations of data). The activities are designed to build data analysis and communication skills, and to stimulate students' mathematical reasoning as they compare, contrast, and draw conclusions.

Stat, Matl, Vis, Patt, Rep (EL)


This kit contains observation matrices for on-going assessment and year-end evaluation for grades 1 through 8 divided into the areas of numeration, geometry, patterns, measurement, problem solving, data, and computation, and employing four levels of performance proficiency indicators.

D/R, Matl, Assm (EL)

Pfenning, Nancy. (1997). Chances are...making probability and statistics fun to learn and easy to teach. Waco, TX: Prufrock Press. [SE060891]

An introduction to probability and statistics suitable for students of various ages and abilities, these activities cover areas including: counting, probabilities, probability distribution, proportion histograms and normal distribution, beginning statistics, standard deviation, sampling, and handling data in different forms.

Prob, RaPc, Stat, Patt, Rep, Gift (ALL)

Pickwick, Alan. (1997). Earth and beyond. Hatfield, United Kingdom: Association for Science Education. [SE060715]

This teachers' guide of astronomy projects and activities, fulfilling the requirements of the National Curriculum in England and Wales and the 5-14 Guidelines in Scotland, includes discussion ques-
tions and cross-curricular themes linking geography (time-zones, continents and poles), mathematics (distances and scales), and art and drama.

IC, Curr, Matl (EL)


This primary mathematics series emphasizes manipulative and mental mathematics via an incremental, integrated, multisensory approach to teaching mathematics. New objectives are introduced through group activities. Concepts are practiced in each succeeding lesson. A scripted teachers' manual provides activities, questioning strategies, and grade-level appropriate language.

Matl, Manp, Curr, Tchg (EC)


This videotape summarizes TIMMS's key findings at the eighth-grade level with respect to curriculum and learning expectations, teaching, teachers' lives, and students' lives.

Soc, Ach, CC, Curr, Tchg (K-12, T)


This report overviews the reform of undergraduate science education at colleges and universities that are involved in Project Kaleidoscope (PKAL) from 1996 - 1997. The report is a distillation of questions that institutions successful in conceiving, implementing, and sustaining reform have addressed.

Curr, Plan, Impl (PS)


The purpose of this book is to help primary teachers establish a classroom that is supportive of an active, meaning-based approach to teaching and learning mathematics. It proposes that all class-rooms should acknowledge and value the child's effort to grow and to learn.

ICIn, Curr, Tchg, Styl, TAtt (EC)


This paper describes various ways to compute modular congruences on a spreadsheet. Macros are discussed that provide the user with automatic computation of congruence. A drill for the practice of calculating congruences is also included.

AdvM, Comp, Matl, Tech (PS)


This collection of ungraded activities on topics in geometry, concept of number, algebra, measurement, graphing, statistics, and probability demonstrates how the study of elementary mathematics can be extended beyond the school and how it can involve teachers and students in investigative, problem-based experiences.

PS, IC, Tchg, Matl (EL)


This book explores relationships between mathematics, children's literature, and literary criticism, and focuses on ways of using trade books to provide children and educators with instructional experiences that integrate the study of mathematics with children's literature.

IC, Tchg, Matl, Lang (EL)


The purpose of this report is to outline the state of the art of calculus assessment and to indicate directions for explorations in assessment that will enable educators to gain a deeper understanding of student
learning and to improve student learning in calculus instruction.

Calc, Assm, Lrng, AdvM (HS)


This paper describes a study of the perceptions of certain secondary students who experienced an integrated curriculum that combined the subjects of geometry and visual art in ways that reflected real world applications of mathematics and art in industry.

IC, Impl, Lrng, PS, Soc (SE)

Shockey, Brenda P. (1997). The effects of varying retention intervals within a block schedule on knowledge retention in mathematics. [SE060954]

This study examined the affects of time between courses in schools with block schedules. Results showed large differences in Algebra II skills and concepts retained at the beginning of the pre-calculus course that followed, but no significant difference were measured at the end of the second course.

Ach, Assm, Alg, Lrn, Plan (HS)


Differences between teacher-centered and learner-centered educational orientations and their implications in regards to ownership of understanding and responsibilities are examined. Also presented is a rationale policy of homework which may be able to bring about goals consistent with current reform initiatives, without radically altering curriculum or pedagogy.

Curr, Styl, Tchg, Lrn, Soc, Tchg (K-12)


This publication summarizes the vision and rationale presented in the national standards documents and current literature. Strategies and resources for implementing a standards-based teaching approach are the main focus of this report.

