Course Number: ELED BED 4311
Course Title: Science Teaching in the Elementary School
Instructor: Ron Wagler, Ph.D. Environmental Science
Mailbox: Education Building 601 (Available Monday through Friday, 8-5pm)
Email: rrwagler2@utep.edu
Required Readings: National Science Education Standards; TEKS and other documents.

Office hours: Monday 2:30pm-4:40pm in Education Building 405 and Tuesday 2:30pm-4:40pm in Education Building 405. Please contact me via email at any time concerning anything associated with this course. We can then set up a time to meet. I am here to assist you. 😊

Class Documents: I will email the free class documents to you. These documents include templates that provide a detailed description, the subject matter, directions and the assessment of each assignment. There is no required textbook for this course. Save the email with the class documents in a place you can easily access. There is no Blackboard site for this course.

Introduction to the Course: This course has been constructed to assist you in critically examining the philosophies, theories, research, pedagogical techniques and materials associated with effective learning and teaching in an elementary science classroom. The overarching goal of the course is to expose you to the knowledge and skills needed to construct and implement a science learning environment where every student is held to high expectations and achieves maximum learning. Some of the content of this course has been influenced by the National Science Education Standards understanding of scientific inquiry. During your classroom teaching experiences, you will be using concepts from the Texas Education Agency Test 291 - Generalist EC-6 Science Content.

Course Objectives (Learning Outcomes):

1) Construct and implement a quality scientific inquiry curriculum;

2) Develop the ability to assist students in designing investigations using scientific inquiry;

3) Understand and address the binational and bilingual dynamics that impact science education in the El Paso del Norte Region;

4) Understand and address the role of underrepresented groups in science curriculum, science decisions and science careers;
5) Understand and implement local resources and quality science curriculum materials into your science activities;

6) Understand science content concepts associated with the applicable TEKS;

7) Understand and implement standards for science excellence (TEKS, National Science Education Standards)

**Assessment of Course Objectives:** will be accomplished by assessing the student’s course assignments and participation.

**Brief Description of each Major Course Requirement:**

Three Reflection Assignments; Two Teaching Lessons; One Assignment To Be Announced (e.g., one page position paper); Group Presentation; Review Five Quality Science Education Websites; Teaching Lesson 3: Cumulative final requiring development of a scientific inquiry lesson that is taught in the public school. Components of final written assignment include Scientific Content, Scientific Inquiry Processes, Science TEKS Alignment, Assessment, Reflection, Additions and Writing Quality, Following Directions, and Public School Teaching Assistance or Observation.

**Description of the Subject Matter of each Lecture or Discussion:**


<table>
<thead>
<tr>
<th>Tentative Schedule</th>
<th>Note: This schedule WILL change.</th>
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</thead>
<tbody>
<tr>
<td><strong>Week of</strong></td>
<td><strong>Topic</strong></td>
</tr>
<tr>
<td>Aug 22</td>
<td>Introduction and Overview</td>
</tr>
<tr>
<td>Aug 29</td>
<td>Nature of Science; Scientific Inquiry</td>
</tr>
<tr>
<td>Sept 5</td>
<td>Labor Day (No Class)</td>
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<tr>
<td>Sept 12</td>
<td>Science Teaching Standards and Equity; Practice Lesson 1</td>
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<tr>
<td>Sept 19</td>
<td>Teach Lesson 1</td>
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<tr>
<td>Sept 26</td>
<td>Safety Standards for the Science Classroom</td>
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<tr>
<td>Oct 3</td>
<td>Practice Lesson 2</td>
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<tr>
<td>Oct 10</td>
<td>Teach Lesson 2</td>
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<tr>
<td>Oct 17</td>
<td>Practice Lesson 3</td>
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<tr>
<td>Date</td>
<td>Event</td>
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<tr>
<td>Oct 24</td>
<td>Teach Lesson 3</td>
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<tr>
<td>Oct 31</td>
<td>Group Presentations</td>
</tr>
<tr>
<td>Nov 7</td>
<td>Online Class One (We will not physically meet this week). Work on your online assignment (Human Footprint Movie Assignment).</td>
</tr>
<tr>
<td>Nov 14</td>
<td>Group Presentations</td>
</tr>
<tr>
<td>Nov 21</td>
<td>Online Class Two (We will not physically meet this week). Work on your online assignment (Human Footprint Movie Assignment).</td>
</tr>
<tr>
<td>Nov 28</td>
<td>Final Class that ties the whole semester together</td>
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<tr>
<td>Dec 5</td>
<td>Finals Week (We will not physically meet this week)</td>
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**Required Assignments and Activities**

