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| ***Department of Curriculum & Instruction*** | *A-fullname-block-2color* |
| Coehp |
| ***ELED 4312 Teaching Science in Early and Elementary Education (3 credits)*** | ***Fall 2014*** |
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***Instructor Information:***

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| **Office Hours:** | Upon Request | |  |
| **Faculty Profile** | [https://www.uta.edu/mentis/profile/?10671](https://www.uta.edu/mentis/profile/?10671" \t "_blank) | |  |
| **Course Web Site:** | | <http://elearn.uta.edu> | |

***Course Information:***

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| **Course Title:** | Teaching Science and Health in Early and Elementary Education |
| **Course Number:** | **ELED 4312.001(87920)** |
| **Semester:** | **Fall, 2014** |
| **Course Location and Time**: | TH200  **Thursdays 11:00 AM – 1:50 PM** |

***Catalog Description:***

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| Principles of integration of science and health concepts in relation to cognitive, socio-emotional, and psychomotor development. Emphasis on developing dispositions promoting scientific investigation and appropriate objects, materials, activities and programs to assist in combination of science and health concepts. Course will also address the instructional needs and appropriate assessment of all students in inclusive socio-economic, multicultural, and multilingual classrooms for this content area. Taken concurrently with ELED 4311, ELED 4314, and BEEP 4384. Students will be assigned for 1 day each week in an approved setting for the practicum portions of these courses (Internship). |

***Textbook(s) and Materials:***

Marek, E.A. & Cavallo, A.M. (1997). *The learning cycle; Elementary school science and beyond*. Revised Edition. Portsmouth, NH: Heinemann (*Main Text*).

Ansberry, K. & Morgan, E. (2010). *Picture-Perfect Science Lessons: Using Children’s Books to Guide Inquiry, 3-6 (2nd Ed.).* NSTA Press. ISBN: 978-1-935155-16-4 (*Second Text*)

Hammerman, E. & Musial, D. (2008). *Integrating Science with Mathematics and Literacy: New Visions for Learning and Assessment*. Second Edition. Thousand Oaks, CA: Corwin Press. (*Second Text*)

Fritzer, P. & Bristor, V. (2004). *Science Content for Elementary and Middle School Teachers*. Pearson Allyn and Bacon. ISBN 0-205-40798-6 (*optional*)

Tk20: The College of Education and Health Professions has adopted Tk20, a comprehensive data management system that will provide us with powerful tools to manage our growth and streamline our processes to enable us to meet your needs more efficiently and effectively. As with other course materials, you will need to subscribe to the program for a *one-time only, non-refundable* cost of $100. You may purchase your subscription online from a link provided on the system’s Web site or from the UT Arlington Bookstore as you would a textbook or other course materials. Please see the letter from Dean Gerlach and visit [http://www.uta.edu/coehp/tk20](http://www.uta.edu/coehp/tk20" \t "_blank) for more information. The set of tools that is required as a course text is called *TK20 HigherEd*. The following is a partial listing of what the Tk20 system will enable you to do:

* Create your key assessments and performance artifacts online, which you will be able to access and use beyond graduation. This will enable you to present documented performance data and information to prospective employers, who are increasingly interested in data-supported evidence of an individual’s current and potential performance.
* Submit forms online, including applications for field-based experiences such as student teaching, practicum, internships, or other clinical practice required for teacher or administrator certification, and receive timely notification of placement details sent directly to your Tk20 account.
* Create multimedia portfolios for documenting your work for presentation to faculty and prospective employers that can be exported to CDs or other media.
* Monitor your progress throughout the program and have access to a fully documented record of your program performance, creating a vested partnership between you and faculty in your progress through your academic program.

On-line tutorials and training materials will orient you to the Tk20 system and its use. For additional information, go to http://www.uta.edu/coehp/tk20. We appreciate your hard work and dedication toward completing your education in the College of Education and Health Professions at the University of Texas at Arlington.

**Posting key assessment (Individual Lesson Plan) to TK20 is required. Failure to post the identified assessments to TK20 will render the assignments ungraded and will result in a failing course grade.**

National Science Teachers Association*. Science and Children*, *Science Scope*, and *The Science Teacher* (monthly publications for elementary, middle and high school science teachers). Washington, DC: NSTA. <http://www.nsta.org>

National Guidelines, Standards, and Professional Organizations**:**

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| NCATE/ACEI Standards | *Elementary Education Standards and Supporting Explanation*  <http://acei.org/images/stories/documents/ACEIElementaryStandardsSupportingExplanation.5.07.pdf> |
| National Research Council (NRC, 1996) | *National Science Education Standards. Washington, DC: National Academy Press*. <http://www.nap.edu/openbook.php?record_id=4962> |
| National Science Teachers Association (NSTA, 2003) | *Standards for Science Teacher Preparation, Revised*. Washington, DC: National Science Teachers Association. <http://www.nsta.org/pdfs/NSTAstandards2003.pdf> |
| National Association for Sport/Physical Education | *National Standards for Physical Education*  http://www.aahperd.org/naspe/standards/nationalStandards/PEstandards.cfm |
| National Health Education Standards (NHES) | *National Health Education Standards* <http://www.cdc.gov/healthyyouth/sher/standards/> |

State Guidelines, Competencies, and Professional Organizations:

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| Texas Essential  Knowledge and Skills (TEKS) | Texas Education Agency, 2006. (Science, Health Education, & Physical Education)  <http://www.tea.state.tx.us/index2.aspx?id=6148> |
| Educator’s Standards | Science Generalist EC-6 Standards  <http://www.tea.state.tx.us/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=6044> |
| Texas Educator’s Code of Ethics | <http://info.sos.state.tx.us/pls/pub/readtac$ext.ViewTAC?tac_view=4&ti=19&pt=7&ch=247&rl=Y> |

State Domains and Competencies:

DOMAIN I—DESIGNING INSTRUCTION AND ASSESSMENT TO PROMOTE STUDENT

LEARNING

**Competency 002**

The teacher understands student diversity and knows how to plan learning experiences and design assessments that are responsive to differences among students and that promote all students’ learning.

**Competency 004**

The teacher understands learning processes and factors that impact student learning and demonstrates this knowledge by planning effective, engaging and appropriate assessments.

DOMAIN III—IMPLEMENTING EFFECTIVE, RESPONSIVE INSTRUCTION AND ASSESSMENT

**Competency 007**

The teacher understands and applies principles and strategies for communicating effectively in varied teaching and learning contexts.

DOMAIN IV – FULLFILLING PROFESSIONAL ROLES AND RESPONSIBILITIES

**Competency 11**

The teacher understands the importance of family involvement in children’s education and knows how to interact and communicate effectively with families.

**Competency 12**

The teacher enhances professional knowledge and skills by effectively interacting with other members of the educational community and participating in various types of professional activities.

**Competency 13**

The teacher understands and adheres to legal and ethical requirements for educators and knowledgeable of the structure of education in Texas.

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.

**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.

**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.

**Competency 027 (Unifying Concepts and Processes in Science)**

The teacher knows and understands the unifying concepts and processes that are common to all sciences.

**Competency 028 (Theory and Practice of Science Teaching)**

The teacher has theoretical and practical knowledge about teaching science and about how students learn 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.

**Competency 030 (Physical Science)**

The teacher understands forces and motion and their relationships.

**Competency 031 (Physical Science)**

The teacher understands the physical and chemical properties of and changes in matter.

**Competency 032 (Physical Science)**

The teacher understands energy and interactions between matter and energy.

**Competency 033 (Physical Science)**

The teacher understands energy transformations and the conservation of matter and energy.

**Competency 034 (Life Science)**

The teacher understands the structure and function of living things.

**Competency 035 (Life Science)**

The teacher understands reproduction and the mechanisms of heredity.

**Competency 036 (Life Science)**

The teacher understands adaptations of organisms and the theory of evolution.

**Competency 037 (Life Science)**

The teacher understands the relationships between organisms and the environment.

**Competency 038 (Earth and Space Science)**

The teacher understands the structure and function of Earth systems.

**Competency 039 (Earth and Space Science)**

The teacher understands cycles in Earth systems.

**Competency 040 (Earth and Space Science)**

The teacher understands the role of energy in weather and climate.

**Competency 041 (Earth and Space Science)**

The teacher understands the characteristics of the solar system and the universe.

***Science Generalist EC-6 Standards***

1. The science teacher manages classroom, field, and laboratory activities to ensure the safety of all students and the ethical care and treatment of organisms and specimens.
2. The science teacher understands the correct use of tools, materials, equipment, and technologies.
3. The science teacher understands the process of scientific inquiry and its role in science instruction
4. The science teacher has theoretical and practical knowledge about teaching science and about how students learn science.
5. The science teacher knows the varied and appropriate assessments and assessment practices to monitor science learning.
6. The science teacher understands the history and nature of science.
7. The science teacher understands how science affects the daily lives of students and how science interacts with and influences personal and societal decisions.
8. The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in life science.
9. The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in life science.
10. The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in Earth and space science.
11. The science teacher knows unifying concepts and processes that are common to all sciences.

***ACEI/NCATE Standards***

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| ***ACEI/NCATE - Standard 3a*** | ***Integrating and applying knowledge for instruction***  Candidates plan and implement instruction based on knowledge of students, learning theory, subject matter, curricular goals, and community. |
| ***ACEI/NCATE – Standard 3b*** | ***Adaptation to Diverse Students***  Candidates understand how elementary students differ in their development and approaches to learning, and create instructional opportunities that are adapted to diverse students. |
| ***ACEI/NCATE-***  ***Standard 3c*** | ***Development of critical thinking, problem solving and performance skills***  Candidates understand and use a variety of teaching strategies that encourage elementary students' development of critical thinking, problem solving, and performance skills. |
| ***ACEI/NCATE – Standard 3d*** | ***Communication to foster learning*** Candidates use their knowledge and understanding of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the elementary classroom. |
| ***ACEI/NCATE – Standard 5a*** | ***Practices and behaviors of developing career teachers*** Candidates understand and apply practices and behaviors that are characteristic of developing career teachers. |
| ***ACEI/NCATE – Standard 5b*** | ***Reflection and evaluation*** Candidates are aware of and reflect on their practice in light of research on teaching and resources available for professional learning; they continually evaluate the effects of their professional decisions and actions on students, parents, and other professionals in the learning community and actively seek out opportunities to grow professionally. |
| **ACEI/NCATE -**  ***Standard 5d*** | ***Collaboration with colleagues and the community***  Candidates foster relationships with school colleagues and agencies in the larger community to support students’ learning and well-being. |

***Texas Essential Knowledge and Skills for Science***

Subchapter A. Elementary

Statutory Authority: The provisions of this Subchapter A issued under the Texas Education Code, §7.102(c)(4) and §28.002, unless otherwise noted.

§112.10. Implementation of Texas Essential Knowledge and Skills for Science, Elementary, Beginning with School Year 2010-2011.

The provisions of §§112.11-112.16 of this subchapter shall be implemented by school districts beginning with the 2010-2011 school year.

