This document presents an annotated listing of the research in science education that was reported during 1997. The listing includes educational research reported through doctoral dissertations and master's theses, journal articles, conference papers, electronic documents, and other items. A listing of institutions where the research was completed is given for dissertations and theses. For journal articles, a list of the journals searched and the number of articles found is included. The 1997 version of this annotated listing represents the first time an attempt has been made to capture a broader range of research listings by incorporating electronic documents available on the World Wide Web and by including articles from journals less familiar to science educators. Each entry in the listing has been assigned major and minor codes representing the topic of the research. An index characterizes the entries by major codes. (WRM)
ANNUAL SUMMARY OF RESEARCH
IN SCIENCE EDUCATION
1997

Edited by

David L. Haury & Wendy Sherman McCann

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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.
- A rationale for development of the document, including identification of target audience and the needs served.
- A vita and a writing sample.

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Preface

For many years, the Clearinghouse for Science, Mathematics, and Environmental Education published an annual *Summary of Research in Science Education*, a document that appeared as a special issue of *Science Education*. The *Summary* was intended to facilitate access to research findings and provide a critique of research efforts in science education at one-year intervals. Sort of a "progress report." A variety of factors led to the demise of that *Summary*, but many individuals have continued to express interest in some sort of annual overview of research in science education. For the second year, this publication has been produced in response to those expressions of interest; it presents an annotated listing of research in science education that was reported during 1997. No effort has been made to provide a critical analysis of research reports or areas of research, but we have attempted to identify and accurately describe the science education research reported through doctoral dissertations, journal articles, conference papers, electronic documents, and other items. In the case of dissertations, we have included a listing of the institutions where science education doctoral research was completed, and in the case of journals, we have identified the journals we searched and the number of science education research articles we found.

Though this may not be a comprehensive listing of the science education research reported during 1997, we believe it is the most complete listing available and represents the major trends in science education research. We have attempted to capture a broader range of reports this year by incorporating electronic documents available on the World Wide Web, and by including articles from journals less familiar to science educators. Our hope is that this one-year "snapshot" of research will provide an overview of the field for experienced researchers, doctoral students, and practitioners who use research findings. We will not know if our hope is realized unless those who find this report useful tell us. Though ERIC/CSMEE has the capacity to produce this listing, it is not clear the extent to which a single annotated listing of science education research is valued by the science education community. We earnestly desire feedback, either in writing or by e-mail at the addresses listed below. This listing will also be available through the ERIC/CSMEE World Wide Web site.

Please forward feedback by mail to: Science Education Research Listing, ERIC/CSMEE, 1929 Kenny Road, Columbus, OH 43210-1080; or send e-mail to ericse@osu.edu.

DLH & WSM
Key to Codes

The following topic codes have been used to indicate the major and minor emphases of each dissertation, journal article, paper, or electronic document in this listing. Each entry has been assigned a minimum of one and a maximum of three major codes and maximum of three minor codes. Within the index at the end of the volume, major codes have been used to categorize each publication.

The grade level or educational level of each study is indicated in parentheses after the topic codes. The level codes for teacher education studies may also reflect the grade level(s) at which the interns or teacher participants teach.

### Topic Codes

<table>
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<tr>
<th>ach</th>
<th>achievement</th>
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<td>mce</td>
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### Level Codes

| AD | adult |
| EC | early childhood, PreK-4 |
| EL | elementary, K-8 |
| MS | middle school |
| SE | secondary, 5-12 |
| HS | high school, 9-12 |
| PS | post secondary, 13- |
| K-12 | all school levels |
| ALL | all student levels |
| TE | teacher education, teachers |
| GEN | general interest |

### Further Elaboration of Selected Codes

In some cases, the codes we have used to group items may not correspond to the more precise terminology often used within the science education discourse community. To aid readers in making a match between the codes we have used and some common areas of research, we offer a further elaboration of codes on the next page. The codes we have used are indicated on the left, and the categories they represent include the topics listed on the right.
Elaboration of Codes

ach achievement, grades, academic success
ats student attitudes, mental state, interest, motivation, efficacy
bfs student beliefs, perceptions, views
bkg background, context, including social or economic factors, past experience, family interest or background, environment, rural vs. urban
cbi instruction by computer programs or simulations
chs student characteristics, including creativity, at-risk behaviors, physical disabilities, learning disabilities, giftedness
cid classroom interaction, discourse interaction (not necessarily classroom), conversational analysis studies
cul comparison of cultural factors, not simply a study of another culture
edt educational technology, design of software, instructional technology other than computers, distance education, multimedia education
eqt equity issues, power issues
int integration, interdisciplinary issues, including thematic education
kns student knowledge, cognitive structures, mental constructs, system of constructs
lrg learning, comprehension
lth learning theory in a more general sense than lrg
mat print or electronic materials, other media, equipment and supplies
mce multicultural education, including bilingual education
ntw networks; collaborations between students, teachers, schools; partnerships; mentoring programs
res research as a topic of study, review of research, including conference proceedings
tec technology as a topic of study, technology education, engineering

Acronyms Used

The following acronyms appear without definition in abstracts throughout this volume:

AAAS American Association for the Advancement of Science
CAI Computer Assisted Instruction
GPA Grade Point Average
NAEP National Assessment of Educational Progress
NCTM National Council of Teachers of Mathematics
NRC National Research Council
NSF National Science Foundation
NSTA National Science Teachers Association
SS&C Scope, Sequence & Coordination
STEBI Science Teaching Efficacy Beliefs Instrument
STS Science, Technology, Society
TIMSS Third International Mathematics & Science Study
Dissertation Research Reported in 1997

Suzanne Shaw Drummer, The Ohio State University
Chris A. Ingersol, The Ohio State University
Joyce C. Miller, The Ohio State University

This section lists 310 dissertations and master's theses in science education research that were completed in 1997 and abstracted in Dissertation Abstracts International during 1997 through January 1999. Each entry is coded (see Key to Codes) with one to three major codes (in bold type), a maximum of three minor codes, and an indication of educational level (in parentheses). When the level code of "TE" is used to refer to teacher education, a second level code may be added when appropriate to indicate the grade level at which the intern or teacher teaches. All entries are indexed by major codes at the end of the volume (see page 103). An index of dissertations by institution is included at the end of this dissertations section (see page 45).


This interpretive study used ethnographic methodology to reveal how an exemplary college chemistry instructor used constructivism as a referent for his teaching and the learning of his students. The instructor switched metaphors as he created conducive learning environments to help facilitate the prospective teachers' enjoyment of their learning journey.

**cns, ped. che. tpd (TE. PS)**


This study reports that in a survey of practicing teachers, "Lack of Time" was the most frequently cited source of professional isolation, and "Friendship" was the most frequently cited source of professional connection. Productive relationships at the state level were higher than expected.

**ntw, bft. tpd (TE. HS)**


In this study, the relationships between student beliefs about the nature of science, student attitudes, and conceptual change about the nature of forces were investigated within a traditional and within a constructivistic high school physics classroom.

**cns, ats, ceg. bfs. nas. phy (HS)**


In an introductory college physics class, multimedia lessons based on the Karpus learning cycle were found to be effective in helping a majority of the students to better understand eight topical categories relating to the concepts of electricity and magnetism.

**edt, ped. lth, phy (PS)**


This study examines the perceptions of teachers who participated in the Satellite Education and Environmental Research (SEER) Program Water Project, a distance education course developed at the University of Nebraska-Lincoln. The central finding that emerged was the changed focus of teaching science more thematically.

**edt, cur, ene, bft (TE)**
Jordanian teachers seemed to understand and enthusiastically embrace basic constructivist ideas promoted in the adapted version of the Science PALs inservice. Contrary to custom, students were observed asking more questions, requesting more activities and science time, and engaging in science discussions.

**tpd, cns, att** (TE)


Results of this study indicate that prior knowledge, interest, learning goals, and strategy use should be included in a theoretical model's design to explain and to predict fifth grade students' understanding of ecological concepts.

**kns, ene, ats, gen** (MS)


Using the STEBI-B instrument as a pretest and a posttest, science teaching efficacy beliefs of preservice elementary teachers were compared. Results show an increase in the self-efficacy subscale for those teachers taking the process oriented course concurrently or after having completed a science methods course.

**att, tpd, phy** (TE, EL)


The purpose of this research was to detail what has been implemented as the secondary school science curriculum, and what the major influences were on its development. To do so, this study looked at how teachers translated curriculum influenced by specific policy documents into classrooms.

**cur, ped** (HS)


This quasi-experimental study (n=76) showed that there was no significant difference between the two groups in the areas of achievement and retention. The computer-based multimedia group did show significantly higher positive attitude scores than the traditional lecture group.

**edt, ach, ats, bio, ped** (PS)


The study (n=786) revealed that Saudi science teachers hold numerous misconceptions about the nature of science (NOS) with a significant difference in understanding between the male and female teachers. Teachers with a major in physics held more adequate views than did teachers with other majors. Novice teachers were found to have more adequate conceptions of the NOS than did experienced teachers.

**nas, btf, knf** (TE, SE)


Science majors had higher degrees of curiosity in science, higher levels of interest in science during high school, higher tendencies to believe that their majors will help them to find a potential job in the future, higher degrees of achievement in science subjects, and rated their math teachers higher than did nonscience majors.

**ats, chs, car, bfs** (HS, PS)

This research used written student journals as a means to improve academic achievement in a course designed for nonscience majors. Although there was no benefit in terms of academic achievement or conceptual and algorithmic problem solving success, students using the student-directed format held more positive opinions toward this type of journal.

ped, ats, che, ach (PS)


This investigation revealed that 22 community college students did not view themselves as part of science or nature. The investigation also found students’ views of the self, nonself, relationships and causality affected their learning and apprehension of key biological concepts.

bio, lth, bfs, lit (PS)


This study reports that the Hunter-Gatherer Theory of Spatial Sex Differences appeared to be able to predict that males could perform better on problems involving mental movement and females could perform better on problems involving the pattern recall of unconnected items.

gen, sks, pbs (MS)


Based on a concern about the persistence of women in science-related disciplines, this study examines whether science and engineering students’ classroom experiences and the importance students attributed to their experiences differed by gender and discipline.

gen, bkg, car, tec, bfs, ats (PS)


Several new constructs for investigating children’s learning in science are proposed in this study, including a construct or a unit of study for analyzing children’s learning called ‘spheres of activity.’ Also, the way children use tasks or develop tasks out of the projects assigned by teachers was examined.

inq, lth, cms (EL)


This study identified whether preservice and inservice teachers differed with respect to their beliefs about constructivist-based learning strategies and performance assessment. It also identified whether teacher beliefs held about constructivist-based learning strategies were related to the construction of assessments they developed for use in their classrooms.

cns, asm, ped, bft. tpd (TE)


Change in the quality of knowledge propositions was compared between the two groups. No significant differences were observed for targeted ecological concepts. The control group showed a significant decrease in the number of correct non-target propositions and an increase in number of incorrect non-target propositions based on pre- to post-treatment data.

cpl, cne, ped, ceg, ats (PS)

Argues that if metaphor, such as Kliebard’s proposed metaphor, is to inform curriculum theory toward program development in environmental studies, then the domain of environmental studies must be constrained to permit development and accurate transmission of visual imagery appropriate to the domain.


Two groups of fifth graders were tested after one group was exposed to a curriculum of mathematics and science while the other was exposed to a mathematics only curriculum. A t-test showed no significant difference between the two classes, but the scores of the experimental group did show a significant difference between the pre- and posttest.


This study explores the relationship between metacognitive teaching strategies, status, and conceptual change during a three month unit on ecology. Students began to understand the value of critically investigating ideas before incorporating them into their knowledge structures.


When college students were matched according to their high school background and their physics pretest scores there was no gender differences in their post-test scores. Women liked the relevant aspects of the course more than men did.


This study showed that science courses had a major effect on teachers. If the National Science Education Standards are adopted, science teachers would not have to wait until their science methods courses to be exposed to the practices recommended by the National Research Council.


The GALT pretest was a significant predictor of logical-thinking skills in each of the entry-level courses of physics, chemistry, biology, or English in six public community colleges representing differing geographical regions of Texas.


This was a qualitative study of the experience of two prospective science teachers. Results imply that field experiences must explicitly attempt to facilitate student teacher development towards critical ways of thinking about science-specific pedagogical conceptions and practices.


Data for this study was collected during six months of research in a sixth-grade classroom. Themes from the history, philosophy and sociology of science were
used to identify the similarities and differences of children’s and scientists inquiry practices.

inq, lth, nas (MS)


This microethnographic study found that since student teachers do not volunteer explanations for why teachers do what they do without explicit prompting, they need opportunities to engage in discourse which facilitates and encourages the dynamic process of sense-making.

tpd, cid (TE, EL)


The study compared the ACT math and science average scores of a senior class who participated in a traditional schedule, with the scores of a later graduating class, in that same school (n=28), who participated in an extended block schedule. The only significant difference was found in the science scores of girls who participated in block scheduling.

ach, ped, gen, ref (HS)


This research examined a chemistry teacher in an AP class in a Midwestern urban setting interactively assessing his students and determined how knowledge gained during that assessment affected his instructional decision-making.

asm, ped, che, cns, bft (HS)


This study examined how the beliefs and experiences of a preservice elementary teacher within the context of reflective science teacher education influenced the development of her professional knowledge. The findings indicated that reframing is crucial to developing professional knowledge.


This study describes the genesis of the Collaborative by drawing upon archival information. The development process is outlined, influences are cited, and recommendations are given for similar projects.

his, ntw, ref (ALL)


This study provides details of real-life problems tackled by students and then discusses the learning which occurred by comparing the teacher's intended curriculum with the actual curriculum experienced by the students in this problem-based learning environment.

pbs, lrg, cur. int. asm (SE)


Six Piagetian-type tasks were developed to investigate causal explanations through interviews (n=101). Results showed that, as grade level increased for four of the six tasks, performance on those tasks tended to improve. There was no statistically significant difference between gender and performance on the tasks.

lth, pbs, gen. bkg (EL)

The proposed model submits that not only are endeavors to communicate scientific ideas to the disinterested populace of overriding importance but can be quite successful if production styles are altered to reflect more “interest-motivating” designs.


An instructional exercise for first year nursing students, in the Jeopardy format, was designed to incorporate understanding, group collaboration, and metacognition. An alternate teaching method was needed to increase student understanding of previously acquired knowledge and its application.


This study explored evaluation of systemic reform and presents a model that organizes systemic reform support into three functions: evaluation, technical assistance, and a third, named here as “systemic perspective.”


This study investigated the relationship between students’ learning approaches and their conceptual understanding of chemical concepts; described the qualitative differences between a deep and surface learning approach; and identified students’ cognitive and metacognitive strategies.


This study reports the results of an experimental microgenetic study of how children learn complex knowledge from text and experiments. Multiple explicit explanations of three or four chemical reactions appeared to be necessary for middle-school students to master key concepts.


Elementary teachers’ attitudes toward science teaching were found to be related to self-confidence, preservice preparation, school environment, and teachers’ beliefs about science.


The results of this study suggest that effective use of hypermedia cases takes place in a community of learners where the learners share the context and can draw upon the resources afforded by the technology, as well as each other.

The data analysis showed that this experimental teaching program had positive effects on students' attitudes toward learning in the course. The results showed increases in students' interest and assimilation of knowledge when learning analytical chemistry with demonstration experiments.

ats, che, ped, ach (PS)


This study found that many computer activities and "high tech" labs were too unstructured, leaving students bewildered, confused and unmotivated. For maximum motivational effects, it was necessary to facilitate students so they could concentrate on the data gathered rather than on the operation of the equipment.

cbi, edit, ats, phy, lab (HS)


Results indicated that an English-speaking teacher can be effective with bilingual students when science instruction is presented in a hands-on format. Another finding of the study indicated a more positive student attitude when science instruction was hands-on.

mce, hos, ats (K-12)


This study explored the experience of scientific socialization and professionalization for women in a lab setting. It details how gender marks many interactions in the lab, including competition, sex-role stereotypes, and a conversational style that may be more compatible with men's than women's forms of talk.

cid, gen, car, lab, bio (PS)


A phenomenological approach was used in order to develop a holistic picture of student participants' experiences in a newly-implemented integrated science course in which many of the suggestions made by science reform efforts were incorporated at a Midwestern inner-city high school.

int, ref, cur, ped (HS)


Findings from this study suggest that the more aligned a new teacher's beliefs regarding teaching and learning are to the National Science Education Standards, the more prone the teacher is to establish a learning environment in which students perceive a constructivist classroom.

bft, bfs, cns, ref (TE)


Class explorations with the concept of photosynthesis using constructivist methods did not seem to change students' original perceptions. Constructivist methods may need to be introduced through guided practice before they can be applied independently by junior high school students.

cns, int, ped, bfs (MS)


High school students and adults with varying degrees of design experience doing two technology investigate-and-redesign (I&R) tasks were studied. Each task involved subjects investigating products, designing experiments to compare them fairly, and then redesigning the devices.

tec, sks, pbs (HS, AD)


No differences were found in scores on the Force Concept Inventory for university physics students who took a regular versus a computer-based recitation course. Achievement scores did differ by gender and ethnicity.

ach, chi, phy, gen. eth (PS)


Students benefited from the adoption of a modified research teaching style. Successful implementation was mirrored by student response to the teaching style. It was concluded that the teacher has a great deal of influence over student acceptance of something different and new.

ped, ats, che (HS)


The science experiences of five student teachers and four practicing elementary school teachers were documented. Also reported were the complexities of constructing scientific knowledge and the influences that led to feelings of alienation from science as well as those that contributed to positive attitudes.

tpd, knl, att, bft (TE, EL)


The effect of guided constructivism and expository instructional methods on the attitudes of students toward physics is reported. Significant interactions between the treatment groups and cognitive levels were found on the criterion variable of beliefs about physics as a process of learning and enjoyment of physics.

ped, ats, cns, phy, bfs, gen (HS)


A formative evaluation of the implementation of the Iowa Chautauqua model in Collier County, Florida, was conducted during 1995-97, focusing on implementation issues and teacher enhancement. Teacher enhancement was closely related to changed practice, which was critically influenced by implementation issues at broader levels.

tpd, ref, ped, skt (TE)


This investigation reports that college students exposed to an environmental science curriculum appear to have more positive attitudes and less stereotypic imagery of scientists than those who have had exposure to a traditional curriculum. Females responded much more dramatically than males.

gen, ene, ats, cur, nas (PS)

This study assessed the effects of an inservice training course entitled “Natural History of the Southern Appalachians” on regional teachers. It appears that regionally specific Natural History training gives teachers inexpensive options to teach science, as well as making them more comfortable with the delivery of science instruction.

**tpd, cur, ene, att (TE)**


Theories related to prior experience and the perception that CS has a culture which is hostile to females were strengthened. The belief that females have greater logistical problems in CS than males, or that females tend to have a different programming style than males which adversely affects the females’ ability to succeed was not supported.

**gen, tec, bkg, sks, car (PS)**


The study reports that the key ideas in teaching three physics topics for high school students differ markedly in theory types, source analogues, and representations from those taught to prospective scientists. The differences are determined by differing purposes and ways of selecting key ideas in textbooks.

**cur, mat, phy, nas (TE, HS)**


Although children enjoyed scientific-based literature stories and colorful pictures, study results indicated that the use of literature did not make a difference in the retention of the content taught.

**cur, trg, hos (EL)**


Middle school subjects used two issues of an interdisciplinary newsletter providing a connection to Mars missions. Students’ attitudes toward science did not significantly decline. Students’ interest in science declined with statistical significance, but the decline was not educationally meaningful.

**int, ats, mat, esg, sts (MS)**


Secondary science teachers were surveyed to determine how informed they were about the six prominent science reform movements in the USA. Most of the responding secondary science teachers were not aware of five of the science reform movements. Implementation of reform proposals appeared to be only loosely connected to the teachers’ awareness of the reform movements.

**ref, knl, cur (TE, SE)**


The purpose of this study was to examine the effects of an experimental elementary science methods course, which employs the use of laser videodisk technology along with instructional practices suggested by cognitive science and instructional design, on preservice teacher gains in Earth and physical science content knowledge and locus of control in science.

**tpd, edl, knl, att. ref (TE, EL)**

Results from surveys indicated that multiple changes occur in the opportunities presented to regular education students when students with handicaps and disabilities are included in the regular science classroom. These include the omission of lab activities and problems with higher order thinking skills.


