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EECE 798 Reading and Writing for Learning in Science

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Queens College/CUNY
Department of Elementary and Early Childhood Education
Spring 2019
EECE 798 Reading and Writing for Learning in Science (3.0 credit)

INSTRUCTOR

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INFORMATION

Class Meets: Wednesday 4:35 – 7:05 pm
 Room PH013
 Office Hours:
 by appointment – email anytime or call

A) COURSE DESCRIPTION

This course is designed to address the [National Science Education Standards](#) vision of instruction that should enable all students to successfully interact with the natural world. These principles include, (1) Science for all students, (2) Learning science is an active process, (3) School science reflects the intellectual and cultural traditions that characterize the practice of contemporary science, and (4) Improving science education is part of systemic education reform.

Conceptual Framework: Queens College Principles for Educator Preparation (QC-7)

This course is being offered by the department of EECE, which is part of the Education unit at Queens College. The Education unit seeks to promote *equity*, *excellence*, and *ethics* in urban education and is committed to developing competencies in all teacher preparation and other education professional candidates that will enable them to:

- Hold high expectations for all learners,
- Work as change agents to promote equity and social justice
- Foster nurturing and challenging democratic learning communities
- Respect and honor diversity.

In addition, the course is aligned with the Education Unit's commitment to preparing educational professionals to work in diverse urban and suburban communities. Specifically, the knowledge, skills, and dispositions that candidates will develop/demonstrate at the successful completion of this course are directly linked to the Education Unit's seven principles: 1) discipline specific competencies to better understand, assess, and meet their education, training, and other workforce development needs, 2) learning and development, 3) families and urban communities, 4) diversity, inclusion, democracy and social justice, 5) language and literacy, 6) curriculum, instruction, and assessment, and 7) technology.

B) COURSE GOALS/OBJECTIVES

Upon completion of the course the student should be able to

- develop an understanding of what science literacy means.
- develop methods by which to engage students in discourse about science through literature including asking questions, debating, interpreting texts, and explaining information.
- develop skills to help students evaluate the quality of science information found in a variety of reading sources (periodicals, texts, tradebooks, newspapers, etc.).
- learn how to offer students more meaningful experiences with science by situating their learning within the context of inquiry in which they raise and answer their own questions.
- recognize the importance of teaching students about critical literacy and providing them with tools to evaluate information within the context of their lives.
- learn how to present science understandings in different ways using graphic organizers, drawings, spoken words, and various forms of written text (poetry, cartoons, narratives, lab reports, essays, etc.).
- demonstrate the ability to select and use diverse forms of literature and ways of knowing to instruct and assess student understanding in science.

C) RECOMMENDED RESOURCES:

- National Science Education Standards ISBN 0-309-05326-9. This is available as a hard copy if you order it on-line through the National Academy Press website. It is also on-line for free at the NAP website: http://www.nap.edu/catalog.php?record_id=4962
- *Project 2061: Benchmark s for Science Literacy* – ISBN 0-19-508986-3. This book is accessible online for free at <http://www.project2061.org/>. Also, it is available as a hard copy and can be ordered through Amazon.com or through Oxford University Press.
- Next Generation Science Standards: Elementary and Intermediate Science Standards - PDF files are available at <https://www.nextgenscience.org/overview-dci>
- *Inquiry and the National Science Education Standards* ISBN 0-309-06476-7. This is available on-line for free at the National Academy Press website: <http://www.nap.edu/catalog/9596.html>
- The NYCDOE Scope and Sequence: The New York City PK-8 Science Scope and Sequence 2018. This is available on-line for free at <https://www.weteachnyc.org/resources/resource/science-scope-and-sequence-pk-8/>