Source: The provisions of this §112.10 adopted to be effective August 4, 2009, 34 TexReg 5063; amended to be effective August 24, 2010, 35 TexReg 7230.

§112.11. Science, Kindergarten, Beginning with School Year 2010-2011.

(a)  Introduction.

(1)  Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process."

(2)  Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include patterns, cycles, systems, models, and change and constancy.

(3)  The study of elementary science includes planning and safely implementing classroom and outdoor investigations using scientific processes, including inquiry methods, analyzing information, making informed decisions, and using tools to collect and record information, while addressing the major concepts and vocabulary, in the context of physical, earth, and life sciences. Districts are encouraged to facilitate classroom and outdoor investigations for at least 80% of instructional time.

(4)  In Kindergarten, students observe and describe the natural world using their five senses. Students do science as inquiry in order to develop and enrich their abilities to understand scientific concepts and processes. Students develop vocabulary through their experiences investigating properties of common objects, earth materials, and organisms.

(A)  A central theme throughout the study of scientific investigation and reasoning; matter and energy; force, motion, and energy; Earth and space; and organisms and environment is active engagement in asking questions, communicating ideas, and exploring with scientific tools. Scientific investigation and reasoning involves practicing safe procedures, asking questions about the natural world, and seeking answers to those questions through simple observations and descriptive investigations.

(B)  Matter is described in terms of its physical properties, including relative size and mass, shape, color, and texture. The importance of light, heat, and sound energy is identified as it relates to the students' everyday life. The location and motion of objects are explored.

(C)  Weather is recorded and discussed on a daily basis so students may begin to recognize patterns in the weather. Other patterns are observed in the appearance of objects in the sky.

(D)  In life science, students recognize the interdependence of organisms in the natural world. They understand that all organisms have basic needs that can be satisfied through interactions with living and nonliving things. Students will investigate the life cycle of plants and identify likenesses between parents and offspring.

(b)  Knowledge and skills.

(1)  Scientific investigation and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures and uses environmentally appropriate and responsible practices. The student is expected to:

(A)  identify and demonstrate safe practices as described in the Texas Safety Standards during classroom and outdoor investigations, including wearing safety goggles, washing hands, and using materials appropriately;

(B)  discuss the importance of safe practices to keep self and others safe and healthy; and

(C)  demonstrate how to use, conserve, and dispose of natural resources and materials such as conserving water and reusing or recycling paper, plastic, and metal.

(2)  Scientific investigation and reasoning. The student develops abilities to ask questions and seek answers in classroom and outdoor investigations. The student is expected to:

(A)  ask questions about organisms, objects, and events observed in the natural world;

(B)  plan and conduct simple descriptive investigations such as ways objects move;

(C)  collect data and make observations using simple equipment such as hand lenses, primary balances, and non-standard measurement tools;

(D)  record and organize data and observations using pictures, numbers, and words; and

(E)  communicate observations with others about simple descriptive investigations.

(3)  Scientific investigation and reasoning. The student knows that information and critical thinking are used in scientific problem solving. The student is expected to:

(A)  identify and explain a problem such as the impact of littering on the playground and propose a solution in his/her own words;

(B)  make predictions based on observable patterns in nature such as the shapes of leaves; and

(C)  explore that scientists investigate different things in the natural world and use tools to help in their investigations.

(4)  Scientific investigation and reasoning. The student uses age-appropriate tools and models to investigate the natural world. The student is expected to:

(A)  collect information using tools, including computers, hand lenses, primary balances, cups, bowls, magnets, collecting nets, and notebooks; timing devices, including clocks and timers; non-standard measuring items such as paper clips and clothespins; weather instruments such as demonstration thermometers and wind socks; and materials to support observations of habitats of organisms such as terrariums and aquariums; and

(B)  use senses as a tool of observation to identify properties and patterns of organisms, objects, and events in the environment.

(5)  Matter and energy. The student knows that objects have properties and patterns. The student is expected to:

(A)  observe and record properties of objects, including relative size and mass, such as bigger or smaller and heavier or lighter, shape, color, and texture; and

(B)  observe, record, and discuss how materials can be changed by heating or cooling.

(6)  Force, motion, and energy. The student knows that energy, force, and motion are related and are a part of their everyday life. The student is expected to:

(A)  use the five senses to explore different forms of energy such as light, heat, and sound;

(B)  explore interactions between magnets and various materials;

(C)  observe and describe the location of an object in relation to another such as above, below, behind, in front of, and beside; and

(D)  observe and describe the ways that objects can move such as in a straight line, zigzag, up and down, back and forth, round and round, and fast and slow.

(7)  Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

(A)  observe, describe, compare, and sort rocks by size, shape, color, and texture;

(B)  observe and describe physical properties of natural sources of water, including color and clarity; and

(C)  give examples of ways rocks, soil, and water are useful.

(8)  Earth and space. The student knows that there are recognizable patterns in the natural world and among objects in the sky. The student is expected to:

(A)  observe and describe weather changes from day to day and over seasons;

(B)  identify events that have repeating patterns, including seasons of the year and day and night; and

(C)  observe, describe, and illustrate objects in the sky such as the clouds, Moon, and stars, including the Sun.

(9)  Organisms and environments. The student knows that plants and animals have basic needs and depend on the living and nonliving things around them for survival. The student is expected to:

(A)  differentiate between living and nonliving things based upon whether they have basic needs and produce offspring; and

(B)  examine evidence that living organisms have basic needs such as food, water, and shelter for animals and air, water, nutrients, sunlight, and space for plants.

(10)  Organisms and environments. The student knows that organisms resemble their parents and have structures and processes that help them survive within their environments. The student is expected to:

(A)  sort plants and animals into groups based on physical characteristics such as color, size, body covering, or leaf shape;

(B)  identify parts of plants such as roots, stem, and leaves and parts of animals such as head, eyes, and limbs;

(C)  identify ways that young plants resemble the parent plant; and

(D)  observe changes that are part of a simple life cycle of a plant: seed, seedling, plant, flower, and fruit.

Source: The provisions of this §112.11 adopted to be effective August 4, 2009, 34 TexReg 5063.

§112.12. Science, Grade 1, Beginning with School Year 2010-2011.

(a)  Introduction.

(1)  Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process."

(2)  Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include patterns, cycles, systems, models, and change and constancy.

(3)  The study of elementary science includes planning and safely implementing classroom and outdoor investigations using scientific processes, including inquiry methods, analyzing information, making informed decisions, and using tools to collect and record information, while addressing the major concepts and vocabulary, in the context of physical, earth, and life sciences. Districts are encouraged to facilitate classroom and outdoor investigations for at least 80% of instructional time.

(4)  In Grade 1, students observe and describe the natural world using their five senses. Students do science as inquiry in order to develop and enrich their abilities to understand the world around them in the context of scientific concepts and processes. Students develop vocabulary through their experiences investigating properties of common objects, earth materials, and organisms.

(A)  A central theme in first grade science is active engagement in asking questions, communicating ideas, and exploring with scientific tools in order to explain scientific concepts and processes like scientific investigation and reasoning; matter and energy; force, motion, and energy; Earth and space; and organisms and environment. Scientific investigation and reasoning involves practicing safe procedures, asking questions about the natural world, and seeking answers to those questions through simple observations and descriptive investigations.

(B)  Matter is described in terms of its physical properties, including relative size and mass, shape, color, and texture. The importance of light, heat, and sound energy is identified as it relates to the students' everyday life. The location and motion of objects are explored.

(C)  Weather is recorded and discussed on a daily basis so students may begin to recognize patterns in the weather. In addition, patterns are observed in the appearance of objects in the sky.

(D)  In life science, students recognize the interdependence of organisms in the natural world. They understand that all organisms have basic needs that can be satisfied through interactions with living and nonliving things. Students will investigate life cycles of animals and identify likenesses between parents and offspring.

(b)  Knowledge and skills.

(1)  Scientific investigation and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures and uses environmentally appropriate and responsible practices. The student is expected to:

(A)  recognize and demonstrate safe practices as described in the Texas Safety Standards during classroom and outdoor investigations, including wearing safety goggles, washing hands, and using materials appropriately;

(B)  recognize the importance of safe practices to keep self and others safe and healthy; and

(C)  identify and learn how to use natural resources and materials, including conservation and reuse or recycling of paper, plastic, and metals.

(2)  Scientific investigation and reasoning. The student develops abilities to ask questions and seek answers in classroom and outdoor investigations. The student is expected to:

(A)  ask questions about organisms, objects, and events observed in the natural world;

(B)  plan and conduct simple descriptive investigations such as ways objects move;

(C)  collect data and make observations using simple equipment such as hand lenses, primary balances, and non-standard measurement tools;

(D)  record and organize data using pictures, numbers, and words; and

(E)  communicate observations and provide reasons for explanations using student-generated data from simple descriptive investigations.

(3)  Scientific investigation and reasoning. The student knows that information and critical thinking are used in scientific problem solving. The student is expected to:

(A)  identify and explain a problem such as finding a home for a classroom pet and propose a solution in his/her own words;

(B)  make predictions based on observable patterns; and

(C)  describe what scientists do.

(4)  Scientific investigation and reasoning. The student uses age-appropriate tools and models to investigate the natural world. The student is expected to:

(A)  collect, record, and compare information using tools, including computers, hand lenses, primary balances, cups, bowls, magnets, collecting nets, notebooks, and safety goggles; timing devices, including clocks and timers; non-standard measuring items such as paper clips and clothespins; weather instruments such as classroom demonstration thermometers and wind socks; and materials to support observations of habitats of organisms such as aquariums and terrariums; and

(B)  measure and compare organisms and objects using non-standard units.

(5)  Matter and energy. The student knows that objects have properties and patterns. The student is expected to:

(A)  classify objects by observable properties of the materials from which they are made such as larger and smaller, heavier and lighter, shape, color, and texture; and

(B)  predict and identify changes in materials caused by heating and cooling such as ice melting, water freezing, and water evaporating.

(6)  Force, motion, and energy. The student knows that force, motion, and energy are related and are a part of everyday life. The student is expected to:

(A)  identify and discuss how different forms of energy such as light, heat, and sound are important to everyday life;

(B)  predict and describe how a magnet can be used to push or pull an object;

(C)  describe the change in the location of an object such as closer to, nearer to, and farther from; and

(D)  demonstrate and record the ways that objects can move such as in a straight line, zig zag, up and down, back and forth, round and round, and fast and slow.

(7)  Earth and space. The student knows that the natural world includes rocks, soil, and water that can be observed in cycles, patterns, and systems. The student is expected to:

(A)  observe, compare, describe, and sort components of soil by size, texture, and color;

(B)  identify and describe a variety of natural sources of water, including streams, lakes, and oceans; and

(C)  gather evidence of how rocks, soil, and water help to make useful products.

(8)  Earth and space. The student knows that the natural world includes the air around us and objects in the sky. The student is expected to:

(A)  record weather information, including relative temperature, such as hot or cold, clear or cloudy, calm or windy, and rainy or icy;

(B)  observe and record changes in the appearance of objects in the sky such as clouds, the Moon, and stars, including the Sun;

(C)  identify characteristics of the seasons of the year and day and night; and

(D)  demonstrate that air is all around us and observe that wind is moving air.

