DOCUMENT RESUME

ED 257 626 SE 045 463

AUTHOR Holliday, William G.; McGuire, Barry L. S.
TITLE A Comprehensive Description of Research in Science Education - 1983.
INSTITUTION National Association for Research in Science Teaching.; Ohio State Univ., Columbus. Information Reference Center for Science, Mathematics, and Environmental Education.
PUB DATE Dec 84
NOTE 137p.
AVAILABLE FROM SMEAC Information Reference Center (SMEAC/IRC), The Ohio State Univ., 1200 Chambers Rd., 3rd Flr., Columbus, OH 43212 ($6.50).
PUB TYPE Information Analyses (070) -- Reports - Research/Technical (143) -- Reference Materials - Bibliographies (131)

EDRS PRICE MF01/PC06 Plus Postage.
DESCRIPTORS *Academic Achievement; *Cognitive Development; College Science; Educational Research; Elementary School Science; Elementary Secondary Education; Higher Education; Learning; Literature Reviews; Science Curriculum; *Science Education; *Science Instruction; Secondary School Science; *Teacher Education; *Test Construction
IDENTIFIERS *Science Education Research

ABSTRACT

Presented is an annotated list of 422 science education research reports published during 1983. Provided with each entry is the title, author(s), source, annotation, and (when applicable) educational level. Also provided is the ED number for those items available from the Educational Document Reproduction Service (EDRS). The following types of research reports are included: (1) 116 articles published in the "Journal for Research in Science Teaching"; (2) 56 articles from other journals focusing on science education; (3) 121 papers presented at the 1983 annual meetings of the National Association for Research in Science Teaching (NARST) and American Educational Research Association (AERA); (4) 107 doctoral dissertations which explored research questions in science education; and (5) 22 reports prepared by such institutions as the National Science Foundation (NSF). Reports appearing in journals outside of science education, reports of local interest, and those not subject to some form of peer review are not included. All entries have also been indexed by author, subject, and category. Categories include: learning and instruction; curriculum; developmental studies; instrument development; science teacher education; foreign contributions to research in science education; and special topics. (JN)

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A COMPREHENSIVE DESCRIPTION OF RESEARCH IN SCIENCE EDUCATION - 1983

National Association for Research in Science Education

Published by

SMEAC Information Reference Center
The Ohio State University
1200 Chambers Road, Third Floor
Columbus, OH 43212

December, 1984

The SMEAC Information Reference Center is pleased to cooperate with the National Association for Research in Science Teaching in producing this description of research in science education. We believe that this comprehensive annotated bibliography will be a valuable tool for researchers and practitioners alike.

We invite your comments and suggestions for future publications.

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CONTENTS

A Comprehensive Description of Research in Science Education - 1983

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The format chosen for this "review" (i.e., indexed; annotated bibliography) of research in science education is considerably different than the past practices chosen by authors of other ERIC documents in science. Contrary to years of tradition, no attempt here is made to categorize, relate, summarize and criticize research reports. Moreover, abstracts of reports were not meshed together using a prose medium and placed under traditional headings, such as "Piagetian studies". In our opinion, it is time to experiment with a new format. Nevertheless, the present authors and Drs. Stanley Helgeson and Patricia Blosser wrote a traditional "review" directly based on the present work. The traditional review appears in the third issue of Science Education (1985).

We believed that, within a single year, an attempt to review so many problems using so many diverse approaches was a most difficult task. In this respect, reading previous ERIC reviews in science education led us to admire the skill with which authors of these reviews have traditionally found something intelligent to say about the checkered and complex relationships identified among the few yet diverse studies, while making responsible conclusions and recommendations. These authors are to be truly commended. Apparently, these authors were asked, in part, by the readership to "glue together" abstracts of selected reports that fell in traditional categories. The prose "glue" that they tired to apply was just not always strong enough. Thus, the four authors of the 1983 ERIC review encourage readers to examine and compare the present format with the traditional format appearing in Science Education.

The format used in the present review was inspired by Professor Marilyn Suydam of The Ohio State University. Annually, she prepares a single "review" issue contained in 75 pages, sponsored by ERIC, and presented in the Journal for Research in Mathematics Education - published by the National Council of Teachers of Mathematics (NCTM). Dr. Suydam's format is apparently popular among math educators. It provides a quite comprehensive set of bibliographic entries (about 200 annotated, about 300 not annotated) comprising both journal articles in one section and dissertations in another. In addition, there is a cross-referenced index of about 20 topics from each section. Lately, Dr. Suydam's works have become much briefer, presumably because of space limitation imposed by NCTM.

A goal of the present paper was to provide readers with an efficient way of searching for research reports. So we prepared a comprehensive, annotated bibliography of 422 reports followed by an extensive

subject and author index. The following types of research reports were included: (1) research articles (n=116) published in the Journal of Research in Science Teaching and in Science Education, (2) selected articles (n=56) in other journals focusing on science education, (3) relevant papers (n=121) presented at the American Educational Research Association (AERA) in Montreal and at the National Association for Research in Science Teaching (NARST) in Dallas, (4) dissertations (n=107) exploring research questions in science education, and (5) reports (n=22) prepared by institutions and organizations such as the National Science Foundation (NSF) and the American Chemical Society (ACS). AERA and NARST conference papers are included here because these works often represent research areas of greatest use and current interest to scholars at the time this ERIC review is published by the journal, Science Education.

Reports appearing in journals outside of science education, reports of local interest, and reports not subject to some form of peer review have usually not been cited in past ERIC reviews. We have followed this tradition. Readers seeking background information not contained in the present bibliography are encouraged to explore the works cited by authors referenced in this bibliography.

Readers seeking copies or summaries of papers, reports and dissertations or wishing to communicate directly with the authors of these documents will find the names of the university or institution of origin printed after each bibliographic entry. Furthermore, the first names of authors are included in all entries for similar reasons. Readers unable to contact the researchers cited in this bibliography are invited to write to NARST, The University of Calgary, Calgary, Alberta, CANADA T2N 1N4, for free information regarding the addresses and telephone numbers of the authors.

Three other modifications (not found in Suydam's work nor in previous ERIC reviews in science education) have been introduced in the new format. First, all entries have been annotated, and their average length is 44 words. Second, the subject and author indexes are unusually comprehensive, and there is extensive cross-referencing. Third, an increased number of non-U.S. works (n=77) has been included in this review.

Inexperienced readers seeking information by using the traditional format apparently had trouble locating relevant studies in the ERIC review covering science education. We hope the adoption of the new format will alleviate some of these problems. For example, such readers inquiring about, say, students' attitudes about learning science using the Keller Plan might have searched the review categories "attitude" or "achievement" or "instructional procedure" for applicable references, when the reviewed information was more likely presented under the rubic, "evaluation". Thus, the new annotated bibliography format permits readers to identify quickly, and clearly, entries covering major topics as referenced in the index, rather than laboriously searching the prose sections presented under many categories.

Experienced readers, on the other hand, often prefer brief abstracts of reports together with bibliographic information because, in their opinion, such information is often a good indicator of the scholarly credibility of the research document. For example, experienced readers often believe that the chances of a document being believable are greater if it is published in the Journal of Research in Science Teaching or in Science Education than if it came from a dissertation or an occasional paper. Conventional wisdom suggests that the manuscripts published by the editors of these two well-respected journals usually constitute the "better half" of the reported research. In contrast, unpublished dissertations have the reputation of varying widely in quality. (Obviously, there are many exceptions to these rules.)

We encourage researchers in science education to supplement this and other ERIC annual "reviews" by producing true reviews, that is, to examine critically - define and clarify - single problems and topics emerging from reports published over many years from a variety of sources and in reasonable depth. Such reviews are valuable documents, but admittedly products requiring hard work. In this regard, such reviews require authors to integrate findings and positions by critically and qualitatively comparing and evaluating ideas and their associated variables, and by describing directions and methods useful to future investigators. Good examples of such reviews are often presented in AERA's Review of Educational Research (since 1970) and in the Annual Review of Psychology which presents reviews of specific problems every three to five years.

Thus, we believe that there is good reason to experiment with "review" formats, and hence readers' expectations of, the annual ERIC review. We hope that the adopted format is beneficial to both experienced and inexperienced readers, and we hope you will find this document useful. We look forward to hearing your reactions.

The authors would like to thank Ms. Carmen Maier for her major contribution in constructing the new format and in producing the camera-ready copy. In addition, we would like to thank Dr. S. Helgeson, Mrs. S. Hohwald, Dr. J. Koran, Mrs. V. Mechie, Dr. R. Olstad, Dr. T. Schroeder, Mrs. M. Stright, and Dr. B. Voss for their contributions.

BIBLIOGRAPHY

Citations containing ED numbers indicate documents available from ERIC Document Reproduction Service, P.O. Box 190, Arlington, VA 22210.

1. Abanami, Abdulmohsin A. (1982). Readability analysis of the 11th and 12th grade earth science textbooks used in the public schools in Saudi Arabia. Dissertation Abstracts International, 43, 2212-A. (University of Houston)

   This readability analysis suggests that a majority of students encounter reading difficulty and need additional reading instruction in order to learn the material presented in their earth science textbooks. In addition, the cloze test appeared to be an appropriate testing procedure for measuring students' reading comprehension of earth science textbooks in the Arabic language. (Secondary)

2. Abegg, Gerald & Corindia, Nancy. (1983). The relationship among students' questioning level, their cognitive level, and teacher's questioning level. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Boston University)

   This study found that students modeled their teachers in the level of questions they asked. In addition, concrete-level students asked more formal-level questions after teachers had been trained to increase the proportion of higher-level questions they asked. It is suggested that another study might be conducted to test the theories of Vygotsky against the findings of this study. (Elementary)

3. Abendroth, Walker & Friedman, Frank. (1983). Joules: Anxiety reduction for beginning chemistry students. Journal of Chemical Education, 60, 25-26.

   Anxiety reduction strategies were incorporated into chemistry laboratory sessions to reduce anxiety and increase academic performance. Treatment enabled students (N=23) to recognize and talk about their chemistry anxieties and experience relaxation techniques. Results suggested that treatment lowered levels of chemistry anxiety and resulted in higher grades. (College)

4. Abraham, Michael R., Renner, John W. & Birnie, Howard H. (1983). Research into teaching chemistry and physics using the learning cycle. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Oklahoma)

   This research was done to answer questions about the three phases of the learning cycle, which are exploration, conceptual invention and expansion of the idea. The results of using validated content tests and a validated attitude inventory were presented. (Secondary)

5. Adair, Susan Anderson. (1983). Science fiction in elementary science education: A content analysis of the quantity and validity of scientific referents in, and the readability of, selected science fiction literature for children published between 1940-1959 and 1960-1980. Dissertation Abstracts International, 44, 68-A. (Temple University)

   Classroom teachers may choose to use science fiction books appropriate to their science programs with the knowledge that the validity of the science and the readability levels have not changed significantly from 1940 to 1980. When teachers are concerned with the quantity of scientific terms, they should be aware of the differences between pre-Sputnik and post-Sputnik books. (Elementary)

6. Adey, Philip S. (1982). Cross cultural Piagetian psychology and science education. Journal of Science and Mathematics Education in Southeast Asia, 5, 10-18.

   This article reviewed the major purposes, conclusions, and criticisms of cross cultural Piagetian studies conducted during the last two decades in light of the availability of new instruments for assessing levels of cognitive development and for analyzing science curricula.

7. Agar, Jr., John Russell. (1983). The evaluation of science teachers by their students. Dissertation Abstracts International, 44, 1407-A. (Temple University)

   This study compared teacher evaluations obtained from a science teacher's students, from a certified science supervisor, and from the teacher himself/herself. There was greater agreement between the students and the teachers or between the students and the supervisors, than there was between the teacher and the supervisors. (Secondary)

8. Ahmad, Hamidah & Rubba, Peter A. (1983). A study of process skill achievement among a sample of high ability malaysian high school graduates. Journal of Science and Mathematics Education In Southeast Asia, 6, 19-22.

   The study investigated the extent of process skill achievement among a sample of recent Malaysian high school graduates, and the relationship of these scores to science scores. Among the conclusions were that the science tests placed little emphasis on the assessment of process skills.

9. Al-Hajji, Yacoub Yousef. (1983). Attitudes of students and science teachers toward science laboratory work in the middle schools of Kuwait. Dissertation Abstracts International, 43, 3866-A. (Boston University School of Education)

   The purpose of this study is to assess attitudes of students and science teachers toward science laboratory work in the middle schools of Kuwait. The data from the two questionnaires suggested that the cognitive level and the time requirements of the experiments students were required to do in the four middle school levels be re-evaluated. (Secondary)

10. Aldridge, Bill G. (1983). A mathematical model for mastery learning. Journal of Research in Science Teaching, 20, 1-17.

    A mathematical model for mastery learning including measures of a motivational factor, a variable reflecting prior learning, and the specific ability of a learner with respect to content being learned was described in this theoretical article.

11. Allen, Deborah Paulick. (1983). Environmental and situational factors that impede or facilitate scientific productivity. Dissertation Abstracts International, 43, 3538-A. (Texas A & M University)

    Results from the study indicate that varous environmental and situational factors do have an impact on the productivity of male and female scientists. Findings suggest that some variables investigated had a greater influence on one sex than they did on the other. (College)

12. Allison, A. Wayne. (1983). A comparison of two methods for training fifth- and sixth-grade students to ask operational questions. Dissertation Abstracts International, 43, 3211-A. (Pennsylvania State University)

    Fifth- and sixth-grade students' ability to ask operational questions, when confronted with cognitive conflict presented in the form of discrepant science demonstrations, can be enhanced by the use of cognitive modeling. In addition, the use of directed written practice in creating operational questions with cognitive modeling will significantly increase the likelihood of fifth- and sixth-grade students using operational questions. (Elementary)

13. Allison, Sr., Roy W, Hann, Ann Chin & Fowler, H. Seymour. (1983). The effect of science teaching on the fourth grade Korean child's concept of Piagetian physical causality. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Capitol Campus, Middletown, PA)

    The purpose of this study was to determine if selected science experiences affect the fourth grade Korean child's concept of Piagetian physical causality and to determine if cross cultural differences exist between children of Korea, the United States, and Trinidad and Tobago. From the results of this study, it was concluded that the causal relations of animism and dynamism could be taught to the fourth grade Korean children. (Elementary)

14. Almas, Hassan Mahmoud. (1983). Investigation of opinions and performance regarding physics instructional procedures in Saudi secondary schools. Dissertation Abstracts International, 44, 450-A. (University of Northern Colorado)

    Third grade students (equivalent to twelfth grade in U.S. and Canada) considered the teacher's role, the textbook, discussions, and overall instructional procedures more important than did second grade students. Moreover, physics teachers, second grade students (equivalent to eleventh grade), and third grade students gave the textbook approximately the same rating. (Secondary)

15. Alport, Jennifer M.. (1983). The interrelationships between two concrete and three formal operational Piagetian structures. Dissertation Abstracts International, 43, 2621-A. (University of Iowa)

The purpose of this study was to investigate the interrelationships between two concrete and three formal operational Piagetian structures. No significant relationship was found between task performance and academic achievement. A finding with implications for science educators is that no task was passed by more than 43 percent of the sample of high school and college students, and that the most difficult task was passed by only 8 percent of the sample.

16. Anderson, Charles W., Smith, Edward L. & Stinger, Lucille A. (1983). The planning and teaching intermediate science study: An application of cognitive science to classroom research and curriculum development. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Michigan State University)

Recent research in the field of cognitive science has demonstrated that students' understanding of a wide variety of scientific concepts was influenced by the existence of preconceptions which were in conflict with accepted scientific theories. Classroom observational data showed important changes in the teachers' behavior, and student learning was improved. (Secondary)

17. Anderson, Edward Charles. (1983). Creation, evolution, and science teaching in the secondary school. Dissertation Abstracts International, 43, 3794-A. (University of Toronto (Canada))

This study is a philosophical analysis of the creation/evolution conflict in which two significant curricular questions are addressed: what subject material emerging from the conflict should be taught, and, what pedagogical approach should be taken in teaching the material to secondary school biology students. (Secondary)

18. Anderson, O. Roger. (1983). A neuromathematical model of human information processing and its application to science content acquisition. Journal of Research in Science Teaching, 20, 603-620.

A mathematical model of information acquisition is presented and empirically evaluated in comparison to evidence obtained from experimental studies of science content acquisition. Implications of the model for human information acquisition and future research are discussed in the context of the unique theoretical framework of the model.

19. Anderson, Ronald D. (1983). A consolidation and appraisal of science meta-analyses. Journal of Research in Science Teaching, 20, 497-509.

This review examined the relationship between results of the meta-analyses reported in issue five of the Journal of Research in Science Teaching and other work of this nature reported in other sources. The author indicated a high degree of consistency among results of these various meta-analyses.

20. Anderson, Ronald D. (1983). Are yesterday's goals adequate for tomorrow?. Science Education, 67, 171-176.

The vast number of differences between the worlds of the fifties and the eighties indicated that the goals of science education should be redefined.

21. Anderson, Ronald D., Kahl, Stuart R., Glass, Gene V. & Smith, Mary Lee. (1983). Science education: A meta-analysis of major questions. Journal of Research in Science Teaching, 20, 379-385.

A multi-institutional endeavor was described where the findings of many research studies were integrated and directed toward major science education research questions. The research questions were selected by a largely empirical process of identifying the most frequently researched questions in the literature.

22. Anderson, Sara Frances P. (1983). Teaching biology-related social issues: A multi-disciplinary approach for high school students. Dissertation Abstracts International, 43, 3868-A. (University of Maryland)

This dissertation took a step forward developing curricular materials in the areas of biology-related social, political, legal and ethical issues roughly covered by the term "bioethics". Such topics as abortion, genetic screening and counseling, political and legal aspects of organ transplants, legal definitions of death were included in this category. (Secondary)

23. Anderson, Ted & Kilbourn, Brent. (1983). Creation, evolution, and curriculum. Science Education, 67, 45-55.

A philosophical analysis of the creation/evolution conflict was discussed. How this topic was taught in the classroom was as important as what was taught.

24. Appleton, Ken. (1983). Beginning student teachers' opinions about teaching primary science. Research in Science Education, 13, 111-119.

Before beginning student teachers start training as teachers, they should have very well-defined views on the teaching of science. While these views are in accord with the philosophies of many science educators, these views do not seem to translate into classroom practices at a later date.

25. Armstrong, Ronald Earl. (1983). Earth science instruction as a factor in enhancing the development of formal reasoning patterns with transitional subjects. Dissertation Abstracts International, 44, 1047-A. (State University of New York at Albany)

It was inferred from data that alternative strategies can be used to plan equally effective sequences of instruction, when content achievement and intellectual development were the criteria. (Secondary)

26. Arzi, Hanna J., Ben-Zvi, Ruth & Ganiel, Uri. (1983). Effects of continuity versus discontinuity of physical science teaching upon long term retention of antecedent learning. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Weizmann Inst. of Science, Rehovot, ISRAEL)

    This paper presented results relating to one question which has been investigated in a longitudinal research project: is the retention of previously learned physical science courses facilitated by new content taught in subsequent courses? The results clearly indicate that the subsequent course had a long lasting facilitation effect upon retention of the preceding course. (Secondary)

27. Babatolu, Ayodele. (1983). The relationship between the West African school certificate examination items in biology and Bloom's taxonomy of educational objectives (cognitive domain). Dissertation Abstracts International, 43, 2214-A. (Ohio University)

    The author mainly found that the objective portion of biology tests should include a more even distribution of items from all six categories of Bloom's taxonomy. (Secondary)

28. Bagasao, Paula Yldefonza. (1983). Factors related to science career planning among Asian and Pacific American college-bound high school seniors. Dissertation Abstracts International, 44, 397-A. (University of California, Los Angeles)

    Contrary to popular belief, Asian and Pacific Americans were not judged to be "all alike". They varied with respect to science-career-planning and type of science career planned. (Secondary)

29. Baker, Dale R. (1983). Research in college science teaching: Can the difference between male and female science majors account for the low number of women at the doctoral level in science?. Journal of College Science Teaching, 13, 102-107.

    Factors accounting for differences in numbers of men/women (N=180) at the doctoral level in science were compared including mathematical, spatial, attitudinal, and personality characteristics of male/female biology/physical science majors and nonmajors.

30. Baker, Dale R. (1983). The relationship of attitude, cognitive ability, and personality to science achievement in the junibr high. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Utah)

Attitudes and mathematical ability seem to affect science grades more than do personality factors. It appeared that although girls in junior high were not hindered by less mathematics or spatial ability than boys and outperformed them in science, girls did not like the subject and lacked an important personality characteristic associated with science. (Secondary)

31. Balling, John D. & Falk, John H. (1983). Classroom versus field trip science experiences: Is one better for learning?. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Chesapeake Bay Ctr. for Environmental Studies)

Fourth grade children (N=171) were presented with a structured lesson regarding aquatic mammals, either as part of a field trip to a zoological park or as an in-class slide lecture. Results indicated significant learning and retention for all subjects. However, the zoo tour group "showed" much more learning than did the class presentation group. (Elementary)

32. Barrow, Lloyd H. & Holden, Constance. (1983). Energy knowledge and attitudes and locus of control of secondary teachers: Study II. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Maine - Orono)

The purpose of the study was to measure the energy knowledge and attitudes and locus of control among the participants of a DOE faculty development workshop. Biomass users scored significantly higher than did non-biomass users. In contrast to the 1980 workshop, the 1981 science teachers had a greater energy knowledge base than non-science teachers. (College)

33. Beasley, Warren. (1983). Teacher management behaviors and pupil task involvement during small group laboratory activities. Journal of Research in Science Teaching, 20, 713-719.