Findings indicate students’ perception of the dissection experience were contingent on the consistency (or lack thereof) of their personal value systems with the underlying factors found in each of four dimensions of dissection (moral, epistemological, physical aversion, and familiarity).


This study focused on what students remembered about five middle school science tasks when they were juniors and seniors in high school. Authentically situated tasks were remembered much better than routine school tasks.


This study was a comparative investigation of the ways by which the globalization of modern science affects the characteristics of different nation-states. Science should also be regarded as a general cultural framework, which is highly institutionalized at the global level.


The study recommends that a program be designed and implemented to sustain and promote the positive perceptions that pupils have of technology throughout their school years.


The informative graphic treatment had positive effects on learning. Additionally, there was strong evidence that these positive effects extended with equal force to both recall and higher order comprehension.


Two versions of a diagnostic instrument known as Determining and Interpreting Resistive Electric circuits Concepts Tests (DIRECT) were developed. Results indicated that students do not have a clear understanding of the underlying mechanisms of electric circuit phenomena.


Middle school science students (n=917) and their science teachers responded to surveys used to characterize science learning opportunities in science classes. Recommendations include science inquiry practice across a range of contexts and more attention to discussing, reading, and writing in the content area.

This study investigated the applicability of a unit that introduces quantum principles within the context of learning about light emitting diodes. Both teachers and students gave these instructional strategies favorable ratings in motivating students to make observations and to learn.

ped, cur, ats, phy, cbi, hos (HS)


This longitudinal case study is the story of one high school’s efforts to implement curriculum reform and the effect of local circumstances on reform ideologies. Political, economic, and structural measures initiated to facilitate reform ultimately represented inherent conflicts of interest which undermined the reform effort.

ref, cur, bkg, bft, phe (HS)


The study determined if teachers had college courses or staff development that included methods of teaching and assessing early elementary level mathematics and science, and the frequency with which mathematics and science were taught using hands-on methods.

tpd, hos, asm, ref (TE. EL)


Results revealed that a majority of visitors (89%) perceived they learned as a result of their visit to a science museum. Visitors most often reported learning science information, and learning from interacting with exhibits and reading exhibit signs.

ntd, lrg (AD)


Quantitative and qualitative study results showed that although males and females began graduate science programs with comparable confidence and backgrounds, females experienced a significantly greater decrease in confidence and had a significantly higher attrition rate.

gen, car, chs (PS)


The number of concepts used and concepts connected increased from sixth through twelfth grade. The complexity and richness of composite maps generally increased with grade level; however, grade-level composites showed only weak differences and progression in understanding.

kns, edt (SE)


Findings reveal that female scientists considered the doctoral chairperson furnishing career enhancing mentoring more important than did the men. Female scientists were not as satisfied as men with their chairperson providing most of the career enhancing and psycho-social mentoring functions.

gen, car, ats (PS)

Results showed that chairs perceived significant differences in native and transfer students. The differences found became greater as the size of the institution increased and became less the greater the number of transfer students attending an institution.

att, bft, bkg (PS)


The purpose of this study was to explore the relationship between the perceived level of integration between science and vocational subject areas and scores on the NAEP. Results indicate that the use of vocational methodologies helped students consistently score higher.

ach, ped, int, gen, cur (HS)


Science teachers in Iowa’s SS&C program had different perceptions regarding grading philosophies and the use of traditional and non-traditional assessments than those of other Iowa science classrooms. Also, SS&C students perceived that they had an active role and voice in assessment.

bft, asm, cns, ats (TE)


The examination of the journals focused on the following areas: aesthetic ‘peak’ experiences: spiritual inspiration derived from experiences in nature: attitudes toward the preservation of wildlife: and environmental ethics.

mce, fsd, ats, int, nfd, bkg (HS)


Female students perceived their working environment more negatively than males. The science department with the highest overall graduate student attrition rate also had a smaller percentage of female students and faculty, and was seen by female students, but not by male students or by faculty, as a less supportive environment.

gen, car, ats, att (PS)


Ecological field research in the context of this paper refers to short (1-7 day) field research projects involving students. The justification for using field research is examined and examples of its application are provided. The uses of field research are related to the five objectives of EE set forth by the Tbilisi Declaration (1978).

fsd, ene, ped (ALL)


Even though results show no significant differences in mean scores for the groups, the scores of the treatment group showed less of a decrease than scores for the control group after one month.

int, ach, esg, bkg (EL)


Results of the multivariate model showed that over the middle and high school years, changes in attitudes toward science were positively related to changes in attitudes about the utility of science.

ats, nas, bkg, cht (SE)

From both qualitative and quantitative measures, the researcher concluded that this activity of the Kentucky Department of Fish and Wildlife's Aquatic Education Program had a positive effect on both the attitude and knowledge of sixth graders who participated in the program.


Results indicate that students who had similar cognitive profiles often used similar problem-solving strategies when individually solving problems. Students exhibited considerable changes in the relative frequencies of their problem-solving strategy use over three instructional units.


The subjects' high school mathematics grade averages were more significantly related to their performance and achievement in the chemistry course than were composite SAT scores, high school grade point averages or science grades. The short-term intensive instruction affected two types of growth: "learning" and "development."


This study evaluated current research on and public attitudes toward electromagnetic fields and incorporated this information into classroom lessons to be used when teaching electricity, magnetism, and the electromagnetic spectrum to high school students.


The study revealed that teachers developed higher levels of concern with continued staff development. Teachers who experienced continued staff development reported higher levels of expertise in using the science modules and increased use of the science modules.


Participants believed that interdisciplinary curricula require changes in technique or approach toward teaching and are valuable in presenting 'real world' problems to students. Levels of discomfort were believed to be due to unfamiliarity with content, working in teams, and with the process of interdisciplinary teaching and learning.


Twenty-four students in a third grade heterogeneous bilingual class in a large inner-city school were used in this study. A significant increase in oral and written English proficiency occurred among the students during the period of the two science units.


Using videotapes of group interactions, software logs, and students' work, the study examined students' representational and inquiry strategies. By creating the visualization the students engaged in a process of meaning-making that included
interweaving prior experiences and beliefs with the representations they are using.

rem, edt, inq, cpl, bio, bfs (HS)


South African students displayed a poor mastery of fundamental processes and of number sense in mathematics, although the curriculum covered a reasonable range of the TIMSS question fields. In the sciences, a lack of understanding of fundamental concepts and problem solving abilities was displayed.

res, ach, cur, ref, ped (MS)


The purpose of this study was to explore how 15 African American children solved problems in second grade science. Their ability to observe, classify, recall, and perceive space/time relationships was assessed. Think-aloud protocols were used for this examination.

pbs, eth, bkg, lsy (EL)


The variables of formal reasoning ability and verbal intelligence were identified as having significant relationships, both individually and in combination, to the dependent variable of selected physical science misconceptions.

phy, alf, cht, tpd, ccg (TE. EL)


This study attempted to determine whether an interactive student-centered environment provided the social context and community for learning needed by students who do not traditionally pursue a career in science.

phy, ped, cpl, chi, int, gen (PS)


Mathematics self-concept, academic self-concept, and time on mathematics were consistently significant predictors of mathematics and science achievement for the full sample (n=522) of high school students. The patterns varied somewhat by gender and educational experience.

ach, bfs, ats, bkg, gen (HS)


This study investigated the validity of multiple-choice and constructed-response science items from the National Education Longitudinal Study of 1988. Identifying characteristics of items that exhibited gender differences was a priority. This study showed the value of a careful validity evaluation, and that differences among items within a format may be as large or larger than differences between formats.

asm, gen, ach, lsy (HS)


This study was undertaken to compare the effectiveness of the learning cycle method of instruction with a more traditional method on increasing student knowledge of selected ecology topics. Results were mixed.

ped, lrg, lth, ene, asm (HS)

This study used questionnaires and an ecological knowledge test to suggest that the educational effectiveness of the outdoor residential program on ecological knowledge was significant. The effect decreased a year later although not to original levels. The outdoor program did not significantly change environmental attitude.

**Ats, cur, ped, lit, mat (AD)**


Students in sites that use strategies such as group discussions and field trips appeared to be more aware of science in the world around them and more enthusiastic about increasing this awareness. GED science materials do attend to the relevance of science in everyday life but students' appreciation of this depends on the teaching strategies employed.

**Bkg, cur, bio, lab (PS)**


This study compared two biology majors programs with high transfer success (HTS) to two programs with low transfer success (LTS). Qualitative methods were used in the analysis to establish common themes which existed at both the HTS and LTS programs.


A teaching innovation using a problem-solving approach to promote authentic science in the physics laboratory was developed and implemented. Students reflected on surprising events to shape their understandings of phenomena, constructed new meanings of concepts, and developed practical knowledge during the course.

**Phe, ene, his (GEN)**


Secondary biology students from five classrooms were studied for the effect of two informal science experiences on achievement and attitude toward science. Both attitude and achievement scores were higher for those students attending informal science institutions.


Historical philosophies and theories of the nature of, value of, and human relationship with Nature were reviewed. The philosophies practicing scientists were compared to those of Nature Writers for analysis of similarities and differences.

Tennessee teacher educators were found to regularly include a fair amount of the 31 identified teaching strategies for individualized instruction in preservice elementary education courses.

tpd, ped (EL)


There was no significant relationship between students' learning style preferences and their ability to interpret motion graphs. A gender bias may be inherent in the instrument due to differences in mean scores between males and females after controlling for differences by using SAT scores and course grades.

lsy, sks, phy, gen (PS)


Study examined the effectiveness of the Research Experience in Teacher Preparation (RETP) project aimed at enhancing teacher perceptions of the nature of science, science research, and science teaching. Student teachers who had initiated research in their classroom had fewer concerns about doing research.

tpd, nas, res (TE)


In an effort to enable elementary teachers to move toward an interactive-constructivist model, the Science Education Center at the University of Iowa collaborated with a local school district. Newer teachers and those who were philosophically aligned with the project were more likely to implement the project.

tpd, cns, ped (TE, EL)


This study explored a new applied high school physics course aimed at being more responsive to the workplace. Using actor-network theory and sociocultural theory, the researcher found that the networks had only a minor connection. Implications for policy of educational change initiatives are introduced.

cur, ref, phy, ntw (HS)


Constructivist teaching strategies were investigated along with grades from science class and scores from high school students (n=249) on the Science Attitude Assessment Tool (Heron & Beuchamp, 1996). Students in constructivist classes had lower grades and a more positive attitude.

cns, ats, ach (HS)


After three semesters at the Professional Development School program, preservice teachers had improved attitudes toward science teaching, higher achievement in process skills and more efficacious beliefs. Most effective were the collaborative cohort team and extended clinical internships.

att, hft, skt, tpd (TE)

In order to study conceptual change in an introductory biology course, the Instrument for the Assessment of Respiration and Photosynthesis (IFARP) was developed. No significant changes were observed in non-majors’ performance, but there was a statistical increase in mean confidence levels.

cpl, cid, ebi, phy, ach (HS)


Seventy-six high school physics students were paired in computer-based instruction. The ability to effectively negotiate solutions was associated with higher achievement, implying that educators should consider training students in resolution skills prior to collaborative instruction.

cpl, cid, ebi, phy, ach (HS)


The Delphi technique was utilized to identify, rank, and refine 59 critical elements of environmental literacy by surveying environmental experts.

ene, lit (GEN)


This study evaluated an intervention called Thinking Aloud Together embedded within a 12-week unit of building mental models of the nature of matter. Students gained in metacognitive knowledge of and ability to articulate their collaborative reasoning behavior.

cpl, kns, cid, rem (MS)


A focus-group identified challenges and needs of first-year science teachers. Participants cited the problems of teaching heterogeneous groups, inadequate facilities, little administrative support, scheduling and time management, and lack of peer support.

tpd, att (TE, HS)

Using methodologies derived from teacher research and feminist research, this study explicates the resonances and dissonances between students' ideas, standards' goals, and feminist theory in order to deepen the understanding of students' thinking about the activities and knowledge of science.

bfs, ref, phe, kns, gen (GEN)


This study investigated whether electronic discussion could improve scientific discourse among students, support knowledge integration, and enhance conceptual understanding. Specific recommendations are offered for the design of productive electronic discussion and future collaborative learning environments.

dt, ntw, cid (PS)


Based on the Hines and the Hungerford and Volk models and the environmental literacy framework proposed by the Environmental Literacy Assessment Consortium, this study determined the contributions of nine variables in teachers' environmental responsibilities. Implications for environmental education program development and instructional practice are presented.

en, tsp (TE)


This research examined university students' conceptual development, problem solving and transfer in a beginning meteorology course. A serious weakness in students' problem-solving skills was revealed as well as the value of the computer-based simulated environment for revealing those weaknesses.

bfs, ref, phe, kns, gen (GEN)


Results show that high school teachers used socially relevant issues to teach the tentative nature of science, the role of individual scientists in validating scientific knowledge and the social aspects of science. The role of scientific communities in validating scientific knowledge was often neglected in the classroom.

bfs, nas (TE)


This research addresses the ill-defined nature of the phrase "integrated mathematics and science education." A conceptual framework gives clarity and precision to this phrase. Discussed are: transition from a separated to an integrated approach, teacher preparation, and different conceptions of each discipline.

int, tsp (MS)


The pilot teaching of the design was implemented to investigate how well students understand concepts and principles of physics, their perceptions of applying these principles into technology, as well as their attitudes toward studying physics.

kns, phy, ats, bfs, tec (PS)

For second grade students (n=394) the classroom teacher was favored at novel instructional sites. It is recommended that nonformal science sites provide training for teachers to lead their own classes through the site in order to reduce the distractiveness of the novel setting.

nfd, tpd (TE)


This study identified critical factors which contributed to female persistence in math, engineering, and science education. The study recommends collaborative learning processes and teaching methods, cohort involvement and study groups, professorial associations with students and internship and lab programs.

car, gen, ntw, cpl (TE)


In testing 332 university students, this study identified gender differences using three experimental treatments: animation, static graphics, and verbal instruction. Results showed that animation was better than static graphics in improving women's long-term learning, but not significant in short-term learning.

gen, lrg, cbi (PS)


A six-week course using experiential learning was devised and delivered to 20 high school students. A model of nature of science enhancement was proposed: engagement in meaningful, extended activities; student accountability for active participation and reflectiveness; and emphasis of high interest values.

bfs, ats, nas (HS)


This study assessed 62 participants' expectations and satisfaction with inservice training provided for certification in Oklahoma for five years. Insight was gained on the timeline, configuration, and structure of future workshops for teachers of application in Biology/Chemistry for high school.

tpd, bio, che (TE, HS)


Instruction in concept mapping helped seventh-grade students retain and assimilate ecology concepts to a greater extent than a control group of students.

sks, lrg (MS)


This naturalistic study sought explanations for disproportionate representation in the professional scientific community and its impact on postsecondary and precollegiate science education. Emergent themes were: delusions of equity, myth of meritocracy, power of the pedigree, traditions of gender, and typing by race.

gen, eqt, car (GEN, PS)

Participants (n=75 elementary teachers) in NASA's Langley Research Center rated this teacher enhancement program as very effective and used NASA's curriculum materials as a means of increasing hands-on activities in their classrooms.

**cur, tpd, esg (TE, EL)**


A core group of schools was able to engage in interdisciplinary, long term, cross-site projects and student exchanges. Insights were gained as to the ingredients necessary to nurture an electronic network as teachers participate in electronic collaborations that will directly impact classroom learning.

**ntw, tpd, int, cur (TE)**


This study evaluated a researcher-developed activity on projectile motion as part of a trigonometry-based physics course. Participants who demonstrated a high level of long-term understanding rated laboratory activities as very important or extremely important to their understanding of projectile motion.

**bfs, lab, lrg, phy (AD, PS)**


The effects of traditional, rotating block, and accelerated block class scheduling on high school biology students were studied. During the first two years of block scheduling lower student achievement scores but more positive student attitudes and perceptions about science learning were reported.

**ped, ach, ats, bio (HS)**


This study described the assistance relationship between 14 teachers engaged in school-based education reform and three full time facilitators. Types of assistance and impact of facilitator assistance on teachers' practice are reported along with implications for designing facilitator-teacher assistance relationships.

**tpd, ntw, ref, ped (TE)**


College student interviews suggested that students who took conceptual chemistry classes were better able to recall and apply concepts. Their performance equaled the traditional students' on both research tests and on multiple-choice final examinations. They also had more positive attitudes and a greater completion rate.

**cur, ats, lrg, che, ped (PS)**


This study assessed the effects of computer-enhanced instructional software on student learning in two high school anatomy classes. There was no difference in posttest scores on an endocrine unit; however, visually perceptive students and students with high persistence scored significantly higher.

**cbi, bio, lrg (HS)**


**ped, ach, ats, bio (HS)**
A survey of primary teachers found that facilities for educational technology use were in need of improvement, and science teachers would need to be further motivated to routinely incorporate educational technology into classrooms.

The purpose of this study was to ascertain the awareness and utilization of concept mapping as an instructional tool among middle school science teachers and to examine how these middle school science teachers incorporated concept mapping into daily lessons.

Ways that nine women learned science were situational and are described in terms of Belenky, Clinchy, Goldberger, and Tarule's *Women's Ways of Knowing*. Women gained an awareness of how they learn science and how that awareness can be used to make them even more successful in the classroom.

This research focused on improving learning in introductory lecture-based physics courses. The guided inquiry approach which proved effective in small-group tutorials could be successfully adapted for large lecture courses to teach two-dimensional motion, forces and Newton's laws, and magnets and charge.

This study evaluated the effects of family workshops on 35 elementary children's science interest and achievement as well as on parents' collaboration in their child's education. There were no statistical differences on science achievement, curiosity, or parental involvement.

This study investigated how microcomputer-based chemistry laboratory environments were designed to facilitate process skill development and knowledge acquisition among 98 high school chemistry students. However, no significant effects on process skills attributable to treatment or gender were identified.

Results of this investigation indicated that the centralized curriculum in India has undermined context-specific treatment of subject matter in the National Council of Educational Research and Training textbooks.

This research investigated of a time-saving team laboratory report assessment (Michigan State University). MAI 36(01), p. 0032, 1998. [AAT1386874]

Biology labs were created and adapted for advanced students. A tool for assessing student scientific laboratory reports was developed and found to be valid and fair.

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This study determined possible reasons for student failure in undergraduate organic chemistry courses; particularly, student difficulties in understanding stereochemistry and reaction mechanisms. Knowledge of general chemistry was the most important variable in student performance. Misconceptions are reported.

alf, che, kns, ach (PS)


This study reports on the UPDATE program, a physics teacher enhancement program offered by the University of Massachusetts which included laboratory experiences. Participants became more confident, enthusiastic, gained more physics knowledge, and changed their teaching practices.

tpd, phy, lab, ped (TE, SE)


This study evaluated the effectiveness of student-constructed graphic postorganizers as used by 35 fifth grade science students with learning disabilities. While the treatment group scored significantly higher the results are tenuous because of the moderate-to-low reliability of the pre-and post-science mastery tests.

ped, chs, ach (EL)


This study examined how student science process skills may be accurately and reliably evaluated using a set of laboratory activities developed for secondary biology students. The treatment group demonstrated statistically better skills on 15 of 20 individual process assessments.

sks, asm, lab, bio (SE)


This study tells the story of two high school science teachers and one special education teacher and their collaborative efforts to develop a science curriculum for all students including those with disabilities. Implications for similar reforms of reform are described.

chs, eqt, cur, ntw, ref (HS)


This study explored the notion of a sense of place and provides an explanation for why it ought to be addressed in educational systems. Ideas for implementing community-based educational programs which foster a sense of place are presented.

bfs, ene, phe (ALL)


The history of the implementation and goals of nature study in Texas was researched and described.

fbd, his (GEN)


Florida's EXPLORES! ground station was utilized and incorporated into numerous interdisciplinary lessons. Participants scored significantly higher on process skills scores after one school year.

sks, int, cur, ene (EL)

This study used a survey (n=100) to evaluate crucial areas involved in science instruction in 12 Catholic elementary schools. The areas of environment, equipment, supplies and resources, teacher training, and teacher attitude were shown to be important factors in teachers’ decisions not to teach science.


