

**CONCEPTS AND METHODS OF
TEACHING SCIENCE AND HEALTH K-9**

STUDENT MANUAL ED 341R 4.0



**Information in this manual is subject to change. DO NOT
download prior to 4 weeks before the start date of the class.**

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COURSE SYLLABUS

I. Course Description

This course is an extension of ED 340R. A study of the methods of teaching science and health in the elementary school with particular emphasis on the topics, organization and administration of science and health education programs.

Students will choose at least one portfolio item from this class. The item chosen should show, in their judgment, their best application of the principles and skills addressed in the course. Prerequisite: ED 340R.

II. Course Objectives

This course is designed to provide students with:

1. an understanding of the science processes and the importance of an activity based science program with an emphasis on inquiry. (INTASC: 1.K.1., 1.P. 4., 2.K.1., 2.P.2., 4.D.1., 6.K. 3., 6.D.2., 7.K.1., 7.P.1., 8.K.1., 8.D.2.,) (IPTS 1.B)
2. preparation for multi-faceted, well-balanced instruction of science content in the elementary grades. (INTASC: 1.D.1., 1.D.2., 1.P.2., 3.P.1., 7.P.4.,) (IPTS 4.A, 4.B, 4.4, 4.5)
3. exposure to a variety of methods in science and health instruction including direct instruction, inquiry, problem solving, discussion (INTASC:1.P.2., 4.K.1., 4.K.2., 4.K.3.) (ECAS 4.D, IPTS 6.B, 6.C, 6.2, 6.4)
4. practical, hands-on experience in teaching science processes and investigation in both individual and cooperative group settings with an emphasis in connecting with students' experiences. (INTASC:5.K.4.,5.D.2., 5.D.3., 5.P.1., 5.P.5.,)(ECAS 4.E, 4.F, IPTS 4.6)
5. a positive attitude toward the teaching of science to elementary students. (INTASC: 1.D.3., 6.K.2., 6.K.3.,)
6. a look at current learning theory and its specific application to the learning of science. (INTASC: 2.K.1., 2.K.3., 2.P.1., 7.K.1.,) (IPTS 2.A, 2.B, 2.c, 2.D)
7. knowledge of the availability of resources for continuing professional growth and development as well as outside resources for instructional input (INTASC: 1.D.4., 7.K.2., 9.K.2., 9.K.3., 10.P.3) (ECAS1.A, 4.G, IPTS 1.D)
8. instruction in integration of science across the curriculum. (ECAS 1.B, 1.C, IPTS 4.7)
9. a look at current learning theory and its specific application to the learning of science. (INTASC: 2.K.1., 2.K.3., 2.P.1., 7.K.1.,)(IPTS 1.C, 2.A, 2.B, 2.C, 2.D, 3D, 3.6,)

10. exposure to various ways of assessment in science education that both aid the teacher in instructing individuals as well as help them assess their own instructional methods and effectiveness. (INTASC: 2.D.1., 4.P.3., 7.D.1., 7.D.2., 8.K.1., 8.D.1., 8.P.4., 8.P.5.,) (ECAS 4.D, 14.A, 14.D, IPTS 8.1, 8.2)

III. Texts

This list is subject to change. Do not purchase books prior to 4 weeks before the start date of the class. mbsdirect.net is the approved source for text book purchases.

A. Required:

Carin, Arthur A., Bass, Joel E.& Contant, Terry L. Merrill. *Teaching Science As Inquiry*. 10th edition. Prentice Hall, 2005. ISBN 0131181653. **Please be sure to order the 10th edition of this text. The text cannot be purchased through MBS. You must purchase from another site such as Amazon.com or BarnsandNoble.com.**

B. Supplemental

1. <http://www.isbe.state.il.us/ils/science/science.html> (Web site for Illinois Learning Standards in Science)
2. <http://www.prenhall.com/carin> (Web site needed for virtual classroom assignment)

IV. Course Outline

A. Session One

1. Reading Due: pp. 4 - 67
2. Assignments Due
 - a. Categories of Science - Plant Assignment
 - b. **Bring one bag of M & M's Plain (47.9 gram size).**

B. Session Two

1. Reading Due
 - a. Pp. 68-123
 - b. Pp. 211 - 242

a. Pp. A-3 - A-14

2. Assignments Due

a. Trade Book Assignment

b. Internet Assignment

c. Constructing Knowledge - Concept Map

d. Virtual Classroom for chapter 4

C. Session Three

1. Reading Due: pp. 126 - 207, 308 - 333

2. Assignments Due

a. Rough Draft 5 E Lesson Plan

b. Rubric for Ooblek Lesson

c. Question Development Assignment

D. Session Four

1. Reading Due: pp. 244 - 306

2. Assignments Due

a. Final Draft 5E Lesson Plan

b. Lesson Presentation

3. **Course Evaluation:** Please take a few minutes to evaluate this course online. We value your thoughtful feedback about your experience in our courses, and we use this information to assess and change our program as needed. Since some of our most valuable changes have been initiated through the course evaluations, we ask you to provide your input, which is anonymously added to our database. The online feature allows us to aggregate and disaggregate information to help the School of Education faculty make curricular decisions based on the historical trends and suggestions of multiple cohorts of students. To complete the survey, go to the following address:

<http://www.surveymonkey.com/s.asp?u=66096842317>

and follow the prompts to find this course. When you have completed the survey, you will be prompted to print a verification form. Please print this form and hand it in with your assignments for the last evening of class.

- E. One Week After Session Four
 - 1. Assignment Due - Field Trip

V. Course Requirements

A. Readings and Assignments

Students are expected to complete assigned readings and activities **prior to** each class session. All assignments must be typed in black (double-spaced) using a 12-point standard font. Standard English usage is expected. *Late assignments will not be accepted for credit.* **Requests for incomplete grades must be submitted in writing prior to the end of the course to the instructor, who will forward the request to the Dean of the College of Arts & Sciences for approval. Only the Dean may approve a grade of incomplete.**

B. Portfolio

Each student in an education prefix course is required to maintain a portfolio which includes at least one sample product from each education course. In a cover memo, explain why you chose the assignment as well as your evaluation of it. This item does not need to be handed in. The final portfolio will be completed during your professional semester (student teaching).

C. Attendance Policy

Because of the accelerated and collaborative nature of the REACH to Teach courses, students are required to attend every class session. Missing a single class means a significant portion of the contact with the faculty member and the learning community has been lost. **For this reason, in all REACH to Teach courses, students missing one class session will be penalized one full letter grade.** Any student missing more than 30 minutes of a course session will be considered absent for the full course session and will receive a grade deduction of one-half to one full letter grade. This includes the accrual of missed class time due to chronic late arrival. **Students missing more than one class period will receive no credit for the class and a grade of F will be recorded. The course must then be retaken in order to receive credit. In addition, students may miss no more than two class sessions in a given semester,** regardless of the circumstances. If a student misses more than two class sessions during a given semester, the student is required to meet in person with the REACH to Teach Student Services

Coordinator to discuss continuance in the program. Students are responsible for monitoring their own attendance to make sure they do not exceed two classes per semester. The REACH registrar will also monitor attendance and notify the REACH to Teach Student Services Coordinator when a student exceeds two absences for a given semester.