Management behaviors of junior high science teachers (N=16) and their relationship to task involvement of students operating in small group laboratory settings were examined. The results of 91 observations indicated that teacher behavior was directed in three ways: whole class; small groups; and non-class related. (Secondary)

34. Beasley, Warren. (1983). Teacher behaviours and student task involvement within small group and individual activity settings. Research in Science Education, 13, 121-132.

Teachers' whole-class presence is an important factor in keeping students on-task while working as individuals or in small groups. Several other teacher behaviours can also be identified as effective techniques for keeping groups on-task. (Secondary)

35. Beditz, Joseph F.. (1983). The effects of class size on student achievement in high school science. Dissertation Abstracts International, 44, 1764-A. (Florida State University)

Results of the student and class level analyses indicated that class size did interact with class ability and teacher qualifications. The author concluded that the question of class size should be studied in a multivariate context with particular attention to interactive relationships between class size and other student and class level variables. (Secondary)

36. Beison, Stephen Michael. (1983). Construction, implementation, and evaluation of Piagetian concrete operational learning strategies to facilitate student attainment of basic concepts in human genetics. Dissertation Abstracts International, 44, 720-A. (Ball State University)

The data indicated that both concrete operational learning strategies and lecture were effective instructional methods in facilitating long-term and short-term human genetics concept acquisition. (College)

37. Bell, Beverly. (1983). Reading and the learner of science. Research in Science Education, 13, 83-94.

Students accept or reject concepts in science depending on their personal understanding and intepretations of nature. When new textually-presented information is to be learned, the students' existing knowledge interacts with the new information in an active, constructive process. (Secondary)

38. Bethel, Lowell J. & Hord, Shirley M. (1983). Using the CBAM to prepare elementary school teachers to teach environmental science. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Texas)

This paper reports a year-long effort designed to improve inservice teachers' knowledge of environmental science and attitudes toward environmental science education. The Concerns Based Adoption Model (CBAM) was used to design and implement an instructional program to meet teacher-perceived concerns and needs. (College)

39. Betkouski, Marianne B. & Peterson, Rita W. (1983). Neuroscience and science education -. Is there a link?. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Stanford University)

There does not appear to be a direct link between neuroscience and education at this time, but there is potential to derive worthwhile paradigms and procedures for educational research. The authors presented information on networks of neuroscientists, cognitive scientists, and educators which were currently active, on relevant conference proceedings, and on the learning and memory research occurring in one major psychobiology laboratory.

40. Biddulph, Fred, Osborne, Roger & Freyberg, Peter. (1983). Investigating learning in science at the primary school level. Research in Science Education, 13, 223-232.

Teacher background, practical difficulties and the aims of science education are the three main difficulties attributed to introductory science courses. (Elementary)

41. Biermann, Carol. (1983). Disjunctive reasoning of students at an urban community college. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Kingsborough Community College, Brooklyn NY)

Factor analysis and correlational studies showed that reasoning tests where not related to the NLN pre-nursing scores or subscores. The NLN test is not testing for an ability to reason. The significance of this statement was profound since one expects that people in the nursing profession were daily encountering important tasks that required higher level reasoning.

42. Black, P.J. & Driver, R.H. (1983). National monitoring of school science in Great Britain: A review of issues. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of London).

Large scale monitoring of pupils' performance produces results which teachers, parents, politicians wish to use. This paper discussed the problems of interpretation of results, with reference to the national monitoring of school science in the United Kingdom. (Secondary)

43. Black, P.J. & Driver, R.H. (1983). An overview of the framework for national monitoring in science. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of London)

This paper describes in outline the science monitoring programme, including the assessment framework, description of the types of tests used, the method of sampling and the main emphases in reporting the results of a national assessment programme being carried out in four areas: mathematics, science, language and modern languages. (Secondary)

44. Blake, Anthony. (1983). Hands on heads: Science and the intelectually immature high school student. Research in Science Education, 13, 193-202.

Science courses have no value for many youth who leave school early, in that these youth are not at a cognitive stage of development where they are capable of assimilating the information being presented. (Secondary)

45. Blosser, P.E., (Ed.) & Mayer, V.J., (Ed.). (1983). Investigations in science education. Vol. 9, No. 2. Washington, D.C.: National Institute of Education (ED). ED232844 (Ohio State University)

Critiques of 10 articles reporting research studies focused on various aspects of attitude development in science education and of six research articles related to investigations of learning and cognitive development were contained in this issue.

46. Blosser, Patricia E. (1983). The role of the laboratory in science teaching. School Science and Mathematics, 83, 165-169.

The role of the science laboratory is defended using information in the ERIC data base. Sections cover: (1) what's available; (2) beliefs about the role of laboratories; (3) what critics say; and (4) research evidence. (Secondary)

47. Blosser, Patricia E. (1983). What research says: Teaching science to middle school students, Part II. School Science and Mathematics, 83, 609-615.

The review focuses on teaching science to middle school students and identifies Piagetian ideas related to the learning of these students while focusing on issues dealing with curriculum and student needs.

48. Blosser, Patricia E. & Mayer, Victor J. (1983). Investigations in science education. Vol. 9, No. 1. (Ohio State University). ED231646

Abstractor's analyses of 12 science education research studies were presented.

49. Bobbert, Larry Clyde. (1983). The effects of using interactive computer simulated laboratory experiments in college chemistry courses. Dissertation Abstracts International, 43, 2300-A. (University of Cincinnati)

The findings indicated that interactive computer simulated experiences were as effective an instructional activity as actual laboratory experience for the subject material tested. In an attitude survey most of the students considered the interactive computer simulated exercises as an acceptable learning methodology and over half expressed a desire for more of these activities in future laboratory work. (College)

50. Branch, Jr., Clarence. (1983). A developmental study in earth and environmental science education with junior high school students: The study of a local stream and science related community problems. Dissertation Abstracts International, 44, 1407-A. (Columbia University Teachers College)

Results indicated that students who received science instruction in the form of a generalized approach to problem study, using teacher developed materials, became more positive in their views toward school science and exhibited a greater tendency to apply knowledge of science to societal issues without sacrifice in the acquisition of basic knowledge of science. (Secondary)

51. Brandt, Richard C. & Knapp, Barbara H. (1982). Extenstion of TVCAI project to include demonstration of intelligent videodisc system. Final report. Hardware, software, and courseware implementation component. Washington, D.C.: National Science Foundation. ED229236 (University of Utah)

This project, stemming from work started under the National Science Foundation grant "Development of a Television Computer Assisted Instruction (TVCAI) System" SER-7806412, called for the transfer to videodisc of some of the videotape materials developed under the grant. (College)

52. Brockley, Barry P. & Barufaldi, James P. (1983). Anxiety about teaching science and attitude toward teaching science among inservice elementary school teachers. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Texas - Austin)

This paper described a research study designed to identify factors which contributed to the avoidance of science teaching among inservice elementary school teachers. While the effect of anxiety about teaching science on teachers' behavior is not clear from this study, it is apparent that science teaching is, for many teachers, an anxiety-provoking experience. One factor that appears to be related to science teaching anxiety is science background. (College)

53. Brockley, Barry Phillip. (1983). The relationship between anxiety about teaching science, perceived importance of science and the amount of science taught by inservice elementary school teachers. Dissertation Abstracts International, 43, 3795-A. (University of Texas at Austin)

The results suggested that science teaching is, for many teachers, an anxiety-provoking experience. One factor that appears to be related to science teaching anxiety is science background, although this does not appear to be related to the amount of science taught. (Elementary)

54. Brooks, Edwin T. (1983). The effects of mastery instruction on the learning and retention of science process skills . Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Indiana University, Shoreham, NY)

The effectiveness of mastery instruction to an equivalent time non-mastery mode of instruction for improving students' learning and retention of selected science process skills was the subject of this study. (Secondary)

55. Brouwer-Janse, Magdalena D.. (1983). The concept of equilibrium in cognitive development. Dissertation Abstracts International, 44, 933-B. (University of Minnesota)

A general problem-solving model quantifying strategic and heuristic processes developed by Pitt and Brouwer-Janse was used to analyze thinking-aloud protocols.

56. Brown, Nan Ellen. (1983). The use of selected characteristics of ability and achievement as predictors of student achievement in a multi-track science curriculum. Dissertation Abstracts International, 43, 3795-A. (University of Colorado at Boulder)

The best predictors of success in a science class were grades in past science and mathematics classes. Contrary to the findings in much of the literature, the girls achieved as well as the boys in high school science and mathematics classes. (Secondary)

57. Brumby, Margaret. (1983). Concept mapping: Structures or process?. Research in Science Education, 13, 9-17.

Concept maps may be complex, difficult to interpret, impossible to compare, and unproductive. These maps do not portray any of the dynamism inherent in the nature of learning. Their greatest use may be in the role of a teaching tool. (College)

58. Buckner, Ewing Douglas. (1983). Effects of differentially sequencing visual materials with laboratory activities on the achievement of high school biology students of varying levels of cognitive development. Dissertation Abstracts International, 43, 2300-A. (University of Georgia)

The results revealed that student achievement was higher when students viewed the visuals before they engaged in laboratory activities relative to when they viewed the visuals after they had completed laboratory activities. These findings were consistent for students at all levels of cognitive development. (Secondary)

59. Burkman, Ernest, Loewe, Eunice & Wongbundhit, Yuwadee. (1983). Differential effects of teaching method and time available for study on male and female students in a high school science course. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Florida State University)

This study assessed differences in science achievement between males and females. Males out performed females at all levels. It is suggested that variations in teaching methods and time available for study might be used to improve the performance in science courses of both males and females and/or to improve the relative performance of females. (Secondary)

60. Burns, Joseph C., Wise, Kevin C. & Okey, James R. (1983). Development of an integrated science process skills test. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Georgia)

The results of the field trial showed the science process test had high reliability and difficulty and discrimination indices within the range of suggested instrument development standards. (Secondary)

61. Butts, David P. (1983). The survey - A research strategy rediscovered. Journal of Research in Science Teaching, 20, 187-193.

Issues associated with survey research, potential uses of survey research as a strategy in science education, and potential problems jeopardizing survey studies were discussed.

62. Butzow, John W. & Gregory, Charles. (1983). The impact of multidisciplinary marine education curriculum infusion materials on schools and teachers in Maine and New Hampshire. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Maine)

Major findings indicated that Project materials were used at approximately the same percent at all grade levels represented. Approximately 33% of the schools were aware of the Project materials and of those, 75% were using them. (College)

63. Caillot, Michel & Chalouhi, Elias. (1983). Problem solving in electricity. Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Canada. ED228063(University of Paris)

Two studies were conducted to describe how students perform direct current (D-C) circuit problems. Students solved the same problem by different procedures which depended directly on how their knowledge was memorized, indicating that current conservation is associated with a specific circuit similar to a canonical one, formulated as a mathematical relation without physical content, or formulated as a law applied to a junction point.

64. Caldwell, John A., Bonstetter, Ron & Pellens-Meinhard, Sandy. (1983). Changes in medical students' perception of their abilities as determined with a defined ranking system. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of North Dakota)

The results from this study indicated a growth in student ability, confirmed by instructor evaluation. The use of defined ranks appeared to provide a clearer picture of student performance. (College)

65. Campbell, James R. & Napolitano, Ralph. (1983). Horizontal enrichment in science and math at the senior high level. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (St. John's University, Jamaica, NY)

This study analyzed very successful horizontal enrichment programs in science in fifteen senior high schools and six of the most successful senior high school horizontal enrichment programs in mathematics. The term "successful" was defined by four criteria. In conclusion, the authors found that these programs were very successful at producing the next generation of professionals. (Secondary)

66. Cannon, Jr., Roger K. (1983). Relationships among attitude, motivation and achievement of ability-grouped, seventh grade, life science students. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Georgia)

Results from this study indicated that level of ability group and time of testing were significantly related achievement and that males achieved higher than did females at all levels. Advanced ability groups were significantly more positively motivated toward science than all other ability groups and that females were more highly motivated than males. As the school year progressed, motivation toward science decreased. (Secondary)

67. Cannon, Jr., Roger Kalup. (1983). Relationships among attitude, motivation, and achievement of ability grouped, seventh-grade, life science students. Dissertation Abstracts International, 44, 1408-A. (University of Georgia)

Science attitude at the beginning of the school year in 38 classes located in North Carolina was more positive than at the end of the year regardless of ability and group gender. The advanced ability group had the most positive attitude throughout the year and the basic ability group had the least. The general ability group demonstrated the earliest and sharpest decline in science attitude. Males had a more positive attitude than females throughout the year. (Secondary)

68. Carlson, Gaylen R. & Streitberger, Eric. (1983). The construction and comparison of three related tests of formal reasoning. Science Education, 67, 133-140.

A paper-and-pencil, a 2-D and a 3-D test of formal reasoning were compared. Although the paper-and-pencil and 2-D tests produced higher results, all three tests were found to be useful in assessing formal reasoning ability. (Secondary)

69. Carr, Ken. (1983). Student beliefs about place value and decimals: Any relevance for science education?. Research in Science Education, 13, 105-109.

Many students do not understand the relationship of the decimal point to the number value system, especially for numbers less than one. (Secondary)

70. Chambers, David Wade. (1983). Stereotypic images of the scientist: The Draw-A-Scientist test. Science Education, 67, 255-265.

Elements of stereotyping of scientists appeared with greater frequency as students advance through grades in education. Significant differences were found linking both the socio-economic background and intelligence of the children to the age at which a distinctive image of a scientist first appears. (Elementary)

71. Champagne, Audrey B., Gunstone, Richard F. & Klopfer, Leopold E. (1983). Effecting changes in cognitive structures amongst physics students. Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Quebec, Canada. ED229238 (University of Pittsburgh)

The report includes a brief description of the broad structure of the instruction and probes used to gather information about aspects of students' cognitive structures (middle school students: N=13 and college students N=6), results (indicating a change in cognitive structure of the college student), and conclusions.

72. Champagne, Audrey B. & Klopfer, Leopold E. (1983). Naive knowledge and science learning. Paper presented at the Annual Meeting of the American Association of Physics Teachers, New York, NY. ED225852 (University of Pittsburgh)

The authors discussed in this paper topics including: (1) the characteristics of naive conceptions; (2) the influence of naive conceptions on students' interpretations of instructional events; and (3) the implications of this research for designed instruction to facilitate the reconciliation of naive conceptions with scientific theories.

73. Chiappetta, Eugene L. & Rawe, James H. (1983). The effects of relating personal experiences through narrative and prompting on the recall of physical science concepts. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Houston)

In a recent assessment of the needs in science teaching supported by the National Science Foundation, it was reported that school science programs can be characterized by one word - textbook. Analysis indicated that the subjects in the familiar narrative group had significantly higher scores than the subjects in the historical group. Prompting did not appear useful. (Secondary)

74. Childress, Philip Norvin. (1983). The effect of science project production on cognitive level transition in adolescents. Dissertation Abstracts International, 43, 3280-A. (Ohio State University)

The activities associated with chunking were most often used by project students. The students who showed the greatest absolute gains in Piagetian developmental level as measured by the Test of Logical Thinking also used activities associated with chunking. (Secondary)

75. Cho, Hee-Hyung. (1983). The impact of textbook concept emphasis on the learning of biological concepts at different cognitive levels by high school students. Dissertation Abstracts International, 44, 1747-A. (Purdue University)

There were significant differences among achievement levels at cognitive levels in terms of achievement level as measured by NAEP in 1976-77. There were significant relationships between achievement level and concept emphasis except at the cognitive level, defined as comprehension. Change in concept emphasis had taken place in at least one of the recently published biology textbooks. (Secondary)

76. Clark, Julia V. (1983). Development of seriation and its relation to the achievement of inferential transitivity. Journal of Research in Science Teaching, 20, 781-794.

Students who showed understanding of transitive inference also demonstrated success on seriation, but subjects who showed clear understanding of seriation did not demonstrate success on making transitive inference. Results were interpreted on the context of Piaget's equilibration theory. (Elementary)

77. Clasen, Donna Rae. (1983). An investigation of the effect of four different instructional strategies on the achievement of gifted seventh-grade students in a specific content area. Dissertation Abstracts International, 43, 3266-A. (University of Wisconsin-Madison)

Immediate posttest results revealed significant differences in favor of the lower-order questioning group over the higher-order and independent study group on the lower-order subscale of the multiple-choice test. (Secondary)

78. Coffey, Don Dale. (1983). Environmental education in the life science curriculum in secondary schools in the state of Oregon. Dissertation Abstracts International, 43, 2872-A. (University of Oregon)

The major findings from a direct-mail questionnaire sent to high school life science teachers in Oregon was that objectives were focused more on understanding the environment and developing an appreciation for it than on helping students solve environmental problems or develop environmental data collecting techniques. (Secondary)

79. Cohen, Herbert. (1983). A comparison of the affect of two types of student behavior with manipulatives on the development of projective spatial structures. Journal of Research in Science Teaching, 20, 875-883.

The author investigated whether examining materials from several perspectives had greater effect on development of projective spatial abilities than examining materials from a single perspective. Results from this study, using 105 students, favored the former approach.

80. Collings, John & Smithers, Alan. (1983). Psychological profiles of physical and biological science choosers. Research in Science and Technological Education, 1, 5-15.

Students studying physical and biological science A-level courses tend to be of the same kind as those between scientists as a whole compared to non-scientists, in terms of cognitive style, career plans and other measured variables.

81. Comber, Mary. (1983). Concept development in relation to the particulate theory of matter in the middle schools (Secondary). Research in Science and Technological Education, 1, 27-39.

Concept development related to particulate theory of matter in 130 children in two contrasting Warwickshire Middle Schools were described in terms of background policies/practices in science teaching as revealed by responses from teacher questionnaires (N=60) and analysis of several science curricula. (Elementary)

82. Connolly, Charlene & Primavera, Louis. (1983). An analytic profile of precociously gifted students enrolled in horizontal enrichment programs. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (St. John's University, Jamaica, NY)

In light of the reality of current enrichment curriculum, an answer was sought to determine if a horizontal enrichment program which prepares research projects for the Westinghouse Talent Search could be a viable alternative to Stanley's (1979) vertical acceleration approach.

83. Cooper, Donald Lamar. (1983). A study of the effects of an activity based inservice science program on teaching attitudes, science process skills, and teaching style of elementary school teachers. Dissertation Abstracts International, 44, 128-A. (University of Southern Mississippi)

In a study investigating the impact of an inservice program called the Science Teacher Improvement Project on elementary school teachers from two southern Mississippi school districts, the authors found that the participants of the Science Teacher Improvement Project were significantly different from the control group in attitude toward teaching science and in process skills and in achievement. (Elementary)

84. Cox, David Charles. (1983). The effects of type of classroom science, grade level, years without science instruction, and elective science courses on performance level for selected high school science process skill competencies. Dissertation Abstracts International, 43, 2621-A. (Ohio State University)

The purpose of this study was to investigate the development of selected science process skills in required and elective science classes in the three high schools of a suburban Oregon school district. Tenth-grade students had significantly higher adjusted SPCT posttest scores than ninth-grade students in required science classes. Science process skill knowledge was retained through the high school years. (Secondary)

85. Crawley, Frank E., Schmitt, Conrad V., Saegert, Merry C.M. & Trout, John S. (1983). Compatibility of student characteristics and instructional strategy: An investigation of the matching hypothesis. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Texas - Austin)

This study was an investigation of the matching hypothesis with students (N=574) enrolled in ninth-grade physical science. The amount of enhancement of attitudes and the nature of the relationship between attitude and degree of compatibility with the instructional strategy were found to depend upon the attitudinal object. (Secondary)

86. Crawley, Frank E., Schmitt, Conrad V., Saegert, Merry C.M. & Trout, John S. (1983). The effects on pupils' achievement and attitude of training secondary science student teachers to match teaching strategies to pupils' learning styles. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Texas - Austin)

This study sought to train secondary science student teachers to teach using strategies compatible with the learning styles of pupils in their classes and to measure the effects of matching on pupils' achievement and attitude. Results indicated that once concern for self and concern for the task of student teaching decreased, student teachers demonstrated a concern for the impact of their teaching and used greater variety in their teaching strategies, a better match for students' learning styles

87. Crenshaw, Neil Willis. (1983). The effectiveness of a reinforced lecture-method on community college students' achievement in general biology with studies on concrete and formal operational levels of intelligence. Dissertation Abstracts International, 43, 2301-A. (Florida Institute of Technology)

It was found that formal-operational students significantly out-performed concrete-operational students on the biology achievement test. In addition, there was a significant relationships between attendance and student achievement. (College)

88. Crow, Linda W. & Piper, Martha K. (1983). A study of the perceptual orientation of community college students and their attitudes toward science as they relate to science achievement. Journal of Research in Science Teaching, 20, 537-541.

