SAN JOSE STATE UNIVERSITY

College of Education
Teacher Education Division
Spring 2005
Elementary Science Methods - EDEL 108B (Sections 03)

INSTRUCTOR: **Dr. Obed Norman**
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Course Related Websites:
1. http://sweeneyhall.sjsu.edu/peass/index.html
2. http://www.dolezalek.com/chris/EDEL108B030104.htm

OFFICE HOURS
M (5:00PM - 7:00PM)
T (5:00PM - 7:00PM)
W (5:00PM - 7:00PM)

CLASS HOURS **MONDAY (7:00 PM - 9:45 PM)**

MEETING ROOM DH 216

OPTIONAL COURSE TEXT: Carin, Arthur and Bass, Joel. (2001). Methods for Teaching Science as Inquiry (8th Edition)

TENTATIVE SCHEDULE

Date (Monday)	**Topic**	**Note**
Strand 1: The Nature of Children:		
1/31/05	Course Introduction Syllabus Negotiation Effective Science Instruction	
2/7/05	Planning for Student Interviews Finding out what children already know. Recognizing the Diversity among students Lesson Planning	

2/14/05	Increasing Children's Knowledge of Science and Kindling their Curiosity to Explore.	
2/21/05	Activity Stations Session I	Last day to add courses
Strand 2: The Nature of Science		
2/28/05	Science Imperatives. Helping Young Children Construct Their Own Knowledge. Video Presentation Reflective Teaching Presentation	
3/7/05	Physical Science Activities Science Process Skills Class Discussion on Feynman	
3/14/05	Design Challenge Activities San Jose Tech Museum	
3/21/05	Physical Science Activities Water Cycle Activities	
Strand 3: The Nature of Teaching		
3/28/05	SPRING BREAK – NO CLASS	
4/4/05 AERA	Science: Our Common Cultural Heritage. Life Science Activities: Energy and Living Systems Technology in Science Teaching	
4/11/05 NARST	Life Science Activities Technology in Science Teaching	
4/18/05	Earth Science Activities Assessment	**Class will meet in SH - 431 (Computer Lab)**

4/25/05	Earth Science Activities Assessment	**Class will meet in SH - 431 (Computer Lab)**
5/2/05	Earth Science Activities Assessment Student Presentations	**Class will meet in SH - 431 (Computer Lab)**
5/9/05	Earth Science Activities Assessment Student Presentations	
5/16/05	Student Presentations	Last day of instruction

A. Introduction

Welcome to the challenging world of elementary school science! The best thing about elementary school science are the children we teach: bright-eyed, questioning, and full of wonder.

> Do not let those eyes grow dim.
> Dare to explore their questions with them
> And dare to learn with them.
> Sustain and nurture the flame of their wonder.
> Because you, teacher, are the keeper of a vital and sacred flame.

A. Philosophy/Mission

The philosophy of the Multiple Subject Credential Program at San Jose State University is based on a vision of competent professional educators who can function effectively in the multicultural, multilingual and technology complex environment of today's schools, and who can meet the science education challenges of tomorrow's schools with confidence and enthusiasm. SJSU is therefore committed to the preparation of teachers who are critical and reflective practitioners prepared to make informed and appropriate decisions in daily practice; to serve in diverse educational contexts; and able to provide appropriate science instruction for diverse populations. These teachers must also be aware of appropriate uses of technology for learning, and be well-prepared in current science education theory, research, methods and practice.

Notes:
a. Student materials submitted for this course may be accessible to all students and faculty in Science Methods.
b. Reasonable accommodations will be made for students with disabilities. Please request such accommodation if required.

C. Course Description

Curriculum and Instruction in Elementary Science - A study of (a) the curriculum organization; (b) techniques and strategies for instruction in science at the elementary level.

This course is aimed at an examination of some of the issues entailed by considering the knowledge which a student brings to classroom as an important instructional variable. Recent findings from a range of international studies show that children bring to science lessons views of the wold and meanings for words which have a significant impact on their learning. As a consequence children's ideas are influenced in unanticipated ways by science teaching. This course will explore these findings, analyze their significance for the teaching/learning process.

A. Objectives of the Course

The objectives of the course are to develop:

1. Positive attitudes towards science, science teaching and learning.

2. Awareness and knowledge of the curricular options, by examining the philosophy, teaching-learning styles, text, teacher's guide, and materials of various curricular options.

