SEATTLE UNIVERSITY
SCHOOL OF EDUCATION
TEACHER EDUCATION

Conceptual Framework: The College of Education prepares ethical and reflective professionals for quality service in diverse communities.

EPDSC 928 Life Science for Elementary and Middle School Teaching

One Continuing Education Credit

Mark R. Roddy, Ph.D.
Loyola Hall 310
(206)296-5765 (hours by appointment)
mroddy@seattleu.edu

TEXTS:

- Washington State Essential Learning Requirements
  http://www.k12.wa.us/curriculumInstruct/
- A bibliography is included as a starting point for exploring topics in science. It is expected that you will read/review a number of sources for this course. Resources are available from the public library or from sources such as Amazon.com.

Organizing Theme: The teacher is an ethical knowledgeable and reflective decision-maker who teaches all learners to function effectively in a global and pluralistic society.

COURSE DESCRIPTION AND INTRODUCTION

> "In a world filled with the products of scientific inquiry, scientific literacy has become a necessity for everyone. Everyone needs to use scientific information to make choices that arise everyday. Everyone needs to be able to engage intelligently in public discourse and debate about important issues that involve science and technology. And everyone deserves to share in the excitement and personal fulfillment that can come from understanding and learning about the natural world." (National Science Education Standards, 1996. p.1)

As a prospective elementary school teacher it is up to you to be prepared to enable your students to enter a world where scientific literacy plays such a vital role. In order to do this, you need to know something about science. Of course knowledge in a content area is not the only ingredient needed by a competent teacher but it is an essential starting point; we cannot teach what we do not know. This course is designed for applicants to the Master in Teaching **elementary certification** program at Seattle University who wish to deepen their knowledge of life science. The course is intended to introduce you to some of the concepts, processes and issues you will need to understand in order to teach life science at the elementary and middle school levels. It is expected that this course will serve as an introduction and that you will continue to deepen your understanding of the life sciences once you are in the classroom. The structure of this course is identical to that of the physical science course (EPDSC 927). If you are working on both, this should lead to some increase in the efficiency of your efforts.

In "Science for All Americans," a case is made for the importance of understanding the way life operates in and affects our world.

> "People have long been curious about living things—how many different species there are, what they are like, where they live, how they relate to each other, and how they behave. Scientists seek to answer these questions and many more about the organisms that inhabit the earth. In particular, they try to develop the concepts, principles, and theories that enable people to understand the living environment better. (AAAS, 1989)

Each assignment required in this course is structured with this goal in mind. The course requirements are interrelated. Researching and writing for one assignment should inform other assignments and vice versa. Choice-making is an important component for learning. Thus, this course offers a range of learning opportunities as you complete assignments.

All assignments are submitted at the same time in one packet. At that time you also register and pay for the course.

See http://www2.seattleu.edu/coe/mit/modules_list.aspx for how to enroll in this course. Include a stamped, self-addressed envelope for returning the assignments.

It is estimated that to complete these assignments, you will invest about 50 hours. If you have had other experiences or coursework in science, these assignments may take less time. If not, they may take more time. It is hoped that you will use this course to your advantage and not simply "go through the hoops" to achieve credit and a grade. You are investing in your preparation for becoming a teacher and in your students! I hope that these experiences provide new insights and increased knowledge, and that they kindle enthusiasm for teaching science to young people.

OBJECTIVES: At the conclusion of this course, the student will be able to:

- demonstrate knowledge and understanding of life science as taught at the elementary and middle school levels;
- demonstrate knowledge of the Washington State Science Standards;
- value professional development by reviewing curriculum and participating in professional opportunities to enhance understanding of life science.
- consider ethical dimensions of teaching life science.
- begin to understand issues of diversity and multiculturalism as they apply to life science.

REQUIREMENTS AND GRADING

This syllabus is a contract between you and your instructor of the course. It is hoped that you become actively engaged in making decisions about your learning. Read the syllabus carefully and consider all the assignments, then create a plan for your learning **with a timeline.** Be sure to allow ample time for completing the course. All assignments must be word-processed (double-spaced) with at least a one-inch margin to allow for comments. All assignments must follow APA guidelines as appropriate and reflect correct grammar, spelling and usage. This course must be completed prior to beginning the MIT Program.