Perceptual orientation (field, dependence/independence) was related to 47 biology/earth science students' attitudes toward science. In addition, students who were field dependent and possessed a positive attitude scored significantly higher on a science achievement test than students who were field dependent and possessed a negative attitude. (College)

89. Cullen, Jr., John Francis. (1983). Concept learning and problem solving: The use of the entropy concept in college chemistry. Dissertation Abstracts International, 44, 1747-A. (Cornell University)

The results of this study indicated that overt attempts to show conceptual linkages to a subsuming concept can cause a restructuring of an individual's conceptual structure so that the subsuming concept assumes a more dominant position in the hierarchy. (College)

90. Cwick, Simin Lohrasbi. (1983). A comparative analysis of seven selected criteria of teacher effectiveness in the secondary science classroom. Dissertation Abstracts International, 44, 723-A. (Ball State University)

Criteria concerning teacher effectiveness in the secondary science classrooms was described and compared with how students of science teachers and administrators feel about these criteria. (Secondary)

91. Dall'Alba, Gloria & Edwards, John. (1983). Dimensions of cognitive demand. Research in Science Education, 13, 213-221.

Great variation exists between the demand to teach at the level of the students and the methods of assessing what the demand levels of the tasks are. A system for assessing the cognitive demand of a task is presented.

92. Davidson, Donna D. (1983). A survey of women studying science in the Los Angeles community college district. Dissertation Abstracts International, 43, 3230-A. (University of California, Los Angeles)

Statistical analyses revealed that gender differences do exist and that high school participation in the sciences has an impact on future science studies. Female students were older and complete fewer science courses in high school and college. Females had lower overall grade point averages but higher grades in science courses. (College)

93. Davidson, Robert. (1983). The reorganization of the Science Education Directorate of the National Science Foundation. Science Education, 67, 455-478.

An arms-length view and analysis of the events in question includes comments on the effectiveness of the reorganizational design and on those factors involved in implementation.

94. DeBoer, George E. (1983). Characteristics of male and female students who experienced high versus low success in their first college science course. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Colgate University, Hamilton, NY)

The results of this study showed that on three variables - persistence, lack of reckless or rash tendencies, and future orientation - score differences were significant between high- and low-success women but not between high- and low-success men. The results imply that career goal orientation may be important in women's success in science and that women continue to struggle against a social norm which says that science is a masculine field. (College)

95. DeLorenzo-Rooney, Teresa Amelia. (1983). Cognitive styles as predictors of success in an experientially-based science program. Dissertation Abstracts International, 43, 2216-A. (University of Houston)

This study supports the theory that field independent persons fare better than their more field dependent and balanced counterparts on levels of recall and application. Thus, educators may need to provide additional activities for the latter two categories to help sharpen recall and application skills. (Elementary)

96. Dennison, Judy Hale. (1983). A process tracing study of the strategies sixth grade children use in finding relations between variables. Dissertation Abstracts International, 43, 3866-A. (Michigan State University)

The subjects in this study were accurate in finding rules involving relations between variables. The sixth grade children in this study used strategies when they were asked to find relations between variables, but they differed in the number of strategies they have in their repertoire for this purpose. (Elementary)

97. Dettloff, Janet M. (1983). Predicting achievement in community college science students. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Wayne County Community College, Detroit MI)

This study was designed to formulate a predictive equation to identify community college biology students (N=420) who most probably would not succeed in a science course. Background characteristics and reading/math ability accounted for 42% of the variance in achievement. Cognitive development accounted for 12.8% of the variance in achievement. (College)

98. DeVore, Richard N. (1983). The relationship of field independence, dogmatism, tolerance for ambiguity, and knowledge of science processes to the development of positive attitudes toward science and science teaching. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Educational Testing Service, Skillman, NJ)

This study indicated that, for this sample, the subjects' tolerance for ambiguity and knowledge of science processes were both related to their attitudes when they began the course and when they finished the course, but these variables did not seem to affect the development of the desired attitudes during the course. (College)

99. Dillashaw, F. Gerald & Okey, James R. (1983). Effects of a modified mastery learning strategy on achievement, attitudes, and on-task behavior of high school chemistry students. Journal of Research in Science Teaching, 20, 203-211.

Results of modifying mastery learning strategy to two diagnostic cycles with high school chemistry students (N=156) indicated that achievement of students using mastery strategies was significantly greater than of students using nonmastery strategies. (Secondary)

100. Dobson, Henry David. (1983). An experimental study of the effectivenss of the planetarium in teaching selected science concepts in the middle school. Dissertation Abstracts International, 44, 1315-A. (Pennsylvania State University)

Fifth-grade level were incapable of mastering the concepts that require two- and three-dimensional reasoning ability. Spatial ability as measured in the CRLT (Cognitive Reasoning Level Test) was found to be an important factor affecting student performance. (Secondary)

101. Dodge, Kay T.. (1983). An ethnographic study of the interrelationship of community college teachers and students in a laboratory setting. Dissertation Abstracts International, 43, 2951-A. (Michigan State University)

In the study, the inquiry process moved from an examination of teacher role, to management patterns, and finally to teacher-student interaction. The study suggested that the teacher role is a function of the transaction between a myriad of extrinsic and intrinsic factors, and that the individual instructor's perception of role not only influences the leadership-management patterns employed in the laboratory, but ultimately the amount and type of teacher-student interaction. (College)

102. Donovan, Edward P., Fronk, Robert H. & Horton, Phillip B. (1983). A new science and engineering career interest survey for junior high school students. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Moorestown High School, Moorestown, NJ)

This paper described the development and validation of a science and engineering (S/E) career interest survey (CIS). Concurrent validity coefficients were calculated in two ways: (a) CIS scores were correlated with the Kuder GIS science subscale (r=.75), and (b) CIS scores were correlated with a CIS verification scale (r=.59). (Secondary)

103. dos Santos Silva, Maria Virginia & Colletto, Nires Metilde. (1983). Using grades obtained on the physics test of the university entrance examination as achievement indicators for students enrolled in general physics in Brazil. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Universidade Federal de Santa Maria, Brasil)

The purpose of this study was to find out if the results obtained by students on the physics test of the University Entrance Examination could be used as indicators of achievement in a general physics course at the Federal University of Santa Maria, Rio Grande do Sul, Brazil. Results showed a positive correlation between the performance on the University Entrance Examination and achievement in the general physics course. (Secondary)

104. Dowling, Kenneth W. & Yager, Robert E. (1983). Status of science education in state departments of education: An initial report. Journal of Research in Science Teaching, 20, 771-780.

Eight trends were presented based on data collected from 50 states concerning the professional preparation of state science consultants, the nature of the positions, number of workers employed in such units, changes in support staff, facilities, and budget for each 5-year interval between 1960-1980.

105. Dressel, Ralph. (1983). Costs of carrying students to a criterion level of competency in physics. Journal of Research in Science Teaching, 20, 231-238.

College students' performance in a competency-based, multiple-opportunity format physics course indicated that costs were related to the character of examination questions and comprehensional modes of students. (College)

106. Driver, Rosalind & Erickson, Gaalen. (1983). Theories-in-action: Some theoretical and empirical issues in the study of students' conceptual frameworks in science. Studies in Science Education, 10, 37-60.

Some of the theoretical and methodological issues involved in studies on conceptual frameworks are examined followed by a discussion on the implications of such studies on classroom learning and instructional design.

107. Druva, Cynthia Ann & Anderson, Ronald D. (1983). Science teacher characteristics by teacher behavior and by student outcome: A meta-analysis of research.. Journal of Research in Science Teaching, 20, 467-479.

The meta-analysis of 65 studies related to relationships between science teacher background characteristics and either their classroom behavior or student outcomes. In general, low relationships were found between these characteristics and classroom teaching behavior and student outcome char[illegible]tics.

108. Duit, Reinders. (1981). Students' notions about the energy concept - before and after physics instruction. Paper presented at the Conference on "Problems Concerning Students' Representation of Physics and Chemistry Knowledge", Ludwigsburg, West Germany. ED229237 (Kiel University)

Two studies on students' conceptions/notions about the energy concept were presented.

109. Dunkleberger, Gary E. & Heikkinen, Henry W. (1983). Mastery learning: Implications and practices. Science Education, 67, 553-560.

Bloom's mastery model has several clear and implementable implications for science teaching. Criteria essential to the implementation of this model in the classroom was identified.

110. Dunn, Carolyn S. (1983). The influence of instructional methods on concept learning. Science Education, 67, 647-656.

Introductory college chemistry students were taught using six different presentation techniques designed to allow a comparison of method on concept acquisition. Two of the methods produced significantly better results than the other four. (College)

111. Duroy, Frank. (1983). A comparison between hypothesis testing strategy and academic achievement of freshmen biology students. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Rutgers University)

The purpose of this study was to evaluate the hypothesis testing strategy of freshmen biology students and comparing it with final grades. Results of the test indicated that, of the 49 students enrolled in this course, 29 used a verification strategy in testing a hypothesis and 20 used a falsification strategy. (College)

112. Duschl, Richard A. (1983). The elementary level science methods course: Breeding ground of an apprehension toward science? A case study. Journal of Research in Science Teaching, 20, 745-754.

Documented training and educational activities of pre-service elementary education majors (N=20) were used to determine what aspects of their science training contributed to developing the apprehension elementary teachers have toward science, science education, and science instruction. The ethnographic methodologies employed resulted in the conclusion that students need science experiences which accurately represent science as inquiry. (Elementary)

113. Duschl, Richard A. (1983). Reconsidering the science curriculum: Clues from the structure of scientific theories. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Maryland)

The paper presents the position that science education has neglected to synthesize into precollege science curricula the important writings and insights of historians and philosophers of science. Leaders in science education should assess the value of models of the structure of scientific theories in developing science programs and curricula.

114. Eaton, Janet F. & Others, . (1983). Students' misconceptions interfere with learning: Case studies of fifth-grade students. (Research Series No. 128). Washington, D.C.: National Institute of Education (ED). ED229094 (Michigan State University)

This study examined the relationship between student misconceptions and learning by focusing on six fifth-grade students as they attempt to make sense of classroom instruction on light and seeing. (Elementary)

115. Edoff, James Dwight. (1983). An experimental study of the effectiveness of manipulative use in planetarium astronomy lessons for fifth and eighth grade students. Dissertation Abstracts International, 43, 3496-A. (Wayne State University)

The inclusion of student object manipulation during a planetarium unit of instruction apparently improves a student's retention of learned information and understanding of lunar phases and motion. Students using a manipulative were better able to recall presented information and had a slightly improved ability to apply presented knowledge and to observe astronomical locations. (Secondary)

116. Edwards, John & Fraser, Kym. (1983). Concept maps as reflectors of conceptual understanding. Research in Science Education, 13, 19-26.

Students made concept maps of units studies in science. These students' understanding of the concepts taught in these units could be assessed using the concept maps or interviews but could not be adequately assessed through written explanations. (Secondary)

117. Eglin, Paula Garrison. (1983). Creationism vs. evolution: A study of the opinions of Georgia science teachers. Dissertation Abstracts International, 44, 128-A. (Georgia State University-College of Education)

Teachers who subscribe to a liberal religious viewpoint and who are familiar with creationist literature and philosophy are more likely to disapprove of creationism, as are teachers with advanced degrees. The survey reveals little enthusiasm for creationism, even among those teachers reporting a fundamentalist background. (Secondary)

118. Ehindero, O.J. (1983), The influence of preferred and actual instructional strategies on the cognitive growth and achievement in biology. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Ife, Nigeria)

This study uses a quasi-experimental design to investigate the long-term effects of preferred and actual instructional styles of 2 preservice science teachers on the cognitive growth and biology achievement of 80 high school students in Nigeria. Results of this study implied that teachers should be introduced to as many different instructional strategies as possible. (Secondary)

119. Ellis, James D. & Zielinski, Edward J. (1983). Effects of a summer institute on middle school science teachers' energy knowledge and attitude and energy education implementation. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Colorado College, Colorado Springs, CO)

The Summer Workshop for Energy Education Teachers in Texas (SWEET-TX) was designed to improve Texas Middle School Science Teachers' understanding of energy issues and concepts. An evaluation of the effects of the program indicates that SWEET-TX was successful at increasing the teachers' energy knowledge and positive attitude as indicated on the National Assessment of Education Progress energy test for young adults. (College)

120. Emereole, Hezekiah Ukegbu. (1983). Teaching physics with the bicycle: A curriculum module for teaching secondary school physics with utilitarian objects in developing countries. Dissertation Abstracts International, 44, 29-A. (Columbia University Teachers College)

A teacher's version of a curriculum module was developed for teaching mechanics, gas laws, and sound with the bicycle as an example of the utilitarian objects approach for teaching secondary school physics in developing countries. The utilitarian objects approach was judged to be an appropriate method for teaching physics. (Secondary)

121. Emerick, Blanche Bante. (1983). An analysis of the science education problem of teaching density as approached from two different Piagetian research perspectives: Operationalism and constructivism. Dissertation Abstracts International, 43, 3845-A. (University of Illinois at Urbana-Champaign)

It was discovered that some subjects did have a concept of density, although it was not the formal operational concept of density. It appears that their concept of density is the culmination of a long process of construction of intuitions, perceptions, and operations, possibly beginning during infancy. The concepts of density held by those subjects can be thought of collectively as a concrete operational concept of density. (Secondary)

122. Eniaiyeju, Paul A. (1983). The comparative effects of teacher-demonstration and self-paced instruction on concept acquisition and problem-solving skills of college level chemistry students. Journal of Research in Science Teaching, 20, 795-801. SE534423

Teacher-demonstration and self-paced modes of teaching concepts and problem-solving skills in college chemistry were compared. The results showed that the self-paced mode was significantly more effective for teaching concepts and problem-solving skills and that most students (N=60) preferred the self-paced instruction to the teacher-demonstration method. (College)

123. Enochs, Larry G. & Harty, Harold. (1983). Development of an inservice implementation proneness typology for science teachers. Science Education, 67, 143-150.

An instrument to quantify teachers' proneness to implement concepts from an inservice program was developed. The predictive validity of the instrument remains to be established.

124. Falk, John H. (1983). Field trips: A look at environmental effects on learning. Journal of Biological Education, 17, 137-142. SE533993

Six studies on school field trip learning were reviewed. Among the findings reported were those indicating that students' perceptions of the novelty of the trip affected what they learned, and that imposed learning was inhibited in settings where novelty was either extremely great or small.

125. Falk, John H. (1983). Time and behavior as predictors of learning. Science Education, 67, 267-276.

Data indicated that observable behavior and time, especially in conjunction with each other, may be used as an unobstrusive indicator of cognitive learning. This technique has implications for the assessment of other types of learning as well. (Secondary)

126. Fawns, Rod. (1983). Background mapping of teachers' cognate perceptions of ASEP units. Research in Science Education, 13, 203-212.

Concept mapping can be used as a guide to understanding teachers' concepts about science and teaching.

127. Fensham, Peter J. (1983). Equations, translations and number skills in learning chemical stoichiometry. Research in Science Education, 13, 27-35.

Misconceptions about what a chemical equation describes often results in students being unable to solve stoichiometry problems even though they have the required math skills. (Secondary)

128. Fensham, Peter J. (1983). A research base for new objectives of science teaching. Science Education, 67, 3-12.

A set of objectives for science education that incorporated the state of the learners' knowledge or world views was proposed. Implementation of such objectives would require new styles of teacher-student interactions.

129. Fields, Steve. (1983). Correlates of cerebral hemisphericity. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Heritage High School, Conyers, GA)

This author examined selected variables among biology students including cognitive ability level, learning style, learning disabilities, and gender. (Secondary)

130. Finegold, Menahem, Connelly, F. Michael, Kass, Heidi & Cracker, Robert K. (1983). A Canadian case study of science education. Ottawa, Ont.: Social Sciences and Humanities Research Council of Canada. ED228075 (Ontario Institute for the Study of Education)

Canadian participation in the Second International Science Study (SISS) was discovered in terms of both international and national aims.

131. Finkel, Edward. (1983). Three approaches to group teaching of verbal problem solving in secondary school physics. Dissertation Abstracts International, 44, 720-A. (Georgia State University)

Many significant relationships between variables were observed, and the regression approach produced useful prediction equations. The performance criteria used here indicated that three approaches to teaching problem solving were equally successful. (Secondary)

132. Finley, Fred N. (1983). Science processes. Journal of Research in Science Teaching, 20, 47-54.

This investigation of the epistomologic foundations of Gagne's conception of science processes suggests that a commitment to inductive-empiricism pervades the presently held view of science processes.

133. Finley, Fred N. (1983). Students' recall from science text. Journal of Research in Science Teaching, 20, 247-259.

Four different groups of physics students (n=38), each recalling different sets of propositions from reading text material related to energy transfer, were identified. The results suggested that science educators cannot assume that all students in a class will recall identical information from the assignment of a reading passage. (Secondary)

134. Finley, Fred N. (1983). Variations in students' science knowledge. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas. (University of Maryland)

The implication of these results was that teachers and curriculum developers could consider the commonly held student knowledge of a subject and the alternative conceptions of a limited number of groups of students in designing instruction. More effective instruction is likely to result when this is done. However, accounting for the additional knowledge that is particular to individuals must be done as it has been by teachers interacting with students in their classes. (Secondary)

135. Fisher, Darrel L. & Fraser, Barry J. (1983). Use of classroom environment scale in investigating effects of psychosocial milieu on science students' outcomes. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Tasmanian College, Launceston, Tasmania, NSW)

The results confirmed the existence of sizeable and statistically significant associations between student learning outcomes and their classroom environment perceptions as measured by the Classroom Environment Scale. (Secondary)

136. Fisher, Darrell L. & Fraser, Barry J. (1983). A comparison of actual and preferred classroom environments as perceived by science teachers and students. Journal of Research in Science Teaching, 20, 55-61.

Junibr high school students, preferred a more favorable environment than the environment they perceived, and their teachers perceived the classroom environment more favorably than did their students. (Secondary)

137. Fleming, M. Lynette & Malone, Mark R. (1983). The relationship of student characteristics and student performance in science as viewed by meta-analysis research. Journal of Research in Science Teaching, 20, 481-495.

Relationships of student characteristics to student performance/attitudes were explored by meta-analysis. Six characteristics (general ability, language ability, mathematics ability, socio-economic status, sex, and race) were analyzed. Strong positive relationships between general/language/mathematics ability and achievement and attitude measures were identified.

138. Fleming, William. (1983). Perceptions of minority pre-engineering students in special enrichment programs. Dissertation Abstracts International, 44, 1408-A. (Temple University)

This study indicated that Blacks and Hispanics performed well contrary to some public opinion. (Secondary)

139. Franco, Glenn Earle. (1983). Assessment of implementation of science - A process approach II (SAPA II) in selected fourth, fifth and sixth grade classrooms. Dissertation Abstract International, 44, 450-A. (Kansas State University)

Higher science process outcomes were associated with those teachers who utilized suggested introduction activities and who judged student performance utilizing science process assessments. In addition, students who actively made decisions, manipulated materials and recorded data had significantly greater science process outcomes than their occasionally-active or passively-occupied counterparts. (Elementary)

140. Fraser, Barry J. & Fisher, Darrel L. (1983). Assessment of classroom psychosocial environment. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (W. Australian Inst. of Tech., Bentley WA)

This familiarized participants with background information, scoring procedures, and validation data relevant to the Learning Environment Inventory, My Class Inventory, Classroom Environment Scale, Individualized Classroom Environment Questionnaire, preferred forms of some instruments, and short forms of some instruments. Finally, an overview was given of recent science education research involving use of these instruments.

141. Fraser, Barry J. & Fisher, Darrell L. (1983). Effects of classroom openness on science students' achievement and attitudes. Research in Science and Technological Education, 1, 41-51.

A sample of 2175 students in 116 science classes formed the basis of a description of perceived actual and preferred classroom openness along five continuous dimensions (personalization, participation, independence, investigation, differentiation) and cognitive and affective attributes. (Secondary)

142. Fraser, Barry J. & Fisher, Darrell L. (1983). Development and validation of short forms of some instruments measuring student preconceptions of actual and preferred classroom learning environment. Science Education, 67, 115-131.

Two types of classroom environmental (c.e.) instruments were developed and validated. Tests measuring perceptions of actual c.e. included individualized classroom environment questionnaire (ICEQ), my class inventory (MCI) and classroom environment scale (CES). Analogous tests measuring preferred classroom environment were also developed.

143. Fraser-Abder, Pamela & Fowler, H. Seymour. (1983). An experimental study into the effect of science teaching on the Trinidadian fifth grade child's concept of Piagetian physical causality. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of the West Indies, Trinidad)

This study investigated the effect of science experiences provided by the classroom teacher on the fifth-grade Trinidadian child's concept of Piagetian physical causality. It concluded that participation in selected science experiences tended to accelerate or enhance the understanding of the concepts of living and floating. The causal relationships of animism and dynamism could be taught to fifth-grade Trinidadian children. (Elementary)

144. Freilich, Mark B. (1983). A student evaluation of teaching techniques. Journal of Chemical Education, 60, 218-221.

College students' (N=192) and teachers' (N=23) responses to a 28-item questionnaire were analyzed to determine the five items most and five items least important in learning. Results suggested that students were practical, goal (job)-oriented, and willing to look to faculty for, or actually demanded, precise guidance. (College)

145. Friend, Harold & Caifa, John. (1983). Effect of increased laboratory time on selected students' attitudes toward science. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Queens College, Flushing, NY)

The purpose of the present study was to determine the effect of increased laboratory time on selected students' attitudes toward science. There was no change in selected students' attitudes toward science, despite increased laboratory time. (Secondary)

146. Fuqua, Ann Keplinger. (1983). Moral reasoning and formal-operational thought: A comparison of science majors and religion majors in three church-related colleges. Dissertation Abstracts International , 44, 1047-A. (George Peabody College of Vanderbilt Univ.)