Useful Websites

- National Science Teacher’s Association. <http://www.nsta.org>
- American Museum of natural history. <http://www.amnh.org>
- Eisenhower National Clearinghouse <http://wwwwww.enc.org>
- Educational Resources Information Center <http://www.eric.ed.gov>
- Science learning site for resources – <http://www.learningscience.org>
- Teacher Source/PBS <http://www.pbs.org/teachersource/>
- Teacher Prof. Dev. The Annenberg Foundation <http://www.learner.org>
- APA style referencing sites: <http://library.uncwil.edu/subject/Psych/APA.html>
- Queens Botanical Garden: www.queensbotanical.org

D) COURSE TOPICS/UNITS/READINGS AND DATES:

SEE WEEKLY SCHEDULE

E) COURSE EXPECTATIONS:

General Responsibilities: For me to help you gain content knowledge and practices, and foster a productive and safe science learning community, you will be expected to assume many roles and interact in a variety of situations. To help foster your learning and those around you, it will be *your responsibility* during each of these moments and interactions to:

- **communicate** your understandings, feelings, and perspectives
- **work** to understand other’s perspectives
- **take** risks
- **make** your own discoveries, gather new information, and develop your own explanations.

Collaboration and feedback:

Collaboration and communication are keys to working within a science community. Therefore, for all of our intellectual development (as students and as teachers), I expect that you will be honest and thoughtful with your reflections of others and be willing to accept feedback. Please remember that we can disagree and challenge one another’s ideas without getting personal.

Cell phone policy:

Please turn your cell phone and other personal communication devices off/silent before entering the classroom; **using your cell phone, or other personal communication devices (iPads, computers...) in the class for personal reasons will impact your grade negatively.**

Attendance Policy:

The hybrid nature of this course requires regular attendance. Poor attendance means poor participation and thus will lower your grade or preclude you from receiving credit for this course. Therefore, one absence will be excused, but students are

expected to turn in work even in the event of absence via email or digital dropbox or via arrangements with a group member. Two unexcused absences will earn a **B** in the course; three or more absences will result in failing the course. If you are tardy more than 30 minutes or leave 30 more than minutes early, it will count as half an absence.

F) Grading:

FAILURE TO SUBMIT ANY ASSIGNMENT IN TIME WILL RESULT IN RECEIVING A ZERO GRADE FOR THAT PARTICULAR ASSIGNMENT, I WILL NOT GRANT ANY EXCPTIONS (EVEN IF YOU ARE ABSENT YOU HAVE TO CONTACT YOUR GROUP MEMBERS AND HAND THE ASSIGNMENT BY THE DUE DATE).

You will be evaluated through a variety of formative and summative assessments including:

1) Autobiographical Account of Your Experiences Learning and Teaching Science (10 %):

Each student will write an autobiographical account (at least 500 words) of her/his experiences in the science field, your account could be on your experience as a student or as a teacher, but it has to have the following sections: introduction, sequencing of events (Organization), and conclusion (what you have learned from these experiences); please refer to the rubric. Due Date by **02/10/2019**.

2) Online Weekly Reports (30%):

This is an individual report: you **MUST** submit **5 weekly reports** online by **10 pm on Sunday** of the week outlined in the tentative schedule. **FAILURE TO SUBMIT THE WR's IN TIME WILL RESULT IN RECEIVING A ZERO GRADE FOR THAT PARTICULAR WR, I WILL NOT GRANT ANY EXCPTIONS.** Please submit your weekly reports to **BB** under the proper assignment #.

What is a weekly report? It is a structured report, approximately one to two pages in length, in which you reflect on your learning by answering specific questions, such as questions that relate to either the readings or class discussions. For example: 1) what did I learn this week, in terms of (**readings, class presentations, and class discussion**), and how could I incorporate this knowledge into my classroom? (**Content**) (2) What questions remain unclear in my mind? (**Content**). To answer the first question, you can read your class notes to recall what happened during class or what you have learned from the assigned readings. Consider writing your response in terms of "knowledge" vs. "skills" you gained. The concept of **knowledge** refers to familiarity with factual information and theoretical concepts. **Knowledge** can be transferred from one person to another or it can be self-acquired through observation and study. **Skills**, however, refer to the ability to apply **knowledge** to specific situations, thinking about these two elements might help you determine *how* do you *know* what you *know*? The report should be single spaced New Times New Roman size 12 with in-text citation. The second question specifically asks you to identify gaps in your knowledge (you must write at least one question. Submit questions regarding course content only. Questions about logistics, assignments, etc. will result in your WR being discarded). I will try to address the most typical questions in class and atypical questions must be addressed through your report. Due Dates **02/10/2019; 02/24/2019; 03/17/2019; 04/14/2019; 05/05/2019**.