Curr, Styl, Tchg, Impl, Lrn, Revw (K-12, T)


This publication contends that using assessment for informing and improving instruction is key to effective teaching and learning while serving as a fundamental building block for other evaluation activities. This document includes research, strategies, and lists of organizations and resources.

Ach, Assm, Tchg, Curr, Revw, Writ (K-12)


This teachers' guide contains activities designed to help teachers enrich the mathematical experiences of all elementary school children toward fulfillment of the NCTM Standards. The appendix contains an annotated bibliography of children's books which integrate mathematical concepts with their storyline.

Matl, NSns, IC, PS, Geom (EL)


In this article, writing is shown to stimulate and enhance learning. Journals help students learn to communicate mathematically, give a medium for use of mathematical terminology, add clarification, and act as an instructional tool for teachers.

Comm, Patt, Writ, Lang, Mtcg, Tchg (K-12)


This comprehensive national directory of federal offices, programs, and facilities supporting K-12 mathematics and science education informs educa-
tors and the public while increasing access to programs.

Matl, Soc, Rsch (K-12)


This 1997 NCTM yearbook presents a vision of how research and classroom practices related to multicultural diversity and gender equity can reinforce each other to ensure a powerful mathematics program for all students regardless of their gender, race, ethnicity, or socioeconomic situation.

Eqty, Tchg, Impl, Soc, Assm, Curr (TE, K-12)

Uncovering math with your family: Fun activities in the world around you. (1997). Dallas, TX: Texas Instruments. [SE060112]

This family mathematics activity guide—organized into four themes: Math in Your Home, Math in Your Neighborhood, Math On the Go, and Math in the Store—is designed to help parents nurture children's natural curiosity as they uncover mathematics in the world around them.

Soc, Matl, IC, PS (EC)


The University of Chicago School Mathematics Project has devoted itself to examining curriculum and teacher training in order to promote changes which lead to improved achievement. Included in this document is information on the project, available materials, and contact persons.

Curr, Insv, Matl, PS, Revw, Tech (K-12)


This paper presents conceptual calculus exercises using different mathematics education software which include instructions on the use of software to highlight a specific mathematical concepts and reviews ISETL, Derive, Geometer's Sketchpad, TI-82, TI-83, TI-85, TI-86, TI-92, and CBL as mathematics education tools.

Alg, Calc, Tech, Comp, GCal (PS)
Every dissertation, journal article, paper, and monograph listed in the preceding three sections is indexed by 1-3 Major and any number of Minor topic codes (see Key to Codes). The 75 major codes have been clustered into 20 groups of related topics for the purpose of indexing. Only the Major codes are listed after each entry in the index.

### Achievement (Ach)

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Prsv, Tech, TAtt
Inv, Cur, TBlf
TChg, Tchr, Grpg
Arth, PS, TKnw
TKnw, Ach
Tchr, TKnw
TAtt, Inv, GCal
Tchr, TChg
TAtt, Cur, TChg
Writ, TAtt
TBIf, Tchc
Tatt, Att
Tatt, TAtt
Tatt, Cur
TBIf, Prsv
GCal, TAtt, Tech
TAtt, GCal
Soc, TBIf, Revw
TBIf, TKnw
TChg, TKnw
Cur, TAtt
TAtt, Ethn
GCal, TAtt, TBIf
TChg, TKnw, Prsv
TKnw, PS, Prsv
TBIf, TKnw
Arithmetic (Arth); Addition, subtraction (A/S); Decimals (Decm); Equivalence, proportion (Eqv); Estimation (Est); Fractions, rational numbers (Frac); Integers (Int); Multiplication, division (M/D); Number sense (NSns); Place Value (PlcV); Ratio, proportion, percent (RaPc); Whole numbers (Whol)

Dissertations and theses

Bosch
Irwin
Jong
Kelleher
Sallee
Jong
Kelleher
Sallee
Tsai
Walder
Whalen
Yang

Articles

Aksu
Behr
Belfiore
Berenson
Bruno
Cawley
Deblois
DeFranco
Dowker
English
Fuson
Gay
Kami
Kaminski
Kiefer
Koechlin
LeFevre
Leung
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Mukhopadhyay
Mulligan
Mura
Power
Ruthven
Schmidt
Sophian
Steiner
Sugate
Towse

Varelas
Wilson
Pfenning
Stockard

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Culbertson
Elliot
Hughes
Keck
Moody
Pryor
Rogers
Salmon
Smith
Sottile
Whitus

Adams
Allinder
Anku
Bennett
Bennett
Bers
Birenbaum
Borko
Brookhart
Cai
Chandler
Elmore
Haeck
Jitendra
Jones
Lynch
Naizer
Pajares
Parker
Schmidt
Shermis

