

Teaching Science in Intermediate and Middle Grades

(MSED 4311, 21416, Spring 2018)

Department of Teacher Education
College of Education, University of Texas at El Paso

Class meeting time: Wednesdays, 12:00 pm – 2:50 pm
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“The object of education is to prepare the young to educate themselves throughout their lives.”
~Robert Maynard Hutchins~

Course Description

This course discusses various methods and strategies for teaching intermediate and middle grades students. Designing and implementing inquiry-based curriculum and activities in real contexts (i.e., local museums, schools) are at the core of this course. Students are provided with opportunities to learn, evaluate, design, and implement inquiry-based lessons through integrating theoretical and practical perspectives. During the course, students are offered opportunities to practice what they learned in informal science education settings.

Course Introduction

This course draws on theoretical and practical perspectives to examine various instructional methods and resources to teach inquiry-based science in intermediate and middle grades. In the theoretical part, learning theories and research-based practice are presented and discussed. To apply the theoretical knowledge, students are provided with opportunities to examine, design and implement lesson plans that correspond to Texas Essential Knowledge and Skills (TEKS) in a collaborative and supportive environment. In the practical part, students have opportunities to interact with middle school students to gain situated experiences in teaching science. The mechanism and integration of theoretical and practical perspectives in this course allow students to experience a process that can serve as a lifelong learning model to help their professional development in their science teaching careers. This course is designed to help pre-service teachers to achieve the Texas Examinations of Educator Standards (TExES) as indicated in the followings:

- Science Standard I: 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.
- Science standard II: The science teacher understands the correct use of tools, materials, equipment and technologies.
- Science standard III: The science teacher understands the process of scientific inquiry and its role in science instruction.
- Science standard IV: The science teacher has theoretical and practical knowledge about teaching science and about how students learn science.
- Science standard V: The science teacher knows the varied and appropriate assessments and assessment practices to monitor science learning

- Science standard XI: The science teacher knows unifying concepts and processes that are common to all sciences.

Test Framework (Generalist 4-8) – Domain IV (See details for each competency in Appendix)

The course is designed to help students to become competent science teachers who can provide the best learning opportunities for their students. At the end of the course, successful students will develop the following competences:

- 1) Competency 036: The teacher understands how to manage learning activities to ensure the safety of all students
- 2) Competency 037: The teacher understands the correct use of tools, materials, equipment, and technologies
- 3) Competency 038: The teacher understands the process of scientific inquiry and the history and nature of science
- 4) Competency 056: The teacher has theoretical and practical knowledge about teaching science and about how students learn science
- 5) Competency 057: The teacher understands the process of scientific inquiry and its role in science instruction
- 6) Competency 058: The teacher knows the varied and appropriate assessments and assessment practices to monitor science learning in laboratory, field, and classroom settings

Student Learning Outcomes:

The course is designed to help students to become competent science teachers who can provide the best learning opportunities for their students. At the end of the course, successful students will be able to:

- 1) Identify and evaluate various resources to support teaching
- 2) Understand science content concepts associated with the applicable TEKS
- 3) Understand and implement standards for science excellence (TEXES, National Science Education Standards)
- 4) Design and implement a quality scientific inquiry curriculum
- 5) Develop the ability to assist students in designing investigations using scientific inquiry
- 6) Appreciate and learn from theoretical and practical perspectives
- 7) Collaborate with other teachers to create the best learning opportunities for their students
- 8) Monitor one's learning and identify ways for improvements

* Assessment of course objectives will be accomplished by assessing the student's course assignments and participation.

UTEP EDGE Alignments:

This course will help students gain experience of (1) learning communities, (2) creative activity, (3) community engagement, and (4) student leadership and help students enhance skills of (1) leadership, (2) problem-solving, (3) communication, (4), and (5) critical thinking.

Readings and Handouts

- 1) Reading 1: Llewellyn, D. (2007). Making the most of concept maps. *Science Scope*, 30 (5), 74-77.
- 2) Reading 2: Llewellyn, D. & Adams, A. (2013). Turning the science classroom into a courtroom-Engaging in argument from evidence. *Science Scope*, 36 (9), 14-20.
- 3) Reading 3: Ansberry, K., & Morgan, E. (2010). Picture-perfect science lessons. National Science Teachers Association. (Chapter 4: BSCS 5E Instructional Model)

- 4) Reading 4: Waldrop, B., & Prain, V. (2011). Teaching and assessing the nature of science: how to effectively incorporate the nature of science in your classroom. *The Science Teacher*, 78(6), 56-60.
- 5) Reading 5: Hsu, P.-L. (2016). Use multiple representations to teach science. *Science Scope*, 40(2), 52-59.
- 6) Reading 6: Day, M., Stobaugh, R., Tassell, J., & Neiman, N. (2012). Creating assessments support science that inquiry. *Science Scope*, 35(8), 54-59.