Grading: This syllabus serves as a contract between you and your instructor. It is my hope that you will do your very best work. I will provide you with feedback in the form of a course grade that reflects the quality of your work.

You will receive a letter grade in this course. Grades on assignments will be as follows: A, A-, B+, B, B-, C+, C. Any grade below a C- will be considered unsatisfactory.

Requirements: *(Specific details are given on the assignment sheets that follow.)*

1. **Reading**: A bibliography is included to assist you in the learning process. You should read as many of these as you can in order to build your knowledge base. This will assist you as work on the remaining assignments. (There is nothing to hand in for this assignment. It is here to assist you in your own efforts to learn.)

2. **Articles**: Select and investigate a set of articles in order to build your understanding of issues and processes related to teaching science at the elementary and middle school level.

3. **Central Concepts and Processes**: Investigate the nature of and pedagogy related to one major concept and one major process within the realm of life science education.

4. **Connections**: Select one of three assignments designed to enable you to investigate the connections between life science, other content areas, and your students' lives.

5. **Concept Connections Web**: Consult appropriate sources to create a diagram showing connections between some of the central concepts, processes and issues in life science.

6. **Reflection Paper**: After you have completed all the assignments, do a self-assessment of the value of this course and of the additional work you will need to do to be prepared to teach life science.

7. **Cover sheet**: Construct a cover sheet and attach it to your assignments.

Assignment: Reflection

Objectives:

- Demonstrate knowledge and understanding of life science as it is taught at the elementary and middle school levels;
- Consider ethical dimensions of teaching science;
- Begin to examine your own needs and preferences as a teacher and learner of science.

Rationale for the assignment: Active reflection on our learning helps us refine our teaching and grow professionally. Inherent in reflection is a commitment to the ethical dimensions of what we do when we teach. This assignment is intended to help you reflect on what you are learning, and motivate you to grow professionally. It will also provide information to your instructor about your learning experience.

Description of the assignment: After you have completed all the assignments,

a. do a self-assessment of
   - the value of the independent study, and
   - the additional work you will need to do to be prepared to teach life science,

b. comment also on the ethical issues that you considered related to this study,

c. please provide brief feedback on each of the assignments by answering the following questions:
   - Which assignments were particularly helpful to your learning? Explain.
   - What changes would you suggest to make this course better? Explain.

d. Finally be sure to attach a time log showing approximately how many hours you spent on each assignment.

All of the above should probably fit in a one to three page reflection.

Criteria for evaluation: Your assessment of your needs as a learner seems relevant and realistic. Your assessment of the strengths and shortcomings of the assignments takes into account aspects of your own experience and understanding. You have provided suggestions for improvement of the course. You have provided a clear time log.

Assignment: Central Concepts and Processes

Objectives:

- Demonstrate knowledge and understanding of life science as it is taught at the elementary and middle school levels;
- Demonstrate knowledge of the Washington State Essential Academic Learning Requirements related to science. (Go to http://www.k12.wa.us/curriculumInstruct/ and click on Science.);
- Value professional development by reviewing curriculum and participating in professional opportunities to enhance understanding of life science;
- Consider ethical dimensions of teaching science.

Rationale for the assignment: Our own experiences as learners generally have not prepared us well for the demands made by the new vision of science education promoted by such influential documents as the National Science Education Standards (NRC, 1996) and the Washington State Science Standards. It is important for you to consider carefully what you are asked to do and to think clearly about the differences between this vision of science education and the one on which you were raised. This assignment gives you a chance to begin to consider how today's curriculum differs from the traditional model and how you might deal with the changes.

You will examine the Washington State Standards, locate one important concept and one important process, and then employ a curriculum planning model to sketch a plan for introducing your students to these concepts and processes. The curriculum planning models emphasizes (a) knowing your subject matter, (b) writing carefully formulated learning targets, (c) designing assessments to measure student attainment of these learning targets, (d) designing learning activities, and (e) assessing the equity of the learning process for all students. Although you will not be able to engage fully in all of the steps of this model (That will come later on in the MIT program), you will get a chance to explore some of the skills and understandings needed to do so.