(9)  Organisms and environments. The student knows that the living environment is composed of relationships between organisms and the life cycles that occur. The student is expected to:

(A)  sort and classify living and nonliving things based upon whether or not they have basic needs and produce offspring;

(B)  analyze and record examples of interdependence found in various situations such as terrariums and aquariums or pet and caregiver; and

(C)  gather evidence of interdependence among living organisms such as energy transfer through food chains and animals using plants for shelter.

(10)  Organisms and environments. The student knows that organisms resemble their parents and have structures and processes that help them survive within their environments. The student is expected to:

(A)  investigate how the external characteristics of an animal are related to where it lives, how it moves, and what it eats;

(B)  identify and compare the parts of plants;

(C)  compare ways that young animals resemble their parents; and

(D)  observe and record life cycles of animals such as a chicken, frog, or fish.

Source: The provisions of this §112.12 adopted to be effective August 4, 2009, 34 TexReg 5063.

§112.13. Science, Grade 2, Beginning with School Year 2010-2011.

(a)  Introduction.

(1)  Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process."

(2)  Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include patterns, cycles, systems, models, and change and constancy.

(3)  The study of elementary science includes planning and safely implementing classroom and outdoor investigations using scientific processes, including inquiry methods, analyzing information, making informed decisions, and using tools to collect and record information, while addressing the major concepts and vocabulary, in the context of physical, earth, and life sciences. Districts are encouraged to facilitate classroom and outdoor investigations for at least 60% of instructional time.

(4)  In Grade 2, careful observation and investigation are used to learn about the natural world and reveal patterns, changes, and cycles. Students should understand that certain types of questions can be answered by using observation and investigations and that the information gathered in these may change as new observations are made. As students participate in investigation, they develop the skills necessary to do science as well as develop new science concepts.

(A)  Within the physical environment, students expand their understanding of the properties of objects such as shape, mass, temperature, and flexibility then use those properties to compare, classify, and then combine the objects to do something that they could not do before. Students manipulate objects to demonstrate a change in motion and position.

(B)  Within the natural environment, students will observe the properties of earth materials as well as predictable patterns that occur on Earth and in the sky. The students understand that those patterns are used to make choices in clothing, activities, and transportation.

(C)  Within the living environment, students explore patterns, systems, and cycles by investigating characteristics of organisms, life cycles, and interactions among all the components within their habitat. Students examine how living organisms depend on each other and on their environment.

(b)  Knowledge and skills.

(1)  Scientific investigation and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures. The student is expected to:

(A)  identify and demonstrate safe practices as described in the Texas Safety Standards during classroom and outdoor investigations, including wearing safety goggles, washing hands, and using materials appropriately;

(B)  describe the importance of safe practices; and

(C)  identify and demonstrate how to use, conserve, and dispose of natural resources and materials such as conserving water and reuse or recycling of paper, plastic, and metal.

(2)  Scientific investigation and reasoning. The student develops abilities necessary to do scientific inquiry in classroom and outdoor investigations. The student is expected to:

(A)  ask questions about organisms, objects, and events during observations and investigations;

(B)  plan and conduct descriptive investigations such as how organisms grow;

(C)  collect data from observations using simple equipment such as hand lenses, primary balances, thermometers, and non-standard measurement tools;

(D)  record and organize data using pictures, numbers, and words;

(E)  communicate observations and justify explanations using student-generated data from simple descriptive investigations; and

(F)  compare results of investigations with what students and scientists know about the world.

(3)  Scientific investigation and reasoning. The student knows that information and critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions. The student is expected to:

(A)  identify and explain a problem in his/her own words and propose a task and solution for the problem such as lack of water in a habitat;

(B)  make predictions based on observable patterns; and

(C)  identify what a scientist is and explore what different scientists do.

(4)  Scientific investigation and reasoning. The student uses age-appropriate tools and models to investigate the natural world. The student is expected to:

(A)  collect, record, and compare information using tools, including computers, hand lenses, rulers, primary balances, plastic beakers, magnets, collecting nets, notebooks, and safety goggles; timing devices, including clocks and stopwatches; weather instruments such as thermometers, wind vanes, and rain gauges; and materials to support observations of habitats of organisms such as terrariums and aquariums; and

(B)  measure and compare organisms and objects using non-standard units that approximate metric units.

(5)  Matter and energy. The student knows that matter has physical properties and those properties determine how it is described, classified, changed, and used. The student is expected to:

(A)  classify matter by physical properties, including shape, relative mass, relative temperature, texture, flexibility, and whether material is a solid or liquid;

(B)  compare changes in materials caused by heating and cooling;

(C)  demonstrate that things can be done to materials to change their physical properties such as cutting, folding, sanding, and melting; and

(D)  combine materials that when put together can do things that they cannot do by themselves such as building a tower or a bridge and justify the selection of those materials based on their physical properties.

(6)  Force, motion, and energy. The student knows that forces cause change and energy exists in many forms. The student is expected to:

(A)  investigate the effects on an object by increasing or decreasing amounts of light, heat, and sound energy such as how the color of an object appears different in dimmer light or how heat melts butter;

(B)  observe and identify how magnets are used in everyday life;

(C)  trace the changes in the position of an object over time such as a cup rolling on the floor and a car rolling down a ramp; and

(D)  compare patterns of movement of objects such as sliding, rolling, and spinning.

(7)  Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

(A)  observe and describe rocks by size, texture, and color;

(B)  identify and compare the properties of natural sources of freshwater and saltwater; and

(C)  distinguish between natural and manmade resources.

(8)  Earth and space. The student knows that there are recognizable patterns in the natural world and among objects in the sky. The student is expected to:

(A)  measure, record, and graph weather information, including temperature, wind conditions, precipitation, and cloud coverage, in order to identify patterns in the data;

(B)  identify the importance of weather and seasonal information to make choices in clothing, activities, and transportation;

(C)  explore the processes in the water cycle, including evaporation, condensation, and precipitation, as connected to weather conditions; and

(D)  observe, describe, and record patterns of objects in the sky, including the appearance of the Moon.

(9)  Organisms and environments. The student knows that living organisms have basic needs that must be met for them to survive within their environment. The student is expected to:

(A)  identify the basic needs of plants and animals;

(B)  identify factors in the environment, including temperature and precipitation, that affect growth and behavior such as migration, hibernation, and dormancy of living things; and

(C)  compare and give examples of the ways living organisms depend on each other and on their environments such as food chains within a garden, park, beach, lake, and wooded area.

(10)  Organisms and environments. The student knows that organisms resemble their parents and have structures and processes that help them survive within their environments. The student is expected to:

(A)  observe, record, and compare how the physical characteristics and behaviors of animals help them meet their basic needs such as fins help fish move and balance in the water;

(B)  observe, record, and compare how the physical characteristics of plants help them meet their basic needs such as stems carry water throughout the plant; and

(C)  investigate and record some of the unique stages that insects undergo during their life cycle.

Source: The provisions of this §112.13 adopted to be effective August 4, 2009, 34 TexReg 5063.

§112.14. Science, Grade 3, Beginning with School Year 2010-2011.

(a)  Introduction.

(1)  Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process."

(2)  Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include patterns, cycles, systems, models, and change and constancy.

(3)  The study of elementary science includes planning and safely implementing classroom and outdoor investigations using scientific methods, analyzing information, making informed decisions, and using tools to collect and record information while addressing the content and vocabulary in physical, earth, and life sciences. Districts are encouraged to facilitate classroom and outdoor investigations for at least 60% of instructional time.

(4)  In Grade 3, students learn that the study of science uses appropriate tools and safe practices in planning and implementing investigations, asking and answering questions, collecting data by observing and measuring, and by using models to support scientific inquiry about the natural world.

(A)  Students recognize that patterns, relationships, and cycles exist in matter. Students will investigate the physical properties of matter and will learn that changes occur. They explore mixtures and investigate light, sound, and heat/thermal energy in everyday life. Students manipulate objects by pushing and pulling to demonstrate changes in motion and position.

(B)  Students investigate how the surface of Earth changes and provides resources that humans use. As students explore objects in the sky, they describe how relationships affect patterns and cycles on Earth. Students will construct models to demonstrate Sun, Earth, and Moon system relationships and will describe the Sun's role in the water cycle.

(C)  Students explore patterns, systems, and cycles within environments by investigating characteristics of organisms, life cycles, and interactions among all components of the natural environment. Students examine how the environment plays a key role in survival. Students know that when changes in the environment occur organisms may thrive, become ill, or perish.

(b)  Knowledge and skills.

(1)  Scientific investigation and reasoning. The student conducts classroom and outdoor investigations following school and home safety procedures and environmentally appropriate practices. The student is expected to:

(A)  demonstrate safe practices as described in the Texas Safety Standards during classroom and outdoor investigations, including observing a schoolyard habitat; and

(B)  make informed choices in the use and conservation of natural resources by recycling or reusing materials such as paper, aluminum cans, and plastics.

(2)  Scientific investigation and reasoning. The student uses scientific inquiry methods during laboratory and outdoor investigations. The student is expected to:

(A)  plan and implement descriptive investigations, including asking and answering questions, making inferences, and selecting and using equipment or technology needed, to solve a specific problem in the natural world;

(B)  collect data by observing and measuring using the metric system and recognize differences between observed and measured data;

(C)  construct maps, graphic organizers, simple tables, charts, and bar graphs using tools and current technology to organize, examine, and evaluate measured data;

(D)  analyze and interpret patterns in data to construct reasonable explanations based on evidence from investigations;

(E)  demonstrate that repeated investigations may increase the reliability of results; and

(F)  communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion.

(3)  Scientific investigation and reasoning. The student knows that information, critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions. The student is expected to:

(A)  in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;

(B)  draw inferences and evaluate accuracy of product claims found in advertisements and labels such as for toys and food;

(C)  represent the natural world using models such as volcanoes or Sun, Earth, and Moon system and identify their limitations, including size, properties, and materials; and

(D)  connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.

(4)  Scientific investigation and reasoning. The student knows how to use a variety of tools and methods to conduct science inquiry. The student is expected to:

(A)  collect, record, and analyze information using tools, including microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, wind vanes, rain gauges, pan balances, graduated cylinders, beakers, spring scales, hot plates, meter sticks, compasses, magnets, collecting nets, notebooks, sound recorders, and Sun, Earth, and Moon system models; timing devices, including clocks and stopwatches; and materials to support observation of habitats of organisms such as terrariums and aquariums; and

(B)  use safety equipment as appropriate, including safety goggles and gloves.

(5)  Matter and energy. The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used. The student is expected to:

(A)  measure, test, and record physical properties of matter, including temperature, mass, magnetism, and the ability to sink or float;

(B)  describe and classify samples of matter as solids, liquids, and gases and demonstrate that solids have a definite shape and that liquids and gases take the shape of their container;

(C)  predict, observe, and record changes in the state of matter caused by heating or cooling; and

(D)  explore and recognize that a mixture is created when two materials are combined such as gravel and sand and metal and plastic paper clips.