* Additional handouts will be made available in classes. These documents play key roles in guiding your assignments and projects. Changes may be made in classes. Please make sure you read these documents in time.

Resources

- Concept map tool: <https://bubbl.us/>
- Learning Science Through Inquiry (Annenberg Learner): <http://www.learner.org/workshops/inquiry/about/overview.html>
- Web-based Inquiry Science Environment: <https://wise.berkeley.edu/>
- National Science Education Standards (NSES): http://www.nap.edu/openbook.php?record_id=4962
- Texas Education Agency (TEA): <http://www.tea.state.tx.us/index.aspx>
- Texas Essential Knowledge and Skills (TEKS): <http://www.tea.state.tx.us/index2.aspx?id=6148>
- Texas Assessment of Knowledge and Skills (TAKS): http://www.tea.state.tx.us/index3.aspx?id=3839&menu_id=793
- State Board for Educator Certification (SBEC): <http://www.tea.state.tx.us/index2.aspx?id=2147489433>
- Texas Examinations of Educator Standards (TExES): <http://www.texas.ets.org/texas/>
- TExES Preparation Manuals: <http://www.texas.ets.org/texas/prepMaterials/>
- Pedagogy and Professional Responsibilities (PPR) Standards: http://www.tea.state.tx.us/index2.aspx?id=5938&menu_id=2147483671&menu_id2=794
- English Language Proficiency (ELP) Standards: http://www.tea.state.tx.us/index2.aspx?id=5938&menu_id=2147483671&menu_id2=794

Principles for this Course

- **Theory and Practice Integration**
In the course, theoretical and practical perspectives on inquiry-based curriculum are pursued and discussed. Students are informed by both perspectives to learn instructional strategies and design their lesson plans in ways that work best for their students. The experience of theory and practice integration can help students to experience a lifelong learning model that can benefit their teaching careers for a long run.
- **Community of Practice**
Community of practice is a concept that depicts how people work together for their common interests and learn from each other's expertise to develop themselves personally and professionally. To form a community of practice in this course, students are provided with various opportunities to communicate their opinions, share their learning, and help each other improve. In particular, the Science Circus Day is served as a common goal that strives students to prepare themselves, help each other, and collaborate to achieve the goal collectively.
- **Service Learning**
Service learning is a teaching method that aims to enrich learning experience and strengthen communities through services. This course designs two main activities for students to contribute what they learn in UTEP back to El Paso communities, including middle school teachers, students,

families, schools, etc. Students in this course will hold two events of Science Circus Day in Centennial museum for teachers, students, and families to learn and experience science inquiry publicly. These two activities in the course not only can help students learn but also serve the El Paso community in a meaningful way.

Assignments

The following assignments are designed to help students become competent teachers and achieve different objectives below.

1. Evaluation for Lesson Plan (50%)

Objectives:

- Students will be able to identify and evaluate various sources to support teaching
- Students will be able to understand science content concepts associated with the applicable TEKS
- Students will be able to understand and implement standards for science excellence (TExES, National Science Education Standards)
- Students will be able to develop the ability to assist students in designing investigations using scientific inquiry
- Students will be able to design and implement a quality scientific inquiry curriculum
- Students will be able to appreciate and learn from theoretical and practical perspectives
- Monitor one's learning and identify ways for improvements