3) Individual Interactive Inquiry Presentation (10%):

Each student will conduct/share a brief (10 minute) yet, interactive inquiry activity to the whole class. The inquiry activity will correlate to their grade level science topic. The activity might be a written Engineering Process or 5E's Lesson plan along with an explanation /reasoning page that reports on the purpose of the work. Prepare for this in advance as it will be shared during the last few weeks of the course along with the group presentations Due date **to submit on BB is 03/24/2019**.

4) Science Book- Mixed Media (30%):

TIP: PLAN WAY AHEAD FOR THIS ASSIGNMENT!

Each Student will compile information in her/his own words and public domain photos or graphics to write a book on a core science content area. Prior to producing your book, you need to present your ideas in a 5-minutes class presentation, you will decide on what will be your book's text type and purpose for the writing so that we will have *three groups of writers of science-content texts*. Choose from:

- **Narrative-** to convey experience
- **Informative/Explanatory-** This type of writing is used to share knowledge and to convey messages, instructions, and ideas

- **Opinion/Claim/Evidence (persuasive)** Persuasive writing focuses on the reader. Its primary aim is to influence others to take some action or bring about change. Persuasive writing may contain great amounts of information—facts, details, examples, comparisons, statistics, or anecdotes—but its main purpose is not simply to inform but to persuade.

Using the non-fiction or fiction children’s literature as a reference, write your book for grade level 1-6, you must use the Common Core State Standards for your particular grade choice as a writing guide. In order to use the appropriate CCSS, you must decide on a grade AND the appropriate science standard as per the NYCDOE Scope and Sequence, or Next Generation Science Standards, then you write your book based on both the CCSS and the NGSS. For example, let’s say that you want to write a book for third graders to use in their studies of physical science because when you examined the NYC Science Scope and Sequence, you have noticed that second and 3rd graders begin their work on force and motion. You might want to introduce the topic of force and motion by connecting it to a hypothetical or actual personal experience; such as your experience with building a playground (simple machines) for your nieces; so that your students will recognize the ‘real-world’ value of their classroom science work. Also, you might want to look at NGSS directly and clicking on ‘search standards by topic,’ click on grade 3 and physical sciences, and then, search. It will show 3. Forces and Interactions. When you click on this, you will then get the gist of what is included for that topic on that level! Next, you will need to access the CCSS and choose to click on the English Language Arts Standards. Scroll down, and on the left of the page you choose and click on the grade level for the writing standards in order to write your book according to the paradigms of the expectations of the CCSS **Due Date to submit on BB is 05/05/2019**.

Suggested Book Elements:

Format: The book should have as many pages as you want but must include at least 10 pages (including the pictures and the Appendix) with words typed in Times New Roman font, in black and size 12 points. Simply put, please do not submit tiny or huge books. You are encouraged to be very creative and original. There are many websites that can give you ideas on book making, such as <https://thejohnfox.com/2016/06/creative-nonfiction-prompts/>.

About the Author’ page: Start your book by writing a description of the inspiration for your book. Perhaps you have learned something about the natural world through going to the beach or on a hike. Did it lead you to an inquiry? What are some of the ways your life has led you to understand the ‘science’ of the world around you? Did your first airplane flight make you wonder about physics? Did the cycles of the seasons help you to better understand the life of the tree that you planted when you were young? Something in your life probably has inspired you to want to look more closely or tell a story. Explain it in your ‘**About the Author**’ page. You **must** explain how you came to know what you know about the topic, any research or inquiry work you did, and any new questions that you have and want to explore to answer next!