Based on a constructivist perspective, four versions of a hypermedia-based genetics tutorial and problem solving program were developed. Findings indicated that both concept maps and metacognitive cues can enhance student learning and that students liked learning in a hypermedia-based environment.


After one school year, 61 ninth grade students showed no significant differences in algebra I achievement, proportional reasoning and graphing abilities between an integrated algebra I/physical science curriculum and a non-integrated traditional algebra I curriculum.


Students in field trip groups had higher achievement as measured by quiz scores than those in the laboratory groups, but they held less favorable attitudes toward field trips.


This study found that high school physics students (n=64) were unable to use feedback to make a significant change in the quality of their responses on six items on the Optics Videotape Assessment and ten optics multiple choice items from the National Physics Exam.


The social aspects of learning, the collaborative and cooperative nature of laboratory work and learning, and the role of self-efficacy emerged as important factors in characterizing nonmajors’ biology laboratories. Additionally, six factors emerged which parallel J. J. Schwab’s four conditions of a curriculum.


Ecological sustainability and the recreational use of wild lands were meshed into one model of integration in environmental education. Outdoor, adventure and experiential education in wild-life based courses provided a complete conduit for effective environmental education.

This study attempted to deepen current understanding of the career decisions of African-American students. Findings indicate that the science major has a greater capacity than the non-science major to accommodate world view images and assumptions about science that conflict with other images and assumptions.


Findings supported the view that teachers who know more about the nature of science and who practice many STS/constructivist teaching strategies assist students in learning more about the nature of science.


Study participants felt their science background was lacking in both content and pedagogical knowledge. A hands-on approach helped them to see science as more accessible. Some participants believed that science methods courses should introduce the history and philosophy of teaching methods.


This study investigated two contrasting science instructional settings: teacher-centered, textbook-dominated instruction and student-centered, materials-dominated instruction. Levels of behavioral involvement of low achieving students may be enhanced by increased structuring of the science learning environment.


This study investigated the ability of twelve high school graduates undertaking a teacher training course in Singapore to restructure knowledge in an unfamiliar scientific text. Able readers demonstrated an ability to restructure knowledge while less able readers did not.


This study focused on how students think and feel about classroom experiences. Findings indicated that about 45% of students withdraw on some academic or social measure, about 50% waffle between engagement and withdrawal and only 5% are enthusiastic about science.


Thirty minority students in the fifth and sixth grades scored high on a post-test after being instructed with a tutorial lesson on the earth’s cycle of water.


Teachers in block scheduled and traditional classes used inquiry-based instruction with nearly the same frequency. Thirty percent of teachers did not grasp the meaning of inquiry-based instruction. Significant achievement differences emerged between biology classes with frequent and infrequent uses of inquiry.

The University of Alabama’s Center for Communication and Educational Technology developed an Integrated Science program for scientific illiteracy in middle schools. Despite extensive curriculum development and technologies, teachers were found to play the most critical role in determining a class’s success.


This study explored college students’ conceptual understanding of acid/base principles related to comprehension and application of scientific concepts during a problem-solving activity. Students’ misconceptions affected problem-solving performance.


This study investigated the factor structure of scientific literacy in regards to gender differences. Females performed better items related to the social aspects of science while males performed better at recognizing the constructs of science. There was no gender difference for items dealing with life science.


Teachers had positive attitudes toward environmental education. However, their commitment to implement it was not positive. The most important barrier found to exist was the lack of environmental education resource material. This was followed by a lack of environmental education teacher training and knowledge.


From an enactivist theoretical perspective on cognition, this study examined action-theory processes when middle-school students engaged in open-ended exploration in self-directed design and building with simple materials.


The findings of this study suggest that student participation in an adjunct course that focuses on improving student learning through the teaching of study/learning techniques, content-related activities...
and reflective writing, can enhance student learning, understanding, and retention in an introductory biology course.

cur, sks, lrq, ped. bio (PS)


Self-regulated learning employed by college students (n=547) was examined by comparing basic and advanced science classes and non-science classes. There were no differences in self-regulated learning in different disciplines and the cumulative GPA was the only significant predictor of science achievement.

ach, lrq (PS)


Characterization of course development emerged as originating from either traditional or progressive perspectives. Beliefs about collaboration also influenced course development.

bft, ntw, cur, bio. tpd (TE)


This two-phase study identified 42 elements that foster student growth in environment-related knowledge, attitudes, skills and responsible behaviors. A national survey of 500 teachers (response rate over 65%) confirmed these elements.

ene, att, bft, ats, sks (TE)


This study reports on the historical development and validity of The Middle School Literacy Instrument (MSELI) which assesses students' ability to identify environmental issues, knowledge of ecological principles, issue selection, self-reported knowledge of environmental actions, and action selection.

ene, asm, kns (MS)


This study determined the extent to which teachers perceived themselves as prepared to implement technology standards (National Science Education Standards and Standards of Learning for Virginia). Teachers (n=500) did not feel competent and expressed concern with computer shortages, training, and lack of time.

att, bft, tec, ref. tpd (TE, SE)


This study continues higher education's decades-long effort at improving performance in general chemistry by investigating the effectiveness of California State University, Fullerton's Chemistry Placement Test at predicting success in first-year chemistry.

ach, asm, che (PS)


The Windows on Science program was found to be useful in fourteen elementary schools either as a reference resource or as a prompt for teacher-mediated instruction for K-6 students.

ped, cur, lit (EL)

3:}

This case study examined middle school teachers (n=3) as they learned a new model of pedagogy, project-based science. Beliefs and practice were intertwined as no teacher changed beliefs about the nature of science while modifying beliefs about the nature of learning. Beliefs colored perceptions of practice.

**bft, ped (TE)**


A review of seven high school texts found that all texts were biased against females. The results of frequency counts showed significant differences between males and females in number of times scientists were mentioned, pictured, and covered in detail.

**gen, mat (HS)**


The findings reveal that an environmental education curriculum which is grounded in Judeo-Christian beliefs has the capacity to make students more aware of their responsibilities and also illuminates that students have previously acquired these values through local forms of knowledge.

**bfs, ene, bkg (MS)**


Combined SAT score and SAT Math Applications scores were significantly, positively correlated to performance in sixth grade gifted science (n=100). Performance scale I.Q. score was significantly, negatively correlated to performance. Females outperformed males to a highly significant level.

**achs (MS)**


This study focused on female and under-represented minority students in science, engineering and mathematics. Performance as a predictor of terminal academic status was limited to only one gatekeeper course. Introductory Physics.

**car, eth, gen, phy, bkg (PS)**


Piaget's theory of cognitive development, Developmental Systems Theory, Life-Span Perspective and environmental education curriculum research were used to develop components included on a questionnaire evaluation. Face and content validity, but not criterion-related validity, were sufficiently demonstrated.

**ene, cur (GEN)**


Teaching experiments may have contributed to advanced-placement students' increased understanding of the particle nature of chemical reactants and products, but not to their problem-solving methodologies. Patterns of problem-solving important to the research base were elicited from the data.

**pbs, lrg, che (HS)**

Scientific habits of mind overwhelmingly contributed to the current success of ten high school young scientists. These habits were developed through structures and relationships in the home where parents had provided a fun, playful, tolerant atmosphere in which messes and experimentation were the norm.


A wide variety of qualitative and quantitative data sources were acquired and analyzed in a longitudinal, multi-level design to obtain rich insights into the factors associated with achievement and equity in the teaching and learning of science in Florida.


Specific features may facilitate learning during family visits to an early childhood science exhibition, “Working Wonders,” at The Science Centre in Calgary, Alberta. Those features are represented in a set of guidelines for the development and evaluation of early childhood exhibitions.


A correlation was reported between the cognitive style of field dependence and the type of visual presentation format used in a computer-based tutorial when college students (n=204) identified human tissue samples. Subjects receiving a color visual presentation scored significantly higher.

As six pre-service secondary science teachers explored more student-centered approaches to teaching, they found less room for technology in their future practice. Data indicated that the technology course work was isolated from the rest of the teacher education program and many misconceptions were left unchallenged.

ped, edt, tpd (TE, SE)


A revised botany course with greater student involvement was developed. Laboratory activities and discussions were based on student ideas. Analysis indicated an increase in student learning.

cur, bio, ped (HS)


The focus of this research was to gain evaluative information from fourth grade teachers and local volunteers participating with the Great Lakes Education Program. Surveys were administered to 106 teachers and 40 volunteers.

en, asm (TE, EL)


This study examined the effect of a culminating demonstration on the learning of third grade students. The culminating demonstration was a fair planned by students. Students were assessed to determine the impact of the demonstration.

asm, ats, cp (EL)


An STS issues program could improve preservice teachers' (n=138) environmental literacy and their perceptions and attitudes towards STS issues and teaching STS issues to elementary students. Preservice teachers could benefit from a program that uses the STS issues model.

sts, att, tpd, ene, cur (TE)


This study explored four Filipino students' dominant ways of operating in science: in other words, the types of structuring that was evident, not in terms of ideas, but in terms of how the students thought about, imagined, and related to physical processes. Affective structures played a significant role in the exploration of science concepts.

kns, bfs, nas (SE, PS)


Key elements were identified that facilitated connectedness to the natural world. Childhood experiences played a significant role. Transformative programs, such as the outdoor program, need to be taken seriously and efforts should be made to incorporate these types of programs in our public schools.

fsd, ats, bkg (PS)


Results indicated significant increases in spatial ability after seven weeks of lessons which focused on developing the ability to perceive, manipulate, and record spatial information. Also, spatial ability correlated with initial spatial ability and science achievement and was not associated with gender or age.

ach, sks (MS)

This case study investigated the nature of support and learning opportunities that an action research group provided for science teachers engaged in curriculum and professional development in the realm of gender issues in science education.

tpd, gen, res (TE)


Despite extensive exposure to atomic models in lectures, in the textbook, and in computer activities, students did not apply models appropriately, but rather used a simple Bohr model which had not been used in the course. Results suggest that more attention be given to models' selection, use, integration, and limitations.

che, rem (PS)


This study presents an in-depth case study of the development, the actual implementation, and subsequent evaluation of an environmental curriculum, and gives an in-depth view of life in this class of sixty-one sessions over a fourteen week period in a ninth grade general science class of twenty-four students.

cne, cur, ped, ats (HS)


Senior secondary-level earth and space science textbooks contained errors and did not explain everyday concepts or promote conceptual change.

mat, esg (SE)


To illuminate science and technology at the university and school system level, this study recommends a framework of science and science education which could foster closer alliances with indigenous knowledge, the needs of the majorities, including women, and sensitivity to ecological balance.

nas, eth, phe, cur. ref (ALL)


This study was conducted to determine the most effective point in a teaching sequence for videos to be shown in order to have the greatest positive impact on student learning in a fourth grade science classroom. There was no significant difference in learning between the group being shown the video at the beginning of the topic and the group shown the video at the end of the topic.

ped, edt, lrg (EL)


Study addressed the advantages of an inquiry-based science environment in an eighth grade science class. Students at all aptitude levels were able to demonstrate learning in an inquiry-based environment and feel successful in their learning.

inq, ats, ach, kns, chs, ped (MS)

This study of 7th and 8th grade students (n=117) compared the educational value of constructivist pedagogy as applied through the design, development and experience of 3-D interactive virtual learning environments to a traditional classroom approach and to a control.

cns, edt, ped, ene (MS)


The conclusions of this study imply that knowledge of the properties of squares improved the students' ability to model a geometric problem more than instruction in data analysis modeling. The use of computer microworlds in conjunction with cooperative groups is a viable method of modeling instruction.

rem, cbi, cpl (SE. PS)


This study suggested that students' acquisition of process skills and their science-related attitudes may be enhanced when instruction in problem-solving by a professional scientist takes place in the classroom.

sks, pbs, ntw, ats (MS)


A circular model emerged from the data in which values education, thematic teaching, and constructivism were intertwined within environmental education. Students' cognitive and affective domains were positively affected. Recommendations for developing and maintaining an outdoor environmental learning center are outlined.

ene, fsd, ats, lrg, tpd, cns (TE, EL)


A problem-solving authoring, learning, and assessment software, the UCLA IMMEX Program (Interactive Multimedia Exercises) was investigated in a twenty-week quasi-experimental study. Evidence was found that IMMEX software is highly efficient in evaluating salient elements of problem-solving.

pbs, edt, bio (HS)


The political reluctance of large scientific bodies to suppress creationism, coupled with their general apathy towards the issue, has reduced the impact of anti-creationism and has ultimately contributed to the continuous thriving of creationism.

evo, his (GEN)


Commitment to a common vision. recognition of the expertise of partners, and the ability of universities to institutionalize program changes were important for collaborative efforts in preservice elementary science preparation. However, the guidelines of science content courses and continuous growth were met inconsistently at the institutions in the study.

tpd, ntw (TE, EL)

A hypermedia program was as effective as the teacher/naturalist for teaching about environmental education material. The majority of students had positive attitudes toward the inclusion of computers in the camp setting, and felt that they were a good way to learn about environmental education topics.

**ence, ed, kns. ats (ALL)**


Interviews with adolescents (n=6) between 12 and 14 years old found an overall dissatisfaction with school science. STS education is presented as having potential to maximize achievement and interest in science and minimize any gender gap in attitudes toward science.

**ats, sts, gen, ref (MS)**


Pairs of students were observed constructing marshmallow and toothpick bridges. A system of analysis was developed and used to detect the construction of new understandings. Patterns were used to infer three means of self-construction: shifts of focus, bridging mechanisms and distributed cognition.

**cns, cid, kns (MS)**


Many students had difficulty connecting mathematical symbols to physical concepts. They did not understand the concept of equilibrium and never mentioned it in their descriptions of thermodynamics. Graduate students had many of the same difficulties and misconceptions as undergraduate students.

**alp, kns, che (PS)**


This study explored the relationship between gender, learning orientation, self-confidence and achievement in high school physics students (n=131). Results indicated that more differences in achievement were accounted for by learning orientation and self-confidence than by gender.

**lsy, gen, ach, ats, phy (HS)**


Two tests were developed to evaluate the effectiveness of the 1996 Wood Magic Science Fair at Mississippi State University's Forest and Wildlife Research Center/Forest Products Laboratory. One test was designed for third-grade students and the other designed for fourth-grade students.

**asm, nfd (EL)**


This study identified 47 factors that may encourage or inhibit science curriculum reform. Staff development, training and support, laboratory facilities and materials, motivation and 'ownership,' collaboration, college preparation, textbook reform, community support and reform initiatives are major factors having a substantial effect on the adoption, implementation, and institutionalization of reforms.

**ref, tpd, mat, bft, lab (K-12)**


This study reports on how time constrains student and teacher action, how the traditional school culture and grading create stumbling blocks for change, how conflicting beliefs about teaching and learning undermine the accomplishment of guided inquiry and
how the teacher guides students through mutually transformative communication.


This study explored the relationship between the grades students earned in introductory college microbiology and American College Testing scores, sex, race, age, GED or high school diploma, full-time or part-time student status, developmental reasoning levels, memory tactics, and expected achievement.


This study investigated how twenty-four high school biology teachers evaluated potentially useful text containing canonical, anthropomorphic and teleological formulations that purport to explain biological adaptation through natural selection.


This four-year study identified conceptual and reasoning difficulties through individual demonstration interviews and descriptive studies that were conducted throughout the period of instruction. Findings were used to guide the design and modification of a tutorial curriculum to address specific student difficulties.


This study showed that modeled, inquiry-oriented laboratory instruction coupled with longer term practice, support and follow-up is effective in preparing teachers to reform their instructional practices and restructure their courses to incorporate a more hands-on, inquiry-oriented approach to laboratory experiences.


Results support the finding that the utilization of the heuristic Vee diagram as a pre-laboratory requirement can improve students' understanding and performance and provide a structure on which students can rely for the effective organization of background knowledge.


This study investigated the role public environmental education plays in greenway projects today.


Results indicate that a computer-assisted tutorial program improved rural students' science achievement; however, the program did not improve rural students' science achievement as well as classroom instruction without the tutorial. More importantly, the program did improve achievement for low achieving students.

Forty high school students from a biology class tested the effectiveness of a computer assisted instruction (CAI) program, titled “Intergalactic Proportions.” Student achievement was significantly higher after using the program. Student’s enthusiasm toward the subject matter also increased.

cbi, ach, ats, bio (HS)


This study examined the worth participants assigned to an exemplary, long term professional development program designed to improve their teaching of elementary science. The relationship of this assigned value to participants’ professional histories and current circumstances is reported.

tpd, bft (TE, EL)


To highlight the ideological elements of science in science education, another more explicitly symbolic system, epic heroism, was used as a comparative framework. This study focused on ideological elements associated with racism, sexism, and other social relationships that are referred to as relations involving divisive bias.

phe, mce, gen (GEN)


Global Positioning Systems help achieve the goal of infusing education with a much needed technology. This study demonstrated how the use of GPS could enhance the secondary science curriculum.

edt, esg, ped, cur (SE)


A physics course on mathematical methods incorporated a computer algebra program. Students reported positive and negative impacts. All of the students satisfactorily completed the course, and all continued to voluntarily use the program during the following semester.

edt, ats, phy (PS)


This research on integrated scientific method (ISM) looked at controversies about the nature of science and how to teach it, how instruction can expand opportunities for student experience, and how goal-oriented intentional learning might improve the learning, retention, and transfer of thinking skills.

nas, ped, lrg (SE)


Students responded to their research projects through their understanding of school social structures. The potential benefits desired in reformers’ calls for authentic scientific practice may be subverted to a degree by students’ acceptance of school social structures and their underlying discourse.

res, bfs, ref (HS)


Students attributed high meaning to atomic structure-based metaphoric statements grounded in very little accurate information. Data revealed that assertions about the impact of metaphors on content learning and accurate conceptions are inappropriate and
appear to be misconceptions about metaphorical language.

kns, lth, ccg (GEN)


The purpose of this study was to integrate music into a hands-on work and energy science unit to reinforce the concepts being taught. The results did not support the instructional effectiveness of integrating music into this particular science unit.

int, hos, phy (EL)


Learning logs, laboratory exercises, and the theme of agricultural science were used in attempt to increase interest and understanding of the scientific principles behind environmental problems. Students showed significant improvement in comprehension of concepts. Entries in learning logs became starting points for discussions that moved the class away from being teacher oriented to one that was student oriented.

lrg, ped, ene, cid (HS)


Experiences from university research were used to develop lesson plans for biology classrooms at the secondary level. Lesson plans were developed around the behavior patterns of the jumping spider Habronattus oregonensis.

cur, bio, res (SE)


The results of this study indicated that students who received instruction in researchable questioning outperformed those students who were not instructed on a measure of science question level.

sks, res, nas (MS)


Oak Park students' (n=41) adaptability to an integrated art and science unit was found to be limited because of their inability to conceptualize curricular structures that were different from the traditional ones to which they were accustomed. Many students, especially high achieving students, were unwilling to experience course innovations and risk possible failure on standardized tests.

int, ref, cur, ats, bfs (HS)


Two groups of ninth-grade students, one group enrolled in a 'regular' science course and one group enrolled in an integrated program, did not demonstrate any significant differences in any objective or subjective assessments.

ach, int, cur (HS)


The learning cycle influenced preservice elementary teachers' conceptions of the nature of science and science instruction. By the end of the term, students had more complete understandings of the dynamic nature of science and the processes used to generate
scientific knowledge. However, the ability to apply their newly learned instructional strategies was influenced by subject matter knowledge.

nas, lth, tpd, knt, ped (TE, EL)


In this study of 114 teachers involved in training activities funded through a federal program, there was a significant relationship between training effectiveness, implementation, and the independent variables of training structure, administrative factors, incentives, and training components.

tpd, bft (TE, EL)


The results of this study suggest that the Corno and Mandinach (1983) model of motivated learning does not realistically represent the behavior of honors or traditionally placed college students majoring in biological science.

lth, cns, bio, ach, bfs (PS)


This research provides detailed and updated information about gender differences in the timing and causal mechanisms for entrance into and exit out of the science and engineering educational trajectory. The transition to college was the point where the educational paths of males and females diverged significantly. Expectations about future family roles had the greatest influence on the gender differences.

gen, bkg, car (PS)

Shea, John E. (1997). An integrated approach to engineering curricula improvement with multi-

objective decision modeling and linear programming (Oregon State University). DAI-A 58(05), p. 1649, 1997. [AAT9734031]

A set of engineering competencies was developed from existing literature, and used in the development of a comprehensive mail survey of alumni, employers, students and faculty. Respondents proposed some changes to the topics in the curriculum and recommended that work to improve the curriculum be focused on communication, problem solving and interpersonal skills.

int, cur, ref, pbs, sks, tec (PS)


Students who used CAI cooperatively had a significantly higher mean than those who used CAI individually. Neither gender nor interaction effects were found. Study suggested that instructors use cooperative learning strategies in CAI settings in computer courses, and CAI software be designed for group work.

gen, cpl, cbi (PS)


The best combination of predictors of the Advanced Placement (AP) Biology Examination was found to be attendance, SAT verbal score, and SAT mathematics score (n= 460 high school students). These predictors can be used to assist in the prediction of scores, the identification of students in need of extra assistance, and the development of strategies to improve the AP Biology Program.

bio, ach (HS)

High school students (n=16) had considerable difficulty with the concepts of pH, neutralization, strength and the theoretical descriptions of acids and bases. Most students could not relate the concepts to actual solutions and were unable to describe acid-base phenomena at a sub-microscopic level. Students revealed a number of alternative conceptions, which remained unchanged by instruction.