Participation points are earned and calculated in the final grade of a course based upon on-time attendance at each session. Students who miss three consecutive course sessions without prior notification to the REACH to Teach registrar will be dropped from the program and will need to apply for readmission.

NOTE: The course grade will reflect the level of writing demonstrated in the written assignments, as well as the content. Papers not demonstrating college level writing skills will receive a grade of “F.” Quality of writing will be a **significant** component of all written assignments. You are encouraged to edit and proofread all assignments.

VI. Grading Criteria

A. Weekly Assignments

Weekly class assignments are tailored to reinforce readings. Weekly reading assignments are listed in course outline.

1. Categories of Science – Plant Assignment (Session One)	25 points
2. Constructing Knowledge – Concept Map (Session Two)	25 points
3. Virtual Classroom - Chapter 4 (Session Two)	20 points
4. Question Development (Session Three)	20 points
5. Assessment - Rubric of Oobleck Activity (Session Three)	20 points
6. Lesson Presentation (Session Four)	50 points
The lesson topic and grade level should be cleared with instructor (Session Three)	
B. Trade Book Assignment (Session Two)	20 points
C. Technology component (Session Two)	20 points
D. Rough Draft of written lesson plan	20 points
E. Written lesson plan that is 5E, with an inquiry-based, hands-on, child focused emphasis. (Session Three - rough draft and Session Four -final draft)	100 points
F. Field Trip Plan (Due week following Session Four)	<u>100 points</u>

Total: 400 points

Grading Scale

A	92-100%	368-400
B	82-91%	328-367
C	70-81%	280-327
D	60-69%	240-279
F	Below 60%	Below 240

ASSIGNMENTS AND ACTIVITIES

Session One
Categories of Sciencing

Introduction

The purpose of this assignment is to help you develop an understanding of the complexity of science unit and lesson plan development.

Directions

After carefully reading chapter one, develop a chart on the topic of plants for a **3rd grade** class. Try to fill in as many boxes as you can. We will discuss in class and add to it, but you will be assessed on what you accomplished before class. (A minimum of 25 needed for perfect score.) The first two columns are the easiest; the last three become more challenging. The first two rows are done for you to illustrate the assignment. **The entire row should correlate to the concept they should know in the first column.**

Plants and How They Grow

What should students know?	What should they explore and discover to help them construct this knowledge?	What can they imagine and create to deepen or illustrate their knowledge	What should they feel and value as a result of this knowledge?	How can they use and apply what they now know?
Many plants use seeds to reproduce.	Plant three different types of seeds and observe offspring.	If two different seeds could become one, describe the resulting plant.	The incredible potential for life in a single seed	Choose the seeds they will plant to design a small window garden.

Reminder: Your assignment for Session One is to bring one bag of M&M's Plain (47.9 gram size)

Session One
M & M In-Class Activity

Discuss the following questions:

1. How many grams of product does your package of M & M's state it has?
2. What color is your favorite M & M color?
3. What color do you think will be most prevalent in this package?
4. Will all packages have the same number and same mass of M & M's?
5. Are packages packed so that they are fairly similar or will there be a wide variety?
6. What are some variables that could affect the mass of the package?

Design and carry out an experiment that will see if all packages are similar or different. Be sure to include a data table on which to record your data.

Session Two

Constructing Knowledge Assignment

Introduction

This assignment does not need to be typed but should be neat and clear. The purpose of this assignment is to help you organize the information presented in chapter three of the text and to experience what a student needs to do to develop a concept map. The concept map will be graded according to **thoroughness** and the **level of understanding** it displays. There is no one way to do the map. The evaluation of this assignment is fairly subjective and giving the rubric ahead of time would influence the outcome of the map. The instructor's evaluation will be final.

Directions

As you read chapter three, jot down rough notes to enable you to construct a concept map that illustrates what a teacher needs to know about the variety of ways that students learn and the many factors that can influence how they learn. As you design your concept map, be sure to include the key concepts **throughout the chapter**. You will use these concept maps in class as part of a group discussion. The assignment will be evaluated based on how many key concepts are clearly shown in the map and if the concepts are correctly linked. On page 71 in your text, a side bar gives a web site with a free download that you can use to construct your concept map. This is not required but is fun to use, will provide a neat and clear map with little manual effort on your part. It does, however, take time to register, download the program and learn the process. (Hint - It would be available for you to use during student teaching and your teaching career.)

Virtual Classroom Assignment

The purpose of this assignment is to give you a chance to observe teachers and students in session without leaving your computer. You will get a chance to think about what you are seeing and respond in writing to questions asked regarding the video clip. This assignment correlates with chapter 4 in your textbook. It will be graded as to accuracy and certain key answers should show an understanding of content from chapter four.

Go to the web site <http://www.prenhall.com/carlin/>. Select chapter 4. Under chapter 4, you will find the category "virtual classroom". Click on it and follow the directions. Print a hard copy to bring to class. It is strongly recommended that these be viewed over a connection that is a T-1 line or cable connection. Downloading over a phone line takes considerable time.

If video will not load, go to "Help" then "Browser Tune Up" and download what ever is needed.

Session Two

Trade Book Assignment

Introduction

The purpose of this assignment is to explore trade books commonly found in the local library. Trade books can be fictional, content-specific, reference-based, activity-driven, or any combination of these. They are usually geared to a specific age group, but can often be adapted as needed. Trade books are an excellent resource for working with children who have special needs. A simpler or more challenging explanation of a topic can be found, and books can be used for supplementing, for reteaching, or enrichment. Trade books are also a wonderful resource to help a teacher better understand a topic or gather additional activities to do with a class.

Directions

After exploring among the stacks in your local library (be careful, this can become addictive), choose one specific subject to peruse. An example of this might be weather. You may want to choose the same subject as the one you want to do your lesson on. This would allow more exposure to content and activities that are pertinent. However, this is not required.

Look specifically at what the library has available and choose four of the **best** books. Provide the following information for each. **Do not report on a book that is out of date, poorly written or is not effective.**

1. Complete bibliographic information - title, author, publisher, place published, and date published.
2. Give a brief summary of the content - a paragraph will be sufficient.
3. What grade level would you estimate the book to be written for and why?
4. Analyze the illustrations- are they realistic, idealistic, whimsical? Are they photographs, true to life drawings, or cartoonish? Are they color or black and white?
5. Explain how you might use this book to enhance the classroom experience. For example, would you use it in a center, read it to the students, or choose activities to have them try out?
6. Give your estimation as to the quality and appeal of the book to students (or teacher, if using for reference). Explain your reasoning.