Significant relationships generally were not found between academic major and principal moral judgment - as determined by Rest's Defining Issues Test, and formal-operational thought - as determined by Burney's Logical Reasoning Test. Science majors and religion majors in church-related colleges constituted the pool of subjects. (College)

147. Gabel, Dorothy L. & Sherwood, Robert D. (1983). Facilitating problem solving in high school chemistry. Journal of Research in Science Teaching, 20, 163-177.

Investigated superiority of instructional strategies (factor-label method, proportionality, use of analogies, use of diagrams) in teaching problem-solving related to mole concept, gas laws, stoichiometry, and molarity. Also investigated was the effectiveness of strategies for students (N=609) with different verbal-visual preferences, proporational reasoning ability, and different levels of mathematics anxiety. (Secondary)

148. Gabel, Dorothy L. & Sherwood, Robert D. (1983). Using analogs to determine chemistry students' skills for solving mole concept problems. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Indiana University)

This study was conducted to determine which skills and concepts high schools have that are prerequisites for solving mole problems through the use of analogs. Comparisons resulted in some of the following conclusions: 1) The size of the object makes no difference in the problem difficulty; 2) Students understand the concepts of mass, volume, and particles equally well; 3) Problems requiring two steps are easier than those requiring one step. (Secondary)

149. Gagne, Robert & Burkman, Ernest. (1982). Promoting science literacy in adults through television. Final report. Washington, D.C.: National Science Foundation. ED229234 (Florida State University)

This report summarized the experience as well as presenting results of the NOVA television series.

150. Gallagher, James J. (1983). A study of policy & program formulation & implementation in a secondary school science department. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Michigan State Unviersity)

An ethnographic study was conducted of the secondary school science department in a midwestern, suburban, middle/upper middle class school district of 1850 students. The report provides a detailed description of the operation of a suburban secondary school science department. Interactions among administrators, teachers, and students are analyzed as well as the factors which underlie policy and program decisions about the science curriculum. (Secondary)

151. Gallagher, James Joseph, Zehr, Eric & Yager, Robert E. (1983). Characteristics of personnel at graduate science education centers: Implications for the future of the profession. Journal of Research in Science Teaching, 20, 271-281.

Biographical/professional information of faculty (N=168) employed at the 35 largest graduate centers for science education was collected and analyzed. Faculty were found to be similar in age, sex, rank, academic preparation, previous experience, research productivity, and professional involvement. Few cooperative efforts or clearly defined research efforts over time were identified.

152. Gardner, Marjorie H. & Yager, Robert E. (1983). Ameliorating current problems in science education. Science Education, 67, 587-594.

A fundamental problem in science education is that science teachers do not have a philosophical framework from which they can act. Thus, an overall plan for science education with a philosophical orientation should be the starting point for a complete reorganization of science curricula.

153. Gauld, Colin & Ryan, Kathryn. (1983). An interview study of responses to diagnostic, multiple-choice physics items. Research in Science Education, 13, 37-45.

Interviews in which students thought aloud about their answers after they had completed a multiple-choice test indicated that students did use strategies in choosing answers. Furthermore, many of the questions did not provide well for an analysis strategy by which students could reason out answers. (Secondary)

154. Gennaro, Eugene D. & Haney, Richard. (1983). Description of science courses for parents and children. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Minnesota)

During the 1960's and 1970's, a number of family learning projects evolved, most of which focused on preschoolers and their parents. The goal of some of these programs was to provide enjoyable structured experiences in which parents and their children learned together. The research studies that were reported were the result of two experimental studies and a naturalistic study.

155. Giddings, Geoffrey Julian. (1983). Presuppositions in school science textbooks. Dissertation Abstracts International, 43, 2622-A. (University of Iowa)

Samples from four contemporary secondary science textbooks were coded and analysed for specific biases. Analysis of the textbooks suggested that the STAS (Science Textbook Analysis Scheme) was a reliable instrument to determine imbalances in textbook content. The data revealed differences in emphasis between different textbooks and within individual textbooks. (Secondary)

156. Gilbert, John K. (1983). Alternative conceptions: Which way now?. Paper presented at the Annual Meeting of the American Association of Physics Teachers, New York, NY. ED225851

The authors suggested that the training of physics teachers should include ample time for the trainees to articulate, confront, and modify their own alternative conceptions.

157. Gilbert, John K. & Watts, D. Michael. (1983). Concepts, misconceptions and alternative conceptions: Changing perspectives in science education. Studies in Science Education, 10, 61-98.

Three models were presented by which conceptual development could be examined. The meaning of concept within a framework of present and past influences on science education were examined in a survey of a wide range of studies.

158. Ginns, Ian S. & Foster, William J. (1983). Preservice elementary teacher attitudes to science and science teaching. Science Education, 67, 277-282.

The effects of using a lecture-oriented versus a research topic-oriented instructional design on students' attitudes towards science were explored. One significant two-way interaction, treatment by sex, was identified. (College)

159. Good, Ron, Berger, Carl, Lawson, Anton E., Renner, John W. & Stewart, Jim. (1983). Cognitive science and science education - A symposium. Symposium presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Florida State University)

The purpose of this symposium was to provide an open forum to discuss the relationship of cognitive science to science education. Each panel member presented ideas about one or two specific topics in current theory and research in cognitive science as well as discussing the more general question, what does cognitive science have to offer to science education?

160. Good, Thomas L. & Hinkel, Gail M. (1983). Teacher shortage in science and mathematics: Myths, realities and research. Washington, D.C.: National Institute of Education (ED). ED231653 (University of Missouri)

A shortage of certified and qualified science and mathematics teachers was one of the most visible and critical problems faced by our nation's schools.

161. Gordon, Dolores Marie. (1983). Phenotype development: Implications for program development in secondary school biology. Dissertation Abstracts International, 44, 1408-A. SE043484 (Temple University)

The author found that there is no dispute, evolution is factual. There are, however, competing positions as to the nature of the process of evolution. (Secondary)

162. Grant, Jean McArthur. (1983). The study of an individualized mode of learning: A comparison of contrasting methods in the teaching of freshman college biology. Dissertation Abstracts International, 44, 682-A. (George Washington University)

The results of the study indicate that PSI (Personalized Instruction Program) can be an alternative teaching strategy that will enable students to assume greater responsibility for their own learning. (College)

163. Griffiths, Alan K., Kass, Heidi & Cornish, Alan G. (1983). Validation of a learning hierarchy for the mole concept. Journal of Research in Science Teaching, 20, 639-654.

Three psychometric methods for validating learning hierarchies were applied to one data set derived from student responses (N=269) to items representing skills in a hypothesized hierarchy for the mole concept. The hierarchy derived from the analysis was supported by a test for transfer of learning from subordinate to superordinate skills. (Secondary)

164. Griffiths, Alan K., Pottle, John & Whelan, Patrick. (1983). Application of the learning hierarchy model to the identification of specific misconceptions for two science concepts. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Memorial University, St. John's, Nfld, CANADA)

The use of learning hierarchies to identify students' misconceptions for some science concepts was advocated. The use of this model to identify misconceptions with respect to the performance of 'stoichiometric calculations' and 'conservation of mechanical energy' was described. A number of specific misconceptions were reported in each case. (Secondary)

165. Haladyna, Tom, Olsen, Robert & Shaughnessy, Joan. (1983). Correlates of class attitude toward science. Journal of Research in Science Teaching, 20, 311-324.

The following variables were found to be related to science attitude of all classes at grade levels 4, 7, and 9: sense of importance of science; student fatalism; teacher quality; and numerous learning-environment variables.

166. Hale, James P. (1983). Problem-solving analysis: A Piagetian study. Journal of Research in Science Teaching, 20, 77-85.

This study investigated the development of propositional logic and three formal logical schemata (underlying generic problem-solving processes/operations) in adults (N=59) enrolled in their second year of medical school. Two students were full formal on the 12-Piagetian tasks used and the 57 remaining were classified as in a transitional stage of formal operations. (College)

167. Hallada, Marian Chu & Voss, Burton E. (1983). Mastery learning in college chemistry. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Michigan)

The mastery strategy here focused on the alterable variables: time on task, formative evaluation and highly structured teaching. Educational gain was demonstrated for the treatment group since the two groups were found significantly different in cognitive entry level but significantly similar in educational outcomes measured in terms of course grades and student satisfaction. (College)

168. Handley, Herbert M. & Morse, Linda W. (1983). Two year study relating adolescents' self concept and gender role perceptions to achievement and attitudes toward science. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Mississippi State University)

A two-year longitudinal study was conducted to assess the developmental relationship of perceptions of self-concept and gender-role identification with adolescents' attitudes and achievement in science. Results indicated that students' self-concepts/gender role perceptions were related to both achievement and attitudes toward science, but more related to attitudes than achievement. These relationships became more pronounced for students in the eighth grade. (Secondary)

169. Happs, John C. (1983). Using socio-cognitive conflict to establish an understanding of the scientific meaning of rock. Research in Science Education, 13, 51-71.

The firm, well-integrated beliefs learners hold about nature when they come into a science classroom may prove difficult to change. Teaching strategies must focus on reforming these beliefs even though students will try to superimpose pre-existing structures on the new information. (Elementary)

170. Harlen, Wynne. (1983). Process skills, concepts and national assessment in science. Research in Science Education, 13, 245-254.

Teachers spend too much time using teaching-directed activities and note dictation and too little time on experimental work. The national assessment program may be partly responsible for restricting teacher activities in that the types of questions being asked do not emphasize process skills. Moreover, many of the values of education are complex and difficult to define and thus do not lend themselves to traditional measurements.

171. Harris, Sidney P. (1983). Physics, an important factor in the success of general college chemistry students. Journal of Chemical Education, 60, 739-740.

The relationship between students (N=1008) preparation in high school physics chemistry and success in college chemistry (as measured by a final letter grade of B- or better) indicated that most well-prepared students (defined as having had previous experience in chemistry, physics, and mathematics) did well in general college chemistry.

172. Harty, Harold & Al-Faleh, Nasser. (1983). Saudi Arabian students' chemistry achievement and science attitudes stemming from lecture-demonstration and small group teaching methods. Journal of Research in Science Teaching, 20, 861-866.

The lecture-demonstration and small-group laboratory approaches on students' (N-74) chemistry achievement and attitudes toward science were compared. Findings indicated that students taught by the laboratory approach achieved better on immediate/delayed posttests than students taught by lecture-demonstration method. (Secondary)

173. Harty, Harold & Hassan, Hassan A. (1983). Student control ideology and the science classroom environment in urban secondary schools of Sudan. Journal of Research in Science Teaching, 20, 851-859.

The relationships between Sudanese science teachers' pupil control ideology and the students' perceptions/observations of the psychosocial environment of their classrooms were examined. No significant relationships between the humanistic/custodial control between the ideologies of teachers and student perceptions were found.

174. Hassan, Abdel Moneim A. (1983). Effects of persuasive communication and self-esteem on changing attitudes of preservice elementary teachers toward teaching chemical changes. Dissertation Abstracts International, 43, 3280-A. (Pennsylvania State University)

The findings of the study indicated that students who received the persuasive communication have a positive change in their attitudes toward teaching simple chemical changes to elementary school students. (Elementary)

175. Hassan, Abdel Moneim A. & Shrigley, Robert L. (1983). The effect of a written persuasive communication on the attitudes of preservice elementary school teachers. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Al-Azhar University, Cairo, Egypt)

The results of the study included many points, such as: (1) written communication can modify the attitudes of preservice elementary teachers toward the teaching of simple chemistry concepts in the elementary school; (2) the effect of the experimental treatment was not retained three weeks later; (3) the experimental treatment did not affect the three self-esteem levels differently. (College)

176. Haukoos, Gerry D. & Penick, John E. (1983). The influence of classroom climate on science process and content achievement of community college students. Journal of Research in Science Teaching, 20, 629-637.

The effect of two classroom climates (discovery and non-discovery) on learning of science process skills and content achievement of college students (N=78) were examined. The results indicated that students in both climates achieved equally well, but students in the discovery climate achieved higher process scores as measured by the Welch Science Process Inventory.

177. Heath, Phillip A. & White, Arthur L. (1983). A study of the effect of the number of properties in a decision making situation on the number of alternatives generated by young children. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Ohio State University, Lima, OH)

This study indicated a direct/positive and significant relationship between the number of properties of an object presented to a student in second- and fourth-grades and the number of alternatives named for a fair distribution of the objects. In addition, it was found that second graders named more alternatives than did fourth graders. (Elementary)

178. Heller, Joan I & Reif, F. (1982). Prescribing effective human problem-solving processes: Problem description in physics. Paper presented at the meeting of the American Chemical Society, Las Vegas, Nevada. ED229276 (University of California - Berkeley)

Theoretical model specifying the underlying knowledge and procedures whereby human subjects can generate effective initial descriptions of scientific problems was formulated. (College)

179. Heller, Joan I. & Reif, F. (1983). Toward theory-based instruction in scientific problem solving. Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Quebec, Canada. ED233886 (University of California - Berkeley)

Several empirical and theoretical analyses related to scientific problem-solving were reviewed, including: detailed studies of individuals at different levels of expertise, and computer models simulating some aspects of human information processing during problem solving.

180. Hertel, Barbara & Heller, Patricia. (1983). A comparison of achievement and attitude of children taking a science class with their parents and children taking the class with peers. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Mahtomedi Middle School, Mahtomedi, MN)

The purpose of this study was to investigate the effects of pairing parents and their middle school-aged children as learning partners in an informal science course. Prior knowledge was a significant factor in the cognitive posttest scores and in the attitude toward subject matter.

181. Hewson, Mariana G. & Hamlyn, Daryl. (1983). The influence of intellectual environment on conceptions of heat. Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Quebec, Canada. ED231655 ("Science Education Project")

This study examined the role played by particular intellectual and physical environments on concept formation, focusing on conceptions concerning heat, in a group of non-western subjects living in the interior of southern Africa (N. Sotho and Tswana peoples).

182. Hewson, Mariana G. & Hewson, Peter W. (1983). Effect of instruction using students' prior knowledge and conceptual change strategies on science learning. Journal of Research in Science Teaching, 20, 731-743.

These authors investigated 90, Form 2, students' (grade 9 equivalent in USA) alternative conceptions and instructional strategies to effect change from alternative to scientific conceptions. Results indicated that significantly larger improvement in acquisition of science concepts (mass, volume, density) resulted from using strategies/materials dealing with student alternative conceptions designed for the targeted student group.

183. Hodson, D. & Freeman, P. (1983). The effect of primary science on interest in science: Some research problems. Research in Science and Technological Education, 1, 109-118.

These authors argue that fostering early science interest could act as a stimulus for lasting interest, affecting numbers of students opting for secondary school science courses. (Secondary)

184. Hofstein, Avi. (1983). What affects student achievement in science? A correlational study. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Weizmann Inst. of Science, Rehovot, ISRAEL)

Multiple regression analysis was conducted; 28% of the total variance of students' score in science was found to be explained by the score on the various skills of the test of enquiry skills. Only a small proportion of the variance is explained by the curiosity variable, students' gender and locus of control. (Secondary)

185. Holland, Ray & Mansell, Tony. (1983). Meanings and their interpretation in science education research. Studies in Science Education, 10, 99-109.

The nature of science education and the directions of research in the field of science education are discussed.

186. Holliday, William G. (1983). Overprompting science students using adjunct study questions. Journal of Research in Science Teaching, 20, 195-201.

The selective attention model was used to explain effects of overprompting students (N=170) provided with study questions adjunct to a complex flow diagram. Strongly prompting students to answers of questions was less effective than an unprompted question treatment, suggesting that prompting techniques be used with extreme caution. (Secondary)

187. Holliday, William G. (1983). Using recent research methods based in cognitive psychology to evaluate science textbooks. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Calgary, Calgary, AB, Canada)

The purpose of this seminar was: (1) to present recent research findings and theoretical considerations described by cognitive researchers querying problems in reading and language, and (2) to discuss the implications of these findings and considerations in light of research problems and issues in science education.

188. Holtz, Marvin Edward. (1983). Relationships among high school students' perceptions of science classroom behavior, observed behavior and Jungian type. Dissertation Abstracts International, 44, 451-A. (Florida State University)

Science teachers' instructional strategies apparently forced students to exhibit similar classroom behavioral patterns and select similar curriculum materials which were inconsistent with their Jungian preferences. (Secondary)

189. Hope, John & Townsend, Michael. (1983). Student teachers' understanding of science concepts. Research in Science Education, 13, 177-183.

First year teacher trainees showed no sex-linked differences in their understanding of science. Biological concepts were generally better understood than physical concepts. (College)

190. Hoskins, Winston Leroy. (1983). An evaluation of an individualized biology program. Dissertation Abstracts International, 43, 2301-A. (North Texas State University)

Average students in the above-average school achieved significantly better in the individualized program. In the medium-low school, students as a whole achieved higher in the control classes. In the very low school, there was no significant difference between the two programs in terms of student achievement. (Secondary)

191. Housel, David Charles. (1983). The effect of an outdoor education component of a teacher preparation program on the attitudes of pre-service teachers toward science and the education of children. Dissertation Abstracts International, 43, 2301-A. (Arizona State University)

The author concluded that the analyses of the data in this study did not support the hypothesis that the outdoor education components would affect attitudes toward the variables measured. It was recommended that, because this and previous studies have produced conflicting results, additional alternative methods of measuring the effect of outdoor education on attitudes of teachers be explored. (Elementary)

192. Howard, Betty Barton. (1983). Effects of two types of post lab tasks on microbiology achievement of college students. Dissertation Abstracts International, 43, 2301-A. (University of Georgia)

Summarizing post lab tasks were found to be more effective in influencing microbiology achievement than were transferring tests. Students having high aptitude achieved better in microbiology lab than lower aptitude students, and students at higher levels of cognitive development achieved better than students at lower cognitive levels. (College)

193. Hueftle, Stacy J. & Others, . (1983). Images of science. A summary of results from the 1981-82 national assessment in science. Washington, D.C.: National Science Foundation. ED234993 (University of Minnesota)

This report described and interpreted findings from a 1981-82 national assessment in science conducted by the Minnesota Science Assessment and Research Project (SEARP).

194. Huppert, Yehuda & Lazarowitz, Reuven. (1983). Individualized audio-tutorial instruction in high school biology (research summary). Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Hof HaCarmel H. Sch., Maagan Michael, ISRAEL)

The Individualized Audio-Tutorial (IAT) method as it was developed by Postlethwait consists of a set of structured learning activities in which a student pursues individually at his own rate. Most of the implementation and research with IAT was done at the college level, and few for the junior and high school students . Findings were categorized in two clusters: 1) cognitive domain and 2) affective domain. (Secondary)

195. Ilyas, Mohammad. (1983). Relationships between science process skills instruction and secondary school teachers' performance, use and attitudes toward using these skills. Dissertation Abstracts International, 44, 1409-A. (Indiana University)

The teaching of science process skills to inservice secondary school science teachers enabled them to acquire science process skills competence, select science process skills objectives and process activities significantly better than the untrained teachers. (Secondary)

196. Jacobowitz, Tina. (1983). Relationship of sex, achievement, and science self-concept to the science career preferences of black students. Journal of Research in Science Teaching, 20, 621-628.

This regression analysis study suggested that early adolescent science career preferences of students (N=261) were related more to interests consonant with sex-role considerations than realistic assessment of mathematics/science achievement. (Secondary)

197. James, Robert K. & Hord, Shirley M. (1983). Assessing implementation using innovation configuration. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Kansas State University)

Science educators in this research session observed classroom-to-classroom variations in the use of innovations in science. The Concerns Based Adoption Model used here included several strategies for studying implementation.

198. Johnson, Roger T. & Johnson, David W. (1983). Importance of student/student interaction. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Minnesota)

Twelve studies examining the effects of cooperative, competitive and individualistic student interaction patterns on acceptance of differences and achievement in science classrooms were summarized. The results of the studies indicate that nothing is lost in terms of achievement with half the studies showing significantly higher achievement scores for students in the cooperative condition and the other half showing no significant differences. (Secondary)

199. Johnson, T. Franklin & Butts, David P. (1983). The relationship among college science student achievement, engaged time, and personal characteristics. Journal of Research in Science Teaching, 20, 357-366.

Engaged-time measures observed and perceived were significantly related to achievement, which indicates that an instructor should endeavor to keep the students as engaged as possible to enhance achievement. Students who were engaged or paid attention or perceived they were engaged or paying attention during lecture classes achieve more than students who were observed as nonengaged or perceive themselves as nonengaged.