Achievements
Allen
Blank
Campbell
Crow
Doig

Assessment, evaluation (Assm)

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Clark
Culbertson
Elliot
Hughes
Keck
Moody
Pryor
Rogers
Salmon
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Bers
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Brookhart
Cai
Chandler
Elmore
Haeck
Jitendra
Jones
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Naizer
Pajares
Parker
Schmidt
Shermis

Calculators (Calc); Computer-assisted instruction (CAI); Computers (general) (Comp); Graphing calculators (GCal); Microcomputer, microcalculator based labs (M/Cbl); Multimedia (MMed); Technology (general) Tech

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Arthurs
Johnson
McNeely
Miller-Whitehead
Moon
Mullis
National
Schoenfeld
Shockey
Stepanek

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Prob, RaPc, Stat
Matl, NSns, IC

Assm, Tchg
Assm, Insv
Assm, Ach
Assm, D/R
Ach, Assm
Matl, Assm
Assm, Rep
Geom, Assm
Assm
Assm
Assm, Curr
Assm, Curr
Assm, Curr
Ach, Assm

Articles

Abramovich
Adams
Adams
Andrews
Asiala
Bennett
Brandell
Brush
Clements

Authors
Grouping for instruction, cooperative learning (Grpg); Planning, decision making (Plan); Teaching (role, style, methods) (Tchg)

Dissertations and theses

Alexander D/R, Plan
Barbera Assm, Tchg
Camacho Tchg, Ethn
Hammill PS, Grpg
Kristjanson Tchg, Tchr
Lieberman Tchr, Tchg
Miller Plan, CUIT
Ong Ach, Grpg
Quinn Grpg, Tchr
Remillard Tchr, Tchg
Rosen Lrng, Tchg
Slaughter M/D, Grpg

Slovin Tchg, Curr
Stumpson
Uen
Wolf
Wyllie

Adams Prsv, Tchg, Aff
Anderson Soc, Tchg
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Bauersfeld Tchg, Revw, Tchr
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Conrad Comp, Tchg, Ethn
Cunningham Tchr, Grpg
Davis Tchr, Grpg
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Driessen Tchr, Grpg
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Steiner Tchr, Frac
Swafford Tchr, TKnw
Taverner Tchr, Tchk
Taylor Tchr, Tchk
Tooke Grpg, PS
Vye Tchr, Tchk
Vye Tchr, Tchk

Weiss Wood
Woodward Wyndhamn
Zaslavsky

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Alaska Plan, Att, IC
Arney PS, IC, Tchk
Blank Curr, Assm, Plan
Course Curr, Plan
Dubinsky Grpg, Tchk, Revw
Echols Grpg, IC
Ferrini-Mundy Insv, Plan
Fostering Curr, Impl, Tchk
Goodman Grpg, PS
Harris Insv, Tchk, Rsch
Hiebert Impl, Lrng, Tchk
Grpg, Alg, Matl
Tchk, Curr
Insv, Curr, Plan
MSEN Insv, Assm, Grpg
Question Curr, Plan
Richardson Clln, Tchk
Ryan PS, IC, Tchk
Schiro IC, Tchk, Matl
Stepanek Curr, Sty, Tchk
Ach, Assm, Tchk
Eqty, Tchk, Impl

Classroom interaction (ClIn); Communications (Comm); Oral communication, classroom discourse (Oral); Writing, journals (Writ)

Dissertations and theses

Buerger Writ, PS
Cossey Comm, Eqty
Dance Soc, Clln
Darrow Curr, Writ
Gregory Comm, Writ
Heath Writ, Matl
McCrone Clln, Oral
Rowland Oral, Clln
Ryan MMEd, Clln
Sallee Writ, Frac

Articles

Christiansen Comm, Clln
Cobb Oral, Tchk, Clln
Crowe Comp, Comm
Di Curr, Att
Gottschalk Comm, Tchk, Mtcg
Grpg, Clln
Cross-cultural (CC); Equity (Eqty); Ethnic, racial (Ethn); Social factors, context, parents (Soc)

Dissertations and theses

Addington
Arnold
Ashley
Balli
Brown
Burton
Camacho
Chen
Conger
Cossey
Curtis
Cyrus
Dance
Flory
Harris
Jong
Kriek
Peach
Saunders
Stengel
Swail
Treaster
Tsai
Tusgate
Vincent
Walder
Washington-Harvey
Weiner

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Anderson
Berenson
Birenbaum
Boaler
Brookhart