Appendix OR Index: Include terms or references

Advice: Research the content that is involved with your experience, connect and incorporate your research into your very own words, and have fun. Please do not copy and paste someone else’s work into your book, this will be construed as plagiarism, it can readily be determined, it is illegal, bad ethics, and it will negatively affect your grade. Please be creative and refrain from listing a slew of facts about a topic while using pictures printed off the internet. PLAN! Use the digital photos/memories from your experiences. Make the book engaging to young children! Make it a model for young children. This is a book that is meant to incorporate your skills of reflection, research, teaching, ELA, knowledge of scientific content and science standards, Common Core State Standards, and literature critiques. As per the grading policy in the syllabus, poor writing skills and the inappropriate use of the written English language negatively affect your grade.

Proofread or ask others to review your book before sharing in class and posting on BB.

5) Thematic Unit (10 %):

Definition: *A Thematic unit is the organization of a curriculum around a central theme. In other words, it's a series of lessons that integrate subjects across the curriculum, such as math, reading, social studies, science, language arts, etc. that all tie into the main theme of the unit. Each activity should have a main focus toward the thematic idea. A thematic unit is much broader than just choosing a topic. They cover a wide range such as Australia, mammals, or the solar system. Many teachers choose a different thematic unit for their classroom each week, while others plan their teaching themes for two to nine weeks.*

Each Group will develop a thematic unit guide for their peers based around your inquiry question with a specific science topic, such as earthworms. In developing this **Unit** for this class, you will provide other participants in our classroom with a sound teaching unit based on stemming from some aspect of the earthworm, but not limited to the earthworm. The unit will need to be aligned to science content standards (either city, state, or national).

The **Unit** will be developed using science inquiry in which students will be guided to answer a question or questions about the science topic of your choice. To support students in their inquiry, you are asked to choose a set (5-10 dependent upon

grade, content focus, and scope of project) of books to be read using literature circles, independent reading, and teacher shared books. The lessons/activities developed for the unit will need to engage students in different not only doing (hands-on activities), and reading (book circles and teacher shares), but also in communicating their growing understanding of their topic. As such, students should be provided with opportunities to talk about what they are learning and to write about what they are learning using pictures and a variety of writing activities **Due Date to submit on BB is 04/21/2019.**

Thematic Unit Guidelines (about 2-2.5 pages)

UNIT Overview:

- What question is your unit of study targeting?
- Which grade level does the unit target and why?
- What questions will students seek to answer as a result of their participation in this unit?
- How does this unit tie together inquiry, reading, and writing?

6) Reflection Paper (10%):

Each Student will be asked to prepare a reflection paper (2 pages, single-spaced) about their learning experiences as a participant in this class up to the point of the due date for the reflection. Students may include their reflections about possible inquiry design and their ideas about how to incorporate this model of science learning through cooperative work and inquiry in their own classrooms. Include ways to incorporate writing and/or field work **Due Date 05/15/2019.**

Grading for this course is based upon a point system:

Final Points	Grade Letter Equivalent	Final Points	Grade Level Equivalent
97-100	A+	77-79	C+
93-96	A	73-76	C
90-92	A-	70-72	C-
87-89	B+	67-69	D+
83-86	B	60-66	D
80-82	B-	Below	F

G) FIELDWORK REQUIREMENTS:

There are no fieldwork expectations for this course, but students may choose to implement some of the activities into their current teaching practice.