(6)  Force, motion, and energy. The student knows that forces cause change and that energy exists in many forms. The student is expected to:

(A)  explore different forms of energy, including mechanical, light, sound, and heat/thermal in everyday life;

(B)  demonstrate and observe how position and motion can be changed by pushing and pulling objects to show work being done such as swings, balls, pulleys, and wagons; and

(C)  observe forces such as magnetism and gravity acting on objects.

(7)  Earth and space. The student knows that Earth consists of natural resources and its surface is constantly changing. The student is expected to:

(A)  explore and record how soils are formed by weathering of rock and the decomposition of plant and animal remains;

(B)  investigate rapid changes in Earth's surface such as volcanic eruptions, earthquakes, and landslides;

(C)  identify and compare different landforms, including mountains, hills, valleys, and plains; and

(D)  explore the characteristics of natural resources that make them useful in products and materials such as clothing and furniture and how resources may be conserved.

(8)  Earth and space. The student knows there are recognizable patterns in the natural world and among objects in the sky. The student is expected to:

(A)  observe, measure, record, and compare day-to-day weather changes in different locations at the same time that include air temperature, wind direction, and precipitation;

(B)  describe and illustrate the Sun as a star composed of gases that provides light and heat energy for the water cycle;

(C)  construct models that demonstrate the relationship of the Sun, Earth, and Moon, including orbits and positions; and

(D)  identify the planets in Earth's solar system and their position in relation to the Sun.

(9)  Organisms and environments. The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to:

(A)  observe and describe the physical characteristics of environments and how they support populations and communities within an ecosystem;

(B)  identify and describe the flow of energy in a food chain and predict how changes in a food chain affect the ecosystem such as removal of frogs from a pond or bees from a field; and

(C)  describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations.

(10)  Organisms and environments. The student knows that organisms undergo similar life processes and have structures that help them survive within their environments. The student is expected to:

(A)  explore how structures and functions of plants and animals allow them to survive in a particular environment;

(B)  explore that some characteristics of organisms are inherited such as the number of limbs on an animal or flower color and recognize that some behaviors are learned in response to living in a certain environment such as animals using tools to get food; and

(C)  investigate and compare how animals and plants undergo a series of orderly changes in their diverse life cycles such as tomato plants, frogs, and lady bugs.

Source: The provisions of this §112.14 adopted to be effective August 4, 2009, 34 TexReg 5063.

§112.15. Science, Grade 4, Beginning with School Year 2010-2011.

(a)  Introduction.

(1)  Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process."

(2)  Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include patterns, cycles, systems, models, and change and constancy.

(3)  The study of elementary science includes planning and safely implementing classroom and outdoor investigations using scientific processes, including inquiry methods, analyzing information, making informed decisions, and using tools to collect and record information, while addressing the major concepts and vocabulary, in the context of physical, earth, and life sciences. Districts are encouraged to facilitate classroom and outdoor investigations for at least 50% of instructional time.

(4)  In Grade 4, investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations and that methods, models, and conclusions built from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and based on new discoveries are constantly being modified to more closely reflect the natural world.

(A)  Within the natural environment, students know that earth materials have properties that are constantly changing due to Earth's forces. The students learn that the natural world consists of resources, including renewable and nonrenewable, and their responsibility to conserve our natural resources for future generations. They will also explore Sun, Earth, and Moon relationships. The students will recognize that our major source of energy is the Sun.

(B)  Within the living environment, students know and understand that living organisms within an ecosystem interact with one another and with their environment. The students will recognize that plants and animals have basic needs, and they are met through a flow of energy known as food webs. Students will explore how all living organisms go through a life cycle and that adaptations enable organisms to survive in their ecosystem.

(b)  Knowledge and skills.

(1)  Scientific investigation and reasoning. The student conducts classroom and outdoor investigations, following home and school safety procedures and environmentally appropriate and ethical practices. The student is expected to:

(A)  demonstrate safe practices and the use of safety equipment as described in the Texas Safety Standards during classroom and outdoor investigations; and

(B)  make informed choices in the use and conservation of natural resources and reusing and recycling of materials such as paper, aluminum, glass, cans, and plastic.

(2)  Scientific investigation and reasoning. The student uses scientific inquiry methods during laboratory and outdoor investigations. The student is expected to:

(A)  plan and implement descriptive investigations, including asking well-defined questions, making inferences, and selecting and using appropriate equipment or technology to answer his/her questions;

(B)  collect and record data by observing and measuring, using the metric system, and using descriptive words and numerals such as labeled drawings, writing, and concept maps;

(C)  construct simple tables, charts, bar graphs, and maps using tools and current technology to organize, examine, and evaluate data;

(D)  analyze data and interpret patterns to construct reasonable explanations from data that can be observed and measured;

(E)  perform repeated investigations to increase the reliability of results; and

(F)  communicate valid, oral, and written results supported by data.

(3)  Scientific investigation and reasoning. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(A)  in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;

(B)  draw inferences and evaluate accuracy of services and product claims found in advertisements and labels such as for toys, food, and sunscreen;

(C)  represent the natural world using models such as rivers, stream tables, or fossils and identify their limitations, including accuracy and size; and

(D)  connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.

(4)  Scientific investigation and reasoning. The student knows how to use a variety of tools, materials, equipment, and models to conduct science inquiry. The student is expected to:

(A)  collect, record, and analyze information using tools, including calculators, microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, mirrors, spring scales, pan balances, triple beam balances, graduated cylinders, beakers, hot plates, meter sticks, compasses, magnets, collecting nets, and notebooks; timing devices, including clocks and stopwatches; and materials to support observation of habitats of organisms such as terrariums and aquariums; and

(B)  use safety equipment as appropriate, including safety goggles and gloves.

(5)  Matter and energy. The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used. The student is expected to:

(A)  measure, compare, and contrast physical properties of matter, including size, mass, volume, states (solid, liquid, gas), temperature, magnetism, and the ability to sink or float;

(B)  predict the changes caused by heating and cooling such as ice becoming liquid water and condensation forming on the outside of a glass of ice water; and

(C)  compare and contrast a variety of mixtures and solutions such as rocks in sand, sand in water, or sugar in water.

(6)  Force, motion, and energy. The student knows that energy exists in many forms and can be observed in cycles, patterns, and systems. The student is expected to:

(A)  differentiate among forms of energy, including mechanical, sound, electrical, light, and heat/thermal;

(B)  differentiate between conductors and insulators;

(C)  demonstrate that electricity travels in a closed path, creating an electrical circuit, and explore an electromagnetic field; and

(D)  design an experiment to test the effect of force on an object such as a push or a pull, gravity, friction, or magnetism.

(7)  Earth and space. The students know that Earth consists of useful resources and its surface is constantly changing. The student is expected to:

(A)  examine properties of soils, including color and texture, capacity to retain water, and ability to support the growth of plants;

(B)  observe and identify slow changes to Earth's surface caused by weathering, erosion, and deposition from water, wind, and ice; and

(C)  identify and classify Earth's renewable resources, including air, plants, water, and animals; and nonrenewable resources, including coal, oil, and natural gas; and the importance of conservation.

(8)  Earth and space. The student knows that there are recognizable patterns in the natural world and among the Sun, Earth, and Moon system. The student is expected to:

(A)  measure and record changes in weather and make predictions using weather maps, weather symbols, and a map key;

(B)  describe and illustrate the continuous movement of water above and on the surface of Earth through the water cycle and explain the role of the Sun as a major source of energy in this process; and

(C)  collect and analyze data to identify sequences and predict patterns of change in shadows, tides, seasons, and the observable appearance of the Moon over time.

(9)  Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to:

(A)  investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food; and

(B)  describe the flow of energy through food webs, beginning with the Sun, and predict how changes in the ecosystem affect the food web such as a fire in a forest.

(10)  Organisms and environments. The student knows that organisms undergo similar life processes and have structures that help them survive within their environment. The student is expected to:

(A)  explore how adaptations enable organisms to survive in their environment such as comparing birds' beaks and leaves on plants;

(B)  demonstrate that some likenesses between parents and offspring are inherited, passed from generation to generation such as eye color in humans or shapes of leaves in plants. Other likenesses are learned such as table manners or reading a book and seals balancing balls on their noses; and

(C)  explore, illustrate, and compare life cycles in living organisms such as butterflies, beetles, radishes, or lima beans.

Source: The provisions of this §112.15 adopted to be effective August 4, 2009, 34 TexReg 5063.

§112.16. Science, Grade 5, Beginning with School Year 2010-2011.

(a)  Introduction.

(1)  Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process."

(2)  Recurring themes are pervasive in sciences, mathematics, and technology. These ideas transcend disciplinary boundaries and include patterns, cycles, systems, models, and change and constancy.

(3)  The study of elementary science includes planning and safely implementing classroom and outdoor investigations using scientific processes, including inquiry methods, analyzing information, making informed decisions, and using tools to collect and record information, while addressing the major concepts and vocabulary, in the context of physical, earth, and life sciences. Districts are encouraged to facilitate classroom and outdoor investigations for at least 50% of instructional time.

(4)  In Grade 5, investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations and that methods, models, and conclusions built from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and based on new discoveries are constantly being modified to more closely reflect the natural world.

(A)  Within the physical environment, students learn about the physical properties of matter, including magnetism, physical states of matter, relative density, solubility in water, and the ability to conduct or insulate electrical and heat energy. Students explore the uses of light, thermal, electrical, and sound energies.

(B)  Within the natural environment, students learn how changes occur on Earth's surface and that predictable patterns occur in the sky. Students learn that the natural world consists of resources, including nonrenewable, renewable, and alternative energy sources.

(C)  Within the living environment, students learn that structure and function of organisms can improve the survival of members of a species. Students learn to differentiate between inherited traits and learned behaviors. Students learn that life cycles occur in animals and plants and that the carbon dioxide-oxygen cycle occurs naturally to support the living environment.

(b)  Knowledge and skills.

(1)  Scientific investigation and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures and environmentally appropriate and ethical practices. The student is expected to:

(A)  demonstrate safe practices and the use of safety equipment as described in the Texas Safety Standards during classroom and outdoor investigations; and

(B)  make informed choices in the conservation, disposal, and recycling of materials.

(2)  Scientific investigation and reasoning. The student uses scientific methods during laboratory and outdoor investigations. The student is expected to:

(A)  describe, plan, and implement simple experimental investigations testing one variable;

(B)  ask well-defined questions, formulate testable hypotheses, and select and use appropriate equipment and technology;

(C)  collect information by detailed observations and accurate measuring;

(D)  analyze and interpret information to construct reasonable explanations from direct (observable) and indirect (inferred) evidence;

(E)  demonstrate that repeated investigations may increase the reliability of results;

(F)  communicate valid conclusions in both written and verbal forms; and

(G)  construct appropriate simple graphs, tables, maps, and charts using technology, including computers, to organize, examine, and evaluate information.