200. Johnstone, A.H. (1983). Nyholm lecture: Chemical education research: Facts, findings, and consequences. Journal of Chemical Education, 60, 968-971.

Presenting students with large amounts of information while their concepts are primitive prevents students from grouping/handling the very information they need to develop concepts. Reducing the load or providing strategies to help students group/sequence the load were recommended.

201. Jolly, Pauline E. & Strawitz, Barbara M. (1983). Teacher-student cognitive style and achievement in biology. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (B.P. 116 Ziguinchor, Senegal, West Africa)

The study investigated the effects of teacher-student cognitive style matches and mismatches on student achievement in biology. Field-independent (FI) students achieved significantly higher scores than did field-dependent (FD) students with both FI and FD teachers, but FD students achieved significantly higher scores with FI rather than FD teachers. (Secondary)

202. Jones, Alister. (1983). Investigation of students' understanding of speed, velocity and acceleration. Research in Science Education, 13, 95-104.

Students' understanding of the concepts of motion varied with schooling and maturity. Unless students had received instruction in these topics their concepts of motion were often vague and confused. (Secondary).

203. Jones, Bruce & Butts, Bill. (1983). Development of a set of scales to measure selected scientific attitudes. Research in Science Education, 13, 133-140.

Four categories (new evidence, causation, honesty and skepticism) were used as criteria in a test of scientific attitudes. The test instrument was developed to identify those attitudes from the affective domain which should be attended to in instruction. (Secondary)

204. Jones, Mary Kerr. (1983). The effect of a preservice science methods course emphasizing the mastery of science process skills on development of formal reasoning of students majoring in elementary school education. Dissertation Abstracts International, 44, 1319-A. (Wayne State University)

The findings provided evidence that preservice elementary teachers did grow in their development of logical reasoning when exposed to a one semester course in elementary school science methods which emphasized mastery of science processes. (Elementary)

205. Jones, Howard L., Sethna, Godrej, Contant, Terry, Sumners, Carolyn, James, Robert K., McIlwaine, Bill & McConnell, Bill. (1983). Second year results of the evaluation of amusement park physics. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Houston)

Detailed in this paper were six studies. Specifically, the studies reported, in part, the degree to which classroom instruction focused on positive student experiences and influenced student attitudes toward science as well as increases in knowledge and application of science concepts. (Secondary)

206. Joss, Charles Adam. (1983). A survey of the science teaching practices in selected elementary Christian schools in the United States. Dissertation Abstracts International, 43, 2949-A. (Michigan State University)

The author found many similarities between Christian school and public school science teaching practices, including low science teaching priority, barriers to effective teaching, and dependence upon teacher-centered methods and reliance upon a single textbook. Differences included better prepared public school science teachers and smaller Christian school class sizes. (Elementary)

207. Jungwirth, Ehud. (1983). Consistency across methods of observation - an in-depth study of the cognitive preference test. Journal of Research in Science Teaching, 20, 511-519.

Two response formats and a request for reason-for-choice on a traditional cognitive preference test (CPT), and an open-ended CPT were used to test for consistency across methods of observation at individual/population levels. Results indicated that validation of CPT constructs has not reached the state of unequivocality necessary for their application in curriculum research.

208. Kahl, Stuart R. & Anderson, Ronald D. (1982). Science meta-analysis project: User's guide for the machine-readable raw data file. Washington, D.C.: National Science Foundation. ED232851 (University of Colorado)

The Science Meta-Analysis Project (SMAP) resulted in the meta-analysis of a sizable proportion of the research in pre-college science education. Seven broad questions were examined during the study.

209. Kahle, Jane Butler & Lakes, Marsha K. (1983). The myth of equality in science classrooms. Journal of Research in Science Teaching, 20, 131-140.

National Assessment of Educational Progress data show that, by age 9, girls express interest but do not engage in as many science activities as boys. This trend continues through ages 13 and 17, paralleled by increasing negative views of science and science classes/careers.

210. Kauchak, Don & Peterson, Ken. (1983). Differences in science students' views of ideal and actual role behavior according to success and gender. Journal of Research in Science Teaching, 20, 565-570.

Differences in perception according to success were found for both ideal and actual student behavior using a double-Q-sort measuring differences in perceptions among students in eighth, tenth, and twelfth grades. (Secondary)

211. Kazi, M.U. & Piper, Martha K. (1983). A comparison of personality attributes of science teachers and medical technologists. Journal of Research in Science Teaching, 20, 529-536.

Identified personality traits (extroversion/introversion and neuroticism/stability) did not distinguish medical technologists (N=83) and college-level biology, chemistry, and physics teachers (N=57) using the Eysnck Personality Inventory.

212. Kelchner, Roy Jesse. (1983). An investigation of the meaningful effects of voluntary supplemental computer-aided instruction on student achievement in undergraduate invertebrate zoology at a technical university. Dissertation Abstracts International, 43, 3280-A. (Florida Institute of Technology)

Voluntary supplemental computer-aided instruction (CAI) on student achievement in undergraduate invertebrate zoology studies at a technical university was found to be effective relative to a comparison group provided with addition readings of related material. (College)

213. Kelsey, Linda J. & Perry, Bruce. (1983). An investigation of the order of attainment of the mental structures for six of Piaget's logical, infralogical and formal tasks. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (West Virginia University)

Piaget's model predicts that the overall order of acquisition for the tasks should be: 1) Seriation Matrix; 2) Tilt of a Cone; 3) Model Landscape; 4) Location of a Point in Two and Three Dimensions; and 5) and/or 6) Bending Rods/Projection of Shadows. The data showed no significant difference in performance on the two formal tasks, so two separate scalogram analyses for the first four tasks plus one formal task were done. (College)

214. Kilgus, Mark Duane. (1983). The analysis of selected cognitive style dimensions of college biology students majoring in science. Dissertation Abstracts International, 44, 658-A. (Wayne State University)

Current classroom biology instruction apparently does little to change or influence cognitive style. ACT (American College Testing Programs) Mathematics score was consistently the most useful predictor of the various cognitive style dimensions considered in this study. (College)

215. Klemm, Emily B.C.. (1983). Relationships between selected inservice teacher characteristics and content mastery test scores in a program-specific teacher workshop for secondary marine science. Dissertation Abstracts International, 43, 2970-A. (University of Hawaii)

Teacher characteristics had a closer relationship to biological science scores than to physical science scores and a closer relationship to pre-workshop scores than to post-workshop scores. The study concluded that significant relationships existed between selected teacher characteristics and teacher scores on the HMSS Content Master Test. (Secondary)

216. Knauft, Robert Lee. (1983). A new instructional approach for teaching evolutionary theory in introductory college biology. Dissertation Abstracts International, 43, 2622-A. (University of California - Berkeley)

The major findings of the project evaluating the effectiveness of an audiovisual, self-instructional approach developing instructional materials on evolutionary theory, were: multi-image lectures were an effective method for introducing instructional sequences, and individualized instruction worked effectively in introductory biology courses. (College)

217. Koballa, Jr., Thomas R. (1983). Constructing one-sided and two-sided communications for use in persuading preservice teachers of the importance for including energy conservation topics in the elementary school curriculum. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Texas - Austin)

The purpose of this study was to construct both one-sided and two-sided communications designed to persuade preservice elementary teachers of the importance for including the topic of energy conservation in the elementary curriculum. The results of data analysis from 45 preservice elementary teachers revealed that the two communications, while similar regarding supportive arguments, were significantly different with respect to non-supportive arguments. (College)

218. Koballa, Jr., Thomas R. & Shrigley, Robert L. (1983). Credibility and persuasion: A sociopsychological approach to changing the attitudes toward energy conservation of preservice elementary school science teachers. Journal of Research in Science Teaching, 20, 683-696.

The effects of two persuasive messages (integrated and nonintegrated) were evaluated after being presented by a credible communicator on energy conservation attitudes of preservice elementary teachers (N=180). These effects and other findings were not dramatic.

219. Koran, John J., Jr., Lehman, Jeffrey R., Shafer, Lynn D. & Koran, Mary Lou. (1983). The relative effects of pre- and postattention directing devices on learning from a "walk-through" museum exhibit. Journal of Research in Science Teaching, 20, 341-346.

The instructional effectiveness of an attention directing and controlling device prior to entering a cave exhibit or existing the exhibit was more effective than having a group walk through similar habitat and viewing a film. Apparently the devices functioned as a forward-shaping or backward review prompting adjunct in this informal learning setting. (Secondary)

220. Koran, John J., Jr., Longino, Sarah J. & Shafer, Lynn D. (1983). A framework for conceptualizing research in natural history museums and science centers. Journal of Research in Science Teaching, 20, 325-339.

These authors reviewed past studies on research in natural history museums and science centers, proposed a taxonomy of exhibits in museum settings, and focused attention on factors which should be considered when studying/learning in these informal settings. In addition, productive methods of conceptualizing research and future lines of research were described and related to learning in informal settings. (Secondary)

221. Kosemple III, John William. (1983). An experimental study to determine the effectiveness of a photochemical instructional aid used in the teaching of oxidation-reduction chemistry. Dissertation Abstracts International, 44, 129-A. (Temple University)

Results obtained from this study indicated that student understanding of a chemical concept was enhanced by the photochemical instructional aid, and more specifically, those students functioning at the transitional operational level benefited the most. Furthermore, data indicated that the apparatus did not appear to serve as a reinforcement device. (Secondary)

222. Kremer, Philip L. (1983). Effects of individualized assignments on biology achievement. Journal of Research in Science Teaching, 20, 105-115.

A comparison was made between detailed (favoring field dependence and induction) and nondetailed (favoring field dependence and deduction) assignments on biology achievement over a 7 month period. High capacity students apparently benefited from diagrams, inductions, and structure - unlike other students. (Secondary)

223. Kueny, Dorothy Philbin. (1983). An assessment of the use of word analysis tests as a predictor of achievement in the learning of an energy related topic by selected senior high school chemistry students. Dissertation Abstracts International, 44, 130-A. (Temple University)

Pearson r values were calculated for each word analysis test and the total word analysis test scores, resulting in many significant correlations. (Secondary)

224. Kulik, James A. (1983). What can science educators teach chemists about teaching chemistry? A symposium: How can chemists use educational technology effectively?. Journal of Chemical Education, 60, 957-959.

Meta-analytical procedures were used to review research studies dealing with Keller's Personalized System of Instruction (PSI), computer-based teaching, programmed instruction, audio-tutorial instruction, and visual-based instruction. Results of most studies regarding student achievement and student ratings came out in favor of classes taught with these methods.

225. Kwon, Jae-Sool & Mayer, Victor J. (1983). Segmented straight line regression analysis to identify momentum effect for the intensive time-series design. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Ohio State University)

Several studies of the validity of the intensive time-series design have revealed a post-intervention increase in the level of achievement data, called the "momentum effect". The results here indicated that the investigated method is useful in representing and identifying the presence and duration of the momentum effect in time series data on achievement.

226. Lang, Harry G. (1983). Preparing science teachers to deal with handicapped students. Science Education, 67, 541-547.

Several resources are available for sensitizing teachers to the special needs of the handicapped. Courses to supplement these resources are required.

227. Langford, James Morgan. (1983). Students' conceptions of one aspect of dynamics in grades five, nine, eleven, and twelve. Dissertation Abstracts International, 43, 2302-A. (Kansas State University)

The results emphasize that students face disequilibration when their Aristotelian conceptions meet Newtonian realities in science classes, and that these conceptions are not readily eliminated from cognitive structure by about one-half of the students who study physics in high school. (Secondary)

228. Lantz, Hays Blaine. (1983). The effects of advance organizers and subsumers on the understanding of solar energy concepts by eighth grade students. Dissertation Abstracts International, 43, 3205-A. (University of Virginia)

The findings indicated two points. First, advance organizers benefited students of all subsumer levels on cognitive learning of solar energy concepts on both immediate and delayed tests. Second, the presence of relevant subsumers in cognitive matrix benefited students on both immediate and delayed tests. (Secondary)

229. Larson, Allen Albert. (1983). The development and evaluation of a geological unit for Maine to be used in eighth grade general science classes. Dissertation Abstracts International, 43, 2302-A. (University of Maine)

A project was developed to study the construction and field testing of a unit of instruction on Maine rocks and minerals, using five teachers and 226 students and two control classes. The unit, "Mainely Rock Talk" was designed to be used in eighth grade general science classes. (Secondary)

230. Lawrenz, Frances. (1983). Evaluation of an inservice teacher training program for energy education. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Arizona State University)

This evaluation assessed the effectiveness of an inservice teacher training program. Results showed that the program was effective but that some improvement was possible. (College

231. Lawrenz, Frances F. & Welch, Wayne W. (1983). Student perceptions of science classes taught by males and females. Journal of Research in Science Teaching, 20, 655-662.

The authors sugested that the science classroom learning environment may contribute to socio-cultural pressures due to differences in classes taught by male and female science teachers. The Learning Environment Inventory was used to assess student perceptions. Results suggested that students perceived classes taught by females as more formal, more goal directed, more diverse, while classes taught by males were perceived as more difficult.

232. Lawsiripaiboon, Pimkarn. (1983). The effects of a problem solving strategy on ninth grade students' ability to apply and analyze physical science subject matter. Dissertation Abstracts International, 44, 1409-A. (University of Houston)

The problem solving strategy (problem solving activities and teacher questions at the application and analysis levels) used in this study seems to be an effective means for improving the overall achievement of physical science students, particularly achievement at the application and analysis levels. (Secondary)

233. Lawson, Anton E. (1983). Predicting science achievement: The role of developmental level, disembedding ability, mental capacity, prior knowledge, and beliefs. Journal of Research in Science Teaching, 20, 117-129.

Disembedding ability, prior knowledge, and belief in evaluation were found to be significantly related to overall achievement, unlike developmental level and mental capacity. Developmental level and prior knowlege including beliefs were differentially predictors of success on specialized tasks.

234. Lawson, Anton E. (1983). The effects of causality, response alternatives, and context continuity on hypothesis testing reasoning. Journal of Research in Science Teaching, 20, 297-310.

Hypothesis testing tasks varying with respect to causality, response alternatives, and context continuity were administered to two samples of adults (N=67). Results suggested that the effects and the degree to which causality, response alternatives and context continuity have on hypothesis-testing reasoning.

235. Lawson, Anton E. (1983). The acquisition of formal operational schemata during adolescence: The role of the biconditional. Journal of Research in Science Teaching, 20, 347-356.

Students (N=387) in grades 8, 10, 12, and college were administered 8 reasoning items and their performance suggested that the basic logic utilized in individuals in scientific hypothesis testing was biconditionally related and that the biconditional was a precondition for development of formal operations.

236. Lawson, Anton E., Lawson, David I. & Lawson, Chester A. (1983). Proportional reasoning and the general linguistic abilities of hypothetico-deductive reasoning. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching. (Arizona State University)

Group differences were found here in which proportional subjects performed better than transitional subjects who in turn performed better than additive subjects on a number of items testing subjects' abilities to identify, generate, and use the linguistic elements of argumentation. Further, it was found that some subjects who were successful on the linguistic items failed the proportions task but no subjects who were successful on the proportions task failed the linguistic items. -
(College)

237. Lazarowitz, Reuven & Meir, Orna. (1983). The use of pictures as stimulators for high school biology students' questions fluency, cognitive levels and content interest. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (I.I.T. Technion, Haifa, Israel 32000)

A goal of this study was to use pictures representing six levels of biological organization in an imposed strategy as visual stimulators for high school students' questions. The results were encouraging regarding the use of pictures as stimulators for students' learning motivation, as well as deepening the understanding of curricula planners in relation with students' interests and needs in science subjects. (Secondary)

238. LeBold, William K. (1983). The new engineer: Black and white, male and female. Washington, D.C.: National Science Foundation. ED229251 (Purdue University)

This report examined and compared early career decisions, initial and 1981 employment, professional activities, and post-graduate education of new, non-traditional engineering graduates (women, Hispanics, Blacks) with their traditional peers. (College)

239. Lee; Ernest W. & Gosbi, Mohamed Ali. (1983). Correlations of science process understandings with cognitive development and other academic variables among prospective elementary teachers and university science majors. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of North Carolina)

Purposes of the study included the question of whether correlations exist between Test of Science Processes achievement and Test of Logical Thinking scores, along with six other independent variables, for two groups of prospective elementary teachers - early childhood and intermediate - and a group of college science majors.

240. Lees, James Robert. (1983). Effect of the energy environment simulator on achievement, attitudes, and behavior relative to energy education concepts systematically replicated in higher education. Dissertation Abstracts International, 43, 3205-A. (University of Akron)

The effect of student major on posttest scores revealed student major as a significant predictor on the Youth Energy Survey (YES). Post hoc Pearson product-moment correlations demonstrated negative relationships between energy knowledge and willingness to take specific conservation actions and in performing conservation tasks. (College)

241. Leonard, Thomas E. & Hofstein, Avi. (1983). High school chemistry student perceptions of the laboratory and classroom. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Concordia College, Milwaukee, WI)

This study examined differences between student perceptions of the classroom and laboratory in high school chemistry. Average and high ability students perceived their learning environments similarly. Low ability students perceived their learning environments to be more cohesive, slower in pace, less satisfying and more difficult than did students in classes of average ability. (Secondary)

242. Leonard, William H. (1983). An experimental study of a BSCS-style laboratory approach for university general biology. Journal of Research in Science Teaching, 20, 807-813.

A Biological Sciences Curriculum Study (BSCS) inquiry approach for university general biology laboratory was tested against a well-established commercial program judged to be highly directive. The BSCS was found to be more effective in learning biology laboratory concepts than the commercial program as measured by a laboratory concepts test. (College)

243. Leonard, William H. (1983). Questions in textual narrative: Do they make any difference?. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Nebraska)

The purpose of this research was to determine the relative effects of placement of questions when these questions were interspersed through the reading passage of textual materials for students in university introductory biology. Four of the six groups reading with questions at the beginning of the paragraph scored significantly higher than the groups which read without questions on the test given immediately after the reading. (College)

244. Levin, James & Jones, Craig. (1983). Elementary teachers' attitudes toward science in four areas related to gender differences in students' science performance. Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Quebec, Canada. ED229230(University of California - San Diego)

Significant differences were found for the main effects of professional status, science instructional ranking, and sex; and also for the interaction effects of professional status x college science, science ranking x sex, and science ranking x college science. (Elementary)

245. Levin, James & Klindienst, David. (1983). Differences in attitudes between academic continuing and academic terminal secondary science students. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Pennsylvania State University)

The purpose of this study was to compare attitudinal data on students who had dropped college preparatory science (academic terminal) in high school with those who continued to enroll (academic continuing) in college preparatory science courses. Significant differences were found for the main effects of gender and science program. There were no significant differences for the main effect of grade or for any two- or three-way interaction. (Secondary)

246. Lijnse, Piet. (1983). Does science education improve the image of science?. Science Education, 67, 575-582.

The attitudes towards science of students (in Holland) who have studied a lot of science was compared with the attitudes of the average citizen. The lack of significant differences indicates that greater attention should be paid in science instruction to the values of science. (Secondary)

247. Lin, Bao-Shan. (1983). Classroom climate and its relationship to student attitudes toward science. Dissertation Abstracts International, 44, 1032-A. (University of Texas at Austin)

T-tests showed that students' gender and ability were not crucial factors related to classroom climate and students' attitudes. Taiwanese classrooms were characterized by high competitiveness, cohesiveness, great diversity, less apathy, and favoritism. (Secondary)

248. Lin, Herbert S. (1983). Problem solving in introductory physics: Demons and difficulties. Dissertation Abstracts International, 44, 130-A. (Massachusetts Institute of Technology)

This thesis explored problem-solving difficulties associated with the introductory physics course, resulting in one psychological and the other sociological in nature. (College)

249. Linn, Marcia C., Clement, Cathy & Pulos, Steven. (1983). Is it formal if it's not physics? (The influence of content on formal reasoning). Journal of Research in Science Teaching, 20, 755-770.

Laboratory and naturalistic content influences on formal reasoning tasks of 13-, 15-, and 17-year-old students (N=90) were compared in terms of their ability to control variables. The results indicated that 8 to 20 percent of performance variance was asspciated with task content. Content effects were also shown to reflect expectations about ask variables.

250. Lord, Thomas R. (1983). Enhancing the visual-spatial aptitude of students. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Burlington County College, Pemberton, NJ)

The results from this study tend to support those researchers that claim "visuo-spatial" aptitude can be enhanced through teaching. This study found that the cognitive capacities for spatial visualization, spatial orientation, and flexibility of closure could improve through carefully designed interactions. (College)

251. Lott, Gerald W. (1983). The effect of inquiry teaching and advance organizers upon student outcomes in science education. Journal of Research in Science Teaching, 20, 437-451.

Two areas of research were explored in this meta-analysis: comparison of inductive versus deductive approaches, and use of advance organizers. The results were not dramatic.

252. Lucas, A.M. (1983). Scientific literacy and informal meaning. Studies in Science Education, 10, 1-36.

The purpose served by scientific literacy is considered. A framework for thinking about questions of informal learning and its interaction with school science learning is discussed.