- (1) TEKS, NGSS, and Materials for Lesson Plan (5%):** Two or three students work as a group to select TEKS, NGSS, and materials for their lesson plan. Students are provided with "Template02-TEKS, NGSS, and Materials for Lesson Plan" to fill out. This assignment should be submitted to the corresponding assignment section through the BLACKBOARD system in time.
- (2) Scientific Topics, Misconceptions, and Concept Map for Lesson Plan (5%):** Two or three students work as a group to select scientific topics, list all possible misconceptions, and design a concept map for their lesson plan. Students are provided with "Template03-Scientific Topics, Misconceptions, and Concept Map for Lesson Plan" to fill out. This assignment should be submitted to the corresponding assignment section through the BLACKBOARD system in time.
- (3) 5 E models for Lesson Plan (5%):** Two or three students work as a group to design three practices that are based on 5E models for their lesson plan. Students are provided with "Template04-5E Models for Lesson Plan" to fill out. This assignment should be submitted to the corresponding assignment section through the BLACKBOARD system in time.
- (4) Lesson plan draft (5%):** Two or three students work as a group to design a lesson plan draft for their lesson plan. Students are provided with "Template05-Lesson Plan" to fill out. The lesson plan draft should be submitted to the corresponding assignment section through the Blackboard system and AND B-email the draft to the whole class.
- (5) Lesson plan (5%):** Two or three students work as a group to complete a lesson plan. Students are provided with "Template05-Lesson Plan" to fill out. The lesson plan should be submitted to the corresponding assignment section through the Blackboard system and AND B-email the lesson plan to the whole class.
- (6) Merit presentation (10%):** Two or three students work as a group to present their science circle lesson plan and its merits in classes (25-30 minutes). A powerpoint file should be submitted to the corresponding assignment section through the BLACKBOARD system and a paper-copy (3 slides per page) of this powerpoint file should be handed in to the instructor before the class on their presentation day.
- (7) Critique presentation (10%):** Two or three students work as a group to evaluate a science circus lesson plan designed by other groups and present its demerits or suggestions for improvements

(15-20 minutes). A powerpoint file should be submitted to the corresponding assignment section through the BLACKBOARD system and a paper-copy (3 slides per page) of this powerpoint file should be handed in to the instructor before the class on their presentation day.

- (8) Improved lesson plan (5%):** Two or three students work as a group to revise their lesson plans according to the feedback they received from the class and from the Science Circus Day event. The improved lesson plan should be submitted to the corresponding assignment section through the BLACKBOARD system in time.

2. Individual Reflection (35%)

Objective:

- Students will be able to appreciate and learn from theoretical and practical perspectives
- Monitor one's learning and identify ways for improvements

(1) NGSS Reflection (5%):

Students will reflect and discuss the following two questions: (1) Why new science standards? Why now? (2) What are some unique features of NGSS that are different from previous standards? Students are provided with "[Template01-NGSS Reflection](#)" to fill out. This assignment should be submitted to the corresponding assignment section through the BLACKBOARD system in time.

(2) 2 Written Reviews on Lesson Plans (10%):

Each student will review two other groups' lesson plans and will provide feedback (minimum 500 words) for improvements. Students are provided with "[Template06-Written review](#)" to fill out. Each written review may include but not limit to (1) praise for merits, (2) identifications of weakness, and (3) ideas and suggestions for improvements. The written review should be submitted to the corresponding assignment section through the Blackboard system and AND B-email the written review to the whole class.

(3) Science Teaching Philosophy (10%):

Students are encouraged to reflect on their science learning experience and teaching philosophy. Students are provided with "[Template07-Science Teaching Philosophy](#)" to fill out, including three components: (1) Autobiography as a Science Learner, (2) Science Teaching Philosophy Statement, and (3) My Science Teaching Philosophy Picture. This assignment should be submitted to the corresponding assignment section through the BLACKBOARD system in time.

(4) Reflection on Science Circus Day (10%)

Students will reflect on their science circus day experience. Students are provided with "[Template08-Reflection on the Science Circus Day](#)" to fill out. The completed form should be submitted to the corresponding assignment section through the BLACKBOARD system in time.

3. Self- and Peer- Assessments on Group Work (10%)

Students will have opportunities to evaluate self and peer about their collaboration work. Students are invited to create their own criteria to evaluate themselves. Students are provided with "[Template09-Self and peer assessments](#)" to fill out.

4. Class attendance and participation (5%)

Objective:

- **Students will be able to appreciate and learn from theoretical and practical perspectives**
- **Students will be able to monitor one's learning and identify ways for improvements**

Each week, we have different readings and topics for discussions. Students should be prepared and are expected to participate in the classes actively. Students are expected to attend classes on time and participate in the course professionally. One attendance form will be available to be signed by individual students during the course. Students who have more than two absences may