<table>
<thead>
<tr>
<th>Points</th>
<th>Assignment</th>
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</thead>
<tbody>
<tr>
<td>15</td>
<td>Participation</td>
</tr>
<tr>
<td>15</td>
<td>3 Reflection Assignments (5 points each assignment)</td>
</tr>
<tr>
<td>5</td>
<td>Teaching Lesson 1</td>
</tr>
<tr>
<td>15</td>
<td>Teaching Lesson 2</td>
</tr>
<tr>
<td>10</td>
<td>Assignment To Be Announced (5 points each; one or two assigned)*</td>
</tr>
<tr>
<td>5</td>
<td>Group Presentation (Dates To Be Announced)</td>
</tr>
<tr>
<td>10</td>
<td>Review Five Quality Science Education Websites</td>
</tr>
<tr>
<td>25</td>
<td>Teaching Lesson 3</td>
</tr>
<tr>
<td>100</td>
<td><strong>Total Points Possible in the Course</strong></td>
</tr>
</tbody>
</table>

*Note that if one is assigned there will be 95 not 100 total points possible in the course.

**Written Assignments**

All written assignments are expected to be submitted on the due date assigned and in proper written format based on the template provided. Late assignments will receive a 33.33% point reduction for each week they are late. If you still have late assignments after the last day of class these assignments will receive a 33.33% point reduction for each day they are late. Assignments not turned in will receive a 0. Bring a stapled paper copy of each assignment to class on the day it is due. All written assignments should be typed. All assignments must be 12 point Times New Roman font. All written assignments have templates. I will email you these documents. These templates must be used and all directions and questions imbedded in these templates must be followed and answered. Please ask if you have questions or concerns about how to do any assignment in this course. If you do not follow the directions presented in the templates you will loss points. You need to check your email every day or ever other day for communications from your professor.
Grading Scale for the Course

<table>
<thead>
<tr>
<th>Grade</th>
<th>Points</th>
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<tbody>
<tr>
<td>A</td>
<td>90-100 points</td>
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<tr>
<td>B</td>
<td>80-89 points</td>
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<tr>
<td>C</td>
<td>70-79 points</td>
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<tr>
<td>D</td>
<td>60-69 points</td>
</tr>
<tr>
<td>F</td>
<td>Below 60 points</td>
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To calculate your grade at any point in the class: Divide the points you have earned by the total points you could have received. Take this number and times it by 100. This is your current grade. Remember to subtract the days you have missed and late assignments.

Participation

It is very important that you fully participate in events that occur in this course. If you are not in class you are not participating. This course has been designed to facilitate small group social interaction via scientific inquiry teaching. There are 6 questions I attempt to answer when assigning your participation points. 1) Are you prepared for class? 2) Are you on task during class? 3) Are you highly motivated during class? 4) Are you performing the act of reflection during class? 5) During the practice teaching days are you practicing your lessons by actually doing the lessons in class? 6) During the teaching days are you teaching your lesson and when others are teaching their lesson are you participating? If you have any concerns about your level of participation in this course, please contact me immediately.

It is vital that you attend every class. If you are not in class you are not participating in the scientific inquiry activities we are going. Historically, students with multiple absences have not performed well in this course because their participation points are greatly impacted. I expect you to incorporate the concepts we discuss in class into all of your written assignments. If you are not in class this is very difficult to do. The schedule of assignments and classroom discussions may also change over the course of the semester. Any changes to the syllabus will be announced in class. Every student is responsible for these changes whether or not she/he is present in class. It is highly recommended that students exchange telephone numbers and/or e-mail addresses with other students in the course. If you are absent from a class contact another student to find out what occurred during the class you were absent from.