Description of the assignment: Imagine yourself teaching at a specific grade level in the K-8 range (e.g., 6th grade or 3rd and 4th). Take some time to look carefully at the Washington State Science Standards and select a central scientific concept and a central scientific process appropriate for the grade level you have selected.

Concepts are things like "animals," "rate," "ecosystem," "interaction," "evolution" and "reproduction." These are addressed primarily in Science Essential Academic Learning Requirements 1 – Systems and 4 – Domains of Science.
Processes are things like "hypothesizing," "predicting," "designing investigations," "comparing findings" and "summarizing conclusions." These are addressed primarily in Science Essential Academic Learning Requirement 2 - Inquiry

The following steps are to be followed twice, once for the concept you select and then again for the process. Identify the grade level you have selected. Identify the concept or process that you have selected. Then provide:

a) a definition of your process or concept and a brief explanation of its importance,
b) a statement about what you want your students to know or be able to do as a result of your introduction to the process or concept, (e.g., "I want my students to know that…. / be able to ….")

c) a description of at least three indicators you would look for to tell you that your students have met your learning target, (e.g., "I will know that we have succeeded when I see that my students can ….")
d) a brief sketch of an activity you might use to introduce the process or concept to your students.

Criteria for evaluation: You have chosen important and appropriate concepts or processes. You have provided accurate definitions and clear descriptions of the importance of your concept and process. You have provided a reasonable statement about what you want your students to know or be able to do as a result of your introduction. You have phrased your indicators of learning so that they could be observed, inferred or measured. Your sketch of the learning activity fits the concept / process, and address the learning target and indicators you provided in steps (b) and (c).

Assignment: Articles

Objectives:

- Begin to construct and demonstrate knowledge and understanding of life science and some of the pedagogical issues within this field as it is taught at the elementary and middle school levels;
- Consider ethical dimensions of teaching science;
- Consider assessment of pupils' understanding in the realm of life science;
- Become familiar with some of the sources for information and professional development in science education.

Rationale for the assignment: As an elementary teacher you will teach many different subjects. It is not possible for you to be expert in every area of the curriculum for there are too many. It is important, though, for you to be familiar with the central issues within this content area. It is perhaps even more important for you to be familiar with sources of information designed for teachers and produced by content experts. There are national professional organizations such as the National Science Teachers Association that publish journals written for teachers.
This assignment will require you to find these journals, probably at a university or school library, and investigate selected articles.

As you read the articles, think about the ethical issues associated with the contexts that are described *or implied*. For example, who is served? Who is not? Who has the power in a classroom? Who should have it? Why?

Description of the assignment: Below is a list of articles. All of the articles come from one of two journals: *Science and Children* for elementary education, or *Science Scope* for middle school education. Both are published by the National Science Teachers Association (www.nsta.org). You can find these articles at the libraries of many universities, particularly if they deal with teacher education. Call ahead. Select **five** of these articles and provide a brief review of each. Each review should probably be less than one page and must include the following elements:

1. a brief summary of the article,
2. a quote illustrating a point with which you agree and an explanation of your thoughts about this matter,
3. a quote regarding a point which you wonder about or with which you do not agree and an explanation of your thoughts about this matter.

THE ARTICLES:

Just Like Real Scientists. (grade 3)
Famous primatologist Jane Goodall and her modern counterpart Ian Gilby inspired third graders to conduct their own animal behavior study – of their pets – and keep records as scientists do.
Betteley, P. (2009). *Science and Children*, vol. 46, no. 5.

A Lemon of a Lesson. (grades 3- 6)
A simple yet effective activity introduces students to what it means to observe.
Minogue, J. (2008). *Science and Children*, vol. 45, no. 6.

A Walk in the "Tall, Tall Grass." (grades K-1)
Field trips and up-close observations of grasses teach kindergarteners to record what they see.
Kaatz, K. (2008). *Science and Children*, vol. 45, no. 6.

Materials Repurposed. (grades K-8)
Find a wealth of free resources at your local recycling center.
White, O., & Townsend, J.S. (2008). *Science and Children*, vol. 45, no. 9.

Project Budburst: Analyzing Data. (grades 4-6)
Project BudBurst is a national program intended to get students and other "citizen scientists" looking more closely at the plants in their neighborhoods and documenting their seasonal changes. It is also an excellent opportunity for students to build data analysis skills.
(2008). *Science and Children*, vol. 45, no. 9.