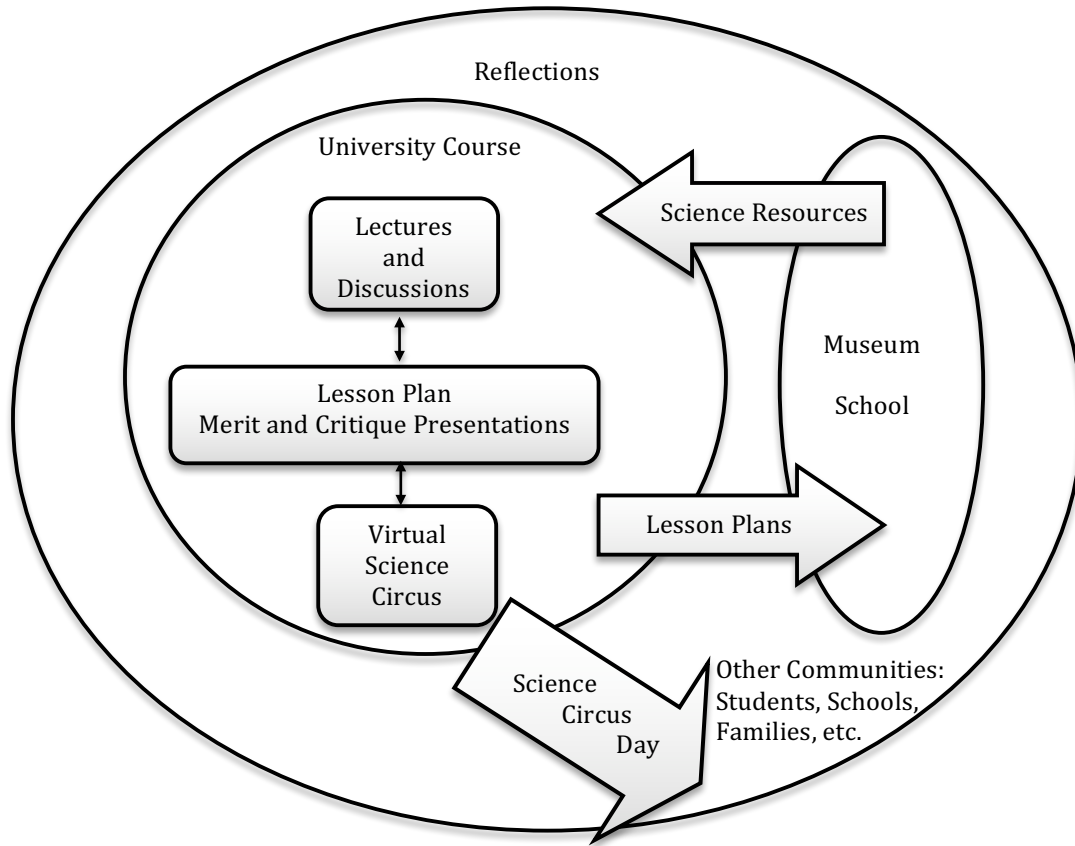
be dropped with an “F” (Fail). In particular, the Science Circus Day is essential in the course. No absences are allowed for this day. Students missing a class are responsible for asking peer to catch up and completing any exercises, readings, etc.

5. **Bonus point (1%):** Email your screen shot of online evaluation completion to Dr. Hsu (phsu3@utep.edu). This screen shot should only show that you completed the course’ online evaluation and should not include the evaluation itself.

Course Requirements:

1. All electronic reports should be submitted through the BLACKBOARD system and use WORD files. File names should start with “your name” or “group name” and end with “the assignment name.” Taking the name of “Group1” and “Isaac Newton” for example.
 1. Group1-LessonPlan.doc
 2. Group2-LessonPlan.doc
 3. IsaacNewton-ScienceTeachingPhilosophy.doc
 4. IsaacNewton-ReflectionOnScienceCircusDay.doc
2. Due time is **8:00AM** for all electronic submissions. All assignments should be submitted to Blackboard and B-email to everyone when indicated. Delayed submissions of any assignments will cause grade reductions. One delay day causes 10% reduction of a deserved grade, two delay days causes 20% of a deserved grade, and so on. ***All (delayed) assignments have to be submitted before May 2, 2018.*** Grading Evaluations: A (90% - 100%), B (80% - 89%), C (70%-79%), D (60%-69%) F (<60%)
3. Each electronic file of assignments should not exceed 10 MB. 10% a deserved grade will be reduced if the file exceeds 10MB.
4. Students are encouraged to take notes during the course for creating your own learning resources.

The Visual Representation of the Course Design



Course Schedule

* Changes may be made during the classes. Students should follow the latest changes.