Session Two
Trade Book Assignment
Evaluation Form

Please submit this as a cover sheet for the assignment

Name _____

A check in each box indicates information was included in your write-ups. No check means it was missing.

Book One

- Summary of Content
 - Grade level suggested (can be a range) with reason
 - Your estimation as to its quality and appeal to students (or teacher if good for reference) with your reasons
 - Analysis of Illustrations
 - Explanation of how you would use book in classroom
 - Bibliographic Info (must include author, title, publisher, date, place published)
- _____

Book Two

- Summary of Content
 - Grade level suggested (can be a range)
 - Your estimation as to its quality and appeal to students (or teacher if good for reference)
 - Analysis of Illustrations
 - Explanation of how you would use book in classroom
 - Bibliographic Info (must include author, title, publisher, date, place published)
- _____

Book Three

- Summary of Content
 - Grade level suggested (can be a range) with reason
 - Your estimation as to its quality and appeal to students (or teacher if good for reference) with your reasons
 - Analysis of Illustrations
 - Explanation of how you would use book in classroom
 - Bibliographic Info (must include author, title, publisher, date, place published)
- _____

(continued)

Book Four

- Summary of Content
 - Grade level suggested (can be a range) with reason
 - Your estimation as to its quality and appeal to students (or teacher if good for reference) with your reasons
 - Analysis of Illustrations
 - Explanation of how you would use book in classroom
 - Bibliographic Info (must include author, title, publisher, date, place published)
- _____

Total Score: _____

Session Two

Internet Assignment

Introduction

The purpose of this assignment is to give you a glimpse of the range of valuable resources to be found on the Internet. There are sites for students to play games, do research, explore locations using virtual reality graphics, talk with scientists, and see rocket launches, just to name a few. There are sites for teachers that provide complete lesson plans, background information, current research in teaching science and sites they can use with their classes. More great sites are being developed all the time.

Directions

Using the Internet, examine at least four science-related sites that are designed for science teachers or for students. You may choose to view the following internet sites but you are not limited to them. Feel free to discover others for yourself. However, limit yourself to sites that are specifically scientific in nature. A general web site for teachers is not acceptable. Also, please do not use commercial sites that sell lessons or materials.

- A. <http://ofcn.org/cyber.serv/academy/ace/>
- B. www.edref.org/Virtual/Lessons/index.shtml
- C. Find any NASA site
- D. <http://cse.ssl.berkeley.edu/segwayed/>
- E. <http://www.exploratorium.edu/IFI/activities/index.html>
- F. <http://particleadventure.org/particleadventure/index.html>
- G. <http://www.sciencegems.com>
- H. <http://www.prenhall.com/carin/>

For each chapter there is a web site listing.

For each site that you choose, write a two paragraph summary of what a teacher can find at that particular site and how it could be used as a resource for the teacher or the student. Be sure to include the correct address for each site. If the site has lesson plans available, download one of them that interests you and include it in your report.

Session Two
Internet Assignment
Evaluation Form

Please submit this as a cover sheet for the assignment

Name _____

Site One

- Address included and site is acceptable
- Lesson download (If applicable)
- Two Paragraph summary of what a teacher can find at the site and how it can be used as a resource for teacher or student.

Site Two

- Address included and site is acceptable
- Lesson download (If applicable)
- Two Paragraph summary of what a teacher can find at the site and how it can be used as a resource for teacher or student.

Site Three

- Address included and site is acceptable
- Lesson download (If applicable)
- Two Paragraph summary of what a teacher can find at the site and how it can be used as a resource for teacher or student.

Site Four

- Address included and site is acceptable
- Lesson download (If applicable)
- Two Paragraph summary of what a teacher can find at the site and how it can be used as a resource for teacher or student.

Total Score _____

Session Two
The Mystery of Oobleck
Student Observation/Question Sheet
In-Class Activity

Name _____

Record observations about OOBLECK. (Use as many senses as possible with the exception of taste.)

1. _____
2. _____
3. _____
4. _____
5. _____

What happens when you rest objects on the Oobleck? Try a paper clip and other objects made available to you. Record your observations.

What are some things about Oobleck that surprised you?

Based on your observations and analysis, what state of matter is your Oobleck? Why?

What could this substance be used for? List 2 ideas below

1. _____
2. _____

NASA has just discovered a planet that has a surface made of Oobleck. Design a landing vehicle that astronauts could use to land on the surface and then take off again. Make a poster of your vehicle and be ready to explain how it works.

Session Two
Making “Cents” Out of Water
In-Class Activity

Name _____

Using an eye dropper, put one drop of water at a time on the coin as indicated in the directions. Count the drops as you do them. When the water first rolls off the coin, stop and subtract one from your total. (Can you guess why you need to do this?) Each partner is to do one trial. Record your data. Find the average.

Type of Medium	Trial One	Trial Two	Average
Penny - Lincoln Side			
Penny - Other Side			
Dropper higher or lower Penny - Lincoln Side			
Dime - Either side.			

As you answer the questions below, explain your answers as needed.

1. Does the side make a difference in the number of drops the penny will hold? Why or why not?

2. Does the height you drop the water from make a difference in the number of drops the penny will hold? Why or why not?

3. Does changing the coin to a dime affect the number of drops held? Why or why not?

4. Does the person doing the trial affect the number of drops the penny will hold? Why or why not?

Stop here until teacher gives further instructions.

Spread out a piece of waxed paper and a piece of aluminum foil on the table in front of you. Place a drop of water on each.

5. Are the drops of water the same? Why or why not?

6. Add more water to each surface. What do you observe as you add more water?

Ask your teacher for a second cup of water. Do the following chart. Repeat this part of yesterday's activity again and record the data on the chart.

Type of Medium	Trial One	Trial Two	Average
Penny - Lincoln Side			

7. Compare your results with your first trial. Are they alike or different? Why or why not?

Session Two
Inquiry Handout
In-Class Activity

Inquiry Science

- Creating Lifelong Thinkers and Learners

What is Inquiry Science?

- Asking questions about the natural world
- Planning investigations
- Collecting relevant data
- Thinking critically about relationships between evidence and explanations
- Using observational evidence and current scientific knowledge to construct and evaluate answers
- Communicating investigations and explanations to others

What makes it “INQUIRY”

- Something intrigues and raises a question in the mind of the learner
- During process, no right or wrong answers
- Observing, designing, collecting, constructing meaning
- Child doing (often collaborating)
- Using prior knowledge
- Transforming activities to stimulate an environment that is conducive to questions

What does the teacher do?

- Identify concept
- Plan inquiry
- Present inquiry
- Initiate discussion
- Supervise activity
- Ask prompting and probing questions
- Guide as needed
- Allow opportunities for students to demonstrate what was learned

Inquiry – A Continuum

- Structured: Following precise instructions
- Guided: Teacher models and guides
- Student Initiated: Students choose area to explore and design own experiment.