The purpose of this project was to develop and pretest an environmental education module that could serve to further the development of environmental education for Taiwanese students in grades 7-11. Experts were interviewed by the researcher and their comments were incorporated in a final revision of the environmental module.


Korean faculty members (n=47) considered the topics of ‘Waste Disposal’ and ‘Fresh Water Resources and Pollution’ as the most important to be included for prospective teachers. Other urgent environmental problems such as soil pollution by pesticides, air pollution caused by hydrocarbon fuels, landslides, flooding, typhoon, and droughts were also considered important.


This study found no evidence of the positive effects of performance assessments on student attitudes towards science, in terms of a greater interest in science, enhanced self-perceived ability in science, higher motivation to pursue additional courses or careers in science, or a more positive perception of the meaningfulness of science.


The purpose of this study was to determine if written action plans at the end of a teacher training institute affect the quantity of environmental education activities implemented in the classroom. Evidence indicated that a written action plan helped teachers to eliminate barriers, implement school-wide projects, and develop relationships with their peers, school district, and the community.


This study analyzed a successful 3-year teacher enhancement program, identified essential components of an effective teacher enhancement program; and proposed a model to identify and articulate the critical issues in designing, implementing, and evaluating teacher enhancement programs.


Based on results from this study, the following interventions are recommended to increase undergraduate science performance: assessment in realistic self-appraisal of science skills; instruction in elaboration and organization strategies; and encouragement of intrinsic interest in science.

Teachers' lack of understanding of the mole concept is used to argue that concepts are theory-laden and can only be attained within the theories to which they belong.


This study examined the relationship of children's exposure to the natural environment and their environmental attitudes at ages 4, 7, and 10. The results indicated that environmental attitudes vary at different age levels.


Overall, students (n=37) being taught using conceptual change instructional strategies showed progress in their test performance, although there was no statistically significant difference over the students (n=38) receiving traditional instruction. Speculations and recommendations about the use of conceptual change teaching techniques with secondary physics students are given.


The effective utilization of the software "Sir Isaac Newton's Games" improved fifth- and sixth-grade students' conceptualization of friction and gravity and prevented drops toward a less optimistic explanatory style as measured by Crandall's Intellectual Achievement Scale. Qualitative analysis suggested that some students may change conceptions greatly in a relatively short period of time.


This study explored the beliefs, pedagogical practices and problems of science teachers as they related to minority students, especially those minority students for whom English is not a first language and who have limited English proficiency. Culturally derived usages of non-standard forms of English are subsumed within this definition of minority students.


This research explored the use of computer aided instruction and the validity of a marine biology simulation for elementary school children (n=30). The analysis of pretest and posttest scores revealed that the students benefited from the computer-aided instruction. The affective evaluation determined that 86.7% of the students felt they knew more about marine biology after using "Under the Sea."


Two units based on forensic science were created and tested. The thematic approach used included chemistry, biology, math, and technology topics.

Thomas, Peter Lynn. (1997). *Student conceptions of equilibrium and fundamental thermodynamic
concepts in college physical chemistry (University of Northern Colorado). DAI-A 58(04), p. 1239, 1997. [AAT9729078]

Interviews with 16 students from three different institutions revealed twenty-nine different prevalent alternative conceptions and non-conceptions concerning equilibrium and fundamental thermodynamic concepts, including beliefs that endothermic reactions cannot be spontaneous, no heat can occur under isothermal conditions, and the entropy of the system must increase for a spontaneous change.

alf, che (PS)


Results indicate that science professors (n=16) emphasized science content when defining scientific literacy and preferred lectures, whereas science education professors (n=15) emphasized inquiry and student participation. Collaboration between science and education departments through seminars, workshops, co-teaching, and co-planning of courses is recommended.

bft, lit, ref, ntw (TE)


Results indicated no sex differences in science achievement at the sixth or seventh grade level. However, attitude was a stronger predictor of achievement for males than females. Males and females who were equal in science achievement may have different attributions for their successes and failures and these differences may have implication for future motivation to study science.

ach, ats, gen, car (MS)


Science teachers demonstrated transformational thinking in their attitudes and beliefs about teaching and learning science and generally used well defined criteria to judge student work. Assessment and instructional practices were viewed as interdependent. Transformational teachers provided students with real-world assessment tasks as learning events.

asm, bft, ped, tpd (TE)


High-status student engineers were the least likely to perform ‘actual’ engineering in design teams. Engineering education advanced an ideology that encouraged its practitioners to consider men’s privilege and women’s invisibility normal. Some teams of students at all levels carved out small oases where ‘actual’ engineering prevailed and women’s participation was robust.

gen, tec (PS)


The largest influence on eighth grade students’ (n=119) pre-post change was “constructive change power,” defined as the product of the strength of constructive activity multiplied by the difference between the mental models used on the pretest and during group discussion. Higher level constructive activity occurred when mental models used by other students were more sophisticated.

cns, cid, cpl, lrg (MS)


This historical study details the pragmatic, business purposes of Hampton’s industries over any ideological agenda. Problems with providing specialized facilities, apparatus, and teachers made it
difficult to provide rigorous, graded science instruction. The curriculum was designed for teacher training, using broad, elementary science topics for general knowledge and to train habits of mind.

his (GEN)


Statistically significant factors contributing to teachers’ practices included: the value placed on students as individuals whose ideas and contributions to the class are important; commitment to work as partners with students in the learning environment; commitment to making instruction relevant; commitment to life-long learning; and years of participation in state and national reform movements.

bft, ped, ref (TE)


This study utilized a selected set of game elements to contextualize and embellish physics word problems with the aim of making such problems more engaging. The primary conclusion drawn was that the ratio of ‘story’ to physics-learning content (3 minutes/45 minutes) was too small to make an educational difference and should be experimentally increased.

cbi, lrg, ats, phy (MS)


Knowledge of content and students formed a base from which prospective teachers developed domain-specific pedagogical content knowledge. Development of topic-specific pedagogical content knowledge occurred before domain-specific pedagogical content knowledge. Prospective teachers believed that classroom experience was integral to pedagogical content knowledge.

ped, tpd, knt, che, phy (HS)


The Attitude Toward Science in School Assessment (ATSSA) was used to evaluate the relationship between such attitude and achievement in science. Overall, the gender differences were not significant.

gen, ats, ach (ALL)


The computer program “Scientific Notation” was developed to provide tutoring, drill and practice and assessment of students new to scientific notation. Results were statistically significant (n=27 students).

cbi, sks (SE)


Results of this study indicate inquiry-based instruction was effective in positively influencing 7th- and 8th-grade students’ understandings of science concepts. Additionally, inquiry-based instruction did not have an adverse influence on science achievement in 9th grade.

inq, ach, ats, gen (SE)


Tinto’s retention model provided the theoretical framework for this research study of the academic and social integration of academically talented students of color into the graduate and professional science degree pipeline. Study findings indicated that supportive and empowering faculty contact was considered most important by students of color who continued on to graduate and professional programs.

eth, ear, ntw (PS)

methodologies (University of California, Davis). DAI-A 59(06), p. 1917, 1998. [AAT9838568]

No difference in the amount of constructivist teaching methods being used in the classroom was found between teachers who had received extensive training and teachers who received little or no training in constructivist theory and methods. The school district's curricular and assessment expectations were found to be important in determining instructional methods.

cns, ped, tpd, cur, asm (TE)


This study profiled the laboratory component of instruction in secondary school level chemistry. The Modified Revised Science Teachers Behaviors Inventory (MR-STBI) was used for analysis.

lab, che, cht, ref (SE)


The study found that regardless of the intent of a computer program, individual students used the program in various ways in response to their educational needs.

lab, che, cht, ref (SE)


This study investigated the effects of learning strategy and summarization within a computer-based chemistry and physics program. The effects of learning strategy and summarization on posttest and enroute performance, attitude, time-on-task, and interaction behaviors were examined. Results of this study have implications for the design of computer-based instruction and the use of this medium with cooperative learning strategies.

cbi, lrg, cpl, ats, che, phy (PS)


This study explored the impact of industrial volunteer/school partnerships on elementary science teaching behaviors and students' attitudes about future science study. Elementary teachers' behaviors during science instruction were not influenced by the partnerships.

ntw, att, ats, hos, lab (EL)


The two teachers studied had different beliefs about scientific literacy. Findings indicated that teacher involvement was important and teacher beliefs were critical to the successful implementation of curriculum reforms that meet state and national scientific literacy goals.

bft, lit, ref, cur (TE, HS)


This study illustrates the dynamics of large-scale, curriculum reform and provides guidance to jurisdictions facing change towards an STS perspective. The model portrays the interrelationships among programs of studies, resources, professional development and the consultation and communication process.

cur, sts, ref. ntw (HS)

Differences between personality characteristics of female (n=72) and male (n=86) freshman engineering students were studied to ascertain whether personality characteristics of these students were different from those of general collegiate students of the same sex. Engineering students of both sexes were more similar than different in personality characteristics. There were greater personality differences between freshmen male engineering students and male college students than there were between freshmen female engineering students and female college students.


The aim of this study was to further understanding of the nexus between individual development and conceptions of science curriculum, with particular emphasis upon root metaphors. Participants of this life-history case study consisted of three female high school students, three male high school students, and their teacher.

*cur, bfs, lft* (HS)


This study investigated the effects of a year long intensive extracurricular middle school science experience program including activities such as camping, rock climbing, specimen collecting and hiking on self-esteem, career goal orientation, and attitude toward science of eighth grade female students. Quantitative and qualitative methods were used.

*nfd, ats, gen, car, bfs* (MS)


The purposes of this study were to develop an integrated mathematics and science course for below average ninth grade students and investigate the effect of this course on students’ performance. Results suggested that the most effective approach to teaching mathematics and science for below average students may be an integrated curriculum and an ‘experimental methodology.’

*int, chs, lrg, cpl, inq* (HS)


This study assessed the multiple intelligences of high school students enrolled in theoretical and applied science courses. Analysis of multiple intelligence profiles collected from this study found significant differences in logical/mathematical, bodily/kinesthetic and intrapersonal multiple intelligences of students in theoretical science courses compared to students in applied science courses.

*lsy, lth, ats* (HS)


This study investigated alternative avenues, such as the use of narrative, for science conceptualization.

*ped, lrg* (MS)


This study evaluated a professional development course titled Chesapeake Watershed Ecology. The course was evaluated within the framework of Stake’s Countenance Model, using an objectives-based approach liberally embedded with qualitative methods.

Three interpretive exhibit centers at Taroko National Park (TNP) in Taiwan were evaluated.


The study focused on the Foundational Approaches in Science Teaching (FAST) project, a long-term survivor of reform in science education. Data collection included document analysis, interviews, and observations.


The purpose of the study was to develop a strategy for integrating technology education concepts into the Chinese mathematics and science curricula. The researcher identified the advantages, disadvantages, and major concepts of current technology education programs of selected countries. Concepts were identified that would be readily acceptable into the current Chinese educational system.


This qualitative study identified some key factors related to the roles of student participation and teacher facilitation in structured inquiry lab activities. Students, teachers, and researchers had a positive feeling about the use of structured inquiry lab activities.


The effects of four instructional methods (direct instruction, computer-aided instruction, video observation, and microcomputer-based lab activities) on sixth grade achievement was studied. Findings indicated that the direct instruction group and the microcomputer-based laboratory group displayed longer retention rates. Effects were not gender related.


This study investigated middle school teachers' perceptions about teaching and their purported strategies for implementing Science/Technology/Society and Constructivist practices in Iowa Scope, Sequence, and Coordination (SS&C) schools, and the congruence between these teacher's perceptions and their actual behaviors. Multiple data collection methods were used.
Dissertations by Institution

This list consists of 128 institutions that produced research dissertations and theses in the area of science education for the year 1997.

Arizona State University
Dieck; Sandomir; Werner

Auburn University
Donald

Boston University
Century

California State University, Dominguez Hills
Lopez; Marco; Richardson; Talluto; Waker

California State University, Fullerton
Marien; McFate

The Catholic University of America
Krylova

Christopher Newport University
Kowitz

The Claremont Graduate University
Dinucci

Cleveland State University
Hurd

Columbia University Teachers College
Havasy; Morgan, P.; Sheppard; Shin, A.; Shin, D.; Wiltshire

Cornell University
Abrams; Sivalingam-Nethi

Eastern Michigan University
Goebbel; Robinson; Volz

Florida Atlantic University
Doby

Florida Institute of Technology
Hirst; Luckett; Shen

Florida International University
Miller, R.

The Florida State University
Abbas; Butler; Lewis; Mattson; Muire; Spiegel; Sweeney

George Mason University
Wood

The George Washington University
Shepherd

Georgia State University
Golley; Yonts

Goteborgs Universitet
Stromdahl

Harvard University
Crismond; Hoffman; Parziale

Iadania State University
Williams, E.

Indiana University
Blank; Ferreira; Gabel; Page

Iowa State University
Hsu, Y.; Lynch

The Johns Hopkins University
Tucker

Jyvaskylan Ylopisto
Ojala

Kansas State University
Escalada; Gruner; Hen; Lee, C.

Lehigh University
Krieger

The Louisiana State University
Killebrew

Massachusetts Institute of Technology
Brandes

Memorial University of Newfoundland
Harding; Pearce

Miami University
Schramm

Michigan State University
Deng; Howes; Krusenklaus; Lamb; Neiswonger; Nevala; Schanhals; Schuen; Surbrook; Tejkl

Mississippi State University
Pearson

Montana State University
Morgan, M.; Oursland

North Carolina State University
DeChant; Engelhardt; Lawrence, L.

Northern Illinois University
Wallace

Northwestern University
Gordin; Polman

The Ohio State University
Brownstein; Carter; Chien; Hariharan; Hsu, S.; Hsueh; Jones, L.; Kochheiser; Wilder

Oklahoma State University
Boedeker; Jobe; Jones, S.

Oregon State University
Jacek; Shea
Pacific Lutheran University  
Creager; Miller, J.

Peabody College for Teachers of  
Vanderbilt University  
Sutherland

The Pennsylvania State  
University  
Bradford; Cho; Foster; Keefer;  
Koul; Minner

Prescott College  
Gardner; Langmaid; Lemburg

Purdue University  
Bryan; Chung, M.; Lee, P.;  
Mitchell; Patron; Ward

Queen's University at Kingston  
Lipman

Rutgers The State University of  
New Jersey - New Brunswick  
Lawrence, M.; Loh-Yeo

Saint Louis University  
Brown; De Laney; Everage

Salve Regina University  
Kosten

San Jose State University  
Orcutt

Seattle University  
Hays

Simon Fraser University  
Chung, P.; D’Agincourt; Hau;  
Huong

Southern Illinois University at  
Carbondale  
DeClue; McBeth; Ngongbo

Stanford University  
Drori; Hamilton; Keating;  
Yamamoto

State University of New York at  
Albany  
Hogan; O’Connor, E.; Preston

State University of New York at  
Buffalo  
Kujawinski

Stephen F. Austin State  
University  
Wu

Syracuse University  
Anaam; Giuliano

Temple University  
Aldrich; Bennett; O’Connor, T.;  
Priestley; Senneca; Wang; White

Texas A&M University  
Parker, D.

Texas A&M University-  
Commerce  
Bowers; Hoffmann

Texas Woman's University  
Blain; Cole; DeSpain; Gavin;  
Gonzalez; Johnson; Lavender;  
Lawlor-Lopez; Newsom; Omami;  
Sartin

Universite de Sherbrooke  
Catallozzi

The University of Akron  
MacGowan

The University of Alabama  
Ford; Goldsmith; Horton; Love;  
Young

University of Alberta  
MacDonald; Oluka; Rymer;  
Wilhelms-Hackman

The University of Arizona  
Draper; Rasmussen;  
Scheideman; Wizinowich

The University of British  
Columbia  
Hepburn; Robeck

University of Calgary  
Munroe

University of California,  
Berkeley  
Hsi; Ridgway

University of California, Davis  
Walters, W.

University of California, Irvine  
Minear

University of California, Los  
Angeles  
Esterle; Harlan; Troper; Windward

University of California,  
Riverside  
Allan; Longo

University of California, Santa  
Barbara  
Harp; Jelinek

University of Central Florida  
Lavigne

University of Colorado at  
Boulder  
Tonso

The University of Connecticut  
Bednarski

University of Delaware  
George

University of Denver  
Mooney

University of Georgia  
Clark; Doster; Hill, G. D.;  
Sharman; Veal

University of Houston  
Adams
University of Houston-Clear Lake
Spachuk

University of Illinois at Chicago
Filippelli

University of Illinois at Urbana-Champaign
Beck; Chin; Chinn; Conefrey; McGaughhey; Nicdao-Quita

The University of Iowa
Al-Momani; Campbell; Craven; Dass; Dundis; Enger; Freedman; Henrique; Lieu; Logan; Manhart; Qin; Varrella; Yutakom

University of Kentucky
Hanley

University of Louisville
Cundiff; Gillespie

University of Lowell
Mueller

University of Maine
Kesselheim; Tingley

University of Maryland College Park
Alao; Huntley

University of Massachusetts
Kudukey

University of Melbourne Park

The University of Memphis
Pensak

University of Miami
Thurmond

The University of Michigan
Barrett; Fife; Meyer; Shauman

University of Minnesota
Armstrong; Beilby; Blue; Parker; T.; Walters, N.

The University of Mississippi
Griffin, L.

The University of Nebraska - Lincoln
Adrian; Ahern; Crapenhoff-Gatewood; Runge; Wiseman

University of Nevada, Reno
Heron; Michel-Clark

University of New Orleans
Kuehne

The University of North Carolina at Chapel Hill
Louden

The University of North Carolina at Greensboro
Hildreth; Williams, T.

University of North Texas
Keller

University of Northern Colorado
Lee, S.; Thomas

University of Pennsylvania
Swan

University of Pittsburgh
Bunt; Glenn; Hill, G. P.; Kim; Myers

University of Pretoria
Dube; Gray

University of St. Thomas
Freund

University of San Francisco
Vasquez

University of South Africa
Kizito

University of South Carolina
Broadway

University of South Florida
Farrell; Schirripa

University of Southern California
Almazroa; Maslin; Palacio-Cayetano; Stansbury

The University of Southern Mississippi
Dallal; Nodurf; Noyes; Owens; Poole; Sentif

The University of Tennessee
Hazari; May

The University of Texas at Austin
Allen; Anderson; Renaud

University of Toronto
Hall; Nyhof-Young

The University of Utah
Hyde

University of Virginia
McCauley

University of Washington
Kraus; Myhre; Osberg; Pride

The University of Western Ontario
Parsons

The University of Wisconsin - Madison
Rusbult; Tonnis

University of Wyoming
Hitt

Wayne State University
Armstrong-Hall

West Virginia University
Curtis; Hemler; Yang

 Widener University
Griffin, G.
Research Articles Published in 1997
Matthew J. Maurer, *The Ohio State University*
Samantha J. Romanello, *The Ohio State University*

This section lists 212 articles in science education research that were published in 1997. Each entry is coded (see Key to Codes) with one to three major codes (in bold type) and up to three minor codes, as well as the appropriate educational level in parentheses following each citation. As with many science-related areas of study, science education is becoming an interdisciplinary field. Many of the articles listed here are examples of research in science education, but appear in publications outside the traditional science education literature. Wherever possible, we have coded these articles to reflect their specific contributions to science educational research methods, techniques, and applications. A brief scan through the list of searched journals will demonstrate the increasing diversity of this literature. All entries are indexed by major codes at the end of the volume, and the list of searched journals (containing the number of articles from each) is included at the end of this chapter (see page 77).