(3)  Scientific investigation and reasoning. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(A)  in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;

(B)  evaluate the accuracy of the information related to promotional materials for products and services such as nutritional labels;

(C)  draw or develop a model that represents how something works or looks that cannot be seen such as how a soda dispensing machine works; and

(D)  connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.

(4)  Scientific investigation and reasoning. The student knows how to use a variety of tools and methods to conduct science inquiry. The student is expected to:

(A)  collect, record, and analyze information using tools, including calculators, microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, prisms, mirrors, pan balances, triple beam balances, spring scales, graduated cylinders, beakers, hot plates, meter sticks, magnets, collecting nets, and notebooks; timing devices, including clocks and stopwatches; and materials to support observations of habitats or organisms such as terrariums and aquariums; and

(B)  use safety equipment, including safety goggles and gloves.

(5)  Matter and energy. The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used. The student is expected to:

(A)  classify matter based on physical properties, including mass, magnetism, physical state (solid, liquid, and gas), relative density (sinking and floating), solubility in water, and the ability to conduct or insulate thermal energy or electric energy;

(B)  identify the boiling and freezing/melting points of water on the Celsius scale;

(C)  demonstrate that some mixtures maintain physical properties of their ingredients such as iron filings and sand; and

(D)  identify changes that can occur in the physical properties of the ingredients of solutions such as dissolving salt in water or adding lemon juice to water.

(6)  Force, motion, and energy. The student knows that energy occurs in many forms and can be observed in cycles, patterns, and systems. The student is expected to:

(A)  explore the uses of energy, including mechanical, light, thermal, electrical, and sound energy;

(B)  demonstrate that the flow of electricity in circuits requires a complete path through which an electric current can pass and can produce light, heat, and sound;

(C)  demonstrate that light travels in a straight line until it strikes an object or travels through one medium to another and demonstrate that light can be reflected such as the use of mirrors or other shiny surfaces and refracted such as the appearance of an object when observed through water; and

(D)  design an experiment that tests the effect of force on an object.

(7)  Earth and space. The student knows Earth's surface is constantly changing and consists of useful resources. The student is expected to:

(A)  explore the processes that led to the formation of sedimentary rocks and fossil fuels;

(B)  recognize how landforms such as deltas, canyons, and sand dunes are the result of changes to Earth's surface by wind, water, and ice;

(C)  identify alternative energy resources such as wind, solar, hydroelectric, geothermal, and biofuels; and

(D)  identify fossils as evidence of past living organisms and the nature of the environments at the time using models.

(8)  Earth and space. The student knows that there are recognizable patterns in the natural world and among the Sun, Earth, and Moon system. The student is expected to:

(A)  differentiate between weather and climate;

(B)  explain how the Sun and the ocean interact in the water cycle;

(C)  demonstrate that Earth rotates on its axis once approximately every 24 hours causing the day/night cycle and the apparent movement of the Sun across the sky; and

(D)  identify and compare the physical characteristics of the Sun, Earth, and Moon.

(9)  Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to:

(A)  observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements;

(B)  describe how the flow of energy derived from the Sun, used by producers to create their own food, is transferred through a food chain and food web to consumers and decomposers;

(C)  predict the effects of changes in ecosystems caused by living organisms, including humans, such as the overpopulation of grazers or the building of highways; and

(D)  identify the significance of the carbon dioxide-oxygen cycle to the survival of plants and animals.

(10)  Organisms and environments. The student knows that organisms undergo similar life processes and have structures that help them survive within their environments. The student is expected to:

(A)  compare the structures and functions of different species that help them live and survive such as hooves on prairie animals or webbed feet in aquatic animals;

(B)  differentiate between inherited traits of plants and animals such as spines on a cactus or shape of a beak and learned behaviors such as an animal learning tricks or a child riding a bicycle; and

(C)  describe the differences between complete and incomplete metamorphosis of insects.

Source: The provisions of this §112.16 adopted to be effective August 4, 2009, 34 TexReg 5063.

***Learning Outcomes:***

**The general structure of this course engages students in active, inquiry-based science experiences that serve the purposes of a) learning to use best science/health teaching practices according to state and national standards, b) translating science/health concepts into meaningful learning experiences and readily usable curricula for all of the early childhood through elementary school students, and c) developing healthy and physically educated citizens to enjoy their lives. The specific goals of this course are as follows.**

1. To gain understanding of the *nature of science*, the *purpose of education*, and the *nature of learners* so we may be prepared to teach, and to help students learn in a way that is consistent with the discipline of science and with how children learn.
2. To gain understanding of the unique qualities of elementary school students, in terms of intellectual, social and emotional development, so we may be better to prepared to accommodate to their learning needs.
3. To develop in-depth knowledge of the National Science Education Standards and Texas Essential Knowledge and Skills Science Standards (TEKS) and apply these standards in preparing high quality teaching and learning experiences for elementary school students.
4. To gain experience in critically analyzing science content, lessons and curricula, and science education literature (research articles, practitioner articles, Internet sites), for the selection and/or modification of appropriate and meaningful learning experiences for elementary school students.
5. To construct and present original standards-based, inquiry (5E learning cycle) curricula for elementary school students based on science activities abstracted from various sources including texts, laboratory books, and the Internet; and in these lessons, effectively incorporate attention to diversity, authentic assessments, elementary school children’s intellectual, social and emotional development, integration with other school subjects, and technology.
6. To practice-teach, critique, reflect upon, and revise originally developed inquiry-based, standards-based curricula for elementary school students for the improvement of teaching effectiveness.
7. To increase awareness of resources available to teaching professionals by participating in professional organizations and/or informal science educational opportunities.
8. To develop physically educated students who have the knowledge, skills, and confidence to enjoy a lifetime of healthful physical activities.
9. To acquire the health information and skills necessary to become healthy citizens.
10. To identify and describe low socio-economic status populations who are underserved and inhibit the socio-economic factors that have prevented services for low-income children who have had inadequate leaning opportunities.

***University Mission:***

The mission of The University of Texas at Arlington is to pursue knowledge, truth and excellence in a student-centered academic community characterized by shared values, unity of purpose, diversity of opinion, mutual respect and social responsibility. The University is committed to lifelong learning through its academic and continuing education programs, to discovering new knowledge through research and to enhancing its position as a comprehensive educational institution with bachelor’s, master’s, doctoral and non-degree continuing education programs.

***College Mission:***

The mission of the UTA College of Education is to develop and deliver educational programs that ensure the highest levels of teacher, administrator, and allied health science practitioner preparation and performance. As a recognized contributor to the fields of education and allied health science, the College engages in effective teaching, quality research, and meaningful service.   The College is committed to diversity and to the advancement of active teaching and learning in all educational environments and at all levels.

Core Values:

* Effective teaching
* Active learning
* Quality research
* Meaningful service

***College Conceptual Framework:***

The work of the College of Education is grounded in constructivism as a theory of teaching and learning and is done in a spirit of expectation that all involved in the College of Education, whether candidate, faculty or administrator, will hold the following as important:  **Excellence, Student-Centered Environments, Research, Collaboration, Diversity, Technology, Field Experiences and Life-Long Learning.**  
    
*Partners for the Future* serves as the theme of the College of Education and Health Professions and epitomizes the understanding that it takes a village of partners to insure the future of education for all.



***University Policies:***

**Expectations for Out-of-Class Study:**

Beyond the time required to attend each class meeting, students enrolled in this course should expect to spend at least an additional 6 hours per week of their own time in course-related activities, including reading required materials, completing assignments, preparing for exams, etc.

**Grade Grievances:**

Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current undergraduate / graduate catalog. <http://wweb.uta.edu/catalog/content/general/academic_regulations.aspx#10>

**Drop Policy:**

Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance**. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://wweb.uta.edu/ses/fao>).

**American with Disabilities Act (ADA):**

The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the Americans with Disabilities Act (ADA). All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

**Academic Integrity:**

All students enrolled in this course are expected to adhere to the UT Arlington Honor Code:

*I pledge, on my honor, to uphold UT Arlington’s tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.*

*I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.*

Academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form at The University of Texas at Arlington. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University.  “Academic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are 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.” (Regents’ Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2., Subdivision 3.22).

**Student Support Services:**

UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at [www.uta.edu/resources](http://www.uta.edu/resources).

**Student Feedback Survey:**

At the end of each term, students enrolled in classes categorized as lecture, seminar, or laboratory shall be directed to complete a Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student’s feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington’s effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit <http://www.uta.edu/sfs>.

**Electronic Communication:**

UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>

**Final Review Week:**

A period of five class days prior to the first day of final examinations n the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week unless specified in the class syllabi. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. Classes are held as scheduled during this week and lectures and presentations may be given.

**Emergency Exit Procedures:**

Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.

<https://www.uta.edu/policy/procedure/7-6>

**Incomplete Work:**

In the case of incomplete work, a grade of “I” can be awarded **only** in the event of serious circumstances that prevent completing all work.

**Medical Reimbursement:**

University students will be responsible for their own transportation, meals, and health care while participating in the field-based program.

* University students bear the burden of any expenses incurred in conjunction with injuries that may occur during field based classes/components, internship, and residency.
* The University will not reimburse the student for any expenses related to injuries or illness.

**UTA Writing Center:**

• Professionally trained tutors offer help with writing projects at any stage of the process at no cost to UTA students (http:www.uta.edu/owl/).

**Librarian to Contact:**

* Andy Herzog, amherzog@uta.edu

***Departmental Policies:***

**Commitment to Diversity:**

• In our commitment to furthering of knowledge and fulfilling our educational mission, the College of Education at UTA seeks a campus climate that welcomes, celebrates, and promotes respect for the entire variety of human experience.

• In our commitment to diversity, we welcome people from all backgrounds.

• We seek to include knowledge and values from many cultures in the curriculum.

• Dimensions of diversity shall include, but are not limited to the following: race, ethnicity, religious belief, sexual orientation, sex/gender, disability, economic status, cultural orientation, national origin and age.

**General Policies:**

* The professor is available for telephone, e-mail or face-to-face conferences as the need arises. **It is your responsibility to solicit help from the instructor.** This s to be done *before* problems affect your grade – not after.
* The professor reserves the right to make changes in the syllabus as deemed necessary. Students will be notified of any changes.
* All borrowed material must be returned before a final grade will be reported to the university.
* Conduct yourself professionally and ethically as described by the Texas Administrative Code – Educator’s Code of Ethics
* **Do not underestimate the importance of the above requirements.** Earning a grade of “A” for this course requires more than earning “A’s” on all assignments; it additionally requires a demonstration of professional behaviors.
* Courses are for persons registered in the class. Visitors and **children are not permitted in class**. You are responsible for finding appropriate child care.