Planning The Lesson

- Identify concept to be taught
- Use the 5-E Plan:
 - Engage the students' attention
 - Explore and interact with material
 - Explain – student constructed first and then teacher added as needed
 - Elaborate – extend learned concepts to new situations
 - Evaluate – check students' understanding and knowledge

Evaluation

- Observation and anecdotal records
- Look for evidence that thinking has been changed
- Allow students to evaluate themselves
- Ask open-ended questions
 - Why do you think....?
 - What evidence do you have....?
- Rubrics can be very helpful
- Paper / Pencil tests

Final Thoughts

- Not every lesson needs to be inquiry.
 - Some concepts can't be taught this way
 - Time constraints
- Give yourself time
 - Start with a few good ones your first year
 - Build your repertoire over time
- Allow students to adjust to this method
 - Many are used to teachers giving answers
 - Cooperative, group work skills need to be developed

Session Three

Questioning Development Assignment

Introduction

The purpose of this assignment is to focus your attention on different types of questions and to help you develop the ability to use a variety of questions in your teaching strategies. You will also apply this skill in developing your written science lesson.

Using the knowledge gained in chapter 5, design 26 questions that could be used with the OOBLECK activity done in class session two. **Please label each set of questions.**

1. Develop 3 questions that are open ended.
2. Develop 3 questions that are convergent.
3. Develop 4 questions that you could use to assess prior knowledge
4. Develop 4 questions that you could use to initiate inquiry and guide the students' exploration of the subject.
5. Develop 4 questions that you could use to guide discussion of the observations made during exploration.
6. Develop 4 questions that you could use to guide discussion of the students' explanations of what they have learned.
7. Develop 4 questions that you could use to guide the students' elaboration (applying what they have learned to a new situation).

Questioning Development Assignment Grading Form

- Are 3 questions open ended?
- Are 3 questions convergent?
- Are 4 questions guiding assessing prior knowledge?
- Are 4 questions initiating inquiry??
- Are 4 questions guiding discussions of observations?
- Are 4 questions guiding discussions of students' explanations?
- Are 4 questions guiding students' elaborations?

Session Three

Rubric Development Assignment

The purpose of this assignment is to help you begin to develop the ability to assess performance based learning. Using the Oobleck activity from the previous session, design a rubric that focuses on evaluating if students are using the process skills correctly.

Step One

Write a paragraph stating the specific processes you are going to assess and why you are choosing to assess them. (See p. 194-195 for help with possible categories) **You need to have a minimum of 5 skills being evaluated.**

Step Two

Determine the way you will decide if the process skills are being used correctly within this activity. What standards will you use? For example, for classifying, you could decide that a good use of this process would be to compare and contrast six or more characteristics of the substance before classifying the substance. A poor use might be to use only two characteristics to make the determination. Be as precise as possible.(See sample rubric on the next page)

Step Three

Determine how you will score the performance indicators. (See sample rubric on the next page.)

Step Four

Develop the Rubric in chart form.

Session Three
Sample Rubric for Evaluating Top Lesson

Circle the number in each area that best describes the lesson.

	5 - 4	3 - 2	1 - 0	Written Comments
<i>Variable One:</i> Design of Experiment	5 4 All or almost all constants controlled except for variable to be changed.	3 2 Effort made to control constants but some missing.	1 0 Testing appears to be random with little or no effort to design well.	
<i>Variable Two:</i> Design of Experiment	5 4 All or almost all constants controlled except for variable to be changed.	3 2 Effort made to control constants but some missing.	1 0 Testing appears to be random with little or not effort to design well.	
<i>Variable Three:</i> Design of Experiment	5 4 All or almost all constants controlled except for variable to be changed.	3 2 Effort made to control constants but some missing.	1 0 Testing appears to be random with little or not effort to design well.	
Data Collection Organization Labeled Correctly	5 4 Data is well organized in chart form with labeling to identify data.	3 2 Effort made to organize and label data, but additional neatness or order needed.	1 0 Little or no effort made to organize and label data.	
Sufficient Trials Done	5 4 At least three trials done for each test.	3 2 Two Trials done for each test.	1 0 One trial done only per test.	
Conclusions Drawn	5 4 Conclusions drawn supported by data.	3 2 Some conclusions supported by data, but others are random or missing.	1 0 Little or no conclusions drawn based on data.	

Session Three

5-E Written Lesson Plan

Introduction

The purpose of this assignment is to give you practical experience in planning a 5E, Inquiry-based lesson. This will allow you to think through all the aspects of a lesson and apply the knowledge you have gained in each area assigned. The rough draft is to be turned in week three. It should be complete, but you should type questions you have in a different color or in some way that will make them stand out. You may then ask those questions in class to help you improve your project. You may wish to bring two copies so that you can make notes on a copy that you can keep. While only the final draft will be actually graded, the instructor will compare the first and second draft to see what improvements were made between the first and second draft. Points will be given on the rough draft for the level of completeness.

Directions

Using the following format, type out a detailed 5E lesson, inquiry-based lesson. Follow instructions carefully and note the copy of the grading sheet that follows the assignment. This can be used as a checklist to determine if you have included everything requested.

A. Cover Sheet

Include title of lesson, grade level prepared for, your name and class.

B. Introduction

Give a brief description of the lesson. Tell why you feel this should be included in your unit. What general goals do you wish to achieve by doing it? Where do you see this lesson fitting into your unit?

C. Time

How much time do you anticipate it will take to complete the lesson? Try the activities ahead of time to make sure that they will work. What problems might you encounter in trying to do them with groups of children?

D. Materials

Be specific. List all items, even the obvious ones. Include any worksheets or handouts you will be using with the lesson. List them and attach copies to the end of the lesson.

E. Objectives (List them under the following categories and correlate them to Illinois Science Learning Standards)

- a. Content
- b. Process
- c. Attitude

F. Procedure

Use the **five step format** shown throughout your text (Engagement, Exploration, Explanation, Elaboration and Evaluation) to show the procedure for your lesson. Be sure to include in your description when and how the students use process skills to carry out their activities. This procedure should be written so clearly and completely, that any teacher should be able to come in and teach the lesson without any questions. If description is not clear or complete enough, points will be deducted.

H. Questions

What questions will you ask the students? These should include questions that **initiate** the lesson, questions used to **build or facilitate** the lesson and **follow-up and evaluative** questions. Try to think of several levels of questions. Be sure to include at least 20 questions. **Classify them as initiating, building/facilitating and evaluating.**

I. Vocabulary

What words will you introduce or review? Give the definition you want the students to know. (These should be grade level appropriate.)

J. Resource Materials

List all resource materials that you used to prepare the lesson and that gave you ideas. Also, list any materials used as part of the lesson.

Session Three
5-E Written Lesson Plan
Rough Draft Evaluation Sheet

Please submit this as a cover sheet for the assignment.

The following parts were mostly complete.