Multisensory Strategies for Science Vocabulary. (grades 2-4)
Support learning about properties of matter for ELL (English Language Learners) - and all - students with these techniques. (2008). *Science and Children*, vol. 46, no. 4.

Ladybugs Across the Curriculum. (grades K-2)
"Scientific inquiry and Howard Gardener's theory of multiple intelligences converge as a kindergarten class explores the world of ladybugs."
Dias Ward, C., and Dias, M. (2004). *Science and Children*, vol. 41, no.7.

What's Bugging You? (grades 4-6)
"A 5E (Engage, Explore, Explain, Elaborate, Evaluate) learning cycle introduces insect classification."
Brown, S. (2006). *Science and Children*, vol. 43, no.4 (April/May).

Inquiry on Board! (grades 3-8)
Inquiry Boards are excellent tools for highlighting the role of variables in an experiment.."
Buttemer, H. (2006). *Science & Children*, vol. 43 no. 7 (October).

The Adventures of the Bucket Buddies. (grades 3-8?)
Are there water fleas and bristle worms in your pond water? What about the water in New Jersey? or Sydney/ students use technology to find out.
Shields, C. (2004). . *Science and Children*, vol. 41, no.7.

Harry Potter and the Dichotomous Key. (grades 2-8?)
"An attention-grabbing product from the Harry Potter series – Bertie Bott's Every Flavor Beans – is a fun tool for teaching students about classification."
Crowther, D. (2003). *Science and Children*, vol. 41, no.2.

Fat Finders. (grades 2-6)
"Comparing fat levels in various foods shows students the science behind their food choices."
Christie-Blick, K. (2006). *Science and Children*, vol. 43, no. 3 (March).

The Learning Cycle and Instructional Conversations. (grades 5-8)
Learn to engage students in an instructional dialogue.
Beisenherz, P., Dantonio, M., Richardson, L. (2001). *Science Scope*, vol. 24 no. 4.

Are You UV Safe?. (grades 3-5)
A teacher guides young students as they learn about the significance of one little bird.
Capobianco, B. & Andrew Thiel, E.. (2006). *Science and Children*, vol. 43 no. 6 (September).

The Cottonwood. (grades K-6)
"How I learned the importance of storytelling in science education."

Ellis, B. (2001). *Science and Children*, vol. 38 no. 4.

The Play Dough Evaluation Project (grades 3 - 5)
Exploring homemade modeling clays is truly a "hands-on" way to help students understand the meaning of the word *property*.
Heckscher, M. (2006). *Science and Children*, vol. 43 no. 2 (Feb.).

The Bird. (grades K-1)
A teacher guides young students as they learn about the significance of one little bird.
Hannon, J. (2001). *Science and Children*, vol. 38 no. 5.

Probing Science. (grades 5-8)
Using probes and computer analysis tools to inspire inquiry and learning.
Kennedy, E. (2001). *Science Scope*, vol. 24 no. 4.

Debating Real-World Issues. (grades 5-8)
Tackle today's tough issues while developing students' critical thinking and research skills.
Koenig, M. (2001). *Science Scope*, 24(5).

Drawing on Student Understanding. (grades 1-6)
Using illustration to invoke deeper thinking about animals.
Stein, M., McNair, S., Butcher, J. (2001). *Science and Children*, vol. 38 no. 4.

Inspired Inquiry. (grade 4)
Using candy and containers of water to spark students' interest in investigation.
Sumner, Wafler,, E. (2001). *Science and Children*, vol. 38 no. 4.

Sense of Wonder Science. (grades pre - K)
Students learn about inquiry and the control of variables with this appealing investigation.
Potter, G. & Ritz, W. (2006). *Science and Children*, vol. 43, no. 7 (October).

Testing Gum, Two, Three…. (grades 4-6)
Students learn about inquiry and the control of variables with this appealing investigation.
Truho, G. (1993). *Science and Children*, vol. 31 no. 1.

Classroom Catapults. (grades 5-8)
Learn how to identify and control variables with student-built medieval siege engines.
Villano, D. (2001). *Science Scope*, vol. 24 no. 5.