- Your 1\textsuperscript{st} absence is excused and no participation points are subtracted.
- Your 2\textsuperscript{nd} absence will reduce your final grade by 5 participation points.
- Every absence after your 2\textsuperscript{nd} reduces your final grade by 10 participation points per absence.

UTEP Teacher Education Department Policy on Course Absences

The UTEP Teacher Education Department considers missing two weeks of class excessive. The student may be dropped for lack of attendance. If you miss two weeks of class, contact your professor immediately.

Other Important Points of Interest Associated with this Course

The expectation is that all students will successfully accomplish the requirements for an A. Save all hard copy assignments I hand back to you so you can calculate your grade at
any time. This is a progressive grading class. This means that I will grade your assignments based on the content and experiences you have progressively received throughout the semester. The standards I will hold you to will be less rigorous at the beginning of the semester, moderately rigorous in the middle of the semester and rigorous at the end of the semester. My expectation is that you will increasingly incorporate what you have learned throughout the semester into each consecutive assignment.

You will need to periodically purchase materials for the activities we do in class. I understand that your university costs are rising and I will keep these material costs to a minimum. The total cost will be much less than purchasing a textbook, laboratory manual or material fees that are almost always associated with other university science courses. Having these materials in class will greatly improve your educational experience while in this course.

**Standards of Academic Integrity**

Students are expected to uphold the highest standards of academic integrity. Any form of scholastic dishonesty is an affront to the pursuit of knowledge and jeopardizes the quality of the degree awarded to all graduates of UTEP. Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are not attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts. Proven violations of the detailed regulations, as printed in the Handbook of Operating Procedures (HOP) and available in the Office of the Dean of Students, may result in sanctions ranging from disciplinary probation, to failing grades on the work in question, to failing grades in the course, to suspension or dismissal among others.

**Students with Disabilities Statement**

If you have or believe you have a disability, you may wish to self-identify. You can do so by providing documentation to the Office of disabled Student Services located in Union E Room 203. Students who have been designated as disabled must reactivate their standing with the Office of Disabled Student Services on a yearly basis. Failure to report to this office will place a student on the inactive list and nullify benefits received. If you have a condition which may affect your ability to exit safely from the premises in an emergency or which may cause an emergency during class, you are encouraged to discuss this in confidence with the instructor and/or the director of Disabled Student Services. You may call 747-5148 for general information about the Americans with Disabilities Act (ADA).

**Note**

Small modifications of the syllabus will occur throughout the semester. These modifications will be based on the specific needs of all the students in the course. Changes that concern assignments will never make the assignments due sooner or level of difficulty more than the original proposed assignment. These modifications will only benefit you in becoming a better science teacher. When the syllabus is modified I will email the new one to you. No extra credit is offered in this course.
Please note that this syllabus is subject to change and/or adjustments.

Appendix

DOMAIN IV — SCIENCE

competency 024 (safe and proper laboratory processes)
THE TEACHER UNDERSTANDS HOW TO MANAGE LEARNING ACTIVITIES, TOOLS, MATERIALS, EQUIPMENT AND TECHNOLOGIES TO ENSURE THE SAFETY OF ALL STUDENTS.
The beginning teacher:
A. Understands safety regulations and guidelines for science facilities and science instruction.
B. Knows procedures for and sources of information regarding the appropriate handling, use, disposal, care and maintenance of chemicals, materials, specimens and equipment.
C. Knows procedures for the safe handling and ethical care and treatment of organisms and specimens.
D. Selects and safely uses appropriate tools, technologies, materials and equipment needed for instructional activities.
E. Understands concepts of precision, accuracy and error with regard to reading and recording numerical data from a scientific instrument.
F. Understands how to gather, organize, display and communicate data in a variety of ways (e.g., charts, tables, graphs, diagrams, written reports, oral presentations).
G. Understands the international system of measurement (i.e., metric system) and performs unit conversions within measurement systems.