**Communications**:

* UTA is the official mode of communication for UTA.
* For questions related to the course requirements, assignments, or exams post your questions on the course Q & A Discussion Board on Blackboard.
* For questions related to grades or other questions that are personal in nature, please use the email function within Blackboard. This will come directly to my UTA email account.
* During the week you will receive a response within 24 hours from your instructor. On the weekends, expect to wait 48 hours for a response.
* All official course information and announcements will be posted on the announcement page in Blackboard.
* For questions related to using Blackboard, review the tutorial, look on the Student Resources Page or email the Help Desk at helpdesk@uta.edu.

**Electronic Devices:**

* As a courtesy to your instructor and your classmates, please silence electronic devices such as cell phones, computers and pagers.
* Texting will not be tolerated.
* Cell phones should be on ‘silent’ and vibrating feature should be turned off. A vibrating phone on a desk makes noise.
* Non-course related Internet surfing will not be tolerated
* Internet use is strictly limited to class discussions.

***EC- 6 Program Policies:***

**Attendance:**

At The University of Texas at Arlington, taking attendance is not required. Rather, each faculty member is free to develop his or her own methods of evaluating students’ academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, I follow the attendance policy set by the EC-6 Program. The attendance policy for the EC-6 Program is listed below:

* Attendance is a strong indication of your commitment and professionalism; therefore, attendance will be taken and absences will be seriously considered when assigning final grades. You are expected to be on time and remain engaged during the entire class.
* Class begins promptly at the designated start time and ends when dismissed by the instructor.
* It is your responsibility to sign in before leaving class. If your leave class and did not sign in, you may not e-mail or phone to confirm your attendance. If you do not sign in, you will be counted absent.
* Absences are classified as excused if they are considered an “Authorized Absence” as defined by the UTA Undergraduate Catalog. In addition, illness of student or dependent family member must be documented by a medical professional. The medical confirmation not must contain the date and time of the illness and the medical professional’s confirmation of needed absence.
* Illnesses or injury that require a student to be absent for more than three class meetings might require students to take an “Incomplete” for the course and repeat the course at a later date.
* Three tardies (or leaving the class before class is concluded or a combination thereof) will equal one absence as per the EC-6 Program Policy.
* Pregnancy is an exciting time for parents-to-be, but may require special planning when occurring during your teacher preparation courses. If you are expecting a baby during your Teacher Preparation Courses, Early Field Experiences or Student Teaching semesters, please share this with the EC-6 Program Director as early as possible. Keep in mind that federal guidelines do not recognize pregnancy as a disability; therefore, neither the public schools nor the University are required to make accommodations in your daily activities or the program’s expectations.  Maternity/paternity leave is not granted. Should your pregnancy or delivery prohibit your completion of the required time in Teacher Preparation Courses, Early Field Experiences or Student Teaching semesters UT Arlington faculty will develop a continuation plan for you. Graduation and certification can only occur when all experiences have been completed.
* Candidates who have more than one unexcused absence will have their final grade dropped by one letter.  Each unexcused absence thereafter will also reduce the final grade by one letter (i.e. 3 absences will drop the final grade 2 letters) as per the EC-6 Program Policy.

**Preparation:**

* In order for you to maximize the learning opportunities available on and off-campus, it is necessary that you come prepared, including having read and reflected on the required readings for each and every class. Reading assignments are important and enable students to examine beliefs, explore theories, and debate ideas with fellow students and instructor.

**Participation:**

 Class participation includes but is not limited to:

* Being prepared for class (reading all assignments and having assignments ready to turn in at the beginning of class. Lack of participation gives the appearance of lack of interest and/or preparation.
* Participating in discussions both whole class and small group
* Being mentally engaged in the class lectures as well as discussions. With this requirement, students who choose to use laptop computers in class are to use them for taking notes of lecture and discussion(s).
* Answering e-mail, “surfing the web”, working on assignments for other classes on laptops during class does not demonstrate appropriate participation effort and participation grade may be affected.
* “Texting” is not appropriate during class. Your participation grade will be affected if you choose to “text” during class.
* One way we show respect is to not talk while others (the professor or fellow students) are talking. If you have difficulty demonstrating respect to the class members, your participation grade will be affected. This includes talking during demonstrations, presentations, or videos. You are expected to add depth to discussions at each meeting at the appropriate time.
* You have chosen a profession that requires a commitment to timeliness, responsibility, cooperation, teamwork, prior planning, above average writing and speaking skills, and an attitude of respect for learners with different needs, colleagues and mentors.
* Due to liability issues, consideration for other students, and developmental appropriateness, visitors and children are not permitted in class. (Guest speakers are an exception.)

**Assignments and Assessments:**

* All assignments should be submitted via the Blackboard course webpage.
* All assignments should be submitted with the designated title of the assignment.
* All assignments should be submitted using APA formatting guidelines and a cover sheet including the following: Student’s Name

Assignment Name

University of Texas at Arlington

Dr. Jiyoon Yoon

Date

Academic Honesty Statement (below)

* Teachers must speak and write effectively; therefore, all written assignments must be in good form. Check your spelling and proofread. Points will be deducted for inappropriate content and form. As teachers, we encourage students to edit the work of classmates prior to submitting for a grade.
* Assignments submitted after the designated date and time are considered late. The instructor will deduct 10% of the value of the assignment for each day it is late.
* All assignments are due before the scheduled final examination for the course. Assignments submitted during or after the final examination will not be graded or considered in the final course grade.
* Candidates are required to attach and sign the program academic integrity statement with each assignment submitted for a course requirement.
* The university’s final exam schedule is available on the university web-site prior to the beginning of the academic year. Candidates are required to take the final examination for this course on the scheduled date and time.

**Grades and Learning**:

* **No** extra credit work will be given.
* Because learning is important you may be asked to reconsider and/or amend assignments completed that do not demonstrate an effective level of growth on your part.
* You will not be allowed to resubmit work that earned a low grade because the directions were not followed.

**Concerns:**

* Should problems or concerns arise, it is your responsibility to solicit help.
* This is to be done before problems affect your grade – not after.

**Video Recording**

* Students may record the lecture in auditory form and make notes from the recordings for their personal use only.  Many cell phones have video capability but video recording is not permitted as the professor and students have not given express written consent to be videoed.  (Anyone appearing in such a video would have to give written consent to having her/his image displayed in any manner.) Students may not transmit, copy, or reproduce recordings in any format or share recordings or transcriptions with others.

**Academic Honesty Statement:**

|  |
| --- |
| The following statement is to be included on the cover page of each written assignment submitted  for credit in all ELED course. For assignments submitted electronically, the candidate’s name may be word-processed on the signature line. The posting of the statement with the candidate’s name through the candidate’s email, Blackboard, or TK-20 account t is recognized as the candidate’s signature.  **\*\*\*\*\*\*\*\*\*\***  **On my honor, I have neither given nor received aid on this assignment. I acknowledge that misrepresenting another’s work as my own is a violation of the UTA Academic Integrity Policy.**  **I have not submitted the attached work as an assignment for any other course or field activity.**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Signature Date** |

**Professional Dispositions:**

***Each student/candidate in the College of Education and Health Professions of UT Arlington will be evaluated on Professional Dispositions by faculty and staff. These dispositions have been identified as essential for a highly-qualified professional. Instructors and program directors will work with students/candidates rated as “unacceptable” in one or more stated criteria. The student/candidate will have an opportunity to develop a plan to remediate any digressions.*** College of Education and Health Professions, approved 2/2013; Adopted by UTeach Program 3/2013.

The full document regarding dispositions is posted in Blackboard.

***Late Work:***

Complete all assignments by the due dates. The final due date for each session can be found in the schedule and the assignment table on BB. After the due date, assignments are considered late but may be turned-in for partial credit at the discretion of the instructional team. To be clear, **late work** is discouraged and subject to a penalty of a 25% deduction of your total earned points for the assignment. **Late work is not accepted for the last assignment.** Please do not wait until the last minute to submit your work and then realize that because of a technical (or other type) problem you are unable to submit your work on time. If you have problems uploading assignments, you should contact [helpdesk@uta.edu](mailto:helpdesk@uta.edu). Again, emailed work will NOT be accepted. All work for this course must be submitted on BB and TK 20.

***Course Assignments:***

**Group Science Lesson Presentation based on 5Es (20pts):**

* Rationale: Science lesson presentation is for improving your classroom experiences as a science and health teacher and for sharing your ideas with your colleagues. You can choose a topic and an activity for science lesson from the textbooks and websites (topics and activities also can find from handouts) and build your own lesson plan based on 5Es. All of your laboratory experiences must be related to real life. Topics and simple lesson plan format with 5Es will be presented in the class and on the Blackboard.
* Steps to do: a) In group (5 members in a group), choose a topic and an activities for your group science lesson, b) develop a science lesson based on 5Es and post the lesson plan on the discussion of Blackboard (Whenever you post the lesson plan, you also need to write what each of the group members does in developing the science lesson); c) compare the lesson in each class when you learn a new instructional component, revise your lesson, and post your learning on the discussion of BB; d) present the finalized lesson to the class in a movie clip for less than 5 minutes and post the finalized lesson and the movie clip link on BB.

\*When the first lesson that is very closed to their finalized lesson, the group will be awarded with extra credits.

**Community Science News Paper (10pts):**

* Rationale: The Community Science News Paper provides you the access to the world beyond the classroom so that you will see the relevance and usefulness of science both in and out of school, delivering “meaningful” science learning experiences to you and your students. Changing the educational experiences of children by moving beyond the classroom walls can diversify the array of learning opportunities and connect school lessons with daily life and real problems. By integrating community resources into children’s learning, you can effectively develop interdisciplinary units for your children in their real lives.
* Steps to do: After visit community science, post 1) your KWL on linoit.com (<http://en.linoit.com/>) 2) with at least one photo. You can submit this in group (up to five members in a group) or individually.

**Musical Concert (20pts):**

* Rationale: Through this activity, you are able to a) practice the guided inquiry-based teaching method; b) understand the scientific principles of how things work integrating with other subjects; c) think creatively about the world around them; and d) develop practical solutions to everyday problems.
* Steps to do: In group (same group with the lesson/the unit), a) develop a story based on the topic of the unit; b) create a script (Duration is about 10 -15 minutes); c) add science songs/music; d) use technology for the stage background and background music/sound; e) play and record the musical; f) upload it on Youtube (Uploading instruction <https://support.google.com/youtube/topic/2888648?hl=en&ref_topic=16547>); and g) submit the musical link and the script on BB.
* Contents for the script: a) Purposes of the musical; b) science concepts in the musical; c) casts; d) plot; e) script lines categorized by scenes; f) stage setting (including what kind of technology is used)

**Individual Science Lesson on TK20 (20pts):**

* Rationale: With the effective unit planning and lesson presentation with groups, you can have skills and knowledge of how to combine and adapt variety of resources/learning and how to use them for your own classroom. This individual lesson will show all the best knowledge and skills that you have achieved through the semester.
* Steps to do: a) Discuss with your cooperative teacher about what topic(s) of science you will teach science (if you do not have a chance to teach science during practicum, then you can choose any new topic on your own, different from your group lesson topic); b) Develop Lesson plan(s) based on the FULL lesson plan format (you will have this on BB); c) review the lesson plan(s) with your cooperative teacher or your colleagues and post it on the discussion of BB with Reflection (The reflection questions will be provided in the class).