- Cover sheet
- Introduction
- Time
- Materials Needed
- Objectives
- Procedure
- Questions
- Vocabulary
- Resources

The following parts were incomplete, but questions explained why they were left incomplete. (Understand that this can be a subjective opinion on the evaluator's part, so make questions specific and acceptable. For example, "What concept objectives are important for this lesson?" would not be acceptable, because it would be understood that you need to know that prior to planning lesson.)

- Cover sheet
- Introduction
- Time
- Materials Needed
- Objective
- Procedure
- Questions
- Vocabulary
- Resource

The following parts were incomplete or not done.

- Cover sheet
- Introduction
- Time
- Materials Needed
- Objectives
- Procedure
- Questions
- Vocabulary
- Resources

Overall scoring

_____ 20	Thorough Rough Draft	_____ 10	Attempt made but needed much more
_____ 15	Needed some improvement	_____ 0	Not turned in.

Session Three
PowerPoint Presentation Handout
In-Class Activity

Field Trips: A Learning Experience That Can Last A Lifetime

- A. Reasons For Field Trips
- B. Student focused
- C. Provides hands-on, interactive experience
- D. Ties science to real life
- E. Enriches the curriculum
- F. Just plain fun

Keys To A Successful Field Trip

- A. Planning, planning and more planning
- B. Clear communication of expectations:
 - 1. Staff at field trip site
 - 2. Chaperones
 - 3. Students
 - 4. Behavior
 - 5. Learning goals
- C. Well-designed schedule

Pre-visiting The Site

- A. Contact Education Department
- B. Walk through site
- C. Design worksheets
- D. Mark maps or floor plans
- E. Think through schedule

Planning The Day

- A. What students will learn (Content)
- B. What skills students will practice (Process Skills)
- C. What attitudes should change (Affect)
- D. Arrange chaperones
- E. Arrange transportation

Designing Worksheets

- A. Make age-appropriate
- B. Watch reading and writing required
- C. Chaperone-assisted
- D. Should involve students with exhibits
- E. Tie into trip objectives
- F. Require some higher thinking skills

Evaluation

- A. All teaching should be evaluated
- B. Does this plan meet goals?
- C. How will students' learning be evaluated?
- D. How will trip itself be evaluated?
- E. When trip completed
 - 1. What things were successful?
 - 2. What things should be changed?

Session Four

Lesson Presentation

Introduction

The purpose of this assignment is to give you experience organizing an inquiry activity, gathering the materials needed to carry out the activity and presenting it to a class. This activity should be the same as one of your written lessons, although it will obviously be modified and shortcuts used to fit the material into a 30-minute time period. You and your partner will choose which of your lessons to present. The elaboration portion of your written lesson will not be included due to time constraints. You will only do the engagement, experimentation, and explanation portion of the lesson. You may need to curtail some of the sections so you can get to the explanation section. You also need to state how you will evaluate the lesson.

The following will be used to score your presentation. Use it as a guideline as you develop your presentation. You will also be asked to evaluate each other on how well you shared the responsibility and labor for the presentation. These evaluations could result in partners getting slightly different final scores.

- **Must be inquiry based** (something the students can do hands-on, manipulating materials) There should be no paper, pencil tasks, but students can record data. Can be directed or free exploration). (5pts)
- **Presentation (should last no more than 30 minutes including set up and clean up)** (5 pts)
- **Objectives** - Did your lesson meet your objectives? (5 pts)
- **Engagement** - Was your engagement clear and did it grab the attention of the audience. (5 pts)
- **Experimentation** - Are directions or goals clear to the participants. Are data recording sheets understandable to the audience and are directions restated on the sheets for those who are not auditory learners. (10 pts)
- **Evaluation** - Discuss with class how you will evaluate if the objectives were met successfully. (5 pts)
- **Logistics** - Do you have enough materials and was set up and clean up smooth and efficient. (5 pts)
- **Overall Presentation** - Do you and your partner seem confident and sure of yourself as you presented this lesson? Were you able to answer questions and handle any issues that came up? (5 pts)

Session Four
Lesson Presentation
Evaluation Form

Please submit this as a cover sheet for the assignment

Final Score _____/50

Name _____

- **Must be inquiry based** _____/5

Something the students can do hands-on, manipulating materials. There should be no paper, pencil tasks, but students can record data. Can be directed or free exploration.

- **Presentation** _____/5

Should last no more than 30 minutes including set up and clean up.
Beginning time _____ Ending time _____

- **Objectives** _____/5

Did your lesson meet your objectives?

- **Engagement** _____/5

Was your engagement clear and did it grab the attention of the audience?

- **Experimentation** _____/10

Are directions or goals clear to the participants? Are data recording sheets understandable to the audience and are directions restated on the sheets for those who are not auditory learners?

- **Evaluation** _____/5

Discuss with class how you will evaluate if the objectives were met successfully.

- **Logistics** _____/5

Do you have enough materials and was set up and clean up smooth and efficient?

- **Overall Presentation** _____/10

Do you and your partner seem confident and sure of yourself as you present this lesson? Were you able to answer questions and handle any issues that came up?

Individual points added or subtracted based on both partners' evaluations. _____

Session Four
Lesson Presentation
Individual Assessment by Partner

Name: _____

Please check all of the following that apply. Add additional comments at bottom.

Activity Development

- I developed or found the activity.
- I adapted an activity that I found
- I helped my partner refine his/her activity.
- We basically used the activity as my partner had developed or found it.
- We thought both of our activities were great but the materials were more readily available for the one we chose.

Material Gathering

- I gathered all the materials.
- I gathered part of the materials.
- I gathered little or none of the materials.
- I was willing to gather materials but my partner had easy access to all of them.

Planning and practice

- My partner and I got together and practiced the various parts of the presentation.
- My partner and I wanted to get together but it was too difficult.
- I wanted to get together but my partner felt it was unnecessary..
- My partner wanted to get together but I felt it was unnecessary.
- My partner and I conversed over the phone and practiced orally.
- We each took parts of the presentation and were responsible for them. We did not work together except in class week three.

Partner Relationship

- My partner was fine to work with and I would be glad to work with him/her again.
- My partner and I have different styles so it was a struggle to work together.
- My partner was controlling and I did not feel I had a chance to voice my opinions.
- My partner was very difficult to work with and I felt he/she caused the presentation to be much less effective than if I had worked alone.
- My partner was passive and I felt I had to do most of the work.
- _____
- _____

Other comments?

Session Four
5-E Written Lesson Plan
Final Draft Evaluation Sheet

Please submit this as a cover sheet for the assignment

Name _____

Grade Level _____

Cover Sheet Included? (2 points) _____

- Title
- Name
- Grade Level

Introduction (5 points) _____

- Does it describe the lesson?
- Tell where it fits in a unit
- Tell what you hope to accomplish

Time (1 points) _____

- Is it given and explained?

Materials Needed (15 points) _____

- Are all listed and described as necessary?
- Are worksheets / handouts included?
- Are worksheets / handouts well designed and usable for grade level?