Describes the knowledge base of a group of science teachers as related to the structure, function, and development of their disciplines and their understanding of the nature of science. Twenty teachers participated in this study and their knowledge base was found to be lacking in all respects.

knt, nas, alf, tpd (TE)


Examines the existing elements in and the various approaches to the integrated curriculum development project in Nigeria. Analyzes the constraints and support systems which are likely to be helpful in environmental education at the secondary level. Suggests measures and guidelines that could enhance the process of curriculum integration.

int, ene, cur, sts (SE)


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.

att, bft, tpd, cht, knt (TE, SE)


Identifies the major tenets of a preservice secondary education program, knowledge structures that beginning science teachers have constructed about the teaching and learning of science, and the correlation between them.

tpd, knt, bft, ped, lth (TE, SE)


Observed sixth grade students and their ways of gathering information for a science report from *Encarta 94*, a CD-ROM encyclopedia.

edt, sks, ats (MS)


Discusses the ninth-grade trial implementation of the Scope, Sequence, and Coordination (SS&C) project and compares this class with the non-SS&C class.
that preceded it. Reports that the project helped teachers create a more inquiry-oriented learning environment and helped students’ performance.

ref, cur, inq, tpd, ach (SE)


Investigates the effect of setting a different scientific inquiry activities on visitors’ understanding of the science underlying an interactive exhibit. Findings indicate that the interpretation activity was the most effective in facilitating visitors’ understanding and the prediction activity was the least effective.

inq, lrg, nfd (GEN)


Research on conceptual change emphasizes the importance of factors in the cognitive domain. This research argues that models of conceptual change learning should also encompass issues of affect, conation, and self-esteem. The use of these expressions is explained via four case studies on members of a rural village informally learning about radiation and radioactivity.

nfd, ccg, lth, bfs (AD)


Investigates whether basic tenets for the “nature of science” are also held by philosophers of science and explores possible related philosophical positions underpinning differences in responses. Reports that the philosophers expressed significant disagreements with the tenets and different philosophers varied on their views about the tenets.

nas, phe (GEN)


Compares approaches to defining functional scientific literacy and helping students achieve it. The canonical approach focuses on literate individuals’ knowledge, skills, and habits of mind, and the sociocultural approach focuses on factors such as values, which affect participation in the community’s activities.

lit, res, kns, sks, bfs (EL)


Uses four case studies to illustrate differences in task engagement in 12 students in two “exemplary” sixth grade science classrooms. Not all students are likely to benefit from improvements in science programs that provide increased opportunities for meaningful learning.

lrg, chs, cur, bkg (MS)


Makes a research-based case for a particular approach to science teacher education which makes the science methods course the centerpiece and foundation of the teacher education program.

res, tpd, ref (TE)


Focuses on cultural influences in environmental education. Examines some of the means of transmission of culture and ideology that a society adopts including metaphors, myths, and institutions. Establishes a close link between inequalities of social classes, ideology, and resource use.

bkg, eqt, phe, ene (K-12)

Reports on preservice elementary teachers’ knowledge of the reasons for day and night, and the change of seasons. Instructional techniques using models and hands-on activities were successful in promoting conceptual change.

This article presents an inquiry method of teaching that encourages students to solve authentic questions about science and math and to use technology to communicate their findings in the Heron Network, a group of web sites constructed by the participants.


Analyzes undergraduate research projects in biochemistry and related subjects at British universities. Discusses the trend toward students doing less research as part of their undergraduate study. Reasons cited for this trend include increased student numbers and costs.


Argues that science may be presented as a continuing effort to improve existing knowledge. Analyzes a three month discourse by sixth graders, showing that the basic commitments enabling scientific progress can be realized in elementary schools.


Discusses an Israeli study examining the professional development of physics, electronics, and mechanics teachers. Examines whether an externally developed school improvement model could customize the supervision process to meet the needs of each school system and academic discipline.


Science student assessors evaluated each other’s work and ranked posters of major ecosystem processes in the same order as staff assessors. Students ranking highly in poster presentation tended to do poorly in their essay work and vice versa.


Describes results from a survey of elementary school students’ perceptions of scientists, school science, and the application of science in daily life. Students drew scientists with various stereotypic features, and most were depicted as white males.


Aims to quantify the models that 13- and 14 year-old students hold about the causes of the greenhouse effect and ozone layer depletion. Assesses the prevalence of those ideas which link the two phenomena.


Explores how collaboration among teachers from several schools and with university researchers facilitates attempts to change practices. Analysis
indicates that collaboration facilitates change by providing opportunities for teachers to learn new content and pedagogical knowledge, encouraging them to be risk-takers in implementing new ideas, and supports and sustains the processes of individual change.

ntw, tpd, ped, kn (TE. EL)


Data were obtained from the 1987-1991 Longitudinal Study of American Youth for this study of secondary students. Beyond the expected effects of gender, socioeconomic status, reading ability, and prior achievement, homework effects were found for mathematics achievement; and homework and assessment format effects were found for science achievement.

bkg, ach, asm, chs, ped (SE)


Examines whether children's television cartoons portray male and female characters using science and technology in a different manner. Findings indicate that most characters were male and were often depicted using science and technology, usually while being aggressive; however, female characters were depicted as pro-social and using science and technology for the greater good of others.

gen, nas, nfd, mat (GEN)


Examines experiences of university students in an outreach program designed to teach science and foster positive attitudes toward science in younger children. Reports positive responses from teachers and children.

ntw, ats, att (EL, PS)


Data from the National Education Longitudinal Study of 1988 were used to identify factors related to gender differences in tenth grade science performance. Findings emphasize the importance of active classroom involvement as a way of promoting gender equity.

gen, eqt, ped, lab, ach (HS)


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.

tpd, gen, eqt (TE)


Reports on the use of a survey to assess college science classroom learning environments. Recommends that college science instructors carefully examine their instructional techniques in light of decreased enrollment in such courses.

bkg, ped, CNS, ats (PS)


Describes a joint venture between the Centre National de la Recherche Scientifique (CNRS) and the Department of Education in France that was created to allow students to do practical scientific work with the help of a CNRS researcher. Concludes that this increases students' interest in chemistry.

ntw, res, ats, che (HS)

Describes the perceptions of inservice special education teachers (n=16) who tried STS instruction with their students. Teachers reported an increase in student behavior, motivation, and critical thinking and an increase in teacher motivation to cover science.

**sts, ats, att, tpd (TE)**


Examines whether the reading levels of state-adopted science textbooks at the high school level are consistent with their intended reader levels. Finds that four of five chemistry textbooks had reading levels beyond high school, while biology textbooks fared better but not as well as the physics and physical science textbooks, which were on grade level for all but one analysis.

**mat (HS)**


Investigates the effects of science students’ domain specific knowledge and language proficiency on local lexical and syntactic processing and on semantic and higher conceptual processing of biology texts written in the students’ first and second languages.

**lrg, nce, mat, knr, bio (PS)**


A study of the Types of Preferred Examinations (TOPE) in secondary school science students was analyzed according to school type and gender. Findings show students prefer written, open book, unlimited time examinations while teachers, though aware of student preferences, continue to use traditional written, time limited examinations.

**asm, ats, att (SE)**


Surveys of predominantly Asian students in college preparatory chemistry classes examined their views of themselves as scientists and readers and writers of science material. Results indicated that gender was related to students’ views of themselves as scientists and writers of science. Family and extracurricular science activities were powerful influences.

**bfs, bkg, gen, che, car (PS)**


Describes a study conducted in the United Kingdom that assessed recall and comprehension scores of elementary and secondary school children following the viewing of two prime time science television programs. Predictor variables including age, sex, linguistic fluency, prior television viewing, and reading habits were investigated.

**lrg, edt, gen, bkg (K-12)**


This survey examines the relationship between science interest and variations in the causal universe within college students’ worldviews. The results indicate that science interest correlates with a logico-structural worldview.

**lth, ats (PS)**


Discusses how traditional lab exercises can be converted into investigative exercises. Describes an
exercise on seed germination that has students design their own experiments based on their initial results. Involves students in the scientific process and allows them to experience the joys and disappointments of experimental work.

lab, inq (PS)


Examines key influences on science teaching and teacher education since 1955. Suggests a new paradigm for elementary science teacher education. Presents a case for three theoretical constructs that can inform policy and programs in science teacher education: constructivism, reflection, and professional community.

phe, tpd, ref, cns, nw (TE, EL)


Presents case studies of the authors’ experiences in attempting to improve their science teaching at the elementary level. Important factors in changing science teaching were identified as personally recognizing and committing to change; and receiving and providing support throughout the professional development.

att, ntw, tpd (TE, EL)


Describes a Brazilian project that aimed to improve the standard of science education in primary public schools through computer assisted learning. A neural network to analyze secondary students’ models of local environmental problems is presented.

cli, rem (SE)


Reports that teachers (n=6) in secondary science classrooms dominated discourse in the role of questioner. Sixty-one student cognitive questions and twelve teacher responses were identified in the data. Eight of the twelve teacher responses appeared to restrict student participation and result in student silence.

cid, skt, att (TE, SE)


Compared two experimental teaching strategies (hierarchical knowledge structuring and semantic networking) with traditional worksheet approaches used in (German) fourth grade classes studying the mallard’s adaptation to its environment. Findings showed no significant effect favoring the experimental approaches over the traditional method.

ped, lrg (EL)


A study investigated whether one medical school’s basic science and clinical departments attached differential importance to academic missions of teaching, research, and clinical service.

cur, res, ped, att (PS)


Ascertains the interplay between scientific experiences and participation in school science among girls in the first year of secondary school. Results indicate that girls in science tend to participate in activities which relate to biology and are academic.

gen, att, bkg, bio (SE)

Responses from 209 of 520 Nigerian women in science and technology professions and universities found they typically attended single sex schools, had highly educated parents, had more fathers than mothers in scientific technical professions, received parental and spousal support, and were concerned about combining marriage and career.

*gen, car, bkg (GEN)*


Investigates a museum exhibition design assumption that visitors develop conceptual understanding of a science topic after utilizing a cluster of conceptually related exhibits which lack explicit concept labeling.

*lrg, nfd (PS)*


Describes a project which teamed science teachers with special education teachers to retool science curricular materials for classrooms where inclusion is practiced. Teacher participants began to shift from non-user and self-concerns to student-benefit concerns, and they reported success in using the retooled activities in classrooms.

*chs, cur, cpl, tp (TE)*


Describes an investigation of the associations between students' perceptions of laboratory environment and their attitudinal, cognitive, and practical performance outcomes. Assesses student outcomes in three distinct areas: (1) student attitudes; (2) achievement on a written examination; and (3) practical performance. Specifically in the biology classroom.

*lab, bfs, ach, ats, sks (HS)*


Describes the development and validation of the Cultural Learning Environment Questionnaire (CLEQ) which assesses eight scales of the culturally sensitive environments of secondary school students.

*mce, bkg, asm (SE)*


The effect of humor on retention of information was examined at the planetarium at Ohio's Center of Science and Industry (COSI) in Columbus, OH. Results showed that the visitors who saw a humorous show retained less of the instructional material and scored lower on the test than the visitors who saw a nonhumorous show.

*nfd, lrg, ped (GEN)*


Addresses the most popular models currently being chosen for biological research and the reasons behind those choices. Concludes with a brief examination of the ethical issues involved, and why some animals may need to be replaced in research with model systems.

*rem, res, bio, phe, sts (SE, PS)*


Explores new research about bacteria. Discusses bacterial genomes, archaea, unusual environments, evolution, pathogens, bacterial movement, biofilms, bacteria in the body, and a bacterial obsession.

*res, bio (PS, SE)*

Reports on a pilot study which sought to find out what four-to-eight year old rural Australian Aboriginal children think about night and day. Findings indicate more variations in thinking than were found in earlier research.

eth, alf, kns (EL)


Provides validity evidence for a new instrument that assesses a career related self-efficacy intervention for Hispanic and Latino students. Focuses on the broad area of career decision making and on math and science tasks. Results indicate adequate validity of the instrument, particularly for women and minority students.

asm, car, eth, ats (MS)


Studies the effect of specific teacher input, modified for comprehension, on the acquisition of science vocabulary by a recent immigrant, a 12 year-old newly arrived at an English secondary school. Comprehensible input played an important part in the acquisition of this student's science vocabulary.

mce, cid, ped (MS)


Investigates the use of a hands-on laboratory program for improving student attitudes toward science and increasing student achievement levels in science knowledge. Findings indicated that students who had laboratory instruction scored higher in achievement and showed a positive correlation between attitude and achievement. No significant differences were obtained for the limited English proficiency groups.

hos, ats, ach, lab, ped, mce (K-12)


A survey of Australian scientists revealed that they felt media coverage of their research had significant benefits, but they received little support from their organizations. Examines factors that encourage or discourage scientists to communicate their work through the media. Survey questions and the group monitor guide are appended.

ntw, nas, tec (GEN)


A critical incident approach was used to analyze the discourse which took place during a visit by a class of eight and nine-year-olds to a gallery concerned with food at the Science Museum in London. Data collection, analysis, and interpretation are discussed.

cid, nfd (EL)


This study presents data from a survey of the attitudes of university physics instructors on allowing students access to textbook problem solutions. A detailed analysis of all survey responses is included, as well as implications for pedagogical strategies.

att, mat, ped, phy (PS)


Investigates interlibrary loan use patterns for scientists at SUNY (State University of New York)
Albany by analyzing one year’s worth of filled interlibrary loan requests for journal articles. Highlights include differences among scientific disciplines; year of publication; and sources of citations.

mat (GEN)


Interviews with parents from 50 Mexican descent families revealed that parents encouraged their preschool children to ask questions about science and causal relationships; older and younger siblings learned different skills from one another; and children learned through observation and imitation.

eth, bkg, sks, lrg (EC)


Explores students’ attitudes towards science, prior science-related experiences, and perceptions of science and scientists and how they vary by gender and grade. Findings indicate that girls and boys expressed similar opinions on all survey scales but girls were less likely to view science as a male-stereotyped field.

gen, nas, ats, bkg, bfs. car (K-12)


Although museums are considered optimal venues for informal learning, this study concludes that most school classes visiting museums are restricted and structured, teachers use mainly task-oriented teaching practices, and the museum activities are rarely linked to topics being studied at school.

nfd, lrg, ped (K-12)


Investigates students’ understanding of the transfer of charge between two charged conductors. Findings indicate that a considerable number of students from eighth grade to college in advanced physics courses were unable to predict the transfer of charge correctly from one conductor to another.

phy, kns, alf (SE, PS)


Explores the influences of text structure on students’ conceptual change. Case studies were conducted and results showed that individuals used refutational text to change their alternative conceptions and acquire new concepts. Findings indicate that refutational text does cause cognitive conflict.

ccg, mat, phy (PS)


Reports a study of the quality and extent of understanding of certain well-known theoretical concepts which are held by prospective teachers (n=173) of chemistry in Yemen. Results indicate that teacher understanding ranges from a partial understanding with a specific misconception to no understanding.

alf, knst, che, tpd (TE)


A bibliometric study analyzed the authorship of biology periodicals, “Nature,” “Science,” and “Cell” from 1991 to 1993. The source data consisted of “hot papers” in biology and a sample of articles from the three periodicals. Results showed that the hot papers have more authors and participating institutions, and that funding sources are related to the number of authors.

mat, bio, res (GEN)

Describes an attempt to introduce differentiation by task in an inner city secondary school. Concludes that differentiated work cards lead to no significant improvement in the achievement of lower ability students. High- and medium-ability students improved their performance as a result of using the work cards.

sks, ach, chs, ped (SE)


Explores the effects of an integrated video media curriculum enhancement on students' achievement and attitudes in a high school chemistry course. Findings reveal significantly higher achievement scores for students who experienced the course enhanced with integrated video media.

edt, ats, ach, che (HS)


Explores both the qualitative and quantitative dimensions of pupils' ideas related to conservation during state changes of water. Analysis of questionnaire data indicates that qualitative understanding precedes quantitative.

kns, alf, phy (K-12)


Details the process and results of an action research project that explored children's understandings of why toys move in certain ways. The purpose of the project is to inform tutoring sessions and the classroom practices of student teachers.

kns, phy, tpd (EL, TE)

Reports on a study designed to assess the perceptions of principals, teachers, superintendents, science supervisors, and science education leaders (n=628) about the role of the science education expert. Findings indicate that the role of the science supervisor has emerged as a key element in the discussion of secondary science education.

**ntw, bft, ref, tpd (EL, SE)**


Investigates which factors are important in revising chemistry laboratory experiments to enhance student interest and enjoyment of experimental science. Findings indicate the importance of several factors including varied content, real-world connections, items from outside the student’s usual range of experience, well-paced experiments, error-free procedures, easily mastered manipulations, social factors, and a positive atmosphere.

**lab, ats, ped, che (PS)**


Presents some results of the SCI-LINK teacher professional development program. The SCI-LINK summer institutes allows teachers to work with scientists to learn about current research and develop curricula for their classrooms. Teachers involved indicated increased self-confidence, development of new teaching ideas and practices, and development of previously unsuspected leadership abilities.

**ntw, tpd, cur, res (TE)**


Investigates the effect of explicit problem-solving instruction on high school students’ (n=145) conceptual understanding of physics. Findings indicate that the explicit strategy improved the quality and completeness of students’ physics representations more than the textbook strategy.

**pbs, ccg, phy, ped (SE)**


Finds that the math and science personal teaching efficacy and outcome expectancy beliefs of preservice elementary teachers showed significant increases after participation in an integrated, hands-on methods course designed according to constructivists philosophy. Results were consistent over two semesters.

**bft, tpd, hos, int. cns (TE, EL)**


Investigates changes in preservice teachers’ conceptions about projectile motion brought about by a combination of reading and demonstration and appeal to usefulness. Results indicate the effectiveness of a combined Demo-Text condition on immediate posttests and effectiveness of text in producing long-term change.

**ccg, tpd, knr, ped. mat (TE, EL)**


Examines the effectiveness of using questions to facilitate processing of diagrams in science texts. Finds that questions about illustrations do not facilitate learning.

**mat, lrg (PS)**


Explores the problems that a national strategy for the professional development of science teachers
attempted to address and reports on the theme of "loose connections" that emerged. Discusses implications for a national professional development strategy.

**tpd, ref (TE)**


Synthesizes the results of three case studies of middle school classrooms in which computer and video materials were used to teach topics in earth and space sciences through interactive simulations.

**edt, lrg, esg (MS)**

Jackson, David F.; et al. (1997). *Internet resources for middle school science: Golden opportunity or "Silicon Snake Oil??* Journal of Science Education and Technology, 6(1), 49-57.

Reports on a study that examines the experiences of six teachers at three schools in learning about and beginning to implement or enhance project-based learning in their middle school science classrooms using a variety of resources available on the Internet.

**edt, ped, tpd (TE,MS)**


Describes the Agricultural Research Service Science Education Collaborative (ARSC), a project aimed at making the U.S. Department of Agriculture's research labs more accessible to the educational community and encouraging students to consider careers in science. Presents a case study of a teacher in the project and discusses the impacts of the partnership.

**car, ntw, tpd, res (GEN)**


Examines contextual factors that influence what students deem interesting and important by examining what teachers signal as interesting/important in their classroom discussions and assessments. Reveals that the valuing system within three classrooms varied in noticeable ways.

**bft, bfs, cid, bkg (HS)**


A discussion of differential item functioning (DIF) in the context of attitude assessment is followed by examples involving the detection of DIF on an attitudes toward science scale completed by 1,550 elementary school students and the finding of no DIF in a workshop evaluation completed by 1,682 adults.

**ats, asm (AD, EL)**


A group of 132 agricultural science students were divided into an experimental group, who completed hands-on activities on Ohm's Law and incline plane, and a control group who completed worksheets. There were no significant differences in immediate or follow up measures of achievement.

**hos, lrg (HS)**


Analyzes the length of spontaneous reasoning chains exhibited by pupils in primary and early secondary schools. Findings indicate that the reasoning chain lengths may make it difficult for students to handle parts of the science curriculum that involve multi-step reasoning processes.