3. Confidence and competence in designing teaching-learning activities, lessons and unit plans, evaluation procedures and in the use of appropriate audio-visual materials and equipment, and technology.

4. Awareness and knowledge of sources of current literature on science teaching and

contemporary issues in science education.

5. Awareness of science curriculum materials and resources available for Elementary Science.

6. Awareness of the multicultural dimensions of the classroom and what this means for science

teaching at the elementary level.

7. Awareness of gender issues as it relates to science teaching at the elementary level.

B. Assigned Readings

Students will be expected to read materials assigned throughout the course. A package of reading materials will be posted on my website and be available for copying. In addition, the following books may be purchased at the bookstore:

1. Science Framework: California Public Schools Kindergarten Through Grade Twelve (1990). California Dept. Education, Sacrament. (REQUIRED ACCESS).
2. National Research Council (1996). National Science Education Standards. Washington, D.C.: National Academy Press. (REQUIRED ACCESS).

In addition the assigned readings students will also be expected to have read:

2. ***Science and Children, & Science Scope*** (periodicals)
3. Any additional readings suggested by the instructor.

Students will be expected to utilize the science education resources

C. Tentative Course Outline:

This course will consist of three parts. Part one will focus on teaching/learning theory from a multicultural perspective. Part two the use of teaching strategies and technology. Part three will review state and national science standards; state adopted science programs and constructivist models of instruction.

The following topics will constitute the core of the course:

Part I - Teaching/Learning

1. Science instruction from a constructivist perspective, by focusing on the nature of science, and nature of the learner.
2. Goals and objectives of elementary science
3. The process of science
4. Conceptual teaching/learning
5. The teacher's role in a diverse classroom

Part II - Teaching Strategies and Technology

1. An exploration of teaching strategies
   -general review
   -field-based teaching activities
   -cooperative learning
   - integrated and thematic approaches to instruction
2. The utilization of technology to teach science

-hands-on experience with e-mail, Netscape, science probes, videodiscs, etc.
-STS issues

Part III - Curriculum and Models of Instruction

1. The National and State Science Standards
2. The California Science Curriculum Framework - a review of the organizational themes in the CA Science Curriculum Framework:
   Scale & Structure
   Stability
   Energy
   Systems & Interactions
   Evolution
   Patterns of Change
1. Review of Elementary Science Curriculum Materials and hands-on experience with a variety of state adopted programs.
2. Review of science content matrices for local school districts.
3. An exploration of models of Instruction.
4. Evaluation of students.

D. Evaluation

Evaluation of course:
Students will be encouraged to give feedback on the course at various points throughout the semester, in addition to participating in the end of semester evaluation. All students should make an appointment before the end of September to clarify &/or discuss assignments.

Evaluation of students:
Evaluation of the course will be based upon a system where each student will be asked to complete a portfolio which contains the following items:

1. A Reflective Teaching Assignment (20%)

A. Prepare a lesson plan focusing on a science concept.
B. Teach a min-lesson based on the above plan to your classmates. A schedule for class presentation will be arranged. Copies of your lesson plan will be required for class presentation.
C. Teach your lesson at a school site, videotape and analyze as per guidelines.
D. Submit a copy of your lesson plans, and a brief report (1-3 page maximum) where you analyze feedback and reflect on your total teaching experience.

DUE DATE (t.b.a)

2. Resource File (40%)

The preparation and/or collection of A-V science resources for the teaching of the science component of a curriculum theme. There should be a variety of items - both print and non-print. A curriculum theme in science will generally last for 3-4 weeks on the average. As soon as possible you should identify a theme and target grade range (for example primary k-1,2-3; elementary 4-5, 5-6). You should make or obtain free materials for the resource file. You are also encouraged to field-test resources from this collection. The resources files will be reviewed in class by peer review. Copies of the thematic overview will be required for sharing with your classmates.