253. Luck, Brenda Truran. (1983). The influence of biological concepts and metaphors on the development of the psychology of learning. Dissertation Abstracts International, 43, 3272-A. (Columbia University Teachers College)

The thesis of this historical essay was that the concepts and metaphors adopted from the science of biology by American educators in the half-century following Darwin's publication of the Origin of Species have affected not only man's understanding of himself but also his approach to education and learning. (Secondary)

254. Lynch, P.P. & Ndyetabura, V.L. (1983). Practical work in schools: An examination of teachers' stated aims and the influence of practical work according to students. Journal of Research in Science Teaching, 20, 663-671.

These authors investigated the orientation of students (N=724) toward 10 aims for school practical work at three grade levels (expressed as influences), and compared these aims for teachers with influences as perceived by students. Some major mismatches between student and teacher (N=257) aims were identified. (Secondary)

255. Lynch, Paddy & Stube, Paul. (1983). Tracing the origins and development of the modern science text: Are new texts really new?. Research in Science Education, 13, 233-243.

Present physical science textbooks, presenting a experimentalist-formulist point of view, have not significantly changed over the past 100 years.

256. Madden, Ronald. (1983). The relationship between selected pre-collegiate experience and success or non-success in college. Dissertation Abstracts International, 43, 2543-A. (University of Iowa)

The problem investigated in this study was to examine the relationship between selected pre-collegiate experience and success or non-success in college. The results of the study suggested that high school rank, gender, race, and ACT math and English scores tended to be closely related to success or non-success in college. (College)

257. Maddock, Maxwell N. (1983). Scientific teaching, attitude to health and awareness of health issues. Research in Science Education, 13, 155-162.

While programs may increase students' knowledge and awareness of the attitudes and habits which will contribute to healthy living, there is no evidence that these programs will result in students making wiser decisions about health practices. (Secondary)

258. Maddock, Maxwell N.. (1983). Two decades of school science education in Papua New Guinea. Science Education, 67, 561-573.

A brief history of the development of science curricula for primary and high school science in Papua New Guinea. A discussion of the research associated with this period (1960-1980) is accompanied by consideration for future directions in science education.

259. Maehr, Martin L. (1983). A synthesis of findings on sex differences in science education research. Washington, D.C.: National Science Foundation. ED229226 (University of Illinois - Urbana)

A meta-analysis of science education literature was undertaken to determine the magnitude and direction of sex differences in school age boys'/girls' motivational orientations and science achievement.

260. Malone, Mark R. (1983). The effects of conducting a preservice elementary science methods course based on the concerns based adoption model (CBAM). Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Louisiana State University)

Results indicated that both the traditional and concerns-based science methods course significantly improved student attitudes and caused PSTs to have a positive shift from lower to higher stages of concerns about teaching science. Neither type of methods course proved superior in affecting student concerns or attitudes toward science and teaching science. (Elementary)

261. Maloney, David P. (1983). Proportional reasoning and rule-governed behavior with the balance beam. Science Education, 67, 245-254.

College level students were tested for proportional logic using six tasks, two of which employed balance beam logic. Students were found to use rule-governed behavior in solving the problems. A relationship was found between the students' ability to solve the balance beam problems and the other proportional reasoning tasks. (College)

262. Markovits, Paul S. & Ellerbruch, Lawrence W. (1983). The effects of imagery on the understanding of torque problems for college introductory physics students. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Montana State University)

A technique of examining a physical phenomenon, projecting an image of the event, and then diagramming that image was used to investigate the effects of imagery on the understanding of torque by college introductory physics students. (College)

263. Marrett, Cora Bagley. (1982). Minority females in high school mathematics and science. Washington, D.C.: National Institute of Education (ED). ED231611 (Wisconsin Center for Education Research-Madison)

This study examined enrollment trends in high school mathematics and science courses among black females and compared their patterns with those of other groups. (Secondary)

264. Mayer, Richard E. (1983). What have we learned about increasing the meaningfulness of science prose?. Science Education, 67, 223-237.

Research in science education has identified methods of increasing the efficiency with which students learn from prose. Thus, instructional techniques which can systematically and predictably influence the learning process are available.

265. Mayer, Victor J. & Farnsworth, Carolyn H. (1983). A study of the validity of attitude measures used in an intensive time-series study. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Ohio State University)

It was found that the intervention, a unit on plate tectonics, caused a positive shift in level of the series data. Also there was a clear difference in attitudes on four of the five concepts between the formal tendency students and the concrete tendency students. This and other evidence leads to the conclusion that the data gathering techniques used in this particular intensive time-series study appear to have yielded valid data on student attitudes.

266. Mayer, Victor J. & Monk, John S. (1983). Handbook for using the intensive time-series design. Washington, D.C.: National Science Foundation. ED228071 (Ohio State University)

Areas addressed in this handbook include a background and rationale for the time-series design, instrument development (developing item pools, generating daily instruments, constructing multiple item instruments), administration and collection of data, and analysis procedures.

267. McGuire, Barry L.S. & Holliday, William G. (1983). Using adjunct questions to change physics students' perception of a reading assignment involving computer-animated graphics. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Calgary)

The selective attention model is often used to explain the effects of adjunct questions on learning from a text. As predicted, significant univariate interactions were detected for each posttest and a significant multivariate interaction (based on a regression approach) was detected after combining the posttest scores. (Secondary)

268. McGuire, Saundra Yancy. (1983). An exploratory investigation of the relationship between cerbral dominance and problem solving strategies used by selected high school chemistry students. Dissertation Abstracts International, 44, 721-A. (University of Tennessee)

Observations based on the data from this study indicate that students should receive instruction in algorithmic and heuristic problem solving methods. The method that is best for a particular student depends on the success attained from using each method as well as the individual preferences of the students. (Secondary)

269. McKenna, Leonard N. (1983). Relationships between cognition of teachers and quality of teaching style in elementary science. Paper presented at the Congress of the Australian and New Zealand Association for the Advancement of Science, 53rd, Perth, Australia. ED236055

This study was concerned with preservice primary school teachers (N=100), a group of tertiary students who traditionally came from the secondary school stream that had, on the whole, avoided subjects like physics, chemistry, and mathematics that demanded a high level of cognitive development for understanding/assimilation of abstract concepts.

270. McKenzie, Danny L. & Padilla, Michael J. (1983). The construction and validation of the test of graphing in science (TOGS). Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Georgia)

The objective of this project was to develop a multiple-choice test of graphing skills appropriate for science students from grades seven through twelve. Skills associated with the construction and interpretation of line graphs were delineated and nine objectives encompassing these skills were developed. It was concluded that TOGS was a valid and reliable instrument for measuring graphing abilities. (Secondary)

271. McMeen, Joy Lee Windle. (1983). The role of the chemistry inquiry-oriented laboratory approach in facilitating cognitive growth and development. Dissertation Abstracts International, 44, 130-A. (Vanderbilt University)

College students who took an introductory college chemistry class increased their level of cognitive development. Apparently, tests of logical thinking may be used as predictors of success in college chemistry. (College)

272. McRobbie, Campbell J. (1983). Cognitive preferences and chemistry achievement. Research in Science Education, 13, 141-153.

Four cognitive categories were identified and used to type chemistry students' cognitive preferences. Significant interactions linked cognitive type to chemistry achievement. (Secondary)

273. Mechling, Kenneth R. & Oliver, Donna L. (1983). What research says about elementary school science. Handbook IV. Project for promoting science among elementary school principals. Washington, D.C.: National Science Teachers Association (1742 Connecticut Ave., NW).

Several research studies that provided direction for improving elementary school science programs were highlighted.

274. Meinhard-Pellens, Richard K. (1983). Distinguishing features of genetic epistemology: The object of study and the methodology. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Iowa)

This analysis abstracted criteria to distinguish science from non-science, distinguish physical science from social science, and further distinguish genetic epistemology from other social scientific approaches. Piaget's equilibration model provides a research model of a moving equilibrium system that is action in thought.

275. Molinari, Joaquin Arnaldo. (1983). Environmental studies at the undergraduate level: Curriculum and integration of knowledge. Dissertation Abstracts International, 43, 3235-A. (Pennsylvania State University)

Environmental Studies programs were offered at all types of institutions, but were proportionally more frequent at Reserch and Doctoral Universities and at Comprehensive Universities and Colleges. In addition, although the lecture mode was the most common instructional mode, environmental programs showed a moderate instructional diversity. (College)

276. Moose, William Cazort. (1983). A qualitative approach to teaching problem solving in college physics. Dissertation Abstracts International, 44, 1322-A. (University of Houston)

Instruction emphasizing the qualitative aspects of physics produced problem solvers as good as those produced by a traditional quantitative approach. (College)

277. Morgenstern, Carol Faltin. (1983). An analysis of standardized tests for secondary school science. Dissertation Abstracts International, 43, 2952-A. (University of Oklahoma)

The purpose of this study was to determine whether or not standardized tests constructed for use with secondary schools science measure student achievement of the rational powers. Less than ten percent of the items collectively measured achievement of the rational powers of classifying, generalizing, inferring, deducing, evaluating, and synthesizing. No items were determined to have measured student achievement of the rational powers of imagining, comparing, and analyzing. (Secondary)

278. Morrison, Beverly Sargent. (1983). An investigation of reading as a learning activity in grade 9 social studies, science and English classes. Dissertation Abstracts International, 43, 2223-A. (University of Wisconsin-Madison)

Reading was observed to be a learning activity that was utilized to some extent in all six of the classrooms. In addition, teachers transmitted to the students messages about the importance of reading, and the students' compliance with reading assignments. (Secondary)

279. Mullinix, Darrel Dean. (1983). Teacher behavior and student cognitive learning in fifteen BSCS green version biology classes. Dissertation Abstracts International, 43, 3207-A. (University of Michigan)

The findings suggested that: (1) classes taught by teachers who ranked higher on a direct-to-indirect scale of verbal behaviors showed a higher mean content gain than the classes of teachers who ranked lower on this scale, (2) classes taught by teachers who ranked higher on a less-to-more inquiry scale showed a higher mean content gain than the classes of teachers who ranked lower of this scale. (Secondary)

280. Mulopo, Moses Muyatwa. (1983). Effects of traditional and discovery instructional approaches on learning outcomes for learners of different intellectual development: A study of chemistry students in Zambia. Dissertation Abstracts International, 44, 1410-A. (Pennsylvania State University)

It was found that for the formal reasoners, the discovery group earned significantly higher understanding science scores than the traditional group. For the concrete reasoners, mode of instruction did not make a difference. Overall, subjects taught by the discovery approach earned significantly higher scientific attitude scores than those taught by the traditional approach. In the area of achievement, the traditional group outperformed the discovery group. (Secondary)

281. Munby, Hugh. (1983). Thirty studies involving the "Scientific Attitude Inventory": What confidence can we have in this instrument?. Journal of Research in Science Teaching, 20, 141-162.

The Scientific Attitude Inventory (SAI) was examined and 30 studies in which it had been used. Results indicated that SAI needed reworking since it was less than certain of what was being measured.

282. Nagy, Philip. (1983). Assessing cognitive structure: A response to Stewart. Science Education, 67, 25-36.

Cognitive structure can be assessed using word association techniques. The use of inference methods for the assessment of cognitive structures is defended.

283. Northfield, Jeff & Gunstone, Richard. (1983). Research on alternative frameworks: Implications for science teacher education. Research in Science Education, 13, 185-191.

Teacher trainees were involved in an exploration of the effect of students' frameworks on learning in science. Unless teachers deal with and change these frameworks, teaching will continue to consist of pushing knowledge into an unwilling framework.

284. Novak, Joseph D. (1983). Vee mapping as a research tool. Research workshop presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Cornell University)

This seminar presented philosophical and psychological concepts that underlie Gowin's Vee heuristic. This heuristic has been shown to aid students in secondary and tertiary schools to understand the nature of knowledge and knowledge production (metaknowledge).

285. Novak, Joseph D., Gowin, Bob & Johansen, Gerard T. (1983). The use of concept mapping and knowledge Vee mapping with junior high school science students. Science Education, 67, 625-645.

Although grade seven and eight students could learn how to concept map and Vee map, no definite evidence of improved performances as a result of learning this skill was found. (Secondary)

286. Nussbaum, Joseph & Sharoni-Dagan, Niva. (1983). Changes in second grade children's preconceptions about the earth as a cosmic body resulting from a short series of audio-tutorial lessons. Science Education, 67, 99-114.

Grade two students were able to learn abstract concepts about the earth's status as a cosmic body. Ausubel-Novak's hypothesis that primary children are capable of meaningfully learning major science concepts is supported. (Elementary)

287. Okey, James R., Shaw, Jr., Edward L. & Waugh, Michael L. (1983). Development and evaluation of lesson plans for computer simulations. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Georgia)

The results in this study showed that limited computer facilities could be used effectively to achieve objectives in the science curriculum with accompanying positive reactions by students and teachers. (Secondary)

288. Olstad, Roger, Padilla, Michael J. & Heller, Patricia. (1983). A comparison of achievement and attitude of children who volunteer to take a microcomputer course with their parents and with their peers. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Washington)

The purpose of this quasi-experimental study was to determine if middle school aged children who volunteer to take a short microcomputer course with their parents differ in achievement and attitude towards computers from children who volunteer to take the same course with their peers. It appears that children who volunteer to take a microcomputer course with their parents are not significantly different in achievement or attitude towards computers.

289. Olstad, Roger G. & Haury, David L. (1983). A summary of research in science education - 1982. Science Education, 67, 207-361.

The authors presented a bibliography, descriptions and commentary, concerning research published during 1982. (They did an excellent job. The editors of the present review strongly encourage science educators to reexamine this work.)

290. Orlich, Donald C. & Morales, Maria M.F.. (1983). A single subject design to test selected science process learning with mentally handicapped children. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Washington State University)

This study determined the rate of improvement of selected mentally handicapped students to comprehend two basic scientific processes - serial ordering and pattern building. Teaching progressively and from simple to complex seemed effective.

291. Ormerod, M.B. (1983). A model to exhibit the interdependence of the cognitive and affective domains of objectives for use in science and technical teacher training. Research in Science and Technological Education, 1, 119-128.

The author proposes a diagrammatic model connecting the cognitive and affective domains of educational objectives, abandoning Krathwohl's hierarchy of affective objectives for one based solely on arousal of interest as a positive dimension.

292. Orpwood, Graham W.F. (1983). The logic of curriculum policy deliberation: An analytic study from science education. Dissertation Abstracts International, 43, 3802-A. (University of Toronto (Canada))

A framework was developed for the analysis of the discourse of curriculum policy deliberation. This framework was tested through the analysis of transcribed sample of deliberation obtained from a science curriculum committee at which the investigator was a participant-observer. This analysis enabled both the identification of logical elements of deliberative discourse and also a discussion of their relationship. (Elementary, secondary)

293. Osborne, R.J. & Wittrock, M.C. (1983). Learning science: A generative process. Science Education, 67, 489-508.

Children form ideas about nature and natural phenomenon long before they come into contact with science education. The generative learning model, used as a basis for explaining cognitive processes, has many implications to teaching science, learning science, teaching science teachers and science education research.

294. Osborne, Roger J. & Cosgrove, Mark M. (1983). Children's conceptions of the changes of state of water. Journal of Research in Science Teaching, 20, 825-838.

Students' (N=43) conceptions of what happens when water boils, evaporates, and condenses, and when ice melts suggests that childrens' conceptions are quite different from those of scientists and that their ideas can sometimes be influenced in unintended ways during instruction.

295. Ostlund, Karen Louise. (1983). A naturalistic study of family learning courses in science. Dissertation Abstracts International, 44, 721-A. (University of Minnesota)

Parents and children reported in post-course questionnaires that their most rewarding experience, following a family learning course in science, was learning the course content.

296. Otto, Paul B. & Schuck, Robert F. (1983). The effect of a teacher questioning strategy training program on teaching behavior, student achievement and retention. Journal of Research in Science Teaching, 20, 521-528.

Six biology teachers and 90 students participated in this study. The results indicated that teachers were trained to use a systematic questioning technique, to employ the technique in classroom settings, and students were taught by the techniques achieved higher and retained knowledge longer than those in control groups. (Secondary)

297. Ouyang, Chong-Jen. (1983). A comparison of two sample groups of elementary science teachers' feelings and attitudes toward the new elementary science curriculum in Taiwan, the Republic of China. Dissertation Abstracts International, 43, 2952-A. (University of Northern Colorado)

Taiwan elementary science teachers teaching in the science experimental schools and those teaching in the regular schools agreed on their overall philosophy of current science teaching, did not agree on their attitudes toward science, did not agree on their preference of science teaching methods, and had equal knowledge of basic science concepts. (Elementary)

298. Owie, Ikponmowosa. (1983). Changes in attitudes toward contraceptives concomitant with instructional activities in physiology. Journal of Research in Science Teaching, 20, 571-575.

A significantly larger number of students (N=173) possessed positive attitudes toward contraceptives after engaging in such activities as reading assignments and large/small group discussions during a physiology course of one semester. (College)

299. Padilla, Michael J., Okey, James R. & Dillashaw, F. Gerald. (1983). The relationship between science process skill and formal thinking abilities. Journal of Research in Science Teaching, 20, 239-246.

Integrated process skill and formal thinking abilities of middle and high school students were shown to have a strong relationship between achievement on the two measures (r=0.73) and on all subtests of both measures. Pencil and paper measures of formal operational and integrated process skill achievement were given to almost 500 grade 7-12 students. One potential inference to be drawn from these results is that process skill teaching might influence formal ability. (Secondary)

300. Pallrand, George J. & Lockwood, Walter. (1983). Problem solving and physics instruction. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Rutgers University, New Brunswick, NJ)

The linguistic encoding appears to involve a search process in which the information in the problem is related to some preexisting representation or algorithm. Once an association is made, a response is generated. (Secondary)

301. Pellens-Meinhard, Sandra K. & Shier, J. Patrick. (1983). A study of the cognitive and social development of freshmen and senior medical students. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Iowa College of Medicine)

The purpose of this study was to explore the development of logical thinking and social awareness in medical students, using methods derived from and compatible with the developmental learning theory of Jean Piaget. Results reflected the growth during medical school in the areas of both logical thinking and social awareness.

302. Perry, Bruce, Kelsey, Linda J. & Wavering, Michael J. (1983). Protocols, scoring criteria, and motivation for presenting six logical, spatial and formal tasks to middle school, high school and college students. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (West Virginia University)

Two studies were designed to investigate the relationships among some of the particular mental structures of logical, infralogical and formal operations. Detailed protocols and scoring criteria were presented to encourage comparison and replication of specific task data with those of other studies.

303. Petrushka, Dorothy A. (1983). Logical ability in reasoning with material of familiar content. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Somerset County College, New Jersey)

Two tests, both in the syllogistic form were administered to each subject (N=48). It was of interest to observe whether familiar material might be treated differently from material of a decidedly less relevant nature. Subjects were much more successful with the familiar material tasks. (College)

304. Piburn, Michael & Jamet, Robert. (1983). Flexibility and achievement in science. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Rutgers University)

This study addressed the question of whether flexibility of thinking, defined as the ability to break a deliberately induced set, could be shown to be an important factor in science achievement. It appears that the ability to break set is an important component in the learning of science. (Elementary)

305. Pilacik, Michael James. (1983). The effect of historically-based laboratory activities in biology on the development of formal operational thought, knowledge of biology content and student interest. (Volumes I and II). Dissertation Abstracts International, 44, 1048-A. (Temple University)

The historical approach (laboratory-based, case histories) did help to improve student scores on the cognitive measures and pupil interest in biology. (Secondary)

306. Ploeger, Floyd D. (1983). The effectiveness of color versus black and white visuals used with a computer program safety simulation. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Tandy Corporation)

The purpose of this research study is to investigate the effectiveness of color line drawing visuals as compared to black-and-white line drawing visuals when used with a computer program simulation concerning safety in the science classroom laboratory. It is suggested that there is no advantage to using color visuals with this computer program simulation. (College)

307. Pope, Maureen & Gilbert, John. (1983). Personal experience and the construction of knowledge in science. Science Education, 67, 193-203.

Learning will occur only if the learner views the knowledge as having personal relevance. If the teacher's science does not fit into the learner's previously developed constructs of the world, then the learning is merely done by rote. (Secondary)

308. Pratt, Donald Lynn. (1983). Responsibility for student achievement among secondary science and mathematics teachers and its relation to student ability grouping and selected teaching styles. Dissertation Abstracts International, 44, 721-A. (University of South Florida)

Only the advanced class-basic class comparisons produced any significant differences in teacher beliefs. None of the comparisons produced significant differences in either teacher use of praise or criticism. Advanced and basic class comparisons produced significant differences in both teacher beliefs and behaviors. (Secondary)

309. Preece, Peter F.W. (1983). The qualitative principle of teaching. Science Education, 67, 69-73.

The significant differences found in many of the quantitative studies on instructional design are statistical mirages that disappear under close inspection. The Qualitative Principle of Teaching states that learning is largely unaffected by the form of teaching. Thus, attention to lesson content rather than design is a justifiable approach.

310. Pridgeon, Anthony Ronald. (1983). An exploratory study involving the characterization and evaluation of the science theme writing of selected secondary school students. Dissertation Abstracts International, 43, 2878-A. (State University of New York at Buffalo)

The interviews revealed that science students often do not understand how to apply effective writing techniques in their science themes. Also, many students viewed science themes as strictly content oriented. (Secondary)

311. Prosser, Michael. (1983). Relationship between the cognitive abilities of a group of tertiary physics students and the cognitive requirements of their textbooks. Science Education, 67, 75-83.