**pbs, sks, lrg, cur (EL)**


The Young Scholars Program at The Ohio State University is a 6-year pre-collegiate intervention program designed to prepare academically talented,
economically disadvantaged minority students for college education. This study describes the success of this effort to reshape the traditional presentation of agriculture.

eth, eqt, sks (SE, PS)


Notes that few counseling psychologists publish research after obtaining their doctoral degree. Investigated predictors of research productivity and science related career goals in doctoral students (n=267) from 15 counseling psychology programs.

car, ats, res (PS)


This paper analyzes a short discussion between several elementary students during a science activity. The interaction between language and science learning is discussed relative to different theoretical perspectives, in addition to classroom implications.

cid, lth, ped (EL)


A study using accreditation data, institutional self studies, and accreditation site visit reports on 59 medical schools explored the extent to which the schools have established institutional and departmental educational objectives.

cur, asm (PS)

Draws from studies in the sociology of scientific knowledge to create a new perspective for understanding school science. Merges ethnography and discourse analysis to study science-in-the-making in a physics classroom. Investigates local conceptual ecologies.

cid, phe, nas (EL)


Specifies some of the conflicts in philosophies, values, and priorities regarding scientific knowledge present in the development of science education curriculum standards through the use of the “Science for All Americans project.” Excerpts interviews to identify key issues.

cur, phe, ref, nas, lit (GEN)


Whether differences in mean scores among gender and racial/ethnic groups on science performance assessments are comparable to those for traditional tests was studied with 2,000 students in grades five, six, and nine. Overall, results suggest that the type of test has little effect on these differences in scores.

eth, gen, sks, asm, ch (MS, SE)


Children’s activities related to science, nature, and technology were studied via structured interviews of parents and students in pre-school through upper-elementary grades. Describes how interviews were developed, what type of information was obtained, and lessons learned.

nfd, sts, lrg, res (EC, EL)

Examines the types of requests for information made by university students (n=60) as they evaluate scientific news briefs. Student requests most often focus on how research is conducted and why results might occur.

Lit, mat, res, kns (PS)


This report presents data from interviews with curriculum developers/textbook authors to offer insights into the gap between objectives of the National Policy on Education and the development of more meaningful and relevant school science materials.

cur, mat, ref (K-12)


Describes the Fifth Grade Roadkill Study that was designed to make students aware of the types of animals, chiefly mammals, that live in the central piedmont area of North Carolina. Involves students taking a survey of roadkills.

res, ped (MS)


This study assessed 73 preserve elementary teachers’ attitudes toward public school choice and science education. Survey data indicated that they moderately supported public school choice, perceived it as a means of improving student science performance and program competitiveness, and perceived parental choice favorably.

att, ref (EL, TE)


Presents research founded on a socio-ecological approach to environmental education that includes individual and structural aspects of environmental awareness and problem solving. Presents one instrument used in discussions with teacher teams.

ene, pbs, ped, tpd (SE)


This study examines the effectiveness of teaching university courses to high school science teachers via a software conferencing system. The study also assessed attitudes, learning outcomes, and interactions between participants and instructors.

edu, tpd, ntw (TE)


Gives historical account of research and practices associated with precollege science laboratories. Described three social contexts of research on science laboratories: separation, interaction, and partnership. Argues that more partnerships are needed to continue improvement to the science laboratory.

lab, his (K-12)


The labor market for college graduates in Europe is better for than for non-graduates. However, economists, engineers, and natural scientists fare better than humanities and social science graduates. Temporary positions are increasing among entry level workers.

car (PS)


; ;
Examines learning in science concepts, process, application, creativity, attitude, and world view of students participating in the Iowa Scope, Sequence, and Coordination (SS&C) project, part of the national reform effort using the STS approach and constructivist teaching practices.

Ref, sts, cns, lrg, ats, sks (MS)


A study compared student learning in two sections of an introductory college biology course for nonmajors. Groups were taught in the traditional teacher centered, lecture/laboratory format (n=86 students) and in a student centered constructivist format (n=98). The latter group performed significantly better on the same tests, maintained a better attitude throughout, and enjoyed the course more.

cns, ped, lrg, ats (PS)


Finds that preservice teachers in science/mathematics, mechanics/fine arts, and allied health/physical education fields scored significantly higher on spatial ability tests than preservice teachers in history/social studies and English/humanities fields. Gender differences were not significant in the higher-scoring majors.

chs, sks, gen (TE)


Describes a project to recruit and retain minority students as preservice science teachers. Successes and modifications are discussed, and implications for similar efforts are given.

tpd, eth, eqt, car (TE)


Describes a Computer-Assisted Instruction (CAI) package covering biology concepts for an entire school year and evaluates the effect of this CAI on learning. Findings indicate positive effects of CAI on achievement and attitude.

cbi, ach, ats, bio (HS)


Reports on a project where 25 preservice and recently-inducted science teachers analyzed materials of Project 2061 and the National Science Education Standards, created an evaluation instrument, and developed and analyzed teaching units.

asm, mat, ref, tpd, cur, ped (K-12)


Uses interviews and a written questionnaire to probe students’ ideas on the origin of earth and life on earth. A significant number of commonly held misconceptions were prevalent in the sample (n=493).

alf, elo (EL, SE)


Describes an ethnographic investigation of nine science teachers’ use of analogies during instruction. Found that the teachers studied did not have adequate knowledge of the functional or cognitive use of analogies in their classrooms. Implications for teacher education are discussed.

ped, cid, tpd (TE)

Biological aging courses should be taught to nonmajors, whose mixed backgrounds require appropriate strategies such as alteration of content order, decompartmentalization, and relating material to social sciences. Appropriate textbooks should be understandable without a science background and integrate the topic with other disciplines.

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Describes a series of science programs that involve university students, elementary students, and their parents in hands-on science activities. Conclusions are based on qualitative data collected from observations of the cooperative groups formed by the participants.

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Examined the performance of middle school students with learning disabilities (n=86) or without (n=39) on the Science Appraisal Battery. Regular education students outperformed students with learning disabilities on all portions of the test and on both verbal and hands-on questions.

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Trials an analysis of engineering reports using a modified version of Gosden’s (1993) analysis of the science research article. Using Hallidayan sociolinguistic concepts, the analysis demonstrates how engineering writers linguistically convert real world entities and processes into non real world concepts.

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Medin, Douglas L.; et al. (1997). **Categorization and reasoning among tree experts: Do all roads lead to Rome?** *Cognitive Psychology, 32*(1), 49-96.

Results of two experiments concerned with categorization among different types of tree experts (4 taxonomists, 10 landscape workers, and 10 park maintenance employees in the first experiment and a subset of these experts in the second) show a pattern of similarities and differences.

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Describes research conducted with student teachers of elementary and secondary science education. Analyzes and compares the preservice teachers’ conceptions of science with their classroom practices when teaching a science lesson. Results indicate that there is no correspondence between student teacher conceptions of the nature of science and classroom practice.

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Focuses on one target group of seventh grade science students (n=19) who are working to achieve consensus and a coherent explanation of light and shadow effects. Articulates the beginnings of a framework for consensus building with inquiry discourse.

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Part One of this article presents empirical results of students’ epistemological conceptions of laws, hypotheses, theories, and models. These results are discussed in relation to research results from different recent publications. Part Two gives an outline and analysis of a two-year program for teaching epistemology in a physics course.

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Describes the development of a revised Scientific Attitude Inventory (SAI II). Reports on a field test of the revised instrument. Concludes that the revised instrument is a significant improvement over the original.

ats, asm (K-12)


Determines the impact of a literature-based program integrated into literacy and science instruction on achievement, use of literature, and attitudes toward the literacy and science program. Finds that literature/science group children scored better on all literacy measures than literature only group children, who scored better on all measures than control group children.

int, ach, ats (EL)


Presents two studies that explore the connection between students' language use and how they participate in small group science activities. Describes the range of language used by groups of students while working with materials in several elementary science classrooms. Also examines how students use language in small groups to discuss, clarify, and build knowledge about the task at hand.

cid, cpl, lth (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. Results supported performance portfolios as a valid method of assessing desired abilities of preservice teachers that can be reliability graded.

asm, tpd (TE, EL)


This study found significant relationships between ability and four student attitudes toward science. Students of high ability rated science as valuable, understandable, and easy; whereas, students of low ability rated science as important.

ats, chs, sks, gen, eth (K-12)


Investigates preservice elementary teachers' responses to a concept attainment task using videodisk pictures and line drawings. Findings indicate that students using videodisk pictures used inferences to construct patterns while students using line drawings in connection with pictures significantly made more observations and developed fewer ideas to make viable patterns.

edt, lrg, knl (TE, EL)


Emphasizes the importance of integrating qualitative and quantitative research methodologies in science education. Reviews literature in areas relevant to science education to show that researchers are far from advocating qualitative research as the only methodology.

res (GEN)

Nichols, Sharon E.; Tippins, Deborah; Wieseman, Katherine. (1997). A toolkit for developing

Reviews research and details authors’ experiences using portfolios, journals, cases, learning maps, stories re-told, metaphors and proverbs to engage prospective teachers in the process of self-reflection and evaluation.

tpd, res, skt (TE)


This report summarizes the results of the responses to a survey to identify the effects of role models on the career choices of women in technology-related professions. Implications for teacher and science professionals planning instructions are discussed.

car, ntw, gen, tpd, tec, eqt (ALL)


Describes the development of the Science Outdoor Learning Environment Inventory which includes seven scales. The instrument was used by high school students (n=643) and the results indicate that the instrument is a sensitive measure that differentiates between various types of field trips.

fsd, asm (HS)


Analyzes the main events that characterize the development of environmental education in Malta. Focuses on three major evolutionary stages of that development: (1) the awareness stage; (2) the fragmentary stage; and (3) the coordinated stage.

ene, cur, his (K-12)


Explores whether older students were less ready to change their alternative conceptions than younger students. Findings indicate that after reading a refutational text, conceptual change occurred in 35% of year six students and 44% of year 10 students. Concludes that there was no evidence to suggest that conceptual change is more difficult for older students.

alf, ccg, phy (SE)


Investigates preservice science teachers’ views of the nature of science and describes changes in those views during a teacher education program.

bft, nas, ccg, tpd (TE)


Investigates students’ causal beliefs about the relationship between variables in an electric experiment and the degree to which their tendency to make either idea-based or evidence-based statements depends on a prior belief about the causal efficacy of that variable.

kns, phy (MS)


Presents a student’s eye view of science education. The views emerged from a three-year research and evaluation study carried out at the Manchester Metropolitan University in England that involved preservice primary teachers.

tpd, att (TE, EL)

Reports on an ethnographic study of laboratory sessions in the departments of Physics and Chemistry at the University of Natal in Durban, South Africa, with specific focus on the comparison of the function of verbs in three first-year laboratory manuals.

lab, mat, lit (PS)


Investigates black high school females’ images of scientists. Descriptions of the scientist differed with the ethnicity ascribed to him or her, and these differences corresponded to the cultural orientation—the dominant culture or the African-American culture in the United States.

eth, gen, nas, bkg, car (HS)


Describes a study that investigated the role of a design context for developing children’s understanding of science as the construction and revision of models. Results indicate that as early as the first grade, children’s model-evaluation skills may be quite amenable to development.

rem, sks, nas, lrg (EL)


Used computerized simulation models of qualitative, conceptual problem solving and quantitative problem solving to examine qualitative physics knowledge acquisition during textbook based physics training.

cbi, pbs, kns, lrg, mat (K-12)

Pole, Christopher J.; et al. (1997). Supervision of doctoral students in the natural sciences:


Interviews with doctoral students and supervisors in physics, mathematics, and engineering attending nine English universities investigated student expectations of doctoral supervision, extent to which expectations were met, and the ways in which supervision changes as the doctoral process progresses.

ats, car, ntw (PS)


A survey of 50 students (grades 4-11) returning to a gifted summer program provided several suggestions for regular schools. Suggestions included curriculum related field trips, serving individual student interests, use of college campus facilities, flexible school policies and teacher planning, hands-on science and technology, and opportunities for gifted students to work together.

chs, hos, ats, cur (K-12)


This study examined how prior knowledge and experience influenced first career and second career beginning science teachers' curriculum and classroom instruction. Observations and interviews indicated that teachers compromised their beliefs about good content and became similar by the end of the year.

cht, kn, ped, bft, bkg, cur (TE)


Explores the language used by teachers to denote various forces and investigates possible misconceptions they might hold about force and motion. Results indicate that biology and chemistry specialists hold the most misconceptions.

alf, kn, phy (SE)

Examines a cross-section of craft knowledge and research-based literature of science learning beyond the classroom. Describes informal science education programs, and discusses implications for science teaching, focusing on the importance of informal science learning for children and in-service and preservice teachers. Proposes a model for enhanced science education and policy change.

*nfd, lrg* (EL, TE)


Assesses the effectiveness of using pop quizzes and rewards to improve student retention of the nitrogen cycle. Students able to diagram the N-cycle on pop quizzes were rewarded with special cards that included the N-cycle. These cards could then be used on subsequent tests. Three months later, 6 of 11 students retained the information.

*ped, lrg* (PS)


This study surveyed over 700 participants about global environmental issues/problems. Participants ranked air quality and hazardous substances as the most important problems and energy shortages and mineral resources as the least important.

*bfs, bft, sts*, ene (SE)


A study of the processes by which grade-12 Australian physics students (n=24) brought order to their observations and practices shows that the phenomena students construct from their laboratory work (not always accurate) develop from connections among the embodied practices of language and physical action, their world, and social relations.

*cns, lth, cid, alf, bkg* (HS)


Explores why students fail to learn from teacher demonstrations in a physics course. Reports that six dimensions may have prevented student learning, including lack of a theoretical framework to separate signals from noise, interference of discourses learned in other contexts, and problems in piecing together coherent representational frameworks.

*ped, lrg, cid, lth, rem* (SE)


Presents a study that analyzes an extensive database consisting of the written and oral discourse of students (n=23) as they described their thoughts on ontology, epistemology, and sociology of scientific knowledge.

*cid, phe, nas, bfs* (SE)


Interviews with 20 engineers revealed that their approach to technological problem solving bore little resemblance to the model of “problem solving through technology” in the Alberta elementary science curriculum. Engineers emphasized the importance of context and previous experience in making decisions about each unique situation, whereas the school program suggests a sequence to be used in all contexts.

*pbs, cur, tec, bkg* (EL)

Investigates the influences of teachers and schooling on 35 research scientists. Results indicate that 63% of the subjects had identified a genuine interest in science by ninth grade. Only 9% of them attributed this to elementary or junior high teachers while 43% were influenced by one or more high school teachers.


This report describes a five-year action research project to examine the critical decisions that helped students in a science teaching methods course to gain confidence in using the STS instructional strategy.


The role of research in designing ScienceWorks, an innovative gallery at The Children's Museum of Indianapolis, is described. The gallery was constructed on the basis of existing and new research on how children think and learn about science.


By evaluating her use and delivery of praise, an elementary teacher discovered that its quality, not quantity, had the most impact on students. Teachers can increase the positive effects of praise by praising sparingly but carefully, directing it to students who respond well to it, and ensuring contingency, specificity, and credibility.


This study proposed to determine if time-based, learning-associated visitor behaviors at interactive science museums differ across weekend/weekday groups and family/nonfamily groups. Results separate weekday visitors into two distinct groups: family visitors spent more time per exhibit than did nonfamily visitors.


Describes four chemical terms that students with well-considered reasons use in ways that are not accepted in chemistry. Senior high school students completed a series of multiple choice tests while other groups of students participated in discussions about the problem situations.


Finds that nature as a theme is completely absent in 80% and the outstanding theme in only 1.7% of television programming; not only less frequent, but
separate from the dominant themes in prime time; and treated as a sociopolitical "issue" (like "politics," "science," "religion," and "education").


Describes the study of a science performance assessment with 96 English Language Learners (ELL) in five high school science classes investigating the face, construct, and consequential validity of an intersection. ELL spelling and syntax on some responses were significant sources of error. Recommendations included.


Uses metaphorical analysis to determine whether or not Max Planck invented the quantum postulate. Demonstrates how metaphorical analysis can be used to analyze the rhetoric of revolutionary texts in science.


Compares the nature of student thinking in confirmation and open-inquiry laboratory activities. Reports that student thinking processes exhibited in confirmation laboratories emphasized procedures and techniques, whereas student thinking in open-inquiry laboratories emphasized data analysis.


Describes the development and testing of a Professional Development System (PDS), created in response to the need to evaluate the Science: Parents, Activities and Literature project. The PDS provides systematic and comparable evidence about curriculum planning, classroom teaching, and leadership that can be used to clarify constructivist practice and document professional growth.


Explores students' conceptual understanding and conceptual growth in classical mechanics in the natural context of a Grade 10 science classroom. Findings indicate that students' knowledge structures remained stable for 10 weeks and unchanged for four weeks after instruction ceased.


Describes a simulation done by students in a Year 4 undergraduate physics laboratory course on pulse technology. Results showed that the microcomputer simulated experiments made for a more comprehensive understanding of the multi-channel laser system.


Summarizes a study to determine effects of the Integrated Activities Learning Sequence (IALS) instructional approach on fourth graders' science, mathematics, and writing achievement; to discover teachers' and students' attitudes toward this approach; and to determine if non-science elementary teachers could develop science instructional materials.

Discusses the use of portfolio assessment strategies for more lengthy, complex, and authentic student assessments. Reports on an investigation to determine the effectiveness of portfolio strategies. Concludes that portfolio assessment procedures enhance conceptual understanding and attitudes towards learning and evaluation in the college science classroom.

Song, Jinwoong; et al. (1997). Exploring the parallelism between change in students' conceptions and historical change in the concept of inertia. *Research in Science Education*, 27(1), 87-100.

Investigates students' (n=736) conceptions of inertia and compares these conceptions with historical changes in the concept. Findings indicate considerable similarities as well as dissimilarities between students' conceptions and the views of past scientists.


Compared Introductory Physical Science (IPS) and Modified approaches to teaching physics concepts. Found that students' preinstruction ideas of matter and density were organized in commonsense theories that constrained understanding of density.


Investigates student teachers' understanding of science and their ability to learn what was needed when it was required for teaching purposes. Findings indicate that half the students were able to prepare themselves adequately through independent research with guidance although their initial background knowledge of science was weak.

Song, Jinwoong; et al. (1997). Exploring the parallelism between change in students' conceptions and historical change in the concept of inertia. *Research in Science Education*, 27(1), 87-100.

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Reports on an exploratory study of how people see and explain a prominent exhibit (Tornado) at an interactive science museum (the Exploratorium). Data was assembled using a novel, technically mediated activity system (Video Traces).


Uses a qualitative approach to uncover a teacher's thinking process during planning and to depict a more holistic view of the structural complexity of teacher cognition during lesson planning.


Describes a study to investigate how effectively concept mapping can be used to focus children on their own learning in science and to provide a way of describing their own achievements. Findings indicate that some children were able to identify specific targets for future learning. Motivation and metacognition were the main areas of benefit.

Stratford, Steven J. (1997). A review of computer-based model research in precollege science

Covers research conducted within the past 10 years on the topic of using computer models and simulations to aid science instruction at the precollege level. The research is categorized into three main areas: (1) students running preprogrammed simulations; (2) students creating dynamic models using modeling environments; and (3) students using programming environments to create simulations.


Reports on the Montana Educational Telecommunication Network established to connect early career teachers in rural Montana with mentor teachers. Participants reported high levels of satisfaction with the program and showed ample evidence of professional development and collaboration. Recommendations are given.


Reports and discusses observations of three confident, experienced teachers organizing investigative science in their classrooms. Teachers wore microphones so that recorded data coupled with field notes formed a concise record which could be discussed with the teachers.


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


Details the findings of action research carried out by preservice teachers to ascertain children’s (n=418) notions of animism and differentiation between living and nonliving things. Ninety-nine percent of children correctly classified animals as living, 80% correctly classified plants as living and inanimate objects as nonliving, and only 56% classified embryos as living.


Compares collaborative problem solving by learners sitting side by side with computer mediated learning at a distance. Three aspects are studied: high school students’ problem solving strategies and interpretation of the teaching situation; their use of components of the situation; and the cognitive processes involved in understanding domain knowledge, energy in physics.