H) CUNY POLICY ON ACADEMIC INTEGRITY:

Academic Dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension, and expulsion as provided at: <http://qcpages.qc.cuny.edu/provost/policies/index.html>

I) ADA Statement

Students with disabilities needing academic accommodation should:(1) register with and provide documentation to the Special Services Office, Kiely 171; (2) bring a letter to the instructor indicating the need for accommodation and what type. This should be done during the first week of class. For more information about services available to Queens’s students’ contact: Director: Dr. Mirian Detres-Hickey, Special Services Office; 171 Kiely Hall; 718-997-5870 (8:00 a.m. to 5:00 p.m.). E-mail address: QC.SPSV@qc.cuny.edu

USE OF STUDENT WORK

All teacher education programs in New York State undergo periodic reviews by accreditation agencies and the state education department. For these purposes, samples of students’ work are made available to those professionals conducting the review. Student anonymity is assured under these circumstances. If you do not wish to have your work made available for these purposes, please let the professor know before the start of the second class. Your cooperation is greatly appreciated.

Course Outline: After previewing the course introductory information, learners will proceed to the Assignments section to complete the following fifteen sessions, working through each session in order. Essential information pertaining to the topic is presented at various points within the course. Throughout the sessions, learners are asked to articulate their ideas in various forms. They are encouraged to reflect on their ideas and experiences in their online journals. The weekly discussions are designed to allow learners to glean information from other learners' experiences with strategies both prior to and following the completion of the weekly assignments. The following is a **rough outline** of the material we should cover in this course. Please note that some modification will likely become necessary as the semester progresses. Time constraints may force me to add, delete, or rearrange content. ***Please see me at the beginning of the quarter if you have any special needs (physical or learning) that I should be aware of and what accommodations I should provide you with.***

WEEKLY TENTATIVE SCHEDULE

Date	Topic/Activities	Assignment due Next Week
Session 1	<p>1. Introduction <i>Meet and greet using a variety of social interaction</i></p> <p>Venn Diagram – what is unique about you and me activity? (who are you in terms of Race; Ethnicity; Gender...compare and contrast, communicating, asking questions)</p> <p>2. Administering reflecting on Science Learning Environments survey</p> <p>3. Breaking the class into literature circles groups. (What roles will each member take (if any)? What are some roles that are useful for having in a science literature circle? Investigate some roles you can use in your group to determine the qualities needed for each role. Determine how roles will be assigned, rotated, used in discussion.)</p>	<p>1. Write an autobiographical account of your experiences in the science field. It could be as a student or as a teacher. Post it on BB by 02/10/2019.</p> <p>2. Read what is culturally responsive pedagogy? on BB</p> <p>3. Write your weekly report #1 due (02/10/2019) on how could you utilize it in designing your lesson plan</p>
Session 2	No Class	<p>1. Group Readings on BB: Group 1: Read the article: How Do You Define Inquiry?</p> <p>2. Group 2: Read the article: Fostering Scientific Literacy and Critical thinking in Elementary Science Education</p> <p>3. Group 3 Read: the article Scripted collaborative drawing in elementary science education</p> <p>4. Group 4 Read the article Language Use in Real-Time Interactions During Early Elementary Science Lessons: The Bidirectional Dynamics of the Language Complexity of Teachers and Students</p> <p>The different groups will present their readings</p>
Session 3	<p>1. Group Discussions of the readings What questions do you have based on readings? What do you want to know more about?</p> <p>2. What is Inquiry? How will we conduct inquiry?</p> <p>3. Exploring important websites Next generation Science Standards NYC Scope and Sequence</p>	<p>Class Readings on BB:</p> <p>1. Read National Academy of Sciences: How Students Learn: Science in the Classroom. Introduction P.18-P.402 (Free Download).</p> <p>2. Each student should start compiling information about her/his Science Book- Mixed Media Assignment.</p>
Session 4	No Class	<p>1. Each student should prepare to present to the class their ideas on Individual Interactive Inquiry Presentation (Second Assignment)</p> <p>2. Second Weekly Report on the readings and class activities Due by 02/24/2019</p>
Session 5	<p>1. Modeling an interactive inquiry</p> <p>2. Group Discussions of the readings</p> <p>3. Observing and designing your experiments (presentations and critiques of the activities)</p> <p>4. Designing testable questions. Setting up</p>	<p>1. Group Readings on BB: Group 1: What the “Seven-Step Lesson Plan” Isn’t! P. 8-17 Group 2: Modeling the 5-E Learning Sequence Group 3: Science Fiction& scientific Literacy</p>