Many of the students enrolled in an introductory physics class at the college level were found to be incapable of consistently using the reasoning skills required to understand their textbooks. Authors of, and teachers selecting, introductory texts are not effectively communicating with their audiences. (College)

312. Purdy, Robert Victor. (1983). The effects of two interventions on moral reasoning, critical thinking, and academic achievement of secondary biology students. Dissertation Abstracts International, 43, 2952-A. (University of Northern Colorado)

The bioethical dilemmas and value clarification lessons prepared for this study were no more effective in developing moral reasoning than traditional instruction. Both the experimental treatments and traditional instruction were equally effective in promoting academic achievement on a unit in bioethics. (Secondary)

313. Purser, Roger K. & Renner, John W. (1983). Results of two tenth-grade biology teaching procedures. Science Education, 67, 85-98.

Increased levels of reasoning can result from the use of the learning cycle teaching approach. Teachers must be aware of the reasoning levels of their students in preparing instructional designs and learning materials. (Secondary)

314. Pyzik, Karen & Gennaro, Eugene D. (1983). A naturalistic study of children and their parents in family learning courses in science. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Island Lake Elem. School, Mounds View, MN)

The social interaction and cognitive processes and outcomes of parents and their middle school children during family learning courses in science were observed and described. Children responded most frequently that they liked taking the course with their parents because their parents gave them help and shared in the enjoyment of the course. Parents responded most frequently that they liked taking the course with their child because it was a shared learning activity.

315. Reif, F. (1982). How can chemists teach problem solving? Suggestions derived from studies of cognitive processes, (Working paper ES-17). Paper presented at the meeting of the American Chemical Society, Las Vegas, Nevada. ED229274 (University of California - Berkeley)

Several central ideas emerging from a systematic approach to teaching problem-solving in the quantitative sciences (chemistry, physics, engineering) were discussed. (College)

316. Rezba, Richard J. (1983). Family involvement in elementary science: A survey of parents. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Virginia Commonwealth University, Richmond VA)

The purposes of this study were to involve parents in take-home activities, to solicit information about their participation and to test the relationship of several variables to the percent participation of parents. (Elementary)

317. Riley, Joseph P., III, & Faller, Richard. (1983). An evaluation of two department of energy sponsored workshops and a comparison between participants' energy literacy and that of the general public. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Georgia)

The purpose of this study was to evaluate two Department of Energy sponsored teacher workshops using a test developed from released National Assessment items. Results indicated that the workshops increased teachers' knowledge about energy and that in comparison to the general public, teachers' scores were significantly higher on the overall cognitive energy test. (College)

318. Roadrangka, Vantipa, Yeany, Russell H. & Padilla, Michael J. (1983). The construction of a group assessment of logical thinking (Galt). Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Georgia)

The assessment of developmental reasoning is becoming a necessary part of teaching. The results can be used to modify science teaching strategies and help teachers better understand students' intellectual development. Results here showed that GALT (Group Assessment of Logical Thinking) has a high reliability and adequately measures six logical operations.

319. Robinson, James Lyndon. (1983). A comparison of attitude toward science and level of cognitive development of community college students. Dissertation Abstracts International, 44, 1747-A. (University of Northern Colorado)

The attitudes students have toward science on enrollment in an introductory science class appear to have no correlation with the cognitive level of the students, regardless of age, gender, or background in science and mathematics. Moreover, a significant positive change in attitude toward science does occur on completion of an introductory science class. (College)

320. Rodriguez, Imelda & Bethel, Lowell J. (1983). An inquiry approach to science and language teaching. Journal of Research in Science Teaching, 20, 291-296.

Participation in science inquiry lessons facilitated the development of both classification and oral communication skills of bilingual Mexican-American students (N=64). (Elementary)

321. Rosenquist, Mark Linn. (1983). Improving preparation for college physics of minority students aspiring to science-related careers: Investigation of student difficulties and development of appropriate curriculum. (Text and Appendix A Only). Dissertation Abstracts International, 43, 3268-B. (University of Washington)

Specific difficulties encountered by the students as they worked through the course were identified and grouped into three categories - difficulty with basic concepts, difficulty with scientific representations, and difficulty with scientific reasoning. (College)

322. Rosenthal, Dorothy Botkin. (1983). Science and society in high school biology textbooks: 1963-1983. Dissertation Abstracts International, 44, 1747-A. (University of Rochester)

There is no evidence from this study that textbook authors/publishers have responded to the statements of numerous science educators calling for a greater emphasis on science and society in high school biology. Current concerns about science education are of a technological and economic nature that, the author concludes, make it even less likely that such a response will occur in the 1980s. (Secondary)

323. Ross, John A. & Maynes, Florence J. (1983). Development of a test of experimental problem-solving skills. Journal of Research in Science Teaching, 20, 63-75.

Multiple-choice tests were constructed for seven problem-solving skills using learning hierarchies based on expert-novice differences and refined in three phases of field testing. (Secondary)

324. Ross, John A. & Maynes, Florence J. (1983). Experimental problem solving: An instructional improvement field experiment. Journal of Research in Science Teaching, 20, 543-556.

An instructional program based on expert-novice differences in experimental problem-solving performance was taught to grade 6 students (N=265). Performance - was assessed with multiple-choice and open-ended measures of specific transfer. Between-group comparisons showed treatment condition based on expert-novice differences in problem-solving strategies consistently outperforming controls. (Elementary)

325. Russell, Thomas L. (1983). Analyzing arguments in science classroom discourse: Can teachers' questions distort scientific authority?. Journal of Research in Science Teaching, 20, 27-45.

This qualitative analysis of classroom discourse analyzes the use of questions used by science teachers and makes assessments in terms of arguments used to establish scientific knowledge claims. Questions are analyzed not for form/frequency but for their function in developing arguments that establish claims rationally. (Secondary)

326. Rutland, Carole L.L.. (1983). A comparison of organizational identification and departmental cohesiveness between selected high school science teachers and selected college teachers of science. Dissertation Abstracts International, 43, 3281-A. (Georgia State University-College of Education)

The results indicate that for the population studied in this group, there is no significant difference between high school science teachers or college science teachers with respect to identity or commitment to their school or, to the cohesiveness or unity teachers feel within their department.

327. Sabar, Naama. (1983). Is the disappointment in science curriculum implementation justified? Some insights into an Israeli case . Paper presented at the American Educational Research Association, Montreal, Canada. ED226998 (University of Tel-Aviv)

This study investigated the implementation of a 7th grade biology curriculum ("Animal and its Environment") in Israel. (Secondary)

328. Samiroden, Walter Donald. (1983). The effects of higher cognitive level question wait-time ranges by biology student teachers on student achievement and perception of teacher effectiveness. Dissertation Abstracts International, 43, 3208-A. (Oregon State University)

Observations made during the investigation suggested that neither mean wait-times nor wait-time ranges are adequate descriptors of teacher question wait-time when used separately, and that both measures should be used in describing research in this area. (Secondary)

329. Sanford, Julie P. (1983). Management and organization in science classrooms. Washington, D.C.: National Institute of Education (ED). ED233881 (University of Texas - Austin)

The Junior High School Management Improvement Study (JMIS) was a field experiment conducted to verify and extend findings of previous reserch in English and mathematics classes. It was indicated that when teachers established orderly classroom environments and maintained students' cooperation, student engagement in appropriate learning tasks was more likely to occur.

330. Schibeci, R.A. (1983). Selecting appropriate attitudinal objectives for school science. Science Education, 67, 595-603.

The success in the development and the assessment of cognitive domain objectives in science education has erroneously lead some researchers to assume that the same success may be possible in the affective domain. Since this may not be possible, a re-examination of the place of attitudinal objectives in science education should be undertaken.

331. Schibeci, Renato A. & Sorensen, Irene. (1983). Elementary school children's perceptions of scientists. School Science and Mathematics, 83, 14-20.

This study looked at the potential of the Draw-A-Scientist Test (DAST) as a quick, reliable method of assessing elementary school children's images of scientists. Results indicated that the DAST is potentially useful to assess global images of some Western Australia children. (Elementary)

332. Schoeneberger, Mary M. & Russell, Thomas L. (1983). Add a little frill: Science in the elementary school. Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Quebec, Canada. ED229277

This paper examined, from the perspective of the teacher, the relatively unimportant place of science in the elementary school curriculum. Two case studies of science education (of eight commissioned by the Science Council of Canada) provided data about science instruction in the K-6 elementary setting. (Elementary)

333. Schollum, Brendan. (1983). Arrows in science diagrams: Help or hindrance for pupils? Research in Science Education, 13, 45-59.

Students interpret diagrams to fit presently held views of nature rather than to be an explanation of nature. The presence of arrows does not alter this interpretation. (Secondary)

334. Scobee, Virginia June. (1983). Metacognitive awareness of brain hemispheric functions during the composing process: A comparison between eminent scientist-authors and gifted students with similar career aspirations. Dissertation Abstracts International, 44, 1682-A. (Texas A & M University)

Adults, more than students, make clear to themselves an understanding of the problem, main purpose, and the audience during the prewriting phase. Also, adults, more often than students, "feel strong forces" of writing discipline during the revision process as though they are critics rather than creators. (Secondary)

335. Scott, Linda E., Johnson, Roger T. & Johnson, David W. (1983). The effects of mixed-sex and single-sex cooperative grouping and individualization in science achievement, attitudes, and verbal leadership of early adolescent females. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Mounds View School District, Shoreview, MN)

This study examined the effects of mixed-sex and single-sex cooperative grouping and individualization on the science achievement, attitudes, and verbal leadership of early adolescent females working in physical science. Single-sex cooperative females had more positive attitudes toward science study than did mixed-sex cooperative females. Conversely, the females in the mixed-sex cooperative condition had more positive attitudes toward the female role in science. (Elementary)

336. Seale, T.S. (1983). The importance of production: An expanding focus in secondary and tertiary science instruction. Science Education, 67, 177-183.

Science curricula should include projects in which science students produce materials of scientific or social value. Such projects would involve students in the processes of science as well as develop an understanding of the role of science in society.

337. Selim, Mohamed Ahmed & Shrigley, Robert L. (1983). The group dynamics approach: A sociopsychological approach for testing the effect of discovery and expository teaching on the science achievement and attitude of young Egyptian students. Journal of Research in Science Teaching, 20, 213-224.

Fifth-grade Egyptian students (N-276) taught using discovery instructional strategies scored higher on achievement measures and on a science attitude measure relative to students taught using a expository method. (Elementary)

338. Shaltz, Mark B. (1982). Development and evaluation of the SUMIT microcomputer module entitled 'predator functional response'. Washington, D.C.: National Science Foundation. ED229249 (Michigan Technological University)

An experiment was conducted that compared the teaching effectiveness of a computer assisted instructional module and a lecture-discussion. (College)

339. Shaw, Terry J. (1983). The effect of a process-oriented science curriculum upon problem-solving ability. Science Education, 67, 615-623.

Four integrated processes (interpreting data, controlling variables, defining operationally and formulating hypotheses) are defined as problem solving. Thus, these are the essential skills to be taught in science. Instruction in these skills can significantly improve students performance in problem solving. (Elementary)

340. Shaw, Jr., Edward L., McKenzie, Danny L. & Padilla, Michael J. (1983). An examination of the graphing abilities of students in grades seven through twelve . Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Georgia)

Approximately 385 subjects in grades 7 through 12 were administered the Test of Graphing in Science (TOGS). TOGS is a 26 item, multiple-choice test for middle and secondary students with a reliability of .84 (KR-20). The results suggested graphing skills should be introduced in earlier grades and be properly emphasized in the science and math curriculum. (Secondary)

341. Sherwood, Robert D. & Westerback, Mary E. (1983). A factor analytic study of the state trait anxiety inventory utilized with preservice elementary teachers. Journal of Research in Science Teaching, 20, 225-229.

Using a four-factor solution derived from a restricted principal component analysis, this study supported the use of the STAI-Y form of the State-Trait Anxiety Inventory (STAI) using preservice elementary teachers. (College)

342. Shrigley, Robert L. (1983). The attitude concept and science teaching. Science Education, 67, 425-442.

The attitude concept can be identified using five key elements. These elements can be used as the basis for conceptually defining attitudes for future research and attitude measurement in science education. (College)

343. Shrigley, Robert L. & Allison, A. Wayne. (1983). Young children ask operational questions in science. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Pennsylvania State University)

The authors investigated the question: Can the frequency of operational questions asked by fifth and sixth grade students be increased by varying the method of science instruction? The dependent variable was the number of operational questions asked by students and three treatments. (Elementary)

344. Shrigley, Robert L. & Hassan, Abdel Moneim A. (1983). Developing an attitude scale toward the teaching of chemistry. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Pennsylvania State University)

The purpose of the study was to develop a reliable and valid Likert-type attitude scale toward the teaching of simple chemistry concepts in the elementary school. Using Edwards' 13 validation criteria, a pool of 60 statements were written, randomized, and administered to 64 preservice elementary teachers. (Elementary)

345. Shuaibu, M.J. & Ogunsola, M.F. (1983). Cognitive styles in students of chemistry in SBS-ABU Zaria, Nigeria. Research in Science and Technological Education, 1, 101-107.

Analyses of cognitive preferences of chemistry students (N-156) in School of Basic Studies (SBS) at Ahmadu Bello University (ABU) indicated that the four preferences (recall, principles, application, questioning) appear to be unrelated to sex and location of previous school for these Nigerian students.

346. Shymansky, James A., Kyle, William C., Jr. & Alport, Jennifer M. (1983). The effects of new science curricula on student performance. Journal of Research in Science Teaching, 20, 387-404.

The meta-analysis of 105 research studies dealing with effects of new science curricula on student performance were described. Twenty-seven different new science curricula involving one or more measures of student performance were included in the analysis. The average student in new curricula exceeded the performance of 63% of the students in traditional science courses.

347. Slinger, Lucille A. & Anderson, Charles W. (1983). Influences of a secondary science methods course with a microteaching experience on preservice teacher development. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Michigan State University)

In this study ten secondary preservice teachers were interviewed and given planning tasks to complete prior to and following their experience in a science methods course which included planning and teaching four inquiry science lessons to small groups of sixth grade students. All ten preservice teachers demonstrated some positive change in teaching style. (College)

348. Small, Melinda Y. & Morton, Mary E. (1983). Research in college science teaching: Spatial visualization training improves performance in organic chemistry. Journal of College Science Teaching, 13, 41-43.

A spatial training (independent of classroom, laboratories, and instructors) improved achievement of organic chemistry students (N=67) and helped to develop skills required to use model kits effectively. (College)

349. Smith, Michael Ulon. (1983). A comparative analysis of the performance of experts and novices while solving selected classical genetics problems. Dissertation Abstracts International, 44, 451-A. (Florida State University)

Observations made from this investigation were used as a basis for modifying current problem-solving theory and for developing a procedural scheme which could serve as a basis for computer modeling of genetics problem solving. (College)

350. Smith, Walter S., Frazier, Norma I., Ward, Sharon & Webb, Mildred. (1983). Early adolescent girls' and boys' learning of a spatial visualization skill - replications. Science Education, 67, 239-243.

A study using sixth graders did not replicate the findings of previous studies which indicated that instruction could produce differential effects on the spatial skills of girls and boys. A sex difference in the spatial skills at this level, in favor of girls, was confirmed. (Elementary)

351. Sneider, Cary & Pulos, Steven. (1983). Children's cosmographies: Understanding the earth's shape and gravity. Science Education, 67, 205-221.

The state of children's model of the earth, dependent on their maturity level and previously acquired cultural information, can effectively be used as the basis for planning instructional sequences. (Elementary)

352. Sneider, Cary Ivan. (1983). Can children learn how to control variables? A neo-Piagetian training study in school and non-school settings. Dissertation Abstracts International, 43, 2623-A. (University of California, Berkeley)

Children and adolescents who participated in the instructional program were found to have significantly expanded the universe of tasks to which they could apply the controlling variables scheme. In addition, a significant treatment effect was evident among separate groups of 9-10, 11-12, and 13-14 year olds.

353. Sorrentino, Barbara Ellen. (1983). Development and evaluation of a handbook in bacteriology for secondary students using individualized instruction. Dissertation Abstracts International, 44, 1748-A. (University of Northern Colorado)

It was found that the handbook can be used effectively for individualized instruction in the science curriculum, as evident from data collected on forty-six males and fifty-one females from the Denver Public high school and Cherry Creek High School. (Secondary)

354. Spector, Barbara S. (1983). Curricular innovation and teacher role change: An exploratory study. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Florida International University)

The purpose of this qualitative study was to understand the factors which influenced the teacher's behaviors during the implementation of an innovation and to develop a theoretical model showing the relationships of these factors. A quantitative study in 1980 by Dr. V. Lien verified the significance of the factors identified in this study.

355. Squiers, Susan M.M.. (1983). An analysis of attitudes of high school seniors towards science and scientists in a southern metropolitan high school. Dissertation Abstracts International, 44, 722-A. (Auburn University)

Curriculum continuance was a significant factor in the attitude toward science and scientists of high school seniors. The authors concluded that enrollment in a science sequence of courses may be important in preventing the loss of students from science and science related fields. (Secondary)

356. Statkiewicz, Walter R. & Allen, Robert D. (1983). Practice exercises to develop critical thinking skills. Journal of College Science Teaching, 12, 262-266.

This study evaluates the effectiveness of exercises designed to develop critical and analytical reasoning skills in the biological sciences. Here, students were required to write out justifications for acceptance/rejection of each solution which resulted in significant improvement in solving the exercises. (College)

357. Staver, John R. & Pascarella, Ernest T. (1983). The effect of method and format on the responses of subjects to a Piagetian reasoning problem. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Illinois at Chicago)

The principal conclusion was that neither method nor format of task administration influenced the performance of subjects, and this lack of influence is similar for various combinations of method and format. Discussion focused on the importance of this non-significant finding for using alternative methods of Piagetian assessment. (College)

358. Stead, Keith. (1983). Insights into students' outlooks on science with personal constructs. Research in Science Education, 13, 163-176.

Many aspects of students' personal attitudes negatively affect their attitude towards science. These personal attitudes often reflect societal expectations. (Secondary).

359. Stefanich, Greg P., Unruh, Roy D., Perry, Bruce & Phillips, Gary. (1983). Convergent validity of group tests of cognitive development. Journal of Research in Science Teaching, 20, 557-563.

These authors investigated the convergent validity of individual Piaget/Inhelder clinical task interviews with Reasoning Test (Ankney and Joyce), Logical Reasoning Test (Burney), and Classroom Test of Formal Operations (Lawson). Correlations obtained were not sufficiently strong to warrant selection/categorization of individual students based on their performance on these measures.

360. Stevens, Suzanne Jane. (1983). The development of an instrument to measure elementary teachers' intentions to use selected science-teaching practices. Dissertation Abstracts International, 44, 1748-A. (University of Michigan)

This study indicated that if early elementary teachers taught science as a separate subject and had adequate storage space for materials (which might be interpreted as indicating that they had the ability to prepare and organize materials), this action could results in the teachers spending more time on practices designed to impart science process skills and thus to improve the state of science education. (Elementary)

361. Stewart, James. (1983). Student problem solving in high school genetics. Science Education, 67, 523-540.

The specific steps used by high school biology students to solve a particular problem in genetics are identified. Students can apply algorithms in order to produce the correct answer without understanding the concepts upon which the algorithm was based. (Secondary)

362. Stronck, David R. (1983). The comparative effects of different museum tours on children's attitudes and learning. Journal of Research in Science Teaching, 20, 283-290.

Students (n=816) touring 31 museums in British Columbia showed greater cognitive learning when led by museum docent. However, more positive attitudes were found when students participated in less-structured tours lead by their classroom teacher. (Elementary)

363. Stubbs, Harriett S.. (1983). Factors influencing introduction of a current environmental topic into the curriculum. Dissertation Abstracts International, 43, 3503-A. (University of Minnesota)

This study found that teachers who included environment, energy and current events in their curriculum and who were receptive to change as measured on the Welch Curriculum Attitude Survey (WCAS) were more likely to have introduced the topic of acid rain to their students. (Secondary)

364. Sweitzer, Gary L. & Anderson, Ronald D. (1983). A meta-analysis of research on science teacher education practices associated with inquiry strategy. Journal of Research in Science Teaching, 20, 453-466.

A meta-analysis was conducted on 68 studies dealing with teacher education having as measured outcomes one or more variables associated with inquiry teaching. Inquiry teaching had some positive effects on the learning "process" but was not superior to traditional methods for imparting knowledge.

365. Swift, J. Nathan & Gooding, C. Thomas. (1983). Interaction of wait time feedback and questioning instruction on middle school science teaching. Journal of Research in Science Teaching, 20, 721-730.

The effects of increasing middle school teachers' (N=40) wait time on general questioning skills in science teaching was evaluated using four groups (10 teachers each): control group receiving printed guides on discussion/techniques; group using an electronic feedback device; group using both guides and feedback device. Wait times were increased to about three seconds. The device improved quality of teacher questions and student contributions. (Secondary)

366. Symington, David J. & White, Richard T. (1983). Children's explanation of natural phenomenon. Research in Science Education, 13, 73-81.