RESOURCE FILE RECOMMENDATIONS

- A thematic overview
- At least 20-30 science activities covering concepts identified in your thematic overview
- A variety of A-V resources to support your theme- overhead transparencies, video tapes, computer disks, collection of (posters, pictures charts), games, student booklets, teacher guides, references material, display material for learning center. At least six kinds of resources should be represented, with no more than two kinds consisting of a single item
- Integrating activities for other subject areas - art, music, social studies, language arts, math, etc.
- Wishes, dreams, msc. ideas folder

Submit your resource file as an organized package, with a cover sheet and individual sections evident (preferably cited on each section). You may photocopy rather than copy by hand. You may include resource books with selected sections marked or flagged (resource books count as

one kind of resource). You may include assignments you have completed for other courses if the work is focused on science or interdisciplinary with science as an emphasis. You may have your assignment pre-checked before the due date (peer evaluation)? The checking process will take far less time than the assembly process. Begin early and you will be pleased with your outcome.

DUE DATE (t.b.a.)

3. **Professional Journal (15%)**

In your professional journal you will keep a record of all science activities completed. Because of the interactive nature of this course participation and attendance in all classes is necessary. You will be expected to make up for any absence, by completing the course topics and doing the activities provided.

DUE DATE (t.b.a.)

4. **Action Plan/Final Exam (20%)**

Prepare an action plan (about 3 pages) which outlines your plan of action as a future teacher of elementary science. **You will present your action plan to your peers in the last class period. Submit to the instructor a copy of your plan, your peer reviews, and any revisions or responses you would like to make.**

One possible approach to this task is to pretend that you are applying for a teaching position where science plays an important focus of instruction. You define the details – grade level, location, etc. Develop an action plan to present to a hiring committee.

In the development of your action plan consider such details as:

1. What focus would your science program take?
- **Philosophy?**
- **learning theory?**
- **teaching strategies?**
- **areas of science, or themes, etc.**
- **evaluation of science**

Remember it is important to use literature to support your position.

Provide an overview of what your science program would look like.
Consider such special arrangements as:
- **classroom**
- **resources – materials**
- **scheduling**
- **events**
- **integration**
- **other issues – ESL, bilingualism, multiculturalism, mainstreaming, females & science, etc.**

Your action plan should be appropriate for a recent graduate; be convincing enough that the committee will recommend that you be hired.

DUE DATE: A draft action plan will be presented on the last day of class, with a final copy due by the scheduled exam date.

5. Attendance and Participation: (5%)

The following system will be used to award final course grades:

A 90-100 (A+ 97-100, A 94-96, A- 90-93) B 80-89, C 70-79

Students who wish to achieve an A standing or better must complete ALL assignments with the time schedule given, and have a perfect participation record other wise they will be awarded the next grade level.

SUGGESTED READING LIST

Abell, S.K., E.L. Pizzini, & D.P. Shepardson (1989). The textbook scan. Science and children, (27 (2), 36-37.

Amaudin, M.W., & Mintzes, J.J. (1986), *The cardiovascular system: Children's conceptions and misconceptions. Science and Children, 23 (5), 48-50.*

Ault, Jr., C.R. (1984). Intelligently wrong: Some comments on children's misconceptions. *Science and Children, 21 (8), 22-24.*

Ausebel, K.P. (1968). *Educational psychology: A cognitive view*. New York, NY: Holt, Rinehart & Winston.

Birnie, H.H., & A Ryan (1984). Inquiry/discovery revisited. Science and Children, 21 (7), 31-32.

Breit, F. (1987). Graphing is elementary. *Science and Children*, 24(8), 20-22.

Bybee, R.W., et al. (1988). What research says.. about new science curricula. *Science and Children*, 25(8), 35-39.

Cain, M.F. (1986). What is a fair test? Lessons in problem solving. *Science and children*, 24(3), 8-10.

Carlisle, R.W., & B.C. Deeter (1989). A research study of science fairs. *Science and Children*, 26(4), 24-26.

Claxton, G. (1984). *Live and Learn: An introduction to the psychology of growth and change in everyday life.* London: Harper and Row Publishers.

Crook, P.R., & Lehman, B.A. (1990). On track with trade books. Science and Children, 27(6), 22-23.

Daugs, D.R., & R.P. Emery (1989). Science literacy. Science and Children, 26(8), 30-31.

Driver, R. (1983). *The pupil as scientist.* Milton, Keynes, England: The open University Press.

Driver, R., Guesne, E., & Tiberghien, A. (1985). *Children's ideas in science*. Milton Keynes, England: Open University Press.