No	Date	Topic	Activities	Assignments Due	Reading	
01	Jan 17	Syllabus review, Blackboard, grouping	1. Lecture 2. Group discussions		Syllabus	
02	Jan 24	Syllabus test, TEKS & NGSS	1. Lecture 2. Group discussions	-NGSS Reflection (template 1)	TEKS & NGSS	
03	Jan 31	Centennial Museum Visit	1. Museum Overview 2. Find a topic for your lesson plan 1 (bring TEKS)			
04	Feb 7	Concept maps	1. Lecture 2. Group discussions	-TEKS, NGSS, and Materials for Lesson Plan (template 2)	Reading 1	
05	Feb 14	Science Inquiry and 5 E Model	1. Lecture 2. Group discussions	-Scientific Topics, Misconceptions, and Concept Map for Lesson Plan (template 3)	Reading 2	
06	Feb 28	Science Inquiry and 5 E Model	1. Lecture 2. Group discussions	-5 E models for Lesson Plan (template 4)	Reading 3	
07	Mar 7	Nature of Science	1. Lecture 2. Group discussions	-Lesson Plan Draft (template 5, B-Email to everyone)	Reading 4	
08	Mar 14	Spring break	No class	-2 Written Reviews on Lesson Plans (template 6, B-Email to everyone)		
09	Mar 21	Representation 1	1. Lecture 2. Group discussions	-Lesson Plan (template 5, B-Email to everyone)	Reading 5	
10	Mar 28	Representation 2	1. Lecture 2. Group discussions	-Science Teaching Philosophy (template 7)	Reading 6	
11	Apr 4	Virtual Science Circus Day	Two merit presentations (Group 1, 2) Two critique presentations (Group 3, 4)	-Merit Powerpoint -Critique Powerpoint		
12	Apr 11	Virtual Science Circus Day	Two merit presentations (Group 3, 4) Two critique presentations (Group 1, 2)	-Merit Powerpoint -Critique Powerpoint		
13	Apr 18	Online Discussion	No face-to-face class			
14	Apr 25	Science Circus Day on Apr 25 from 12:00pm-2:50pm (Centennial Museum)				
15	May 2	Reflective discussions	1. Reflection 2. Group discussions	-UTEP online evaluation -Reflection on the Science Circus Day (template 8) -Improved Lesson plan (template 5) -Self-and Peer-Assessments (template 9)		

Appendixes:

Test Framework (Generalist 4-8) – Domain IV

The course is designed to help students to become competent science teachers who can provide the best learning opportunities for their students. At the end of the course, successful students will develop the following competences:

- 1) Competency 036: The teacher understands how to manage learning activities to ensure the safety of all students
 - Understands safety regulations and guidelines for science facilities and science instruction.
 - Knows procedures for and sources of information regarding the appropriate handling, use, disposal, care and maintenance of chemicals, materials, specimens and equipment.
 - Knows procedures for the safe handling and ethical care and treatment of organisms and specimens.
- 2) Competency 037: The teacher understands the correct use of tools, materials, equipment, and technologies
 - Selects and safely uses appropriate tools, technologies, materials and equipment needed for instructional activities.
 - Understands concepts of precision, accuracy and error with regard to reading and recording numerical data from a scientific instrument.
 - Understands how to gather, organize, display and communicate at in a variety of ways (e.g., charts, tables, graphs, diagrams, written reports, oral presentations).
- 3) Competency 038: The teacher understands the process of scientific inquiry and the history and nature of science
 - Understands the characteristics of various types of scientific investigations (e.g., descriptive studies, controlled experiments, comparative data analysis).
 - Understands how to design, conduct and communicate the results of a variety of scientific investigations.
 - Demonstrates an understanding of potential sources of error in inquiry-based investigation.
 - Demonstrates an understanding of how to communicate and defend the results of an inquiry-based investigation.
- 4) Competency 056: The teacher has theoretical and practical knowledge about teaching science and about how students learn science
 - Understands how the developmental characteristics, prior knowledge and experience
 - Selects and adapts science curricula, content, instructional materials and activities to meet the interests, knowledge, understanding, abilities, experiences and needs of all students, including English- language learners.
 - Understands how to use situations from students' daily lives to develop instructional materials that investigate how science can be used to make informed decisions.
 - Understands common misconceptions in science and effective ways to address these misconceptions.
 - Understands the rationale for the use of active learning and inquiry processes for students.
 - Understands questioning strategies designed to elicit higher-level thinking and how to use them to move students from concrete to more abstract understanding
 - Understands the importance of planning activities that are inclusive and accommodate the needs of all students.
 - Understands how to sequence learning activities in a way that allows students to build upon their prior knowledge and challenges them to expand their understanding of science
- 5) Competency 057: The teacher understands the process of scientific inquiry and its role in science instruction