Students were asked to explain why an explanation of a natural phenomenon (given earlier in class by another student) was correct or incorrect. Often children changed their mind as a result of this process. (Elementary)

367. Taglieber, Jose Erno, Lunetta, Vincent N. & D'Ambrosio, Ubiratan. (1983). Factors that influence the science learning of eighth grade students in Santa Catarina State (Brazil) public schools. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Iowa)

As seen in the literature, researchers have discovered that cognitive science achievement can be influenced by a complex set of independent factors; and this study examined the general picture of science achievement at the eighth grade level and how some of those independent factors actually worked in a setting like the schools of Santa Catarina. (Secondary)

368. Talton, E. Lynn. (1983). Peer and classroom influences on attitudes toward science and achievement in science among tenth grade biology students. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Georgia)

Attitude and achievement measures of the students from 70 biology classes were collected at the beginning, middle, and end of the 1980-81 school year. The data indicate that there was a significant relationship between student attitudes and classroom climate and attitudes toward science at the middle of the year. (Secondary)

369. Tamir, Pinchas. (1983). Cognitive preferences of Jewish and Arab high school students who studied an inquiry oriented biology curriculum for several years. Research in Science and Technological Education, 1, 17-26.

Biology Cognitive Preference Inventory taken by grade 12 Jewish (N=406) and Arab (N=297) biology majors revealed similarities between cognitive preferences, achievement, and background variables. Both groups became oriented toward principles/questioning rather than memorization. (Secondary)

370. Tamir, Pinchas. (1983). Teachers' self report as an alternative strategy for the study of classroom transactions. Journal of Research in Science Teaching, 20, 815-823.

The Self Lesson Report Form (SLRF) was described here and designed as an alternative to direct classroom observation or to commonly used questionnaires in which students and/or teachers report on general practices used in their classes. (Secondary)

371. Tamir, Pinchas. (1983). Inquiry and the science teacher. Science Education, 67, 657-672.

While teaching science as inquiry has been shown to be an effective method of instruction, it has not gained much prominence as a technique. Evidence from research suggests that an effective remedy here is to instruct preservice teachers in the techniques of inquiry teaching.

372. Tamir, Pinchas. (1983). A meta analysis of studies on cognitive preferences in science learning. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Hebrew University, Jerusalem, Israel)

Fifty-four studies of cognitive preferences in science were meta-analyzed using four types of data, namely: standard scores, effect sizes, correlations and factor analysis. (Secondary)

373. Tate, Richard & Burkman, Ernest. (1983). Interactive effects of source of direction, allocated time, reading ability, and study orientation on achievement in high school science. Science Education, 67, 509-522.

Data from a national field test of the Individualized Science Instructional System (ISIS) were used to assess student performance against classroom management approaches. Four-way analysis for interactions revealed that only source of direction and allotment of time were significantly linked to students achievement. (Secondary)

374. Thelan, Leverne J. (1983). Values and valuing in science. Science Education, 67, 185-192.

Present-day science curricula attend to the knowledge aspects of science but almost totally neglect real world issues. Science curricula should include a balanced approach between knowledge and social issues.

375. Thumann, Elizabeth Hauck. (1983). Interactions between two methods of teaching science and student cognitive style. Dissertation Abstracts International, 43, 2227-A. (University of California - Los Angeles)

Analysis showed a significant aptitude-treatment interaction with reflectivity-impulsivity x treatment interaction. Students who exhibited reflective reasoning patterns achieved higher science achievement scores, probably because they were more successful in answering classroom discussion questions and received positive feedback as a result. Students were more successful in high-control classrooms. (Elementary)

376. Tobin, Kenneth. (1983). Discourse patterns associated with the use of extended wait time in whole class settings. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (W. Australian College, Mt. Lawley, Australia)

The purpose of the study was to investigate changes in discourse attributable to the use of an extended teacher wait time in a sequence of seven lessons related to probabilistic reasoning. The results indicated that teacher wait time increased significantly over the seven lesson sequence from an average of 1.9 seconds to an average of 4.4 seconds. (Secondary)

377. Towse, Peter J.. (1983). Do new science courses improve attitudes toward science? A study in Lesotho. Science Education, 67, 159-169.

A science curriculum was designed to improve students' attitudes toward science. No significant differences were found between the treatment and control groups. (Secondary)

378. Udoibe, Ndarake David. (1983). Relationship between Nigerian students' values and educational goals in science and non science majors within the consortium of universities of Washington, D.C. metropolitan area. Dissertation Abstracts International, 44, 452-A. (American University)

American students like their Nigerian counterparts valued economic security, career, and personal identity as their primary sources of life satisfactions. However, career and family were more popular among domestic students. (College)

379. Ulerick, Sarah L. (1983). A critical review of research related to learning from science textbooks. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Minnesota)

This paper examined the failure of traditional science education research to address adequately the textbook as a learning variable; and, drawing on research concerned with discourse comprehension, suggested a paradigm within which content of textual instructional materials could be analyzed and evaluated.

380. Umelo, Anthony Nwosu. (1983). A survey of environmental perceptions and knowledge of environmental issues possessed by science and non-science educators in Nigeria. Dissertation Abstracts International, 43, 3281-A. (American University)

Conclusions drawn from the study were: (1) that perceptions of environmental issues among educators who were academically oriented towards science did not depend on their knowledge of environmental issues; (2) that among educators who were not academically oriented towards science, perceptions of environmental issues were related to their knowledge of environmental issues. (College)

381. Vachon, Myra K. & Haney, Richard E. (1983). Analysis of concepts in an eighth grade science textbook. School Science and Mathematics, 83, 236-245.

This study was conducted to determine the cognitive demand made by an eighth-grade science textbook. Reasoning patterns and science concepts were listed and compared. It was found that concrete reasoning was required more often than formal reasoning, but some points of difficulty for students who were not formal reasoners were noted. (Secondary)

382. Valdesolo, Ernesto Tino. (1983). The effect of bilingualism on the ability to formulate scientific hypotheses. Dissertation Abstracts International, 44, 1410-A. (Boston University School of Education)

The major findings were: (1) Hypothesis formation was a process skill that could be improved through training, and (2) Improvement in the ability to formulate scientific hypotheses was equally significant among bilingual and monolingual students. (Secondary)

383. Van Koevering, Thomas E. & Sell, Nancy J. (1983). An analysis of the effectiveness of energy education workshops for teachers. Science Education, 67, 151-158.

Teachers tend to teach topics in which they are knowledgeable. Well-planned workshops can enhance teachers' knowledge and add to the variety of topics they teach. An attempt is made to identify topics that should or should not be emphasized in workshops for elementary and junior high school science teachers.

384. Voelker, Alan M. & Miller, Jon D. (1983). Building predictive models with log-linear analysis. Research workshop presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Northern Illinois University)

This seminar prepared science educators to use log-linear analysis in building predictive models with cross-classificational data.

385. Voss, Burton E. (1983). A summary of research in science education - 1981. Science Education, 67, 287-419.

This author reviewed research published in 1981 and presented his findings using the major categories of previous reviews including cognitive style, Piagetian studies, student characteristics and learning, teacher strategies and learning, teacher use of instructional materials and learning, instructional technology, evaluation, curriculum research, teacher education and science supervision. (Thanks for your help - ed.)

386. Voss, Burton E. & Akinmade, Christopher. (1983). An investigation of the attitudes and perceptions of junior high school students toward science courses. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Michigan)

The results indicated that seventh grade students were significantly more motivated toward school and toward science courses than were ninth grade students. Although attitude toward school was found to have a dominant effect on attitude toward science courses, the former variable did not account for all the variation in attitude toward science courses. (Secondary)

387. Wagner, Paul A. (1983). The nature of paradigmatic shifts and the goals of science education. Science Education, 67, 605-613.

If students are to learn science, provision must be made for them to acquire linguistic competence in the paradigm, suitable behavior patterns to the research paradigm and a critical spirit to the claims of the paradigm. Curricula must be designed that incorporate these three conditions.

388. Walberg, Herbert J., Rascarella, Ernest T., Junker, Linda K., Geneva, D. & Boulanger, F. David. (1983). Voluntary activities in science during early adolescence. Science Education, 67, 13-24.

Several types of achievement or production are significantly linked to the amount of voluntary science activity in which a student engages. (Secondary)

389. Walford, Geoffrey. (1983). Science textbook images and the reproduction of sexual divisions in society. Research in Science and Technological Education, 1, 65-72.

An analytic framework for clarifying the problem with possible affirmative action is proposed with the goal to reduce sexism in science textbooks. While there is agreement about the extent of sexism found in the books, there is some confusion as to the best method of changing it.

390. Waterman, Margaret A. (1983). Understanding the nature of scientific knowledge: Interviews with college students. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Kenyon College, Gambier, OH)

This work is based on recent evidence from conceptual change research in science and mathematics education which suggests that an individual's beliefs about knowledge may play a role in what that individual chooses to learn and how. The results of this study can serve as foundation for study of interactions between epistemological positions and learning/achievement. (College)

391. Waterman, Margaret Ann. (1983). College biology students' beliefs about scientific knowledge: Foundation for study of epistemological commitments in conceptual change. Dissertation Abstracts International, 43, 2303-A. (Cornell University)

Beliefs about scientific knowledge of 691 biology students at Cornell were assessed by means of a survey, each of whose items reflected one of two theories of scientific knowledge: hypothetico-deductive (discovered) or conceptual change (constructed). Changes in mean response of students to survey items from pre- to posttest were significant for many items. These changes and students' lack of awareness of them are discussed within the theoretical framework of conceptual change theory of learning. (College)

392. Watkins, Willard Eugene. (1983). An analysis of the patterns of science education in metropolitan, small town and rural secondary schools in Arkansas and their relationship to students' achievement in science. Dissertation Abstracts International, 43, 3281-A. (Kansas State University)

The more "metropolitan" a school is, as defined by this study, the higher the student's achievement, as measured by the SRA science test. In addition, the number of science courses offered by a school was found to be inversely related (fewer classes predict higher achievement scores) to student achievement in science, when the school's demographic setting was controlled. (Secondary)

393. Watts, D. Michael & Gilbert, John K. (1983). Enigmas in school science: Students' conceptions for scientifically associated words. Research in Science and Technological Education, 1, 161-171.

Students conceptions of the words "force" and "energy" were examined using the interview-about-instances approach. Implications for science instruction and instructional strategies are discussed based on findings that many students have views of these concepts that were different from accepted scientific views.

394. Waugh, Michael L. & Yeany, Russell H. (1983). The effects of computer managed diagnostic testing on science achievement for students of varying levels of motivation and ability. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Georgia)

The results of this study indicated that computer managed diagnostic testing was an effective and efficient means of increasing immediate science achievement and that the effect was consistent across levels of motivation and ability. In regard to subsequent achievement, the earlier diagnostic testing experience appeared to have negatively influenced achievement, possibly because of a dependence on the diagnostic feedback. (Secondary)

395. Wavering, Michael J., Birdd, Donald & Perry, Bruce. (1983). The performance of students in grades six, nine and twelve on five logical, spatial and formal tasks. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Eastern Kentucky University)

Approximately 100 students in grades six, nine and twelve were interviewed individually on five of Piaget's tasks. The data show that only 54% of the subjects passed the concrete operational seriation task, less than 20% scored at the highest level on the projective space and measurement group tasks, and only 9% or less scored at the formal level on the separation and control of variables or proportional reasoning tasks. (Secondary)

396. Welch, Wayne W. (1983). Experimental inquiry and naturalistic inquiry: An evaluation. Journal of Research in Science Teaching, 20, 94-103.

Naturalistic and experimental inquiry methods in educational research and evaluation were described and compared, using illustrations from two science education research projects. Several strengths and limitations of each inquiry style were identified. The author suggested that investigators consider both paradigms in planning research and evaluations studies.

397. Wells, Dorothea Swart. (1983). The development of a model for designing logically sequenced biology curricula. Dissertation Abstracts International, 43, 3805-A. (University of Houston)

The conclusion drawn from the questionnaire was that a logical sequence of concepts was developed. The proposed model provided a means for developing and presenting a unit, showing the interrelationship of the parts and providing the structure needed for learning. It avoids presenting data to students in an atomized form. (Secondary)

398. West, Leo H.T. & Pines, A. Leon. (1983). How "rational" is rationality?. Science Education, 67, 37-39.

Inconsistency in the arguments regarding the rationality factor associated with conceptual changes by learners are cited as support for an argument that conceptual changes may be the result of one or more nonrational factors as well.

399. White, Richard T. (1983). Research in science education: The past ten years and the next five. Research in Science Education, 13, 1-8.

Research emphasis has shifted away from the mode of instruction and toward the state of the learner reflecting the rise in Piaget's influence. An increasing emphasis on the affective aspects of instruction was also noted.

400. Wideen, Marvin F. (1983). Research in science teacher education: A review and critique. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Simon Fraser University, Burnaby, BC, Canada)

Most studies did not address the complexities of the process and for the most part ignored the social and political contexts. Recommendations include working toward a more liberal methodology, seeking a more substantial and meaningful conceptualization, and addressing questions associated with goals, the political and social context, and the effectiveness of program elements.

401. Willett, John B., Yamashita, June J.M. & Anderson, Ronald D. (1983). A meta-analysis of instructional systems applied in science teaching. Journal of Research in Science Teaching, 20, 405-417.

The meta-analysis of 130 research studies on effects of instructional systems used in science teaching were examined and included audio-tutorial, computer-linked, individualized, and media-based instructional systems, personalized system of instruction, mastery learning, self-directed study, programmed learning, source papers, and team teaching. On average, these systems produced one-tenth of a standard deviation better performance than traditional science teaching.

402. Williams, Richard L. & Yore, Larry D. (1983). The effects of content, color, visuals, and page layout on elementary students' ability to read science materials. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching. (University of Victoria, B.C., Canada)

Using the Cloze method for measuring readability, the current study quantified the relationships between page format, grade level, sex and the science content areas of biological science, physical science and earth science. The implications for textbook writers and publishers were that science reading materials should be produced with more attention to readability and sequence of developmental reading skills. (Elementary)

403. Williams, Robert T. (1983). The science teacher shortage in North Carolina: Facts and myths. Science Education, 67, 479-488.

Much of the data regarding the shortage of science teachers is misleading unless taken in context. Recommendations to assist in alleviating science teacher shortages include the application of pressures in the appropriate sectors of society and government.

404. Willson, Victor L. (1983). A meta-analysis of the relationship between science achievement and science attitude: Kindergarten through college. Journal of Research in Science Teaching, 20, 839-850.

A meta-analysis of research results for correlating science achievement and attitude was conducted, utilizing 43 studies with 15 variables coded for each correlation found in each study (yielding 280 coefficients). Casual ordering results support achievement causing attitude in grades 3 to 8 and mixed results thereafter.

405. Willson, Victor L. (1983). Adding results to a meta analysis: Theory and example. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Texas A & M University)

Meta-analysis has been used as a research method to describe bodies of research data. It promotes hypothesis formation and the development of science education laws. The results shown here suggest how new findings complement the previous meta-analysis and extend its conclusions.

406. Wilson, Gwendolyn Owens. (1983). Hemispheric dominance and student performance in an engineering-graphics course. Dissertation Abstracts International, 43, 2952-A. (University of Tennessee)

The findings of this study were that right-brain students performed better than left-brain students in an engineering graphics class, and integrated-brain females performed better than integrated-brain males. (College)

407. Wilson, John T. (1983). Relationships between motivation and achievement of 17 year olds in science. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching. (University of Iowa)

Selected questions in the affective and cognitive area from National Assessment of Educational Progress were subjected to a secondary analysis. The result included the identification of two different sets of factors or motivators, one for boys and one for girls. (Secondary)

408. Wise, Kevin C. & Okey, James R. (1983). A meta-analysis of the effects of various science teaching strategies on achievement. Journal of Research in Science Teaching, 20, 419-435.

The meta-analysis of 160 studies concerning teaching techniques were examined and included questioning, wait-time, testing, focusing, manipulation, presentation approach, inquiry/discovery, audio-visual, and teaching direction. On an average, these techniques produced one-third of a standard deviation improvement over "traditional" techniques.

409. Wise, Kevin C. & Okey, James R. (1983). The impact of microcomputer based instruction on student achievement. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Georgia)

This paper provides an analysis of student achievement outcomes (both cognitive and affective) attributable to microcomputer based instruction. The magnitude of effects were examined using the technique of meta-analysis for those reports that provide adequate data. Comparisons of instructional effects for microcomputers and large main frame computers were made.

410. Wollman, Warren. (1983). Models and procedures: A classroom study of teaching for transfer. School Science and Mathematics, 83, 122-132.

A teaching strategy explicitly designed to promote transfer using the pendulum and balance beam procedure suggested that about half of the students could acquire in brief time a procedure for transferring knowledge to novel tasks. (Elementary)

411. Woolley, Thomas W. & Dawson, George O. (1983). A follow-up power analysis of the statistical tests used in the Journal of Research in Science Teaching. Journal of Research in Science Teaching, 20, 673-681.

These authors examined power-related changes that have occurred in science education research over the past decade. Guidelines for reporting minimal amounts of information for clear/independent evaluations of research results are presented.

412. Wright, Emmett L. & Caterina, Michael A. (1983). Development and validation of a bargaining, cohesion and cooperation environmental decision-making attitude assessment instrument. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Maryland)

This study reported on the development of the Decision Making Attitude Assessment Instrument. A reliable instrument was developed which can be used by classroom teachers and researchers to assess the environmental decision-making attitudes of bargaining, cohesion, and cooperation of college students. (College)

413. Yager, Robert E. (1983). The importance of terminology in teaching K-12 science. Journal of Research in Science Teaching, 20, 577-588.

A series of textbook investigations indicated that more new words/phrases are introduced than in a similar time frame as foreign languages are studied.

414. Yeany, Russell H. & Miller, P. Ann. (1983). Effects of diagnostic/remedial instruction on science learning: A meta analysis. Journal of Research in Science Teaching, 20, 19-26.

This analysis indicates that instruction significantly and positively influences science achievement, but that there is no clear indication that use of prescription/remediation in addition to diagnosis brings about significant additional increases in achievement.

415. Yeany, Russell H. & Porter, Charles F. (1983). The effects of using two and three dimensional models on science achievement of students with varying levels of spatial ability, cognitive development and gender. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Georgia)

The following conclusions were drawn from this study. First, the combination of two- and three-dimensional instruction appeared to have been the most effective strategy. Second, formal operational students tended to score significantly higher than less-than-formal operational students. Third, spatial visualization ability had little relationship with achievement. (Secondary)

416. Yore, Larry D. (1983). The effects of cognitive development, age and inquiry strategy on elementary students' science achievement. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (University of Victoria, Victoria, BC, Canada)

Age and cognitive development of learners were assessed for 151 elementary school students in grades one, three and five. The study suggested that by age eight or nine years students possess the logical structures required by structured inductive and semi-deductive teaching/learning strategies. (Elementary)

417. Zakari, Omar Mohammad M. (1983). A comparison between the effects of specific behavioral objectives versus study questions on learning of undergraduate Saudi Arabian biology students. Dissertation Abstracts International, 44, 452-A. (Florida State University)

Students with study questions performed significantly higher than students without study questions on a posttest given during the last day of instruction and on a retention test given a week later. It was concluded that study questions should be employed as a preinstructional strategy. (College)

418. Zebrowski, Jr., Ernest. (1983). College science textbook publication: A look at the sociological mechanism. Science Education, 67, 443-453.

Many of the "sociological mechanisms" which shape the science textbooks in use in college are in conflict with each other. Thus, these textbooks are often the result of many philosophical and conceptual compromises. (College)

419. Zeidler, Dana Lewis. (1983). Identifying mediating factors of moral reasoning in science education. Dissertation Abstracts International, 43, 2623-A. (Syracuse University)

The purpose of this study was to investigate to what extent and how such factors as knowledge of content, attitudes, value commitment and past experiences mediate the formation of moral judgments on science oriented moral dilemmas. (College)

420. Zurub, Abdel Rahman & Rubba, Peter A. (1983). Development and validation of an inventory to assess science teacher needs in developing countries. Journal of Research in Science Teaching, 20, 867-873.

The development and validation of an inventory designed to identify the needs of science teachers in developing nations, particularly the Arab countries, was described and based on the instrument, Science Teacher Inventory of Need.

421. Zurub, Abdel Rahman & Rubba, Peter A. (1983). An assessment of need among secondary level Jordanian science teachers. Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, Dallas, TX. (Southern Illinois University)

The purpose of this study was to identify the most prevalent needs perceived by Jordanian secondary level science teachers. The Science Teacher Inventory of Need (STIN) was developed and used for that purpose. Conclusions were drawn as to the inservice needs of Jordanian science teachers. (Secondary)

422. Zurub, Abdel Rahman A. (1983). An assessment of need among secondary level Jordanian science teachers. Dissertation Abstracts International, 44, 130-A. (Southern Illinois University at Carbondale)

Analysis showed that Jordanian secondary level science teachers perceived needs which they shared and perceived needs which were specific to the subgroups when using the Science Teaching Inventory of Need (STIN) instrument. (Secondary)

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