Helm, H., & Novak, J. (Eds.) (1987), *Proceedings of the international seminar on misconceptions in science and mathematics.* Ithaca, NY: Cornell University Press.

Feldman, D.H. (1980). *Beyond universals in cognitive development.* Norwood, NJ: Ablex Publishing corporation.

Fields, S. (1987). Introducing science research to elementary school children. *Science and Children,* 25(1), 18-20.

Goldberg, L. (1982). Learning how to learn. *Science and Children*, 19(7), 10-11.

Goldberg, L., et al. (1990). Outstanding science tradebooks for children in 1989. *Science and Children,* 27(96), 30-37.

Hawkins, D. (1982). *Critical barriers in understanding and learning.* Research Report, University of Colorado.

Hein, G.E. (1987). The right test for hands-on learning? *Science and Children,* 25(2), 8-12.

Kelly, G.A. (1955). *The psychology of personal constructs*. (2 volumes.) New York, NY: W.W. Norton Inc.

Klein, C.A. (1989). What research says . . about girls and science. *Science and Children*. 27(2), 25-31.

Koeller, S. (1982). Expository writing: A vital skill in science. *Science and Children*, 20(1), 12-15.

Martens, M.L. (1990). Getting a grip on groups. *Science and Children*, 27(5), 18-19.

Meng, E., & Doran, R.L. (1990). What research says . . about appropriate methods of assessment. *Science and Children*, 28(1), 42-45.

Norman O. et al. (2001) *The Black-White "Achievement Gap" as a Perennial Challenge of Urban Science Education: A Sociocultural and Historical Overview with implications for Research and Practice.*

Novak, J.D. & Gowan D.B. (1984). *Learning how to learn.* New York, NY: Cambridge University Press.

Osborne, Roger, & Freyberg, Peter (1985). *Learning in science: The implications of children's science*. Auckland, New Zealand: Heinemann.

Piaget, J. (1929). *The child's conception of the world*. London: Routledge & Kegan Paul.

Schon, D.A. (1983). T*he Reflective practitioner: How professionals think in action.* New York, NY: Basic Books.

Stephans, J., Kuehn, C. (1985). Children's conceptions of weather. *Science and Children,* 23(1), 44-47.

Thompson, B. (1979). Myth and science for the handicapped. *Science and Children,* 17(3), 16-17.

Tingle, J. (1987). Science Fairs . . Unfair? *Science and Children,* 25(3), 33-35.

Wasserman, S., & Ivany, G.J.W. (1988). *Teaching elementary Science: Who's afraid of spiders*. New York, N.Y.: Harper & Row Publishers.

Winicar, S. (1989). Variations on a (science fair) theme. *Science and Children*, 26(4), 27.

Note: The above list is only preliminary at this stage. I would strongly encourage students to acquire as many as possible of the above reading materials for their professional library.

SCIENCE PROGRAMS

The following is a list of the most recent science programs, which are available for your review. State adopted programs are in SH331, with other programs in DH35.

Addison-Wesley
- -Addison-Wesley Science (K-6)
- -Explorations in Science (K-4)
- -Chemical Education for Public Understanding Program (8)

Carolina Biological Supply Co.
- -Science and Technology for Children (3-6)

Creative Publications
- -Windows on Beginning Science: Active Learning for Young Children (k-2)

Decision Development Corp (**adopted**)
- -Science 2000 (7)

Delta Education, Inc.
- -SCIS 3(K-3)

Education Development Center, Inc. (**adopted**)
- -Insights Elementary Science Curriculum (K-6)

Edunetics, Inc.
- -Rediscover Science ILS (7-8)

Encyclopaedia Britannica (**adopted**)
- -Britannica Science System (3-6)

Glencoe Division of Macmillan/McGraw-Hill
- -Science Interactions (6-8)
- -TLTG Physical Science Video Disc Curriculum (8)

Harcourt Brace Jovanovich, Inc.
-Innovations in Science (1-6)

Holt, Rinehart and Winston, Inc. (**adopted**)
-Science Plus, Technology and Society (7-8)

Kendall/Hunt Publishing Co.
-Science for Life and Living - Integration Science, Technology, and Health (k-6)
-Middle School Life Science (7)

Macmillan/McGraw-Hill (**adopted**)
-Macmillan/McGraw Hill Science (K-8)

Macro Press
-Exploring Science (K-6)