	<p>experiments</p> <p>5. Drawing conclusions based on observation and evidence.</p> <p>6. Inference vs. Deduction</p> <p>7. How to share results with others, revise ideas, form new questions for investigation</p>	Group 4: Reading and Writing to Learn Science: Achieving Scientific Literacy
Session 6	<p>1. Discussion on readings and how it could be used to develop a successful lesson plan that integrates ELA with Science</p> <p>2. Class Presentations of the second assignment <u>Individual Interactive Inquiry Presentation</u></p>	Second Weekly Report on the readings and class activities Due by 02/24/2019
Session 7	No Class	Third Weekly Report on the readings and class activities Due by 03/17/2019
Session 8	Class Presentations of the second assignment <u>Individual Interactive Inquiry Presentation</u>	<u>First Draft of Science Book- Mixed Media Assignment</u>
Session 9	No Class	<u>First Draft of Science Book- Mixed Media Assignment</u>
Session 10	Class Presentations of the first draft of the fourth assignment <u>Science Book- Mixed Media Assignment</u> Developing thematic units for supporting student inquiry in the classroom presentations	Fourth Weekly Report on the readings and class activities Due by 04/14/2019
Session 11	No Class	<p>Prepare for a group assignment (in class) on developing thematic units for supporting student inquiry in the classroom</p> <ul style="list-style-type: none"> • What question is your unit of study targeting? • Which grade level does the unit target and why? • What questions will students seek to answer as a result of their participation in this unit? • How does this unit tie together inquiry, reading, and writing?
Session 12	No Class	Finalize your work on <u>Science Book- Mixed Media</u>
Session 13	No Class	Finalize your work on <u>Science Book- Mixed Media</u> Fifth Weekly Report on the readings and class activities Due by 05/05/2019
Session 14	Show case your <u>Science Book- Mixed Media</u> to the Class	Reflection Paper is Due 05/15/2019
Session 15	Catch-Up Day	

5-E Lesson Plan Sample Template

Subject Area: Science

Your Name:

Grade Level: 6th grade

Learning Objectives: Students will describe how air takes up space and has weight using three examples

Introduction:

This activity will allow your students to experience and understand that air is matter

New York State Curriculum Alignment

NYC Scope and Sequence: matter is anything that takes up space and has mass.

NYS science standards: PS 3.1a substances have characteristic properties. Some of these properties include weight, color, odor, phase at room temperature, density, solubility, heat and electrical conductivity, hardness, and boiling and freezing points.

Lesson Length: 1-2 periods

List of Materials

1. Large, heavy books
2. Large, clear plastic bowl
3. Water
4. Clear plastic cup
5. Clear plastic cup with small hole in its side (near the base)
6. Recording sheet/science journal
7. Mobile lab
8. Chart papers

INSTRUCTIONAL SEQUENCE

Engage the Learner

Using the KWL chart ask the students the following essential questions:

- a) What is Air?
- b) What do I already know about it?

Fill out the answers under the K column

- a) What can I find out about it?"

Fill out the answers under the W column

1. Use 2 balloons of equal size and shape and color. Fill one with air and leave the other empty. Ask the children which one will be heavier and which one lighter? Have them test for results using seesaw balances. With older children, you may weigh and record the weights.

Explore the Concept

Students will work in small groups (3-4 students) to allow discussion and consensus.

Have your students fill clear, plastic bowl with water and float the clear plastic cup in it.

With the other members of their team, have the students predict and discuss whether the cup is empty or not, and what they think will happen to the cup if it is inverted and pushed to the bottom of the bowl. Have the students write their predictions on their recording sheets or in their science journals.