Objectives (15 points) _____

- Are the objectives stated behaviorally?
- Are content objectives clear and labeled as content objectives?
- Are process objectives clear and labeled as process objectives?
- Are attitude objectives clear and labeled as attitude objectives?
- Are objectives correlated to Illinois Learning Standards?

Procedure (35 points) _____

- Is five step format used?
- Does engagement grab the students' attention?
- Is exploration hands-on and does it involve whole class?
- Is explanation clear and understandable? Did you include both how you draw out student understanding as well as specific words of how you would
- directly explain the content you wish the students to know?
- Is elaboration hands-on and does it build on the concepts you previously introduced in exploration?
- Is the evaluation measurable and delineated?

Questions (15 points) _____

- Are there a variety of questions?
- Are there at least 20 questions?
- Are questions classified into categories?
- Are all three categories included?

Vocabulary (7 points) _____

- Are appropriate terms listed and defined?
- Are they defined for grade level?

Resources (5 points) _____

- Are they listed and annotated?

Grammar and Spelling _____

- Points deducted for errors in spelling or grammar.

Total Score _____ / 100

Session Four
Mealworm Movement Worksheet
In-Class Activity

Examine your mealworm with a magnifying glass. Draw a picture (at least 6 cm long and 2 cm wide) and label the parts you recognize.

Describe how your mealworm moves. What does it use to move?

Inquiry

Does the type of surface affect the behavior of mealworms?

Materials

1. 20 cm x 25 cm pieces of:
 - Aluminum foil
 - Cloth
 - Sandpaper
 - Dark paper
 - Light paper
 - Wet paper towel
 - Dry paper towel
2. Three mealworms
3. Marker
4. String
5. Clock or stopwatch
6. Magnifying glass
7. Petri dish or other clear container

Procedure

1. Choose 2 opposite “surfaces” on which you will observe your mealworms.
2. Place a mealworm in the center of a surface.
3. Watch the mealworm for two minutes.
4. Observe and record the behavior of the mealworm on the surface. Does it move quickly? Slowly? In a straight line? A circle? Does it stop and start often?
5. Make notes on the general appearance and movement of the mealworms along the surface. Note if they keep moving, slow down, or move sporadically. Compile the data in the tables below.
6. Try to measure the distance and speed of each mealworm. It isn’t easy to measure how far a mealworm has traveled unless it travels in a straight line. To measure distance, you may follow the mealworm with a marker, then lay a string along the marker line. Straighten out the string and measure how far the mealworm traveled with a ruler. Use a different color marker for each mealworm. Speed is the distance traveled in a set amount of time. How far did your mealworm travel in a minute? Since $\text{speed} = \text{distance}/\text{time}$, and your mealworm traveled for 2 minutes, $\text{speed} = \text{distance traveled in 2 minutes}/2 \text{ minutes}$.
7. Repeat steps 2-5 for each mealworm.
8. Repeat steps 2-5 for each surface.

Data Tables

Surface:										
Worm #	Movement Pattern	Activity Level					Stopping & Starting	Distance cm	Speed cm/min	Comments
		Low	Med	High	1	2				
1										
2										
3										

(Over)

Surface:										
Worm #	Movement Pattern	Activity Level					Stopping & Starting	Distance cm	Speed cm/min	Comments
		Low	Med	High	1	2				
1										
2										
3										

Surface:										
Worm #	Movement Pattern	Activity Level					Stopping & Starting	Distance cm	Speed cm/min	Comments
		Low	Med	High	1	2				
1										
2										
3										

Conclusions

1. On what surface were the mealworms the most active? On what surface were they the least active? Why do you say this?

2. What behavioral similarities did you see among the worms you tested on the same surface?

3. Were there any behavioral differences between individual mealworms? What were they?

4. What did you learn about mealworms? What did you learn about animal behavior?

5. How do you predict mealworms will behave on the following surface?
 - a. Glass

 - b. Wax paper

 - c. Carpeting

 - d. Newspaper

Extensions

- A. Language Arts
 1. *Research* the life cycle of a mealworm. A mealworm is actually not a worm at all, but rather the larva stage of a Darkling Beetle. Find out what it likes to

eat and how long it is a larva before it changes into an adult. Where does it live? What kinds of conditions does it like to have?

2. Websites

- a. <http://insected.arizona.edu/mealinfo.htm>
- b. <http://www.princeton.edu/teacher/tsm/tradesecrets/mealworms.htm>
- c. <http://www.teachersnetwork.org/dcs/critter/mealworm/>

3. *Include creative writing within the unit.* One day, a student accidentally forgot to put the top of the container of mealworms back on the container. One of the mealworms crawled out of the container and onto the table. Write a two page story telling of his/her adventures.

B. Math

Already well integrated into this lesson.

C. Science

1. Have the students keep the mealworms in the classroom until they complete their metamorphosis. Keep your mealworms in a container with sufficient food for several weeks. Examine them regularly, at least once a week. The larvae should turn into white pupae that wiggle vigorously when picked up. In one or two weeks, adults should appear. They are dark brown and very agile. This process of changing form is called metamorphosis. (Warn students ahead of time, that this can take many months depending on the age of the larva.)
2. Read a book about metamorphosis in insects. Observe the students' reactions. Discuss how the mealworms change to become a pupa and then a beetle. "How do they look?" Have them draw each stage. Make sure they note the non-moveable legs in the pupa.
3. Books available on Mealworms specifically:
 - a. Himmelman, John, *A Mealworm's Life*, Children's Press, New York, 2001.
 - b. Mason, Adrienne, *Mealworms - Raise them, watch them, see them change*. Kids Can Press, Toronto, 1998.

Field Trip Assignment

Due: One Week After Session Four

Introduction

The purpose of this assignment is to have a second experience incorporating all the things you have learned in this course and to allow you the chance to experience actually planning a field trip. A field trip is an excellent way to bring real world science into a curriculum. A field trip is a high interest, child-centered activity that should either build on things previously learned in the classroom or introduce a new area of study and enrich a child experientially.

Directions

Using the description below, type out a detailed plan for the field trip. A check-off list can be used to insure that all parts are included.

You are being asked to plan a field trip to any of the following places:

- | | |
|----------------------------------|---|
| 1. Shedd Aquarium | 5. Museum of Science & Industry |
| 2. JFK Health World | 6. Botanical Gardens |
| 3. Ryerson Conservation Area | 7. Any major zoo |
| 4. Peggy Notebaert Nature Museum | 8. Other science related sites if approved. |

Your first step will be to talk with the education departments of these places and see what specific programs they have to offer school groups. You can also often find this information on their web sites. (**Get this information ASAP.**) Then decide which of these would interest you, or if you want to completely plan your own experience. Often, you may use part of their planned activities and part of your own. Ask for any materials they can give you (handouts, maps, scheduling information, etc.).

Include in your packet any information and handouts they give you.