Explores student-scientist partnerships (SSPs) that help students gain a unique understanding of both the content and the process of science. Discusses the potential of SSPs, the range of SSP activities, a strategy for national impact, the educational importance of SSPs, the research importance of SSPs, and technology as a facilitator.


Investigates students’ (n=277) performance and the effects of pre-training on tasks rated high in ambiguity, in particular those where the solution to
the tasks cannot be arrived at through predictable algorithms.

pbs, sks (K-12)


Studies the effect of V-Scope activities on the performance of 11th-grade students in analyzing kinematics graphs. Results indicate that the V-Scope kinematics laboratory activities can promote kinematics concepts and graphing skills.

edt, lab, sks, phy (HS)


Reports on a study which addresses the implications of instructional strategies that are used to create cognitive disequilibrations in order to achieve conceptual change. Discusses several difficulties in the application of such conceptual change strategies.

ccg, ped (SE)


Presents a study designed to determine which particular aspects of pregnancy, birth, and babies were of most interest to 8-year-old children. Children were interested in details of a baby's behavior and development as well as the impact of its arrival on the parents. There were distinct gender differences in those topics which particularly interested boys and girls.

ats, bio, cur, gen (EL)


The effects of the integration of art and science through instruction in computer art graphics on learning geology were studied with 53 college students and 189 comparisons in the same geology class. Results indicate that building representations of scientific concepts through computer art may improve students' achievement.

int, rem, lrg, edt, csg (PS)


Describes the use of supplemental instruction in an introductory chemistry course designed for freshman nursing students and explores its impact on student performance and response to the program. Results indicate a positive impact of supplemental instruction and its popularity with students.

ped, ats, ach, che (PS)


Reports a study that investigated gender equity in science education based on a random national sample of over 12,000 ninth graders in 51 rural and urban Chinese provinces.

gen, ach, eqt (HS)


Explores the involvement and professional growth of a teacher in a professional development project entitled "Simply Science." Findings indicate an increase in the teacher's pedagogical content knowledge and confidence in teaching science and a change in her views about cooperative learning strategies.

knt, ped, cpl, tpd, bft (TE)

Watts, Mike; Barber, Brenda; Alsop, Steve. (1997). *Children's questions in the classroom*. *Primary Science Review*, 49, 6-8.

Presents accounts from primary teachers as they worked towards fostering questioning. Techniques included providing good stimuli for questions, having students share thoughts in groups of increasing size, and modeling good questions and question-asking.

ped, cid, skt, sks, cpl (TE)

Watts. Mike; Gould, Gillian; Alsop, Steve. (1997). *Questions of understanding: Categorizing pupils'

Explores the extent to which student questions are indicative of understanding as well as strategies for encouraging questioning. Student questions are categorized as consolidation questions, exploratory questions, and elaboration questions.

kns, skt, ped, tpd (K-12)


The 1993 Survey of Science and Mathematics Education, involving a national probability sample of 1,250 U.S. schools and 6,000 teachers, probed the status of science and mathematics education as they relate to National Council of Teachers of Mathematics and the National Research Council's standards.

ref, ped, bft, cur (K-12)


A nine week course attempted to develop the interpersonal, transferable, and management skills of animal science students through team exercises. It was successful in improving most of the 23 skills, but made little or no change in working to schedule, listening, or absorbing spoken information.

sks, ped, cpl (PS)


Four observations of 16 agricultural science faculty at work showed that classroom discourse was predominantly at lower cognitive levels. Classes of 51 or more had the fewest higher level thinking opportunities and 400 level courses had the greatest.

cid, lrg (PS)


Poses some questions and practical answers to help teachers and students use computers effectively in science classes. Sample questions include: Does the increased use of computers in classrooms inhibit any student's progress toward scientific literacy? and, How do males and females respond differently to computer use in science classrooms?

edt, lit, gen, lrg (PS)


Examines student and teacher perceptions about the purpose and effectiveness of laboratory work at Year 10. The views of students and their teacher on the goals, conduct, and assessment of laboratory work were compared. Findings suggest that the relevance of laboratory work to everyday life could be made clearer to students.

lab, bfs, bft, ped, cur (HS)


Describes an innovative teaching project that was implemented for training technology teachers in Australia. Presents a rationale for using a problem-based learning collaborative methodology in technology teacher training.

pbs, tec, cpl, ped, tpd (TE)


Describes a study that examined the relationships in achievement between members of dyads who were paired according to epistemological maturity. Also examines the relationship between individual students' epistemological maturity and their understanding of photosynthesis.

cpl, ceg, kns, phe, bio (PS)

Evaluate effects of an outdoor "hands-on," cooperative science laboratory on seventh and eighth grade students' environmental knowledge levels and science processing skills. Results support involving students in lab work allowing them to test hypotheses, conduct experiments, analyze data, and generate conclusions.

**fsd, hos, sks, ene, kns, lrg (MS)**


Examines student discourse in both small and large contexts. Concludes that two forms of discourse (constructive and generative, dialectic and persuasive) effectively promote progressive discourse and thereby facilitate shared coherent explanations of phenomena.

**cid, cns (SE)**


Examines a report, The Assessment of Performance in Design and Technology, that attempts to assess problem solving abilities in the field of design. Describes pilot projects, an extended project, and some test projects. Summarizes a research project on identifying when and where design appears in the school curriculum.

**pbs, tec, cur, asm (SE)**


Reports on research which identifies factors, both inside and outside the curriculum, that influence students in choosing whether or not to continue with science.

**ats, bkg, cur, car (K-12)**


Describes studies that utilized questionnaires and interviews to explore the factors affecting the career choices of students. Reveals differences between scientists and non-scientists with regard to their preferred learning styles and relates these differences to career choice and self-perception.

**cul, car, lsy, bfs, bkg (SE)**


Describes how technological capabilities such as calculation, imaging, networking, and portability support a range of pedagogical approaches, such as inquiry based science and dynamic modeling.

**edt, ped (EL)**


Reports a study that tracks the changes in children's ideas about science and scientific concepts through the use of interviews and questionnaires. Students responded to seven questions about science learning, scientists, and their future relationship to science.

**bfs, nas, lit, car (EL)**


Compares student perceptions of their physics teachers' interpersonal behavior and teachers' self-perceptions of their behavior and their opinions about physics education in 1984 and 1993. Results indicate that teachers were more in favor of realistic teaching content in 1993 than in 1984 and behaved less dominantly and more cooperatively in 1993 than in 1984.

**bfs, bft, phy, cid (SE)**

Presents a study that examines the beliefs of teachers (n=24) and their interpretations of a two week summer institute intended to change their treatment of scientific knowledge and assessment strategies at the classroom level.

**bft, ceg, tpd, asm (TE)**


Compares science examination preferences of college students and faculty in Israel and the United States. Findings indicate American students prefer traditional written examinations more than their Israeli counterparts, and there exists significant differences between students’ preferences and that of their faculty.

**cul, asm, ats, att (PS)**


Explores student performance in chemistry examinations on items that require higher-order cognitive skills (HOCS) or lower-order cognitive skills (LOCS). Findings indicate that students performed considerably lower on questions requiring HOCS than on those requiring LOCS.

**asm, sks, che (SE)**


Reports on the metaphors used by nine science supervisors to describe their supervisory functions. Findings indicate that the metaphors cohered into four distinct categories whose functions exemplify the supervisory models of manager, caregiver, politician, and colleague.

**att, tpd (TE)**


Describes the comments of nine inservice science supervisors who viewed a videotaped lesson taught by a novice biology teacher. Open-ended interviews with the supervisors revealed that while they preferred activity-centered instructional methods, their pedagogy was still essentially a traditional transmissive pedagogy.

**ped, tpd, ref (TE, HS)**
Articles Published in 1997

Journals Searched

Academic Medicine (1)
Action in Teacher Education (1)
Alberta Journal of Educational Research (1)
American Biology Teacher (4)
American Educational Research Journal (1)
Applied Linguistics (1)
Applied Measurement in Education (1)
Assessment & Evaluation in Higher Education (1)
Australian Science Teachers' Journal (1)
Biochemical Education (2)
Clearing House (1)
Cognition and Instruction (2)
Cognitive Psychology (1)
Contemporary Education (1)
Counseling Psychologist (1)
Education Evaluation and Policy Analysis (1)
Educational Gerontology (1)
Education in Science (1)
Educational Research (1)
Electronic Journal of Science Education (11)
Elementary School Journal (7)
Environmental Education Research (4)
ERS Spectrum (2)
European Journal of Agricultural Education and Extension (1)
Evaluation Practice (1)
Gifted Child Today Magazine (1)
Higher Education Management (1)
Hispanic Journal of Behavioral Sciences (1)
Innovative Higher Education (1)
Instructional Science (1)
Journal of Agricultural Education (2)
Journal of the American Society for Information Science (1)
Journal of Biological Education (1)
Journal of Career Development (1)
Journal of Chemical Education (1)
Journal of College Science Teaching (7)
Journal of Computer Assisted Learning (2)
Journal of Computers in Mathematics and Science Teaching (3)
Journal of Curriculum and Supervision (2)
Journal of Educational Media (1)
Journal of Educational Research (2)
Journal of Elementary Science Education (2)
Journal of Natural Resources and Life Sciences Education (1)
Journal of Research in Science Teaching (20)
Journal of Science Education and Technology (5)
Journal of Science Teacher Education (16)
Journal of Teacher Education (1)
Journal of Technical Writing and Communication (1)
Journalism and Mass Communication Quarterly (1)
Language and Education (1)
Learning and Instruction (2)
Learning Disabilities: A Multidisciplinary Journal (1)
Library Resources & Technical Services (1)
Measurement and Evaluation in Counseling and Development (1)
Modern Language Journal (1)
Multicultural Teaching (1)
Phi Delta Kappan (1)
Physics Education (1)
Primary Science Review (6)
Reading Psychology (1)
Reading Research Quarterly (2)
Research in Middle Level Education Quarterly (2)
Research in Science Education (10)
Research in Science and Technological Education (8)
Research Papers in Education: Policy and Practice (1)
School Effectiveness and School Improvement (1)
School Science and Mathematics (3)
School Science Review (4)
Science and Children (1)
Science Communication (1)
Science Education (24)
Science and Education (3)
Science Educator (2)
Science Scope (2)
Science Teacher (1)
Studies in Higher Education (1)
Teaching and Change (2)
Teaching and Teacher Education (1)
Vocational Training: European Journal (1)
Research Papers, Monographs, and Electronic Documents Produced in 1997

Lynda C. Titterington, The Ohio State University
Andrea K. Balas, The Ohio State University

This section lists 145 papers, monographs and electronic documents in science education research. The papers and monographs were produced in 1997 and abstracted in the ERIC database by the end of July, 1998. The electronic documents are listed as they appeared on the Internet in September or October, 1998. Some URLs are given as search or index screens when actual document URLs are unwieldy. Each entry is coded (see Key to Codes) with one to three major codes (in bold type) and up to three minor codes, as well as the educational level (in parentheses). All entries are indexed by major codes at the end of the volume (see page 103).


The Challenger Center for Space Science Education uses space exploration as a theme to create a positive learning experience that raises students’ expectations of success; fosters in them a long-term interest in math, science, and technology; and motivates them to pursue studies in these areas. This document is a feasibility report for establishing a Challenger Learning Center in the city of Kenai in Alaska.

tec, esg, ats (K-12)


Reported here are highlights of a year-long evaluation of the influence of “Science for All Americans” and “Benchmarks for Science Literacy.” Data for the evaluation were collected through expert interviews, reviews of state science curriculum frameworks and textbooks, telephone and mail surveys, and case studies of reform activities in six states.

ref, cur (ALL)


This essay reviews the most current data on women’s progress in mathematics and science achievement, attitudes, course-taking patterns, and college majors. The research cited here suggests that the gender gap in science and mathematics in the United States appears at grade ten while internationally the gap appears at grade eight.

gen, eqt, ach, ats, car, cul (ALL)


The purpose of this paper is to specifically demonstrate the effective application of the Internet in teaching biology. Specific strategies include accessing information via the Internet, effective search assignments, rules for appropriate use of the Internet, creating one’s own web page, Internet connectivity, advanced capabilities, and individualizing instruction.

edt, ped, bio (PS, TE)


The report highlights research conducted to uncover what the nation’s students (ages 10-17) think of their science education, how they would improve it, how they think they learn best, and how they rate their parents and teachers regarding science. Data collection included an in-depth telephone survey on attitudes toward science and science (n=1,016).

ats, bfs, ped (K-12)

These conference proceedings address concerns about the research methodology and implications of TIMSS, and encourage innovative and far-sighted exploration of TIMSS resources.

ach, res (K-12)


This report presents the findings of a workshop to discuss international standards and examine why international criteria are difficult to articulate and apply. Three articles define the meaning of standards, the Australian experience with standards, and teacher practice.

cul, ref, cur (K-12)


This article addresses questions of how a teacher can support and facilitate conceptual change in student’s thinking. The focus is on the instructional practices of one teacher and includes: description of her instruction; her learning goals; details on the presentation and analysis of data; and student responses to instruction. It concludes that students in this setting learn science content by creating a community of discourse similar to that of a science community.

ccg, ped, cid, cns (K-12)


This document includes data from the NSF that detail the geographic distribution of the 1993 U.S. research and development spending total ($165 billion). Indicators include doctoral scientists and engineers, science and engineering doctorates awarded, science and engineering graduate students and post doctorates in the statistics tables.

res, car (PS)


This report focuses on science and mathematics indicators at state and national levels. The 1997 report presents new state indicators from the 1995-96 school year and examines trends by state from 1990 to 1996 on indicators of: student achievement; content and instruction; and context and conditions for teaching.

ach, cur, ped, bkg (K-12)


This book represents a collaboration between NRC's Center for Science, Mathematics, and Engineering Education and the NCTM to analyze current reform efforts. It also recommends policies to guide and support reform in mathematics and science teaching and learning.

ref, ped, cur, lit (K-12)


This book presents a broad vision for improving science education. At times it is historical and philosophical, and at other times it is concrete and
practical. It addresses a number of issues that the science education community should attend to as it begins to sail toward a worthwhile destination, achieving literacy for all students.

lit, ref, phe, his, sts (K-12)


This report presents the major results of the NAEP 1996 science, mathematics, reading and writing long-term assessments. These results chart trends going back to the first year in which each NAEP assessment was given: 1969/1970 in science, 1973 in mathematics, 1971 in reading, and 1984 in writing. Trends in average performance over these time periods are discussed for students at ages 9, 13, and 17 for the science, mathematics, and reading assessments.

ach (K-12)


An introductory college astronomy course was restructured along constructivist lines to better foster critical thinking about problems in science. Qualitative student data were collected (interviews, coursework, researcher fieldnotes, and learning journals). Students demonstrated significant diversity in the capacity to apply reflective judgment in the context of science.

cns, sks, pbs (PS)


These conference proceedings include summaries of papers presented at a 1996 National Academy of Sciences symposium to identify and discuss the criteria identified by the Standards for effective science teaching and for effective professional development for teachers of science.

tpd, ref, res (TE)


These findings suggest that mathematics skills obtained by the end of high school have a much stronger association with later earnings than science or writing skills.

sks, car, cur (SE)


This volume, focusing on Student-Scientist Partnerships (SSPs), illustrates the workings and effectiveness of this new paradigm and growing force in science education. Data gathering and sharing is possible and rapid with the help of the Internet and a variety of technologies. Several SSPs are described in-depth. This book provides an understanding of these programs from multiple perspectives and encourages teachers to become involved in similar efforts.

tec, ntw, ref (PS)


This book, written by scientists who are also educators, provides a path to understanding students and helping them grasp the methods of science. The book includes suggestions for having a greater impact in the classroom and provides resources for further research.

ped, tpd (PS, TE)
This book describes the legacy of success of Summer Science Camps which are no longer funded by the NSF. These camps engaged young participants in the process of learning by doing, and encouraged students to think of mathematics and science as disciplines connected with their lives and communities and to construct experiences that promote personal scientific knowledge.

**nfd, hos, sts, kns (GEN)**


This directory focuses on a subset of teacher enhancement projects that engage entire school districts in the reform of science, mathematics, and technology education. Systemic change projects are characterized by a shift in the focus from the professional development of the individual teacher to the professional development of all teachers within the whole school organization.

**tpd, ref (K-12, TE)**


The research was designed to investigate ways in which practical activities can be used to foster links between upper elementary children’s spontaneous concepts and Newtonian mechanics. The conclusions are presented as evidence for describing the group as engaging in scientific dialogue and for inferring solutions to the pedagogical issues raised by this video episode.

**cid, ceg, ped (EL)**


Teaching teams of student teachers and cooperating teachers stressed student involvement in science curriculum development. They worked out a set of learning centers whereby students individually chose which tasks to pursue and which to omit in an ongoing science unit of study. Students achieved...
more optimally when democracy was practiced in the classroom.

cur, ref, bfs (ALL)


Science teachers need to select tenets from the philosophy of education which stress students attaining vital content, abilities and attitudes. In this paper, diverse schools of philosophical thought are discussed in terms of how each might relate to improving the science curriculum.

phe, ref, cur, pbs, ped (ALL, TE)


This report describes how the National Network of Eisenhower Regional Consortia and National Clearinghouse are accomplishing their stated objectives. Each section uses activities in a variety of geographic regions to highlight the services that are provided through the Consortia and Clearinghouses.

nfd, tpd, mat, ntw (GEN)


Conference papers with chemistry education emphasis are investigated. The results indicate that papers with physics content dominate. Chemistry and biology content were addressed at about the same frequency. The chemistry topics covered in the papers include air pressure, equilibrium, atomic theory, and periodicity.

his, che, phe (SE, PS)


This paper addresses the emerging relationship between teams of high school science teachers and ecologists who were paired in a year long collaborative endeavor. The teachers and ecologists agreed on the kinds of benefits exchanged, but rank them differently in importance. Science content learning was an important value derived from this collaboration, more lasting were impact on teachers’ self-perceptions and practice and from the connection to the scientists’ culture. The scientists benefit from teachers’ engagement with their work.

ntw, lrg, tpd (TE)


This paper analyzes a segment of videotape showing a group of upper elementary children discussing data obtained from a practical activity where the data conflict with their intuitive models of motion. The analysis attempts to demonstrate the extent to which the dialogue is an example of “progressive classroom discourse” in terms of the notion of generating new understandings for participants.

cid, lrg (EL)


Columbus, OH: Eisenhower National Clearinghouse. [SE 060 755]

This issue presents 31 resources related to professional development in mathematics and science education. The resources featured in this issue were selected from the existing collection at ENC and can be used in a variety of settings: from self study to group study; in consultation with peers and supervisors; and as part of an inquiry into practice or an action research project.

tpd, mat (TE)

issue of the ENC Focus series. Columbus, OH: Eisenhower National Clearinghouse. [SE 060 754]

The SchoolNet Software Review Project (SSRP) created an evaluation process and with expert teacher evaluators throughout Ohio, compiled a database of results. This report presents the results of the evaluation of 127 mathematics and science software programs. Thirty items were chosen to provide a balanced sampling of reviewed titles in terms of Average SSRP Score, price, and grade level and are presented by emphasizing their availability, abstract, SSRP evaluators' comments, and system requirements.

edt, pbs (EL)


Literature is one of the disciplines that can meaningfully be integrating mathematics and science. One way to think of the connection between children's literature and mathematics is to consider how fictional literature might influence kids' thinking about the issues that are involved in the scientific enterprises. This volume presents resources related to this issue in three sections.

int, sts, mat, ped, tpd (K-12)


The purpose of this document is to describe the evaluations conducted to determine the effectiveness of the VINE Program, and to relate what was learned about the evaluation process and the programs themselves. The focus is on a summative evaluation's questions regarding the impact of the program and whether it is accomplishing what had been intended.

ene, hos, asm (EL)


The results presented here are from a meeting of undergraduate biology departments who receive funding from the Howard Hughes Medical Institute. The discussions focus on assessment; predictors of student success in science; the importance of undergraduate research; career choices; women and underrepresented minorities; encouraging interdisciplinary collaborations; and teacher education and professional development programs for preservice, inservice, and precollege teachers.

cur, car, ntw, tpd, gen, asm (PS)


Teachers need to know how and when to use a variety of strategies for inquiry learning. This publication is intended to furnish K-12 teachers with both research-based rationale and recommendations for effective techniques that can be applied in today's complex and changing classrooms.

ref, inq, ped (K-12)


This literature review discusses good teaching practice and what teachers need to know to be able to teach math and science well. Types of knowledge identified include conceptual understanding, pedagogical content knowledge, and subject-specific beliefs and attitudes.

knt, ped, res, att, bft, skt (TE. K-12)

This paper discusses two issues related to math and science curriculum standards: the allocation of curriculum content, and the political issues involved in systemic change. Strategies for gaining assent to national, state, and local content standards are analyzed.