Assignment: Connections (pick one of three options)

Objectives:

- Demonstrate knowledge and understanding of life science as taught at the elementary and middle school levels;
- Demonstrate knowledge of the Washington State Standards related to science (Go to http://www.k12.wa.us/curriculumInstruct/ and click on Science.);
- Value professional development by reviewing curriculum and participating in professional opportunities to enhance understanding of life science;
- Consider ethical dimensions of teaching life science;
- Begin to understand issues of diversity and multiculturalism as they apply to life science.

Rationale for the assignment: When children look at the world that surrounds them they wonder why things work the way they do. At the most basic level, science is a way of making sense of the world. Science gives us ways to investigate and to construct our understanding so that we can explain and so give order to our perceptions. We want our students to build a robust and thorough understanding of the basic concepts, processes and issues in science so that they can use this tool to their benefit and to the benefit of society. How can we best help them to learn what they need to know? As in any content area, we learn about science and construct scientific understanding through the cycle of experience, reflection and revision of our prior understanding. Experience is the beginning point in this cycle. The experiences we give students are central to what or whether they will learn. Too often though, the experiences we give students in science are confined. We fail to make the connections between science and students' lives. This assignment is meant to give you a chance to begin to explore a few of the ways in which you can broaden the experiences you give to students as you help them to learn about science.

Description of the assignment: Select and complete one of the following three assignments. (The assignments are fully described in the following pages.) Base your selection on what you believe will be most helpful to you in increasing your knowledge of life science and preparing to be an elementary/middle school teacher.

Connections Option #1 -- Launch Pad of Science -- Create a Web page with annotated links to life science Web sites that are appropriate for upper elementary/middle school student use.
OR

Connections Option #2 -- Books of Science **--** Review children's literature to gain greater insights into life science.
OR

Connections Option #3 -- Mathematics and Science -- Investigate the connections between mathematics and life science at the elementary / middle school level.

Connections Option #1.

Assignment: Connections > Launch Pad of Science

Objectives:

- Demonstrate knowledge and understanding of science taught at the elementary and middle school levels;
- Use knowledge of effective verbal and nonverbal communication techniques and make appropriate use of educational technology to foster learning;
- Value professional development by reviewing curriculum and participating in professional opportunities to enhance understanding of science.

Rationale for the assignment: Web-based technology has the potential to affect teaching and learning at all levels. At its most positive, the Internet opens the door to a world of information and resources for both teachers and students. Well-researched, accurate resources to supplement curriculum in science can be found in a number of Web sites. Familiarizing yourself with a few select resources to support your teaching and learning will help you sift through the massive amount of sites awaiting you.

If you know or are able to learn something about how to make Web pages, you might want to build your own Web page with links to sites that you and your students might be able to use to augment your science curriculum. They might be sites that you could use directly with your students or they might provide you with lesson / project ideas. They might simply be sources of background information for you as you seek to learn what you need to know as a teacher in life sciences. In any case, this assignment allows you to take the time to look through some of these sites, to think about their use in a school and then to build an annotated set of links to these sites.

Description of the assignment:

- Explore some science-related sites on the Web and find at least 10 sites that you think would be useful to you as a teacher;
- For each site, describe in a paragraph or less, the usefulness of the site for your students or for you as a teacher;
- Format this annotated list as a Web page with active links to the sites you select. You must also print a paper copy of the Web page and submit this in the course packet so that I will know what the page is supposed to look like if there are any difficulties in accessing the site.

Here is an example of an entry in the page you will create:

The Weather Underground
http://www.wunderground.com/
This site provides easy access to an enormous amount of weather data. The immediate availability of this kind of information will allow my 6th grade students to ask and begin to answer their own questions about the weather. The international maps of various weather variables will be useful when we study geography. I can also use this site as a source for graphics in a unit dealing with the seasons and climate.

If you need a start, you may find some useful ideas here: http://teed521.wikispaces.com/

Criteria for evaluation: Evidence that:
1. You have conducted a thorough investigation and analysis of Internet resources that will support science topics,
2. You have prepared a useful Web page to showcase your resources.

Connections Option #2.

Assignment: Connections > Books of Science

Objectives:
- Demonstrate knowledge and understanding of science taught at the elementary and middle school levels;
- Value professional development by reviewing curriculum and participating in professional opportunities to enhance understanding of science;
- Consider ethical dimensions of teaching science;
- Understand issues of diversity and multiculturalism as they apply to science.