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competency 025 (scientific inquiry)
THE TEACHER UNDERSTANDS THE HISTORY AND NATURE OF SCIENCE, THE PROCESS AND ROLE OF SCIENTIFIC INQUIRY AND THE ROLE OF INQUIRY IN SCIENCE INSTRUCTION.
The beginning teacher:
A. Understands, plans and implements instruction that provides opportunities for all students to engage in nonexperimental- and experimental-inquiry investigations.
B. Focuses inquiry-based instruction on questions and issues relevant to students and uses strategies to assist students with generating, refining and focusing scientific questions and hypotheses.
C. Understands and instructs students in the safe and proper use of a variety of grade-appropriate tools, equipment, resources, technology and techniques to access, gather, store, retrieve, organize and analyze data.
D. Knows how to guide students in making systematic observations and measurements.
E. Knows how to promote the use of critical-thinking skills, logical reasoning and scientific problem solving to reach conclusions based on evidence.
F. Knows how to teach students to develop, analyze and evaluate different explanations for a given scientific result.
G. Knows how to teach students to demonstrate an understanding of potential sources of error in inquiry-based investigation.
H. Knows how to teach students to demonstrate an understanding of how to communicate and defend the results of an inquiry-based investigation.

I. Understands principles of scientific ethics.

J. Understands the roles that logical reasoning, verifiable evidence, prediction and peer review play in the process of generating and evaluating scientific knowledge.

K. Understands the historical development of science and the contributions that diverse cultures and individuals of both genders have made to scientific knowledge.

competency 026 (impact on daily life/environment)
THE TEACHER UNDERSTANDS HOW SCIENCE IMPACTS THE DAILY LIVES OF STUDENTS AND INTERACTS WITH AND INFLUENCES PERSONAL AND SOCIETAL DECISIONS.
The beginning teacher:
A. Understands that decisions about the use of science are based on factors such as ethical standards, economics and personal and societal needs.
B. Applies scientific principles to analyze the advantages of, disadvantages of or alternatives to a given decision or course of action.
C. Applies scientific principles and processes to analyze factors that influence personal choices concerning fitness and health, including physiological and psychological effects and risks associated with the use of substances and substance abuse.
D. Understands concepts, characteristics and issues related to changes in populations and human population growth.
E. Understands the types and uses of natural resources and the effects of human consumption on the renewal and depletion of resources.
F. Understands the role science can play in helping resolve personal, societal and global challenges.

competency 027 (unifying concepts and processes in science)
THE TEACHER KNOWS AND UNDERSTANDS THE UNIFYING CONCEPTS AND PROCESSES THAT ARE COMMON TO ALL SCIENCES.
The beginning teacher:
A. Understands how a unifying, explanatory framework across the science disciplines is provided by the concepts and processes of systems, order and organization; evidence, models and explanation; change, constancy and measurements; and form and function.
B. Demonstrates an understanding of how patterns in observations and data can be used to make explanations and predictions.
C. Analyzes interactions and interrelationships between systems and subsystems.
D. Applies unifying concepts to explore similarities in a variety of natural phenomena.
E. Understands how properties and patterns of systems can be described in terms of space, time, energy and matter.
F. Understands how change and constancy occur in systems.
G. Understands the complementary nature of form and function in a given system.
H. Understands how models are used to represent the natural world and how to evaluate the strengths and limitations of a variety of scientific models (e.g., physical, conceptual, mathematical).

competency 028 (theory and practice of science teaching)
THE TEACHER HAS THEORETICAL AND PRACTICAL KNOWLEDGE ABOUT TEACHING
SCIENCE AND ABOUT HOW STUDENTS LEARN SCIENCE.
The beginning teacher:
A. Understands how developmental characteristics, prior knowledge and experience and students’ attitudes influence science learning.
B. Selects and adapts science curricula, content, instructional materials and activities to meet the levels of interest, knowledge and understanding as well as the abilities, experiences and needs of all students, including English-language learners.
C. Understands how to use situations from students’ daily lives to develop instructional materials that investigate how science can be used to make informed decisions.
D. Understands common misconceptions in science and has effective ways to address those misconceptions.
E. Understands developmentally appropriate design and implementation of hands-on learning experiences in science and selects effective, appropriate instructional practices, activities, technologies and materials to promote students’ scientific knowledge, skills and inquiry processes.
F. Understands questioning strategies designed to elicit higher-level thinking and how to use them to move students from concrete to more abstract understanding.
G. Understands the importance of planning activities that are inclusive and that accommodate the needs of all students.
H. Understands how to sequence learning activities in a way that enables students to build on their prior knowledge and that challenges them to expand their understanding of science.