**ref, cur, bkg (GEN)**


This monograph reviews studies and analyses of large-scale systemic reform initiatives aimed at mathematics and science education, especially those undertaken by state governments and the National Science Foundation.

**res, ref (K-12)**


Findings from a first year evaluation of Integrated Math and Integrated Science curricular programs implemented at Polk Academy, a high school in the San Francisco Bay area (approximately 90% students of color) are presented. Promotion of scientific literacy, critical thinking, and communication skills was the goal of the integrated program.

**int, lit, sks, cur, ref (HS)**


In this book, researchers address the mismatch between skill requirements of the workplaces and the skills acquired by students in school, the validity of existing assessment technologies, and ethical and legal issues in the implementation of new testing and certification programs.

**sks, car, asm, kns (GEN)**


The contents of the report include: the introduction, international results, results within Australia, achievement in the mathematics content areas, achievement in the science content areas, performance assessment and performance expectations, curriculum factors, teachers and schools, and policy perspectives.

**ach, cur, cul, ref (K-12)**


This book includes a general discussion about the learning capabilities of students in various grade levels followed by discussions of selected content areas with practical suggestions, including assessment options, for bringing the specific content area into the classroom. Vignettes are presented as examples of how some of the Standards might be implemented using a variety of approaches adaptable to many different settings.

**lrg, ped, ref, tpd (EL)**


This book is about the learning cycle that moves children through a scientific investigation by allowing them first to explore materials, then to construct a concept, and finally to apply this concept to new ideas. It includes integrated learning cycles and learning cycles across the disciplines and the uses of various questioning strategies, alternative evaluation schemes, and modern technologies.

Physicists have created a language in which the fundamental components and symmetries of the world can not be observed; it has to be made intelligible using figurative language-analogy and metaphor. Following an analysis of the nature of metaphors, analogies and models some results of an empirical investigation of students' conceptions of figurative language are described.

cid, rem, kns, phe, phy (GEN)


Science teaching has a major role in molding students' world views by providing concepts that impose some meaning on the world. Science education should speed up the rate of diffusion of current scientific insights about the nature of reality.

phe, cur (GEN)


The relationships between students' conceptions (at the level of the population group) of quantum phenomena are investigated using a structured questionnaire and multivariate analytical techniques. A novel quantitative methodology is used to probe students' qualitative implicit understanding. The findings confirm the primacy of dualism in students' thinking.

alf, phe, phy, kns (K-12)


The Guidebook sets forth five different methods of analyzing curricula. Methods vary in their depth of analysis; the time/resources necessary; their potential uses; the type of information/conclusions that can be obtained; and in their focus on the needs of diverse learners.

cur, asm, eqt (K-12)


This research intends to answer the following questions: is there evidence of more equity and value-added in student scores?; was variability in scores decreasing?; how do scores compare across years and grade levels?; and, what are the implications for curriculum and assessment reforms? The null hypothesis of the investigation was that there is no difference in science scale scores across years or grade levels.

ach, eqt, asm, cur (EL)


This is a follow-up to an earlier study conducted using state of Tennessee data for student scale scores in science for the years 1990-4 revealing an increase in the mean of science scale scores for grades 2-8 each year. This population represents the remaining members of the 1991 student cohort. The finding seems to indicate that teacher effect on student achievement may be both cumulative and residual.

ach, ref (EL)


The research goal is to determine the impact of standardized science test scores on student's continuous achievement. The data show a dip in grade 4 but an overall increase in scores. Data are displayed in tables for minimum/maximum science scale scores, mean/five year mean science scale scores, science scale score descriptives, and analysis of variance.

ach, ref, ped, cur (EL)

By highlighting some of the eighth-grade findings from TIMSS, this booklet aims to help readers better understand how TIMSS can serve as a tool for education reform. Policymakers and educators can compare the findings of TIMSS with local student performance and educational practices in order to facilitate reform initiatives.

**ach, ref, cur, ped, lit (MS)**


GLOBE engages K-12 students and scientists in collecting and analyzing data and is truly a partnership between science and education. The nature of this partnership is reflected in the various research protocols and learning activities for each grade level and in the fact that the science processes used by researchers are reflections of the inquiry processes used at the K-12 or equivalent level.

**ntw, res, inq, pbs, sks (K-12)**


This issue examines the perspectives on some of the factors that are important in influencing fourth and eighth grade students' achievement in math and science, and includes graphics and tables presenting some results of TIMSS comparing the status of U.S. students with those of other countries.

**ach, ref (EL, MS)**


Results of the 1996 NAEP Science Assessment for grades 4, 8, and 12 are presented through graphs and examples of test questions with student answers. Student performance is measured against standards set by the NAEP governing board. Test data are combined and reported on the national and state level.

**ach, kns (K-12)**


This kit consists of multimedia resources including reports on TIMSS research findings, videotapes of classroom teaching, discussion guides, presentation overhead masters, checklists, leaflets and flyers.

**ach, cul, ped, cur, tpd (K-12)**


The video highlights the findings from assessing the math and science performance of over 500,000 students in 41 countries at three different grade levels. It summarizes the study's key findings at the eighth-grade level, and includes the views of business leaders, policy makers, educators, and researchers on the study's implications for America's schools. The video summarizes the findings of the TIMSS study with respect to four topics: curriculum and learning expectations, teaching, teachers' and students' lives.

**ach, cul, cur, bkg, tpd (K-12, TE)**


This report highlights student achievement in mathematics and science. After data comparisons of grades 4, 8, and 12 student scores to those in Korea and Singapore, the NEGP proposes three steps to raise achievement levels: set tougher standards that are comparable to the world's best, al, en all components of the education system with the standards; and strengthen our teachers' subject matter knowledge and teaching skills.

**ach, ref, tpd, cul, skt, knt (K-12)**

The purpose of this annual report to the nation is to capture the attention of Americans in order to better our schools and increase our expectations for student performance. More than two dozen national core indicators are presented which convey how much progress has been made in each Goal area. This year’s highlights include student achievement in mathematics and science, two of the core academic subjects in which we expect all students to demonstrate competency.

ref, ach (K-12)


This pamphlet outlines the National Science Education Standards which are the guidelines that define the science content that all students should know and be able to do and which also provide guidelines for assessment of student understanding of the content.

ref, cur, asm, tpd, ped (ALL, TE, GEN)


This report offers a vision of what science teacher preparation will look like in a standards-based program, and then recommends ways in which the National Science Foundation (NSF) can mobilize the postsecondary education community to achieve these goals.

ref, tpd (TE)


This volume examines opportunities and challenges for those at the front line of science education in elementary and middle schools. It is a resource for teachers and administrators who have not yet implemented a program of inquiry-based science education.

inq, ref (EL)


This report presents data on the demographic and employment characteristics of the nation's doctoral scientists and engineers. The population includes persons under the age 76 holding doctorates from U.S. institutions. It includes detailed statistical tables, technical notes, and the survey instrument.

car, chs (PS)


This report presents data on the characteristics of men and women who received a bachelor’s or master’s degree in a science or engineering field from U.S. academic institutions during the 1990/91 and 1991/92 academic years. The data were collected in 1993 and reflect the status of individuals as of April of that year.

chs, car (PS)


This program seeks to encourage a greater number of talented faculty to devote creative energy to improve learning by undergraduates in the nation’s classrooms and laboratories. The award winning projects were selected for their creativity, scientific and educational quality, and potential for utility at multiple institutions and national impact.

ref, ped, cur, tpd (PS, TE)


The Survey of Earned Doctorates (SED) has been conducted annually for the National Research
Council. The data presented in this report show trends in doctorate awards by science and engineering field and recipient characteristics, institutions awarding doctorates, and postgraduation plans of recipients for the years 1987-1996. Data for the SED are collected from the individual doctorate recipients.

car, chs (PS)


This is a compilation of articles from *The Science Teacher* that pertain to block scheduling and strategies for effective science instruction within this framework. Also included are a forward and an introduction that relate this new approach to current goals and standards for science education.

ped, tpd, ref (SE)


This report describes science performance for eighth graders in NC, compares the results for various groups of students, and examines the results for individual demographic groups and for individual background questions. Sections provide information about: what was assessed; who was sampled; and how the results are reported: the distribution of science scale score results; student results of the hands-on tasks; and contextual information about school characteristics, instruction, and home support.

ach, chs, hos, bkg (MS)


This paper calls for a collaboration for imaging and visualization. It also presents information about involved organizations and technology related to imaging and visualization in science. Educational implications from imaging and visualization at NASA and retrofitting the curriculum to match scientific technology advances are discussed.

rem, tec, ntw, ped, cur, tpd (K-12)


The 1995-1996 TIMSS is the largest and most comprehensive international study ever conducted. This overview helps educators and others in states, communities, and schools to use TIMSS as a starting point. It provides an overview of the TIMSS study, key findings and conclusions from the eighth and fourth grade reports, and supporting materials to help communities and states use TIMSS to examine their own practices from an international perspective.

ach, cul, ped, cur, lit (K-12)


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Alabama, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

ach, chs, bkg, asm, tpd (MS)


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Alaska, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

ach, chs, bkg, asm, tpd (MS)

This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Arizona, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Arkansas, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in California, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.
This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Delaware, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in DDESS, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for fourth graders in the DDESS, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in the District of Columbia, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Florida, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Georgia, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP describes science performance for eighth graders in Guam, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Hawaii, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Indiana, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP describes science performance for eighth graders in Iowa, compares the results for various groups of students within that population, and examines the results for
individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Kentucky, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Maryland, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Massachusetts, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Michigan, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

ach, chs, bkg, asm, tpd (MS)


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Minnesota, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

ach, chs, bkg, asm, tpd (MS)


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Mississippi, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

ach, chs, bkg, asm, tpd (MS)


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Montana, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

ach, chs, bkg, asm, tpd (MS)


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Nebraska, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

ach, chs, bkg, asm, tpd (MS)
This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Nebraska, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Nevada, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in New Hampshire, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in North Carolina, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for
individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in North Dakota, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Oregon, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Rhode Island, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Texas, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

ach, chs, bkg, asm, tpd (MS)


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Utah, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

ach, chs, bkg, asm, tpd (MS)


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Vermont, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

ach, chs, bkg, asm, tpd (MS)


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Virginia, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

ach, chs, bkg, asm, tpd (MS)


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Washington, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

ach, chs, bkg, asm, tpd (MS)
This report, drawn from the 1996 NAEP, describes science performance for eighth graders in West Virginia, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

ach, chs, bkg, asm, tpd (MS)


This report, drawn from the 1996 NAEP, describes science performance for eighth graders in Wisconsin, compares the results for various groups of students within that population, and examines the results for individual demographic groups and for individual background questions. Four appendices are also provided which contain information about the reporting of the 1996 NAEP science results; the format of the assessment instrument; and teacher preparation.

ach, chs, bkg, asm, tpd (MS)


The purpose of this study of the 4-H Youth Experiences in Science Project is to illuminate the interactions and other dynamics of adolescents as teachers in a science curriculum that was planned to use the teens as primary instructional source teachers, rather than merely as tutors. This study found that the nature of child science (the instructional goal) was particularly well suited to the instructional strengths of teenagers.

ntw, ndf, ped, sks (EL, HS)


Over the past decade, undergraduate colleges and universities of all sizes in all parts of the country, public and private, have begun to pursue reform for the sciences and mathematics. The report is a distillation of questions that successful reformers have asked, including the key sets of questions which institutions successful in conceiving, implementing and sustaining reform have addressed.

ref (PS)


This paper contains a comparative analysis of publications developed by the NSTA, AAAS, and NRC that provide national standards for science education. Topics include assessment, state science curriculum frameworks, and policy issues.

ref, asm, cur, lit (K-12)

DC: National Academy Press [Available online].
Retrieved October 9, 1998 from the World Wide
Web. [http://www.nap.edu/readingroom/books/geo]

Through highlighted case studies, this book
illustrates geography's impact on environmental
change, population growth, information
infrastructure, the condition of cities, and the spread
of AIDS. It also examines tools for data collection,
analysis, and display.

esg, sts, res (K-12)

Regets, Mark. (1997). What's happening in the
labor market for recent science and engineering
Ph.D. recipients? Arlington, VA: National Science
Foundation. [SE 060 872]

Labor market conditions for science and engineering
Ph.D. recipients changed slightly between April 1993
and 1995. Data is used from the 1993 and 1995
Survey of Ph.D. recipients, a biennial NSF survey of
holders of Ph.D.s from U.S. institutions up to age 75.
Included are: unemployment rates; involuntarily
working outside of field; tenure track positions; and
salaries.

car, chs (PS)

Rodriguez, Alberto J. (1997). Counting the runners
who don't have shoes: Trends in student
achievement in science by socioeconomic status and
gender within ethnic groups. NISE Occasional
Papers. Madison WI: Wisconsin Center for
edu/NISE/Publications/Research_Monographs/Rm3-
Counting_the_Runners.html]

This results of this meta-analysis indicate that there
has been some improvement in the achievement of
traditionally underserved students. By understanding
the students' point of view, educators can identify
factors that influence success and design effective
intervention programs.

ach, eqt, gen, eth, ped (K-12)

Rubba, Peter A. (Ed.); et al. (1997). Proceedings of
the 1997 Annual International Conference of the
Association for the Education of Teachers in
Science. PA: Association for the Education of
Teachers in Science. [SE 060 318]

These proceedings of the 1997 Annual International
Conference of the Association for the Education of
Teachers in Science (AETS) include a copy of the
conference program and 43 papers and presentation
summaries from the meeting, ordered by conference
session.

res (ALL)

Schau, Candace; et al. (1997). Use of fill-in concept
maps to assess middle school students' connected
understanding of science. Paper presented at the
Annual Meeting of the American Education Research
Association (Chicago, IL, March 1997). [SE 060
340]

This paper is based on the belief that knowledge must
be organized in order to be accessible from long term
memory and this kind of organization requires
connected understanding. Findings indicate that the
select-and-fill-in concept map format can be used
with ethnically diverse middle school students to
measure their connected understanding of science.

kns, asm, eth, lth (MS)

Scottish Office Education and Industry Department.
(1997). Achievements of primary 4 and primary 5
pupils in mathematics and science. Edinburgh,
Scotland: Author. [SE 060 553]

This document reports on the performance of
Scottish primary students in mathematics and
science. Students scored below the international
average in mathematics and are ranked in the lower
half of the range of countries involved in the study.
In science, students scored above the international
average and are ranked in the middle.

ach, cul (EL)

Springer, Leonard; Stinne, Mary E.; Donovan,
on undergraduates in science, mathematics,
engineering, and technology: A meta-analysis.
NISE Research Monographs. Madison WI:
Wisconsin Center for Educational Research.
Retrieved October 1, 1998 from the World Wide
Web. [http://www.wcer.wisc.edu/NISE/Publications/
Research_Monographs/index.html]

This meta-analysis demonstrates that various forms
of small-group learning are effective in promoting
greater academic achievement, more favorable
attitudes toward learning, and increased persistence through science, math, engineering and technology courses and programs.


Although the standards are not new, they have not been fully implemented and there are many indications that teachers need more information about them. This publication summarizes the vision and rationale presented in the national standards documents and current literature on the topic. Strategies and resources for implementing a standards-based teaching approach are the main focus of this report.


This literature review of teacher education compares the relationships between mathematics and science education with respect to the math and science departments. The author recommends including pedagogy and content in teaching methods courses.


The book is based on in-depth case studies of the teaching of electricity by three primary school teachers in which children's understanding was investigated before and after teaching. The research identified a set of electricity concepts that can be acquired readily by primary school teachers and taught effectively to children. The research also indicated numerous ways in which teachers can develop children's ideas successfully and some of the pitfalls to be avoided.
This volume is premised on the belief that testing practices influence educational procedures and learning outcomes. Exemplary innovations in exam practices that assess scientific understanding in new and more appropriate ways are detailed in this book. The research and resulting compendium of exam practices in graduate level science courses is a much needed resource for science educators and administrators.


MSEN applies the resources of UNC to strengthen mathematics and science education in schools throughout the state. The faculty direct center operations and provide K-12 teachers with professional development offerings by bringing them into contact with university faculty, scientists, and other professionals, and exposing them to the current educational research.


The North Carolina Mathematics and Science Coalition is an organization of education, public policy, civic, community, and business leaders working to stimulate and promote efforts to implement systemic reforms in mathematics and science education. The purpose is to focus the efforts of diverse groups of stakeholders working together to bring excellence to mathematics and science education.


Ecological or environmental programs integrated into science courses in the elementary grades can make children aware that they can have either a positive or negative effect on their environment. This bibliography was compiled from articles and dissertations on environmental education and children's awareness, attitudes, and perceptions toward the natural environment.


This study addresses some basic questions about students' strategies for seeking and using information from the World Wide Web. From the results, it is clear that the students are not engaged and thoughtful by virtue of being on-line. The students are constrained and this may be connected to their consistent reduction of the task to finding an answer or a perfect source.


This monograph identifies criteria for judging the alignment between expectations and assessments central to current efforts of systemic and standards-based education reforms in mathematics and science.


This research brief, intended for those who seek to improve student learning by creating coherent systems of expectations and assessments in states and districts, examines the concept of alignment and is required for expectations and assessments to be in alignment.

This research brief reports the results of a 1993 survey that compared teacher’s classroom practice to the national standards for math and science education. Instructional issues include: time spent on these subjects, classroom activities, and the context for science and math teaching.

ref, ped, tpd (K-12)


This book is about inquiry learning during a year-long classroom exploration with 4th graders who set up a bird feeder and recorded observations in a journal. The role of teachers should be to highlight problems that learners encounter and to support them in devising appropriate strategies and possible solutions to problems.

inq, ped, pbs (EL, TE)


This paper looks at the evidence of learning in children engaged in small-group discussion with a teacher. Motives of the participants in this dialogue are analyzed, and the teaching-learning process is considered to be the resolution of productive misunderstandings between everyday notions and scientific notions. The concluding discussion draws implications and raises questions about the role of the teacher in scientific dialogue.

cid, trg (EL)


This action research focus was the teaching internship in science. The internship’s effectiveness was documented with program’s artifacts: interns’ unit/lesson plans, class hand-outs, professors’ journal notes; classroom observations; school principal/classroom teacher comments; and course evaluations. Qualitative analyses revealed the positive and negative aspects of this internship.

tpd, ntw (TE)
Index

Every dissertation, journal article, conference paper, monograph, and electronic document listed in the preceding three sections has been categorized by one to three major codes. Each publication is indexed here according to the major codes, and the complete set of major codes for each publication is listed after each entry.

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alf, ceg, che
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alf, che

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Alternative Frameworks (alf)
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Beatty, A. (Ed.) cur, ref, cur
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Chaplin, D. sks, cur, ped
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Lokan, Ford & Greenwood ach, cur
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Draper, F.  lrg, kns
Engelhardt, P.  alf, phy, kns
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Dinucci, J.  ref, knk, cur
Doby, J.  tpd, edt, knk
Loh-Yeo, W.  skt, mat, knk
Veal, W.  ped, tpd, knk

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Adams & Krockover  tpd, knk, bft
Atwood & Atwood  alf, knk, cgg
Haidar, A.  alf, knk, che
Hynd et al.  cgg, tpd, knk

Powell, R.  cht, knk, ped
Preece, P.  alf, knk, phy
Smith, R.  knk, tpd
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Glenn, J.  che, ach, lrg
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Krieger, C.  lab, lrg, cbi
MacDonald, A.  kns, lrg
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Mitchell, R.  lbs, lrg, che
Morgan, M.  sks, lab, ped
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Russet, C.  nas, ped, lrg
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Vasquez, D.  cbi, lrg, ats
Werner, L.  cbi, lrg, cpl
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Lord, T.  lrg, ndf, lrg

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Lee, P.  int, lit, sks

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Summers, Kruger & Mant  cgg, knk, ped

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