Rationale for the assignment: One of the most effective ways to learn is through is through reading, listening to, and telling stories. This works in science as well as it does in other areas but we are not used to thinking of literature as a valid tool in the curriculum. This assignment should give you a chance to explore some new ways to make connections between science and your students' lives.

Description of the assignment: Select 5 books appropriate for children and related to life science. These can be stories or fact books. You can get these from the Web sources below or you can select your own. (Go to a library! Ask a librarian!) As you read each book keep in mind the objectives identified for this assignment. In no more than five pages for this entire assignment (information may be presented in a chart or in a narrative) review each of the books including the following information:
- Give a bibliographic citation for each of the books you read;
- Briefly describe the strengths of each book in relation to science education. Be sure to describe at least one way in which you might use this book in your classroom.

WEB RESOURCES:

The National Science Teachers Association (NSTA) has built a Web page with links to "Outstanding Science Trade Books for Children." You can find this page at http://www.nsta.org/ostbc

Lisa Bartle, a librarian at California State University San Bernardino, has built a Web page providing access to a searchable data base of award winning children's literature. You can go there (http://www.dawcl.com), select "science" as the genre and get a long list of science fact type books.

Carol Hurst, a DotCom person, has a Web site where you can find hundreds and hundreds of children's books. She even has some related to science. You can find them by going to this site: http://www.carolhurst.com/subjects/curriculum.html Scroll down to the science heading. There you will find subheadings for deserts, geology, oceans, rivers and winter.

Criteria for evaluation:
- The response is professionally presented and includes all the information requested.
- The responses demonstrate a careful reading of the books and consideration of their potential impact on young people.

Option # 3

Assignment: Connections > Mathematics and Science

Objectives:

- demonstrate knowledge and understanding of life science as taught at the elementary and middle school levels;
- demonstrate knowledge of the Washington State Science Standards (http://www.k12.wa.us/Science/Standards.aspx);
- value professional development by reviewing curriculum and participating in professional opportunities to enhance understanding of life science;
- consider ethical dimensions of teaching life science.

Rationale for the assignment: Mathematics is often described as the language of science. Scientific concepts are thought by some to reach a high level of refinement only when they can be expressed in the form of a mathematical equation. The two disciplines are very closely related. Advances in one field often stimulate and support work in the other. In schools, however, the two are generally taught without sufficient attention to the connections between them. Both will make more sense to students if they are taught with attention to these connections.

For example population growth, a central concept in physical science, is fundamentally related to rate, a mathematical construct. When we study rate as a mathematical operation it makes sense to apply this operation in the context of population growth. This third option in the Connections assignment is meant to give you a chance to investigate the ways in which you might help students see these kinds of connections.

Description of the assignment: The text required for this course is the Washington State K-12 Science Standards (http://www.k12.wa.us/Science/Standards.aspx) For this assignment you will also need to look at the Math standards (http://www.k12.wa.us/Mathematics/Standards.aspx). Use these sources to find connections between what is taught in science and mathematics.

As you examine the science standards you will see that often they suggest "Mathematical Connections" (See, for example, a list of these following the statement of standard 6-8 INQ.) Find examples of at least 5 connections between science and mathematics. For each example start with the science end and then identify the mathematical end of the connection. Name the scientific concept, issue, or procedure, identify its place in the science standards, and then describe the nature of the connection to mathematics. Be sure to write your description so as to make the classroom application of the connection clear.

Criteria for evaluation:

- Clear and accurate citations from the EALRs,
- Logical connections between the mathematics and the science standards.
- Reasonable descriptions of classroom applications of the connections.

Assignment: Concept Connections Web

Objectives:

- Demonstrate knowledge and understanding of life science as it is taught at the elementary and middle school levels, emphasizing connections between concepts and processes related to science;
- Demonstrate knowledge of the Washington State Science K-12 Learning Standards (http://www.k12.wa.us/Science/Standards.aspx);
- Value professional development by reviewing curriculum and participating in professional opportunities to enhance understanding of life science.