- Plans and implements instruction that provides opportunities for all students to engage in non-experimental and experimental inquiry investigations.
 - Focuses inquiry-based instruction on questions and issues relevant to students and uses strategies to assist students with generating, refining and focusing scientific questions and hypotheses.
 - Instructs students in the safe and proper use of a variety of grade-appropriate tools, equipment, resources, technology and techniques to access, gather, store, retrieve, organize and analyze data.
 - Knows how to guide students in making systematic observations and measurements.
 - Knows how to promote the use of critical-thinking skills, logical reasoning and scientific problem solving to reach conclusions based on evidence.
 - Knows how to teach students to develop, analyze and evaluate different explanations for a given scientific result.
 - Knows how to teach students to demonstrate an understanding of potential sources of error in inquiry-based investigation.
 - Knows how to teach students to demonstrate an understanding of how to communicate and defend the results of an inquiry-based investigation.
- 6) Competency 058: The teacher knows the varied and appropriate assessments and assessment practices to monitor science learning in laboratory, field, and classroom settings
- Understands the relationships among science curriculum, assessment and instruction and bases instruction on information gathered through assessment of students' strengths and needs
 - Understands the importance of monitoring and assessing students' understanding of science concepts and skills on an ongoing basis
 - C. Understands the importance of carefully selecting or designing formative and summative assessments for the specific decisions they are intended to inform.
 - Selects or designs and administers a variety of appropriate assessment methods (e.g., performance assessment, self- assessment, formal/informal, formative/ summative) to monitor student understanding and progress.
 - Uses formal and informal assessments of student performance and products (e.g., projects, lab journals, rubrics, portfolios, student profiles, checklists) to evaluate student participation in and understanding of the inquiry process.
 - Understands the importance of sharing evaluation criteria and assessment results with students.

Appendix 1: Guidance for Evaluating Lesson Plans

This following checklist provides basic information to guide your lesson plan evaluation. You may generate your merit and critique reports/presentations in terms of this general checklist. However, each lesson plan has its own strengths and weaknesses, you are encouraged to evaluate lesson plans by analyzing its own characteristics.

1. Does this lesson plan correspond to TEKS? For which grade?
2. Are goals well defined and appropriate for these students?
3. Are activities properly designed for achieving these goals?
4. Does this lesson plan provide resources (e.g., equipment, space, time) for science inquiry activities?
5. Does this lesson plan provide instructions for facilitating students' science inquiry skills?
6. Do activities enable students to connect with the goals in personally meaningful ways?
7. Does the plan allow students to rehearse the skills required for this lesson?
8. Is the cognitive demand on students appropriate?
9. Do the subject matter cognitive demands allow students to connect their prior knowledge?
10. Are the materials in the lesson plan comprehensible?
11. Does the lesson plan provide sufficient information about how to prepare equipments and activities for students?
12. Is there sufficient use of visuals (e.g., realia, graphic organizers, etc.)?
13. Does the lesson take into account students' native languages and cultures?
14. How are students' speaking, listening, reading, and writing integrated into the lesson?
15. Do materials and activities take into account the learning styles of students?
16. Is there opportunity for students to ask questions and interact with material and other students?
17. Is there any assessment? Are they appropriate for students?
18. Do lessons include a variety of activities, materials and teaching methods?
19. Does the lesson plan articulate possible teaching or learning difficulties? Is there any solutions for these difficulties?
20. Are differences among students addressed? (visual, oral, diversity, students with special needs, ESL).

Appendix 2: Grading Rubric for “Merit and Critique Presentations” on Lesson Plans

	Excellent (76-100%)	Great (51%-75%)	Acceptable (26-50%)	Not acceptable (0-25%)
Clarity	The presentation is well-structured, clear and easy to follow	The majority of the presentation is easy to follow	The majority of the presentation is unclear and confusing	The presentation has no structure and difficult to follow
Fruitfulness	The presentation includes at least 10 merits/demerits and suggestions to support the lesson plan evaluation	The presentation includes 6-9 merits/demerits and suggestions to support the lesson plan evaluation	The presentation includes 3-5 merits/demerits and suggestions to support the lesson plan evaluation	The presentation includes 1-2 merits/demerits and suggestions to support the lesson plan evaluation
Validity	These points are well supported with solid arguments and elaborations	The majority of these points are well-articulated	The majority of these points are not well-articulated	These points are not articulated and not convincing

Appendix 3: Grading Rubric for “Lesson Plans (Science Circus Day)”