competency 029 (assessments in science learning)
THE TEACHER KNOWS THE VARIED AND APPROPRIATE ASSESSMENTS AND ASSESSMENT PRACTICES FOR MONITORING SCIENCE LEARNING IN LABORATORY, FIELD AND CLASSROOM SETTINGS.
The beginning teacher:
A. Understands the relationships between a science curriculum, assessment and instruction and bases instruction on information gathered through assessment of students’ strengths and needs.
B. Understands the importance of monitoring and assessing students’ understanding of science concepts and skills on an ongoing basis, including how to use formal and informal assessments of student performance and how to use products (e.g., projects, lab journals, rubrics, portfolios, student profiles, checklists) to evaluate students’ understanding of and participation in the inquiry process.
C. Selects — or designs — and administers a variety of appropriate assessment methods (e.g., performance assessment, self-assessment, formal/informal assessment, formative/summative assessment) to monitor students’ understanding and progress and to plan for instruction.
D. Understands the importance of communicating evaluation criteria and assessment results to students.

competency 030 (physical science)
THE TEACHER UNDERSTANDS FORCES AND MOTION AND THEIR RELATIONSHIPS.
The beginning teacher:
A. Demonstrates an understanding of the properties of universal forces (e.g., gravitational, electrical, magnetic).
B. Understands how to measure, graph and describe changes in motion by using concepts of position, direction of motion and speed.
C. Analyzes the ways unbalanced forces acting on an object cause changes in the position or motion of the object.
D. Analyzes the relationship between force and motion in a variety of situations (e.g., simple machines, geologic processes).

competency 031 (physical science)
THE TEACHER UNDERSTANDS THE PHYSICAL AND CHEMICAL PROPERTIES OF AND CHANGES IN MATTER.
The beginning teacher:
A. Describes the physical and chemical properties of substances (e.g., size, shape, temperature, magnetism, hardness, mass, conduction, density).
B. Describes the physical properties of solids, liquids, and gases.
C. Distinguishes between physical and chemical changes in matter.
D. Applies knowledge of physical and chemical properties of and changes in matter to processes and situations that occur in life science and Earth and space science.
E. Distinguishes between mixtures and solutions and describes their properties.
F. Explains the importance of a variety of chemical reactions that occur in daily life (e.g., rusting, burning of fossil fuels, photosynthesis, cell respiration, chemical batteries, digestion of food).

competency 032 (physical science)
THE TEACHER UNDERSTANDS ENERGY AND INTERACTIONS BETWEEN MATTER AND ENERGY.
The beginning teacher:
A. Understands conservation of energy and energy transformations and analyzes how energy is transformed from one form to another (e.g., mechanical, sound, heat, light, chemical, electrical) in a variety of everyday situations.
B. Understands the basic concepts of heat energy and related processes (e.g., melting, evaporation, boiling, condensation).
C. Understands the principles of electricity and magnetism and their applications (e.g., electric circuits, motors, audio speakers, lightning).
D. Applies knowledge of properties of light (e.g., reflection, refraction) to describe the functioning of optical systems and phenomena (e.g., camera, microscope, rainbow, eye).
E. Demonstrates an understanding of the properties, production and transmission of sound.

competency 033 (physical science)
THE TEACHER UNDERSTANDS ENERGY TRANSFORMATIONS AND THE CONSERVATION OF MATTER AND ENERGY.
The beginning teacher:
A. Describes sources of electrical energy and processes of energy transformation for human uses (e.g., fossil fuels, solar panels, hydroelectric plants).
B. Applies knowledge of transfer of energy in a variety of situations (e.g., the production of heat, light, sound and magnetic effects by electrical energy; the process of photosynthesis; weather processes; food webs; food and energy pyramids).
C. Understands applications of energy transformations and the conservation of matter
and energy in life and in Earth and space science.