Rational for the assignment: One of the things that sometimes separates an effective teacher from one who is less so is a good grasp of the at least the basics of the "big picture" within a discipline. This enables the teacher to make informed curricular decisions and to more accurately diagnose students' difficulties in grasping concepts and acquiring important skills. This assignment will provide you with an opportunity to begin to consider that big picture and to think about how central concepts, processes and issues relate to one another within the context of science education.

Description of the assignment: Spend some (more) time studying Washington State's science standards. As you do so, make a list of what you consider to be important concepts, processes and issues. These can be taken directly from the text of the standards (e.g., life, growth, hypothesis formation, control of variables), or you may infer them (e.g. the treatment of evolution in state funded curricula). Try to generate a list of at least 50 items. From this list, select approximately a dozen and write them on small slips of paper. Arrange these slips on a larger piece of paper so as to show relationships between them. For example, I might place "motion" near "density" and then connect them with a line labeled "Differences in density can cause motion." because within a fluid or gas these differences can lead to motion resulting in a separation into layers of different density. This is part of what happens in clouds and in large-scale currents in the ocean. Once you have a reasonable web, tape, glue, or otherwise attach the labels and explain the connections between the items.

Each item must be connected to at least one other and preferably to several others. Each connection must be labeled/explained. Your connection may be a matter of definition or it may be more tenuous and creative, e.g., "The more I get my students up and moving in their search for scientific understanding, the less dense they will be." In any case you should end up with a single sheet of paper showing a web of relationships between the issues, concepts and processes you selected. If you cannot fit the explanation of the connection on the line, simply label the connection with a number and provide a key at the bottom or on the back of the sheet. Use art if you are able. Be creative!

Criteria for evaluation: The items selected for inclusion in the web are central issues, processes, or concepts in science. The connections between items are clearly labeled and explained. The work is neat enough to read and visually interesting.

Cover Sheet

EPDSC 928
Life Sciences for Elementary and Middle School Teaching

Before turning in your assignments, please review this checklist of activities and then use it as the cover page for your assignments.

Name:
Address:

E-mail address and / or phone number:_____

This syllabus is updated periodically. Please note the date at the bottom of page of the syllabus so that both the instructor and the student are using the same syllabus.
Date on syllabus: _____

Have you included all the requested information for each assignment?

- ❑ **Articles**
- ❑ **Central Concepts and Processes**
- ❑ **Connections Assignment**
- ❑ **Concept Connections Web**
- ❑ **Reflection Paper**
- ❑ Did you include a self-addressed, stamped envelope (with sufficient postage) to return all of your assignments?

After you have completed each assignment, it is a good idea to review the assignment descriptions to determine if you included everything requested. Also, review the criteria for evaluation. This provides you with the opportunity to do a self-assessment before you turn in your assignments for evaluation.

BIBLIOGRAPHY and SELECTED REFERENCES

AAAS (American Association for the Advancement of Science). (1989). Science for All Americans. Washington, D.C. AAAS.

Aram, R., Whitson, S., Dieckhoff, R. (2001). Habitat sweet habitat. *Science and Children*, 38(4).

Beisenherz, P., Dantonio, M., Richardson, L. (2001). The learning cycle and instructional conversations. *Science Scope*, 24(4).

Daugherty, B. (2001). The ants have it. *Science and Children*, 38(5).

Ellis, B. (2001). The Cottonwood. *Science and Children*, 38(4).

Gibb, L. (2000). Second grade soil scientists. *Science and Children*, 38(3).

Hannon, J. (2001). The bird. *Science and Children*, 38(5).

Kennedy, E. (2001). Probing science. *Science Scope*, 24(4).

Koenig, M. (2001). Debating real-world issues. *Science Scope*, 24(5).

Lowrey, L. (ed.), (1997). Pathways to the Science Standards - Elementary School Edition. Arlington, VA. NSTA (National Science Teachers Association).

NRC (National Research Council), (1996). National Science Education Standards. Washington, D.C., National Academy Press.

Stein, M., McNair, S., Butcher, J. (2001). Drawing on student understanding. *Science and Children*, 38(4).

Sumner, Wafler,, E. (2001). Inspired Inquiry. *Science and Children*, 38(4).

Truho, G. (1993). Testing gum, two, three…. *Science and Children*, 31(1).

Villano, D. (2001). Classroom catapults. *Science Scope*, 24(5).