	67-100%	34-66%	0-33%
1. Lesson Title	-The title is intriguing, succinct and represents the lesson plan	-The title is intriguing and represents the lesson plan	-The title is intriguing but does not represent the lesson plan
2. Grade	-The lesson plan is suitable for the grade identified	-There are some concerns of the use of the lesson plan for this grade	-The lesson plan is not suitable for the grade identified
3. Time	-Time is appropriate	-Time is some what inappropriate	-Time is not described or inappropriate
4. Learning objectives	-Concise descriptions of what learners are expected and able to do by the end of the lesson - Objective statements include a variety of actions verbs (concrete and explicit) that address different cognitive levels. - There is evidence in the assessment section that students’ learning is linked to the concepts and skills addressed in the learning objectives.	- Descriptions of what learners are expected to learn are general. -Most action verbs in the objective statements are from either lower or higher order thinking levels that do not address different cognitive levels. -Fail to show connection with the assessment section.	-The description of the learning objectives is vague. -Action verbs in the objective statements do not support meaningful learning.
5. TEKS alignment	-Listed standards reflect the grade level, concepts and skills of the lesson plan. -There is evidence (i.e., in the assessment section) that student’s learning is linked to the components of the listed standards.	-Listed standards reflect the grade level and the concepts of the lesson plan. -Partial evidence (i.e., in the assessment section) that student’s learning is linked to the components of the listed standards.	-Lesson is loosely connected to the standards.
6. NGSS Alignment	-Listed standards reflect the grade level, concepts and skills learned in the project -There is evidence (i.e., in the assessment section) that student’s learning is linked to the components of the listed standards.	-Listed standards reflect the grade level and the concepts -Partial evidence (i.e., in the assessment section) that student’s learning is linked to the components of the listed standards.	-Project is loosely connected to the standards.
7. Materials in the Centennial Museum	-Names and pictures are accurately listed	-Names and pictures are listed	-No names or pictures are accurately listed
8. Self-Created Materials	-Required tools and resources are listed. -Reference in procedures are clearly defined as to they are to be utilized	-Most of the required resources and materials are listed. -Some reference or clear definition in procedures.	- Some citing of resources through the lessons; materials listed but not included in the procedures.
9. Safety considerations	-Safety concerns are discussed; suggestions or solutions for addressing these safety concerns are provided	-Safety concerns are discussed	-Safety concerns are not discussed
10. Scientific Topics	-Topics show sequence and progression. -The descriptions of these topics are fully introduced -Opportunities are provided for students to link daily work to past and upcoming content/skills.	-Topics show somewhat sequence and progression. -The descriptions of these topics are provided -Opportunities are provided for students to link daily work to past and upcoming content/skills.	-Topics does not consider the proper sequence and progression -No descriptions of these topics are provided -No relevant connections to students’ daily life
11. Possible Misconceptions about These Scientific Topics	-List all possible misconceptions about the scientific topics involved	-Only list part of the possible misconceptions about the scientific topics involved	-Only list a few possible misconceptions about the scientific topics involved
12. Concept	-provide concept map that accurately	-provide concept map that	-provide concept map that does

map	present the relationship of scientific concepts involved in this lesson plan -provide concepts and linking words	somewhat present the relationship of scientific concepts involved in this lesson plan -only provide concepts or linking words	not accurately present the relationship of scientific concepts involved in this lesson plan
13-15. Practice for the targeted, younger, older audience	<ul style="list-style-type: none"> -Lessons include activities to “hook” the student into the day’s lesson, and are engaging and relevant. -The cited activity relates to the lesson objectives, and organizes principles or information that is to follow. -Lesson/s includes a variety of opening activities. -The lesson plan uses 5 E Models in which the teacher will employ strategies (i.e., lecture, film, pictures) to provide the information needed for students to gain knowledge or skills. -The lesson plan describes the activities the students will practice to demonstrate their mastery of the new learning (concepts/skills). -The lesson plan informs the level of mastery the teacher will determine as she/he walks around the room assisting students. --The lesson plan informs the activities that will serve as ‘reinforcement practice’ so that the new concept/s are not forgotten. -Reinforcement practice are planned to be practiced after students have understand the new concepts. -The lesson plan describes the reinforcement practices (i.e., homework, individual or group work in class). -Assessment tools are designed to address instructional objectives and standards. -Assessment practices are open-ended, engaging and relevant. -There are indications of assessment modifications to accommodate students with special needs. 	<ul style="list-style-type: none"> -Lessons are logically sequenced, so that learning builds progressively; connections between lessons are clearly made -Very few warm-ups are provided -The cited activity relates to the objectives of the lesson. -Lessons always start with the same opening activity. -The lesson plan simply lists the strategies to be employed during this stage of the lesson. -The lesson plan lists the activities the students will practice to demonstrate their grasp of the new learning. -There is a list in the lesson plan informing the activities that will help students practice the new concept. -The lesson plan does not tell when the students will use the ‘reinforcement practices. -Assessments are linked to objectives and standards. -There is no variety of assessment practices. 	<ul style="list-style-type: none"> -Lessons do not have a logical sequence. Little opportunity to check for students’ understanding, no warm-ups are included in the lesson -Lesson/s does not include an opening activity. -The lesson plan does not inform about the strategies the teacher will employ to provide students with the needed knowledge or skills. -No guided practice opportunities are cited in the lesson. -There is no information in the lesson plan relating to opportunities for students to practice what they have learned in the current and previous lessons. -Assessment provides little or no evidence for student understanding of the new concept/skill.
16. Reference	<ul style="list-style-type: none"> -At least ten references are cited (at least three references from the course and seven references from external sources) -Reference sources are indicated and cited clearly 	<ul style="list-style-type: none"> -Five to nine references are cited -Reference sources are indicated and cited clearly 	<ul style="list-style-type: none"> -One to four references are cited -Reference sources are indicated and cited vaguely
17. Appendixes	<ul style="list-style-type: none"> -Attach all necessary information that help readers understand the project (e.g., instruments, curriculum, working sheets) 	<ul style="list-style-type: none"> -Attach most of the relevant information that help readers understand the project (e.g., instruments, curriculum, working sheets) 	<ul style="list-style-type: none"> -Attach only part of relevant information that help readers understand the project (e.g., instruments, curriculum, working sheets)