Decide what concepts, experiences, and activities you want the students to be involved with for the day and begin your plan. A field trip is a great opportunity to give students first hand experience and interaction outside the classroom. It can be a real learning experience or a "play" day with nothing accomplished. The outcome of this experience is determined by the advanced planning a good teacher puts into every field trip. A field trip requires a previous visit by the teacher to plan and lay out the day.

Sections of Field Trip Plan

Each field trip plan should include the following parts:

- A. Field Trip Overview

1. Write a page or two of objectives and what you hope to accomplish with this trip. What will you do to be sure that the students are interacting with the exhibits and that real learning will take place? Think through the big picture.
 - a. Give an overview of what you plan to accomplish on this trip and how you will go about accomplishing it.
 - b. What are the concepts that you want the children to learn from this experience? Be very specific! List and describe the process skills that the children will be using during the day to accomplish what you have asked them to do.
 - c. What attitudes, if any, do you want to affect?
 - d. Be sure to label which objectives go with content, process and attitudes.
 - e. Be sure to correlate the concepts, processes and attitudes to Illinois Learning Standards.

B. Letter to the principal

1. Write a letter/memo to your principal giving him/her the following information:
 - a. What is your reason for taking the class on this trip?
 - b. What part of your curriculum does this reinforce or enrich?
 - c. What makes this a worthwhile experience and justifies the cost and the time involved?
 - d. Include information regarding cost, date and transportation.

C. Class composition and logistics

1. While this is hypothetical, think through the process.
 - a. What grade level are you planning this trip for?
 - b. What is the size of your class?
 - c. How many chaperones will you be taking and how will you go about getting them?
 - d. What transportation will you use?

- e. What is the cost of the trip, including transportation?
- f. What will you do about lunch for the students?
- g. What time will you leave? What time will you return?
- h. What is the schedule while you are at the center/museum? Include bathroom breaks, appointed meeting times for programs, lunch schedule, place and time to meet buses . . .
- i. Include a physical layout of where you are taking the class with key areas highlighted.

D. Materials needed for students to use before, during and after the field trip

1. What are you planning to do to prepare the students before going on the trip?
 - a. This should include an overview of any topics you are going to cover and any materials you will use to help the students to get the most from the experience.
 - b. For example, if your goal is to use this trip as a culminating experience in a unit, what have you previously covered? If you are using the trip to introduce a unit, then what will you do to introduce the unit ahead of time? This section should be **at least** two paragraphs long.
2. What materials will your class use while you are there to focus attention on the exhibits?
 - a. These should be specific questions, worksheets, etc. to focus their attention. For younger children, you can use simpler worksheets with words that can be circled or with pictures, or you can ask the chaperone of a particular group to ask the group questions and record their responses.
 - b. Also, describe any classes or other experiences they will be having that you do not have worksheets for.
 - c. What things will the students do while on the field trip? What will they visit? Interact with? In what order? In small or large groups?
3. What will you do to follow-up the field trip? How will you incorporate what they have experienced in future learning experiences? What activities will follow this trip? This section should be **at least** two paragraphs long.

Evaluation /Assessment

How will you evaluate the effectiveness of this trip? This should be two-fold.

1. How will you evaluate the children to see if they have gained the concepts, practiced the processes and developed the attitudes you are planning for?
2. How will you evaluate the field trip itself to determine whether it was planned properly and accomplished what you set out for it to do?

Chaperone Packet

What instructions will you give the chaperones who are leading groups? These should be written instructions and include:

1. Specific suggestions about discipline.
2. Ways they can help the children during the day.
3. The responsibilities they have for their specific group.
4. A schedule for the chaperones.
5. A map of the specific places you want the students to focus their attention on.

Field Trip Assignment *Evaluation Sheet*

Please submit this as a cover sheet for the assignment

Name _____

The project will be evaluated based on the inclusion of each of the following. Points will be deducted if explanations are unclear or planning in a particular area appears incomplete.

Objectives and Goals (25 points) _____

- Overview of what you plan to accomplish
- Concept Objectives that you will want the children to learn from this experience
- Process Objectives that the children are meeting during the day
- Attitude Objectives you wish to cover
- A summary of how you will use the day to meet these objectives
- Content, Process and Attitude Objectives are correlated to the Illinois Learning Standards

Letter to Principal (10 points) _____

- Your reason for taking the class on this trip
- The part of your curriculum the field trip will reinforce or enrich
- Why this is a worthwhile experience and justifies the cost and time involved
- Information regarding cost, date and transportation

Schedule and Planning Sheet For Trip (10 points) _____

- Grade level
- Size of your class
- Number of chaperones and how you will get them
- Transportation used
- Cost of the trip, including transportation
- Lunch arrangements
- Time of departure and time of return
- Schedule while at the site
- Map or diagram with key areas highlighted

Materials for Students to Use (32 points) _____

At museum/trip location (20 points)

- Actual worksheets/activity guides and materials students will use.
- Written explanation of all activities done during the field trip.

Before the trip (6 points)

- Description of what will be covered.
- If available, worksheets you will use

After the trip (6points)

- Information on incorporation of experiences into future learning
- Activities that will follow-up the experience

Chaperone Packet (15 points) _____

- Written instructions given to chaperones
- Specific suggestions about discipline
- Suggestions on how they can help the children during the day
- Responsibilities for their specific group
- Schedule for the chaperones
- Map with specific places students will be throughout the day.

Assessment (8 points) _____

- Evaluation of children to see if they have gained the concepts, practiced the processes and developed the attitudes planned for.
- Evaluation of field trip itself, to determine whether it was planned properly and accomplished what is desired.

Spelling or grammar errors? (Points deducted) _____

TOTAL POINTS _____ / 100

ILLINOIS PROFESSIONAL TEACHING STANDARDS

ED 341R, Concepts and Methods of Teaching Science and Health K-9

I. Illinois Professional Teaching Standards

Standard 1: Content Knowledge

The competent teacher understands the central concepts, methods of inquiry, and structures of the disciplines and creates learning experiences that make the content meaningful to all students.

- 1A. understands major concepts, assumptions, debates, principles, and theories that are central to the discipline(s) in which certification is sought.
- 1B. understands the processes of inquiry central to the discipline.
- 1C. understands how students' conceptual frameworks and their misconceptions for an area of knowledge can influence their learning.
- 1D. understands the relationship of knowledge within the discipline to other content areas and to life and career applications.

Standard 2: Human Development & Learning

The competent teacher understands how individuals grow, develop, and learn and provides learning opportunities that support the intellectual, social, and personal development of all students.

- 2A. understands how students construct knowledge, acquire skills, and develop habits of mind.
- 2B. understands that students' physical, social, emotional, ethical, and cognitive development influences learning.
- 2C. understands human development, learning theory, neural science, and the ranges of individual variation within each domain.
- 2D. understands that differences in approaches to learning and performance interact with development.

Standard 3: Diversity

The competent teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.