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Birenbaum
Boaler
Brookhart
Byrnes
Campbell
Carr
Chandler
Cunningham
DeFranco
Dembo
Didion
Driesen
Eliott
Elmore
FitzSimons
Fouad
Fusion
Ganter
Gustein
Harris
Henningsen
Hoffer
Jacobs
Ladson-Billings
Leder
Lee
LeFever
Lehrer
Leron
Lopez
Mittelberg
Morgan
Murtadha-Watts
Pehkonen
Persissini
Saminy
Sawada
Schmidt
Signer
Sleeter
Stacey
Streitmatter
Tate
Taverner
Toomey
Twale
Valerde
Waxman
White
Wilson
Yoshida

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Achievements
Achieving
Attaining
Campbell
Chaplin
Denoya
Denoya
Directory
Directory
Dossey
Ediger
Helping
Hinzman
Introduction
Kenney
Mastering
Miller-Whitehead
Moderator's
Mullis
Pursuing
Thorson
Trentacosta
Uncovering

Curriculum, programs (Curr); Diagnosis, remedial mathematics (D/R); Integrated curriculum (IC); Manipulatives (Manp); Materials (texts, other resources) (Matl)

Dissertations and theses

Alexander
Atkinson
Belonga
Bills
Boggs
Burke
Conger
Cooper
Culbertson
Darrow
Eilers
Flory
Goldsby
Good
Grant
Heath
Henderson
Hughes
Johnson
Kriek
Lauten
Manse
Miller
Molinsky
Newman
Nolan

Implemented (Impl)

Soc, Matl, IC

Soc, Matl, PS

Soc, Matl, TAtt

Soc, Matl, IC

Soc, Matl, Curr

Soc, Matl, IC

Soc, Matl, Curr

Soc, Matl, IC

Soc, Matl, Curr

Soc, Matl, IC

Soc, Matl, Curr

Soc, Matl, IC

Soc, Matl, Curr

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Soc, Matl, Curr

Soc, Matl, IC

Soc, Matl, Curr

Soc, Matl, IC

Soc, Matl, Curr

Soc, Matl, IC
Articles

Aksu, A.
Allinder, D.
Anku, K.
Asiala, M.
Austin, J.
Belfiore, A.
Boaler, J.
Boulton-Lewis, G.
Carroll, A.
Clare, R.
Clarke, H.
Engelbrecht, M.
Faulkner, C.
Fouche, C.
Fuson, C.
Graham, J.
Harris, R.
Hoyles, C.
Jardine, R.
Jenny, L.
Jitendra, A.
Jones, J.
Kendall, S.
Kleinberg, R.
Knapp, C.
Kyle, M.
Lawson, J.
Lee, S.

Papers

Art, A.
Curt, A.
D/R, M/D
Eng, A.
Lng, A.
Etn, C.
Tch, C.
Rev, W
Curt, Assm

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Statistics (Stat)

Dissertations and theses

Articles

Bateson, A.
Cali, A.
Chapl, C.
Curs, W
Tch, C.

Publications

190
### Gender differences (Gend)

**Dissertations and theses**

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<th>Topic</th>
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<tbody>
<tr>
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**Articles**

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<td>Wulff</td>
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**Papers**

<table>
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<th>Author</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Kestner</td>
<td>Geom, PS, IC</td>
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<tr>
<td>O'Connell</td>
<td>Stat, Matl, Vis</td>
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</table>

### Gifted (students) (Gift); Knowledge (student’s) (Knw); Learners (characteristics of) (Lrrn); Learning disabled (LD); Learning style, cognitive style (Styl); Misconceptions (Mscn)

**Dissertations and theses**

<table>
<thead>
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<th>Author</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Bass</td>
<td>Styl, Mscn</td>
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<tr>
<td>Bonn</td>
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<td>Case</td>
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**Papers**

<table>
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<th>Author</th>
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<tbody>
<tr>
<td>Calhoun</td>
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</table>

### Geometry (Geom); Measurement (Meas); Spatial visualization (Vis)

**Dissertations and theses**

<table>
<thead>
<tr>
<th>Author</th>
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<tbody>
<tr>
<td>Choi</td>
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**Articles**

<table>
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<tbody>
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<td>Aspinwall</td>
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**Papers**

<table>
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<th>Author</th>
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<tbody>
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<td>Geom, PS, IC</td>
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<td>O'Connell</td>
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</table>

### Implications of research, interpretations of research (Impl); Research issues, methods (Rsch); Reviews of research (Revw)

**Articles**

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**Papers**

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<tr>
<th>Author</th>
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<td>Achieving</td>
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Inservice teacher education, professional development (Insv); Preservice teacher education (Prsv)

Dissertations and theses

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Ach, Gend. Revw
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Impl. Asm
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Impl, Lrng, Tchg
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Assm, Curr, Impl
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Eqty, Tchg, Impl
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