**Final Course Reflection (20pts):**

* Rationale: Teaching is a reflective process, as such, for the final “exam,” you will be completing a reflection over your experiences in class and in the field during this semester. The purpose of this assignment is to help you reflect on your science learning experiences and to discover the ways in which you continue to be influenced by your own personal experiences. Specific details and prompts will be posted to Blackboard. Answer the provided questions in a 3-4 page paper using a narrative form. Please use 1” margins, 12 point font, and double-space.

**Attendance/Group Participation (10pts):**

* Rationale: By assessing your progress not only by the assignments after class but also during class, your performance can be evaluated more accurately.
* Rubrics:
* Class Attendance (5pts)

Whenever you are absent (in class and in practicum), you are going to lose 1 point. If you miss more than 3 days you are required to repeat the course. For a making-up, you need to provide: a) a proof that shows your reasons why you are absent. When you need to be absent because of your family or health, you have to provide doctor's statement or any other proof. Otherwise, you cannot have any chance to make up the class, assignment, and test; and (b) a 5 page-long, double spaced paper about what you learned related to science education during your being absent. But if you miss more than 3 days you are required to repeat the course.

* Activity Participation (5 points)

You need to prepare yourself for the class. When you do not respond to the requests asked by the instructor, you are going to lose 1 pt. You are expected actively to engage in all the class activities. The instructor will have a checklist for your progress during the class. When you are not actively engaged, you will loose points.

***EC-6 Generalist Topics and Activities for ELED and BEEP 4312:***

**The following table shows how the topics and the activities are following the TExES & TEKS.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Topic | Description | Competency from TExES | TEKS | Activity |
| Safe & Proper Lab Processes | manage learning activities, tools, materials, equipment & technologies to ensure safety | 24 | K: 1, 4; First: 1, 4; Second: 1, 4; Third: 1, 4; Fourth: 1, 4; Fifth: 1, 4; Sixth: 1, 4 | All activities will discuss safety and management of materials |
| Scientific Inquiry | history and nature of science, process and role of scientific inquity and its role in science instruction | 25 | K: 2, 3, 4; First: 2, 3, 4; Second: 2, 3, 4; Third: 2, 3, 4; Fourth: 2, 3, 4; Fifth: 2, 3, 4; Sixth: 2, 3, 4 | Checks Activity |
| Impact on Daily Life & Environment | how science impacts daily lives of students and interacts with and influences personal and societal decisions | 26 | Fifth: 1; Sixth: 3 | Turtle Hurdles (PPS, p. 161); Oil Spill! (PPS, p. 177) |
| Unifying Concepts & Process in Science | unifying concepts and processes that are common to all sciences | 27 | K: 2, 3, 4; First: 2, 3, 4; Second: 2, 3, 4; Third: 2, 3, 4; Fourth: 2, 3, 4; Fifth: 2, 3, 4; Sixth: 2, 3, 4 |  |
| Theory & Practice of Science Teaching | theoretical and practical knowledge about teaching science and about how students learn science | 28 |  |  |
| Assessments in Science Learning | varied and appropriate assessments | 29 |  |  |
| Physical Science: Forces & Motions | forces and motions and their relationships | 30 | K: 6; First: 6; Third: 6; Fourth: 6; Fifth: 6; Sixth: 8 | The Secrets of Flight (PPS, p. 345); Sheep in a Jeep (PPS, p. 191); Roller Coasters (MPPS, 133) |
| Physical Science: Matter | physical and chemical properties and changes in matter | 31 | K: 5; First: 5; Second: 5; Third: 5; Fourth: 5; Fifth: 5; Sixth: 5, 6 | Earthlets (PPS, p. 37); Chemical Change Café (PPS, p. 227); That Magnetic Dog (MPPS, p. 123) |
| Physical Science: Energy & Matter | energy and interactions between matter and energy | 32 | K: 6; First: 5; Second: 6; Third: 5; Fourth: 6; Fifth: 6; Sixth: 7, 8 | Batteries Included (PPS, p. 325); Sounds of Science (PPS, p. 217); Mirror, Mirror (MPPS, p. 147) |
| Physical Science: Energy Transformations | energy transformations and the conservation of matter and energy | 33 | K: 5; Third: 6; Fifth: 6; Sixth: 9 |  |
| Life Science: Living Things | structure and function of living things | 34 | K: 9, 10; First: 9, 10; Second: 9, 10; Third: 10; Fourth: 10; Fifth: 10; Sixth: 12 | Name That Shell! (PPS, p. 55); Bugs! (PPS, p. 307) |
| Life Science: Reproduction | reproduction and the mechanisms of heredity | 35 | K: 10; First: 10; Second: 10; Third: 10; Fourth: 10; Fifth: 10 |  |
| Life Science: Adaptations | adaptations of organisms and the theory of evolution | 36 | Third: 10; Fourth: 10; Fifth: 10 |  |
| Life Science: Organisms & the Environment | relationships between organisms and the environment | 37 | First: 9; Second: 9; Third: 9; Third: 10; Fourth: 9, 10; Fifth: 9; Sixth: 12 | Mystery Pellets (PPS, p. 119) |
| Earth & Space Science: Earth Systems | structure and function of earth systems | 38 | K: 7; First: 7, 8; Second: 7; Third: 7; Fourth: 7; Fifth: 7; Sixth: 10 | Grand Canyon (PPS, p. 277); If You Find a Rock (MPPS, p. 157) |
| Earth & Space Science: Earth Systems | cycles in earth systems | 39 | K: 8; First: 8; Second: 8; Third: 8; Fourth: 8; Fifth: 8; Sixth: 10 | The Changing Moon (PPS, p. 247) |
| Earth & Space Science: Weather & Climate | the role of energy in weather and climate | 40 | K: 8; First: 8; Second: 8; Third: 8; Fourth: 8; Fifth: 8 |  |
| Earth & Space Science: Solar System | characteristics of the solar system and the universe | 41 | K: 8; First: 8; Second: 8; Third: 8; Fourth: 8; Fifth: 8; Sixth: 11 | The Changing Moon (PPS, p. 247) |

PPS = Picture Perfect Science (grades 3-6); MPPS = More Picture Perfect Science (grades K-4)

***Grade Calculation:***

**Students are expected to keep track of their performance throughout the semester and seek guidance from available sources (including the instructor) if their performance drops below satisfactory levels.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Point Maximum** | **Assessment** | **ACEI/NCATE Standards** | **Generalist EC-6 Standards** | **Due** |
| 10 | Attendance/Group Participation | 3a, 3b, 3c, 5a, 5b, & 5d | I, II, III, IV, V, VI |  |
| 20 | Science Lesson Presentation with 5Es | 3a, 3b, 3c, 5a, 5b, & 5d | I, II, III, IV, V, VIII, IX, X, XI | Oct 16th & 23rd |
| 10 | Community Science News Paper | 3a, 3b, 3c, 5a, 5b, & 5d | VI, VII, VIII, IX, X, XI | Oct 30th |
| 20 | Individual Lesson with reflection (on TK20) | 3a, 3b, 3c, 5a, 5b, & 5d | I, II, III, IV, V, VIII, IX, X, XI | Nov 30th |
| 20 | Musical | 3a, 3b, 3c, 5a, 5b, & 5d | III, IV, VIII, IX, X, XI | Dec 8th |
| 20 | Final Course Reflection |  | I, II, III, IV, V, VIII, IX, X, XI | Dec 8th |
| **Total 100 Points** |  |  |  |  |

Final numerical valuations relate to letter grades and points as follows:

A = 93 – 100% (100-93 points)   
B = 85 – 92% (92-85 points)   
C = 77 – 84% (84-77 points)   
D = 70 – 76% (76-70 points)   
F = Below 70% (69 points and below)

***Tentative lecture/topic schedule***:

As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course.In order to facilitate the needs of students in the classroom, additional materials and/or assignments will be added based on feedback and assessments made throughout the semester. These assignments will be posted on Blackboard and announced during class.