competency 034 (life science)
THE TEACHER UNDERSTANDS THE STRUCTURE AND FUNCTION OF LIVING THINGS.
The beginning teacher:
A. Understands that living systems have different structures that perform different functions.
B. Understands and describes stages in the life cycles of common plants and animals.
C. Understands that organisms have basic needs.
D. Analyzes how structure complements function in cells, tissues, organs, organ systems and organisms.
E. Identifies human body systems and describes their functions.

competency 035 (life science)
THE TEACHER UNDERSTANDS REPRODUCTION AND THE MECHANISMS OF HEREDITY.
The beginning teacher:
A. Describes the processes by which plants and animals reproduce and explains how hereditary information is passed from one generation to the next.
B. Compares and contrasts inherited traits and learned characteristics.
C. Understands the organization of hereditary material and how an inherited trait can be determined by one or many genes and how more than one trait can be influenced by a single gene.
D. Distinguishes between dominant and recessive traits and predicts the probable outcomes of genetic combinations.
E. Evaluates the influence of environmental and genetic factors on the traits of an organism.

competency 036 (life science)
THE TEACHER UNDERSTANDS ADAPTATIONS OF ORGANISMS AND THE THEORY OF EVOLUTION.
The beginning teacher:
A. Demonstrates knowledge of adaptive characteristics and explains how adaptations influence the survival of populations or species.
B. Describes how populations and species change through time.
C. Describes processes that enable traits to change through time, including selective breeding, mutation and other natural occurrences.

competency 037 (life science)
THE TEACHER UNDERSTANDS THE RELATIONSHIPS BETWEEN ORGANISMS AND THE ENVIRONMENT.
The beginning teacher:
A. Understands that organisms respond to internal or external stimuli and analyzes the role of internal and external stimuli in the behavior of organisms.
B. Understands relationships between organisms and the environment and describes ways that living organisms depend on one another and on the environment to meet their basic needs.
C. Identifies organisms, populations or species with similar needs and analyzes how they compete with one another for resources.
D. Analyzes the interrelationships and interdependence among producers, consumers and decomposers in an ecosystem (e.g., food webs, food chains, competition, predation).
E. Identifies factors that influence the size and growth of populations in an ecosystem.
F. Analyzes adaptive characteristics that result in a population’s or species’ unique niche in an ecosystem.
G. Knows how populations and species modify and affect ecosystems.

competency 038 (earth and space science)
THE TEACHER UNDERSTANDS THE STRUCTURE AND FUNCTION OF EARTH SYSTEMS.
The beginning teacher:
A. Understands the structure of Earth and analyzes constructive and destructive processes that produce geologic change.
B. Understands the form and function of surface water and groundwater.
C. Applies knowledge of the composition and structure of the atmosphere and its properties.
D. Applies knowledge of how human activity and natural processes, both gradual and catastrophic, can alter Earth systems.

competency 039 (earth and space science)
THE TEACHER UNDERSTANDS CYCLES IN EARTH SYSTEMS.
The beginning teacher:
A. Understands the rock cycle and how rocks, minerals and soils are formed.
B. Understands the water cycle and its relationship to weather processes.
C. Understands the nutrient (e.g., carbon, nitrogen) cycle and its relationship to Earth systems.
D. Applies knowledge of how human and natural processes affect Earth systems.
E. Understands and describes the properties and uses of Earth materials (e.g., rocks, soils, water, atmospheric gases).

competency 040 (earth and space science)
THE TEACHER UNDERSTANDS THE ROLE OF ENERGY IN WEATHER AND CLIMATE.
The beginning teacher:
A. Understands the elements of weather (e.g., humidity, wind speed, pressure, temperature) and the tools used for measurement.
B. Compares and contrasts weather and climate.
C. Analyzes weather charts and data to make weather predictions.
D. Applies knowledge of how transfers of energy between Earth systems affect weather and climate.
E. Analyzes how Earth’s position, orientation and surface features affect weather and climate.

competency 041 (earth and space science)
THE TEACHER UNDERSTANDS THE CHARACTERISTICS OF THE SOLAR SYSTEM AND THE UNIVERSE.
The beginning teacher:
A. Understands the properties and characteristics of objects in the sky.
B. Applies knowledge of the Earth–Moon–Sun system and the interactions between them (e.g., seasons, lunar phases, eclipses).
C. Identifies properties of the components of the solar system.