- 3D. understands and identifies differences in approaches to learning and performance, including different learning styles, multiple intelligences, and performance modes.
- 3E. understands cultural and community diversity through a well-grounded framework and understands how to learn about and incorporate students' experiences, cultures, and community resources into instruction.
- 3L. identifies and designs instruction appropriate to students' stages of development, learning styles, strengths and needs.

Standard 4: Planning for Instruction

The competent teacher understands instructional planning and designs instruction based upon knowledge of the discipline, students, the community, and curriculum goals.

- 4A. understands the Illinois Learning Standards, curriculum development, content, learning theory, and student development and knows how to incorporate this knowledge in planning instruction.
- 4B. understands how to develop short- and long-range plans consistent with curriculum goals, learner

- diversity, and learning theory.
- 4C. understands how to take the contextual considerations of instructional materials, individual student interests, and career needs into account in planning instruction that creates an effective bridge between students' experiences and career and educational goals.
 - 4L. creates and selects learning materials and learning experiences appropriate for the discipline and curriculum goals, relevant to the students, and based on students' prior knowledge and principles of effective instruction.
 - 4M. creates multiple learning activities that allow for variation in students' learning styles and performance modes.
 - 4N. incorporates experiences into instructional practices that relate to the students' current life experiences and to future career and work experiences.
 - 4O. creates approaches to learning that are interdisciplinary and that integrate multiple content areas.

Standard 6: Instructional Delivery

The competent teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem-solving, and performance skills.

- 6B. understands principles and techniques, along with advantages and limitations, associated with various instructional strategies.
- 6C. knows how to enhance learning through the use of a wide variety of materials as well as human and technological resources.
- 6G. uses multiple teaching and learning strategies to engage students in active learning opportunities that promote the development of critical thinking, problem-solving, and performance capabilities and that help students assume responsibility for identifying and using learning resources.
- 6I. varies his or her role in the instructional process as instructor, facilitator, coach, or audience in relation to the content and purposes of instruction and the needs of students.

Standard 8: Assessments

The competent teacher understands various formal and informal assessment strategies and uses them to support the continuous development of all students.

- 8I. uses assessment results to diagnose students' learning needs, align and modify instruction, and design teaching strategies.
- 8J. appropriately uses a variety of formal and informal assessments to evaluate the understanding, progress, and performance of the individual student and the class as a whole.

II. Standards from Certification in Elementary Education

Standard 1: Curriculum

The competent elementary teacher understands and demonstrates the central concepts, tools, of inquiry, and structures of content and creates meaningful integrated learning experiences that develop all students' competence in subject matter and skills for various developmental levels.

- 1A. understands the connections among various content areas and is able to analyze ideas, problems, and real-world situations within and across content areas.
- 1B. understands the connections among various content areas and is able to interpret and communicate information, reasoning, concepts, and procedures within and across content areas.

- 4A. understands the interrelationships among science, technology, and society in historical and contemporary contexts.

Standard 4: Curriculum – Science

The competent elementary teacher understands the interrelationships among science, technology, and society; understands the fundamental concepts of life, physical, environmental, earth and space sciences; and uses strategies to engage all students in inquiring new knowledge through the use of scientific thinking and reasoning.

- 4B. understands the fundamental concepts, principles, and interconnections of life, physical, environmental, earth, and space sciences and their use to interpret, analyze, and explain phenomena.
- 4C. understands principles and procedures, including safety practices, related to the design and implementation of scientific investigations and the application of inquiry skills and processes to develop explanations of natural phenomena.
- 4D. understands the use of scientific investigation and inquiry skills across the sciences to conduct experiments and solve problems.

Standard 8: Human Development and Learning

The competent elementary teacher understands how individuals grow, develop, and learn and provides learning opportunities that support all students' cognitive, social, emotional, moral/ethical, and physical development.

- 8D. recognizes and respects differences among students and designs instruction so all students can learn.

Standard 9: Diversity

The competent elementary teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.

- 9F. makes appropriate provisions (in terms of time and circumstances for work, tasks assigned, communication, and response modes) for all students.
- 9G. uses information about students' families, cultures, and communities as a basis for connecting instruction to students' experiences.
- 9H. uses cultural diversity and individual student experiences to enrich instruction.
- 9I. uses a wide range of instructional strategies and technologies to meet diverse student needs.

Standard 10: Planning for Instruction

The competent elementary teacher understands instructional planning and designs instruction based upon knowledge of the discipline, students, community, and curriculum goals.

- 10B. understands how to develop flexible short- and long-range plans consistent with curriculum goals, learners' diversity, and learning theories.
- 10G. establishes goals and selects learning materials, based on the Illinois Learning Standards, content knowledge, learning theories, and students' needs, including IEPs.

- 10H. creates flexible short-range and long-term plans based on elementary-level scope and sequence when planning curriculum and instruction.
- 10I. creates learning activities to allow for variation in students' learning styles and performance modes
- 10J. incorporates experiences into instructional practices that relate to the students' life experiences and to future career and work experiences.
- 10K. creates approaches to learning that are interdisciplinary and that integrate multiple content areas.
- 10L. selects and uses a wide range of instructional resources and technologies.

Standard 12: Instructional Delivery

The competent teacher understands and uses a variety of instructional strategies to encourage all students' development of critical thinking, problem-solving, and performance skills.

- 12B. understands principles and techniques associated with various instructional strategies.
- 12C. understands how to enhance learning through the use of a wide variety of materials and resources.
- 12D. understands the disciplinary and interdisciplinary approaches to learning and how they relate to life and career experiences.
- 12E. uses multiple teaching and learning strategies and varied resources to promote the development of critical and creative thinking skills.
- 12F. monitors and adjusts strategies in response to learners' feedback.
- 12G. varies his or her role in the instructional process as instructor, facilitator, coach, or audience in relation to the content and purposes of instruction and the needs of students.
- 12H. uses a variety of clear, accurate presentations and representations of concepts; uses alternative explanations; and presents diverse perspectives.
- 12I. presents curriculum that demonstrates an interconnection among subject areas that will reflect life and career experiences.
- 12J. selects and uses a wide range of instructional resources and technologies to support learning.

Standard 13: Communication

The competent elementary teacher uses knowledge of effective written, verbal, nonverbal, and visual communication techniques to foster active inquiry, collaboration, and supportive interaction.

- 13E. models accurate, effective modes of communication and uses a variety of communication tools, including technology.
- 13F. uses effective questioning techniques and stimulates discussion in different ways for specific instructional purposes.
- 13G. creates varied opportunities for all students to use effective written, verbal, nonverbal, and visual communication.
- 13I. practices effective listening, conflict-resolution, and group-facilitation skills as a team member.

Standard 14: Assessment

The competent elementary teacher understands and uses various formal and informal assessment strategies to support the learning of all students.

- 14A. understands assessment as a means of evaluating how students learn; what they know and are able to do in relation to national, State, and local standards; and what kinds of experiences will support students' future growth and development.
- 14D. understands how to select, construct, and use assessment and evaluation strategies and instruments for diagnosis and prescription for the learner.