|  |  |  |
| --- | --- | --- |
| Class Meeting  Friday | Topic | **Assignment** |
| Class 1  **8/21** | Who are we?   * Introductions * Attitude test * Expectations – Drawing/writing a letter * [16 trends](http://staffdev.henrico.k12.va.us/la/files/16%20trends.pdf) | Discussion Board on BB-  [16 trends](http://staffdev.henrico.k12.va.us/la/files/16%20trends.pdf) |
| Class 2  **8/28** | How much science does a science teacher need to know?   * Definition of Science – Mystery Boxes * History of science education * Characteristics of Science * Measurement Systems * Non-experimental/experimental design | Reading: Chapter 1 (Marek, E.A. & Cavallo, A.M., 1997).  [Nature of Science](http://www.project2061.org/publications/sfaa/online/chap1.htm)  [Timeline of Science Education History](http://hechingerreport.org/content/timeline-important-dates-in-u-s-science-education-history_5063/)  [Characteristics of Science](http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&ved=0CFIQFjAD&url=http%3A%2F%2Fwww.angelo.edu%2Ffaculty%2Fcadkins%2FAnatIntroFall05.doc&ei=vQoUUr6IB-Kf2QXC_oHYBw&usg=AFQjCNGjqA54rksumWm6MSGsfDX1yeqDYw&sig2=6UOnjrTpRwROP0dRomy2uQ&bvm=bv.50952593,d.b2I)  [Teaching Science Process Skills](http://www.longwood.edu/cleanva/images/sec6.processskills.pdf) |
| Class 3  **9/4** | How can you be an inquiry-based science teacher?   * Inquiry * Questioning * Bloom's Taxonomy * Creative Problem Solving * Being a scientist | Reading: Chapter 2, 4, & 6 (p128-134)  [Harwood, W. S. (2004). A new model for Inquiry by William S. Harwood, Journal of College Science Teaching, Vol. 33. No 7.](http://tab-sa.org/cd2012/00%20Science/Alison%20-%20Matter%20and%20Materials/Teacher%20Reference%20Document%20--%20Activity%20Model%20of%20Scientific%20Inquiry.pdf)  [Osborn: Creative Problem Solving Process](http://www.idea-sandbox.com/destination/2007/10/osborn-creative-problem-solving-process/).  [Moving Students from information Recitation to Information Understanding](http://www.nsta.org/publications/news/story.aspx?id=53416). |
| Class 4  **9/11** | How will you plan a lesson? | Choose a topic and an activities from the provided activities (EC-6 generalist topics and activities), textbook, or website, develop your group own lesson, post it on BB |
| Class 5  **9/18** | How did you plan a lesson?   * Misconception * Discrepant Events * 5Es * FOSS * National & State Standards (NSES/NGSS/NHES/NSPE/ TEKS) * Lesson Planning | Reading: Chapter 5 (105-115) & 8  [TEKS-Science](http://ritter.tea.state.tx.us/rules/tac/chapter112/ch112a.html)  [NSES](http://www.nap.edu/openbook.php?record_id=4962)  [Misconception in Science](http://dese.mo.gov/divimprove/curriculum/science/SciMisconc11.05.pdf)  [Use of Discrepant Events](http://repository.nie.edu.sg/jspui/bitstream/10497/1546/1/TL-13-1-51.pdf)  [FOSS](http://www.fossweb.com/) |
| Class 6  **9/25** | How can you take care of diverse science learners?   * Understanding Intellectual Development and Qualities of Elementary Children * Multiple intelligence * Multiculturalism * Gender awareness * Low SES status students * Parent involvement * AAC Device * Diverse/Multicultural Lesson * Physical Health Education Lesson | Reading: Chapter 3  [Worldwise School](http://www.peacecorps.gov/wws/" \t "_blank)  [Flat Stanley Project](http://www.flatstanleyproject.com/" \t "_blank)  [Science Classrooms for Students With Special Needs](http://files.eric.ed.gov/fulltext/ED433185.pdf)  [400 years of women in Science](http://www.astr.ua.edu/4000WS/newintro.html" \t "_blank) [Steve Spanglerscience](http://www.stevespanglerscience.com/" \t "_blank)  [World Map](http://www.lib.utexas.edu/maps/world.html" \t "_blank)  [Enhancing the communication skills of newly-arrived Asian American students](http://www.ericdigests.org/1999-1/asian.html" \t "_blank)  [Methods for communicating with Parents](http://www.adi.org/journal/ss05/Graham-Clay.pdf)  [National PTA Standards](http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCQQFjAA&url=http%3A%2F%2Fjohnwgardnertestsite.pbworks.com%2Ff%2FS3%2BTool%2B-%2BNational%2BStandards%2Bfor%2BParent%2BInvolvement.doc&ei=2fQnT83WCOfi2QXDlJXpAg&usg=AFQjCNEsOwTS_RIEmQpSrynkYcBKNJQdKQ" \t "_blank)  [Parent Involvement](http://masspta.org/files/legislative/nclbRecommendations.pdf) |
| Class 7  **10/2** | What is an interdisciplinary approach?   * STS * Integration of other subjects (health education, social studies, math, language art, music, and so on) * Paper Window (Art & Music) * Musical Concert (Song, tech for stage) * Science Song Contest | Reading: Chapter 5 (115-127) & Integrating Text Chapter 2 (Hammerman & Musical)    [Case studies of Multidisciplinary Approach](http://scholar.lib.vt.edu/ejournals/JTE/v6n2/pdf/wicklein.pdf)  [Meaning of integration of Science and Math](http://www.project2061.org/publications/designs/online/pdfs/reprints/8_davisn.pdf)  [Ten Ways to Integrate](http://www.ascd.org/ASCD/pdf/journals/ed_lead/el_199110_fogarty.pdf)  [STS](http://go.hrw.com/resources/go_sc/gen/HSTPR001.PDF) |
| Class 8  **10/9** | Population workshop  Being a Scientist  Puzzling Lesson Plan – Review & Compare | [Galileo Project](http://galileo.rice.edu/)  [King Sejong, The Great](http://www.koreanhero.net/kingsejong/) |
| Class 9  **10/16** | Group Science Lesson Presentations 1-6 | Group Science Lesson Presentations |
| Class 10  **10/23** | Group Science Lesson Presentations 7-13 | Group Science Lesson Presentations |
| Class 11  **10/30** | Community Science – [Track of dino at Glen Rose, TX](http://www.wfaa.com/news/local/Scientist-dig-deeper-into-dino-tracks-in-Glen-Rose-166911036.html), FWMSH, Perot Museum, or any community science place), CAST (conference for the Advancement of Science Teaching) or any other science conference/workshop/Webinar | Science News Paper with KWL (What I know; What I want to learn; What I learned) |
| Class 12  **11/6** | How can you use technology to teach science?   * Science education software * NETS for Teachers * Evaluating Effective Educational Technology * Motion detector and TI-84 graphing * SmartBoard/iPad * Social Network * Cyberbulling (low SES students) | Reading: Chapter 6 (134-140)  [Educational Technology with Early Learners](http://www.naeyc.org/yc/files/yc/file/201205/McManis_YC0512.pdf)  [Learning with Technology](http://www.dcmp.org/caai/nadh176.pdf)  [Evaluating effective educational technology](http://www.act.org/research/policymakers/pdf/school_tech.pdf)  [National Educational Technology Standards for Teachers](http://www.iste.org/standards/nets-for-teachers)  [Instructional Technology in Science](http://scimathmn.org/stemtc/resources/science-best-practices/instructional-technology-science)  [Science iPad Apps](http://appsineducation.blogspot.com/p/science-ipad-apps.html)  [Cyberbullying Research Summary](http://www.cyberbullying.us/cyberbullying_and_suicide_research_fact_sheet.pdf) |
| Class 13  **11/13** | How do you assess your science classroom?   * Assessment * Concept Map * [STAAR](http://www.tea.state.tx.us/student.assessment/staar/ac/) | Reading: Chapter 7 & & Integrating Text Chapter 3 (Hammerman & Musical) [Assessment in Science Education](http://www.nap.edu/openbook.php?record_id=4962&page=75)  [Using Concept maps](http://www.cmu.edu/teaching/assessment/assesslearning/conceptmaps.html)  [Authentic Assessment](http://www.jcu.edu/education/dshutkin/ed587/articles/Authentic_assessment.pdf) |
| Class 14  **11/20** | How do you manage your science classroom?   * Classroom Management techniques * Safety * Maslaw’s Hierarchy of Needs * Meeting diverse need of students (special and low SES students) | Reading: Chapter 6 (137-140)  [Classroom Management Techniques](http://www2.uwstout.edu/content/lib/thesis/2002/2002kaliskap.pdf)  [Effective Classroom Management](http://ptgmedia.pearsoncmg.com/images/9780137082117/downloads/Jones-ch01.pdf)  [Safety](http://www.flinnsci.com/Sections/Safety/safety.asp" \t "_blank)  [TEA Safety Standards & Laws/Rules](http://www.tea.state.tx.us/index2.aspx?id=5483)  [Discipline & Safety](http://www.ibtimes.com/kiera-wilmot-expelled-scientists-teachers-outraged-harsh-punishment-teens-experiment-accident)  [Classroom Management](http://www.ipl.org/div/pf/entry/48536#management)  [Research on Closing the achievement between high & low SES students](http://bdgrdemocracy.files.wordpress.com/2011/08/ses_overview.pdf) |
| **11/27** | *Thanksgiving Break* | Submit your Individual Lesson (on TK20) by Sunday of the Thanksgiving week (11/30) |
| Class 15  **12/8 (Mon)** | Final –Final Course reflection & Musical Contest (on BB) | Submit your **Final Course Reflection** & your group video link of the **musical play** on BB |

***Recommended Readings:***

Ashbrook. (2011). Ongoing Inquiry, Science and Children, 22-24

Banchi & Bell (2008). The Many Levels of Inquiry, Science and Children, 26-29.

Buttemer (2006). Inquiry on Board, Science and Children, pp. 34-39,

Campbell and Williams-Rossi. (2012). The Way They Want to Learn, The Science Teacher, pp. 52-56

Coffey, J., Douglas, R., & Stearns, C. (2008). *Assessing Science Learning; Perspectives from research and practice*. National Science Teachers Association: NSTApress.

Corder & Slykhuis. (2011). Shifting to an Inquiry Experience, Science and Children, 60-63

Duschl, R.A. & Grandy, R.E. (2008). *Teaching scientific inquiry; Recommendations for research and implementation.*  AW Rotterdam, The Netherlands: Sense Publishers

Everett & Moyer. (2009). Literacy in the Learning Cycle, pp. 48-52

Harwood, W. S. (2004). A new Model for Inquiry by William S. Harwood, Journal of College Science Teaching, Vol. 33. No 7.

Larwa. (2001). Rice is Rice. Right?, Science and Children, pp. 24-27.

Llewellyn, D. (2007), 3rd Ed. *Inquire within; Implementing inquiry-based science standards in grades 3-8*. Thousand Oaks, CA: Corwin Press.

Lott. (2011). Fire up the Inquiry, Science and Children, 29-33.

Martin-Hansen & Johnson. (2006). Think-Alouds in Inquiry Science, Science and Children, pp. 56-59.

Roth, W-M. (1996). Teacher Questioning in an Open-Inquiry Learning Environment: Interactions of

Context, Content and Student Responses. *Journal of Research in Science Teaching, 33* (7): 709-736.

Sandifer. (2011). Inquiry Science and Active Reading, , Science and Children, pp. 47-51

Simpson. (2010). Personalized Inquiry, Science and Children, 36-39.

Subramaniam. (2010). Clash of the Titans, , Science and Children, 38-43

Tilgner, P. (1990). Avoiding Science in the Elementary School. *Science Education* 74 (4): 421-431.

West, S. (2010). Analysis of Descriptive, Comparative and Experimental Scientific Research Designs in the TEKS, The Texas Science Teacher, Vol 39, No. 1.

Zenchak & Lynch. (2011). What’s the Next Step?, Science and Children, pp. 50-54

Library Home Page [http://www.uta.edu/library](http://www.uta.edu/library" \t "_blank)

Subject Guides [http://libguides.uta.edu](http://libguides.uta.edu" \t "_blank)

Subject Librarians [http://www.uta.edu/library/help/subject-librarians.php](http://www.uta.edu/library/help/subject-librarians.php" \t "_blank)

Database List [http://www.uta.edu/library/databases/index.php](http://www.uta.edu/library/databases/index.php" \t "_blank)

Course Reserves [http://pulse.uta.edu/vwebv/enterCourseReserve.do](http://pulse.uta.edu/vwebv/enterCourseReserve.do" \t "_blank)

Library Catalog [http://discover.uta.edu/](http://discover.uta.edu/" \t "_blank)

E-Journals [http://liblink.uta.edu/UTAlink/az](http://liblink.uta.edu/UTAlink/az" \t "_blank)

Library Tutorials [http://www.uta.edu/library/help/tutorials.php](http://www.uta.edu/library/help/tutorials.php" \t "_blank)

Connecting from Off- Campus [http://libguides.uta.edu/offcampus](http://libguides.uta.edu/offcampus" \t "_blank)

Ask A Librarian [http://ask.uta.edu](http://ask.uta.edu/" \t "_blank)

The following URL houses a page where we have gathered many commonly used resources needed by students in online courses: [http://www.uta.edu/library/services/distance.php](http://www.uta.edu/library/services/distance.php" \t "_blank)

Finally, the subject librarian for your area can work with you to build a customized course page to support your class if you wish. For examples, visit [http://libguides.uta.edu/os](http://libguides.uta.edu/os" \t "_blank) and [http://libguides.uta.edu/pols2311fm](http://libguides.uta.edu/pols2311fm" \t "_blank). If you have any questions, please feel free to contact the Coordinator for Information Services, Suzanne Beckett, at [sbeckett@uta.edu](mailto:sbeckett@uta.edu) or at 817.272.0923.