At this time, the students should test their predictions and record their observations.

Then using the plastic cup with the small hole in it, tell the students to repeat the test. Again, have them record their predictions and their observations.

Encourage the students to compare their results from Step 3 with their predictions from step

Explain the Concept and Define the Terms

Following their responses to the previous questions, have them answer, “What happened to the Styrofoam in Step 4?” Have them write a hypothesis for this experience as well.

Literacy Connection

Using the Computer Mobile Lab:

Students will:

Write paragraphs about their findings using words, and share them with class using different modes of technology such as, projectors, and smart boards. Allow the students to revise their sentences if necessary.

Share their revisions. *Explore word relationships by using graphic organizers.*

Elaborate on the Concept

At this time, encourage the students to discuss with their table teams what would happen (if anything) if they were to cover the small hole in the cup with tape and repeat the test.

As a class, revisit the idea of whether or not the first cup was empty. Have the students answer the following question on their recording sheets or in their science journals “What did you find out about air from this activity?”

Evaluate students' Understanding of the Concept

All students will be assessed based on their thinking and problem-solving skills, and on their ability to transfer these skills to newer contexts. Evaluate the students for understanding by evaluating the written responses from both the recording sheet and the self-reflection sheet. Students will self-evaluate their collaborative and procedural experiences by using a rubric such as this or one you create.

Possible Engagement Activities

Air has Weight and Move Things

Place a Ping-Pong ball in a basin of water. Ask the children if there is a way to make the ball move without touching it.

Have one child at a time try blowing the ball to see if the child can make the ball move.

Blow up balloons and float them on water. How can you make them move without touching them?

This lesson has been adapted from PBS Teachers Retrieved July 17, 2012 from

<http://www.pbs.org/teachers/ecoinvestigators/lesson-plans/air/what-is-air/>

Backward Design Lesson Plan

The Three Stages of Backward Design

We use backward design in order deliver a meaningful curriculum that addresses the state learning objectives, we consider our goals, examine established content standards (national, state, and city), and review curriculum expectations. Because there is typically more content than can reasonably be addressed within the available time, teachers are obliged to make choices. This first stage in the design process calls for clarity about priorities. Long-term performance goals establish learning priorities—what it is we want students, in the end, to be able to do with what they have learned. The bottom-line goal of education is transfer. The point of school is not to simply excel in each class, but to be able to use one’s learning in other settings. Accordingly, Stage 1 focuses on “transfer of learning.” Essential companion questions are used to engage learners in thoughtful “meaning making” to help them develop and deepen their understanding of important ideas and processes that support such transfer. Figure 1 contains sample transfer goals and Figure 2 shows sample understandings and essential questions.

“Figure 1—Sample transfer goal.”

Discipline/Subject/Skill	Transfer Goals
Science	<ul style="list-style-type: none"> Apply scientific knowledge, skills, and reasoning to solve real-world problems.

Figure 2—Sample understanding and essential questions

Understandings	Essential Questions
Quantitative data can be collected, organized, and displayed in a variety of ways. Mathematical ideas can be represented numerically, graphically, or symbolically.	<p>What’s the best way of showing (or representing)_____?</p> <p>In what other way(s) can this be represented?</p>

Important knowledge and skill objectives, targeted by established standards, are also identified in Stage 1. An important point in the UbD framework is to recognize that factual knowledge and skills are not taught for their own sake, but as a means to larger ends. Acquisition of content is a means, in the service of meaning making and transfer. Ultimately, teaching should equip learners to be able to use or transfer their learning (i.e., meaningful performance with content). This is the result we always want to keep in mind.

- Form small groups according to your area of science certification
- Discuss the following questions among your group members

What should students know, understand, and be able to do? What is the ultimate transfer we seek as a result of this unit? What enduring understandings are desired? What essential questions will be explored in-depth and provide focus to all learning?