Math/Science Nucleus
-Science Mate - Volumes 1-6 (K-6)

National Geographic Society
-National Geographic Kids Network (1-5)

Optical Data Corp.
-Windows on Science (1-8)

Prentice-Hall, Inc. (**adopted**)
-Prentice Hall Science Learning system (6-8)

Scholastic Inc./IPG (**adopted**)
-Scholastic Scienceworks (K-3)

Scott, Foresman, & Co. (**adopted**)
-Discover the Wonder (k-6)

Silver Burdett & Ginn
-Science Horizons Multimedia system (K-6)

The Wright Group
-Sunshine Science-Investigating Our World (k-1)

Videodiscovery, Inc.
-Life Lab Science (K-3)

Wings of Learning
-The Voyage of the Mimi (5)
-The Second Voyage of the Mimi (6)

Zaner-Bloser
Breakthroughs (1-6)

LESSON PLAN
(In-Class Peer Feedback Data)

1. Presentation

- format

- clarity

2. Appropriateness for Designed Level:

- level

- suitability

A. Further Research Efforts:

B. Overall comments

LESSON PLAN
(School-Based Data)

1. Student Feedback:

2. Teacher's comments:

4. Self-analysis:

5. Suggestions for next time:

CRITERIA FOR RESOURCE FILE REVIEW

THEME:_____

GRADE RANGE_____

Review resource file for the following

1. –A **thematic overview**
   list of concepts to be covered
   list of sources to contact for information

1. –At least 20-30 Science activities covering the concepts identified in your thematic overview

2. –A variety of A-V resources to support theme. AT least six kinds of resources should be well represented, with no more than two kinds consisting of a single item.

overhead transparencies	videotapes
computer disks	collection of (posters, pictures, games, and charts)
student booklets	teacher guides
reference materials	display materials for learning centers

3. –Interactive bulletin board display featuring a science topic, or concept related to your theme. No commercially produced ones please!!!

4. –Children's books to support the theme (books, or a list of books)

5. –Integrating activities for other subjects areas – art, music, social studies, language arts, math, etc.

6. –Special Resources section including field trips, people, places, reference list for books, videos, etc.

7. –Wishes, dreams, msc. Ideas folder

REVIEWERS SIGNATURE_____

CRITERIA FOR PEER CRITIQUE RESOURCE FILE

1. PRESENTATION
-usable
-some use
-limited use
-no use

2. ORGANIZATION
-well done
-o.k. to fairly well done
-minor deficiencies
-major deficiencies

3. APPROPRIATENESS
-resource appropriate for intended level
-most of the materials were appropriate
-limited appropriateness
-not appropriate

4. DEPTH & SCOPE
-comprehensive
-adequate
-limited
-restricted

5. ORIGINALITY &/or RESEARCH
-self developed/well researched
-some personal development/some research
-limited development/very limited research
-no development/ a collection only

OVERALL COMMENTS:

ACTION PLAN

1. **ORGANIZATION**
   - -very good
   - -good
   - -fair
   - -poor

2. **RESEARCH**
   - -well done (well researched)
   - -good (adequately researched)
   - -some research (some research)
   - -under researched (not enough research)

3. **OVERALL PLAN**
   - -superior
   - -well done
   - -adequately done
   - -poorly done

4. **PRESENTATION**
   - -well presented
   - -adequately presented
   - -poorly presented

5. **AWARENESS OF CURRENT LITERATURE**
   - -well versed
   - -adequate
   - -inadequate

COMMENTS:

A FRAMEWORK FO RYOUR JOURNAL REFLECTIONS:

GENERAL: The purpose of the activity reflections is to help you consolidate your understanding of both the science concepts and the pedagogical aspects of a given science activity. Regard your journal reflection as a future teaching resource that will help you as you use these science activities in your own teaching. Below are some questions that you can use to guide your journal reflections.

1. What was the most important thing(s) you learned from this activity?

2. What are the most important things to remember when you do this activity with K-8 students?

3. What changes will you make to this activity when you use it with you particular students?

4. What logistical and / or safety concerns you have about using this activity with your students?

5. What additional knowledge or information would you wish to acquire before you feel confident about doing this activity with your own class.

6. Make a list of possible questions your students might raise as they work on this activity?

7. What are some of the issues that you would like to see raised in the discussion phase of this activity?