18. Mechanics of English	-Appropriate expression of concepts, varied and accurate vocabulary, no errors occur with regards to grammar, conventions and spelling. -Lesson plans are consistent in format	-Clear expression and vocabulary, some mechanical errors exist but not to get in the way of understanding. -Lesson plans have some formatting problems.	-Some mechanical errors exist but not to get in the way of understanding. -Many errors with regards to grammar, spelling, and conventions. -There is no obvious formatting structure
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Appendix 4: Grading Rubric for “Science Teaching Philosophy”

Criteria	Excellent	Satisfactory	Underperform
	67-100%	34-66%	0-33%
1. Philosophy of science teaching statement is 300-500 words			
2. Philosophy statement addresses: <ul style="list-style-type: none"> your beliefs about science education teaching and learning in formal and informal settings interactions in the science classroom (student-student and student-teacher) 			
3. The tone in your philosophy statement is: <ul style="list-style-type: none"> Reflective Personal (in your writing you use the ‘I’ instead of the third person) and Clear 			
4. Autobiography as a science learner is 300-500 words <ul style="list-style-type: none"> Detailed and reflective descriptions of your experiences as a science learner 			
5. Mechanics of Standard English <ul style="list-style-type: none"> Appropriate expression of concepts, varied and accurate vocabulary, no mechanical errors. 			

Appendix 5: Grading Rubric for “Reflection on Science Circus Day”

		67-100%	34-66%	0-33%
Content	Facts	Accurate and detailed descriptions of facts happened in the Science Circus Day	Rough descriptions about the Science Circus Day	Unclear and distorted descriptions about the Science Circus Day
	Feelings	Informative expression of your feelings about the Science Circus Day	Rough expression of your feelings about the Science Circus Day	Unclear expression of your feelings about the Science Circus Day
	Questions	Reflective and meaningful questions generated from the Science Circus Day	Relevant questions generated from the Science Circus Day	No reflective or irrelevant questions generated from the Science Circus Day
	Ideas	Insights generated and lessons learned from the Science Circus Day	Rough descriptions about what you learn from the Science Circus Day	Unclear descriptions about what you learn from the Science Circus Day
Format	Mechanics of English	-Appropriate expression of concepts, varied and accurate vocabulary, no errors occur with regards to grammar, conventions and spelling. -Reflections are consistent in format (e.g., double space, font size 12 with 1 inch margins, cited references when included follow the APA format).	-Clear expression and vocabulary, some mechanical errors exist but not to get in the way of understanding. -Reflections have some formatting problems.	-Some mechanical errors exist but not to get in the way of understanding. -Many errors with regards to grammar, spelling, and conventions. -There is no obvious formatting structure

Collaborator Information

❖ Centennial Museum

Address: At the corner of University Avenue and Wiggins Road on the UTEP Campus

Phone: (915) 747-5565

Website: <http://admin.utep.edu/Default.aspx?tabid=59900>

Museum Hours: Tuesdays-Saturday: 10am-4:30pm

Accommodation

If you have a disability and need classroom accommodations, please communicate your needs to the instructor and contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass.

Standards of Academic Integrity

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

Equal Educational Opportunity

In order to create equal educational opportunities in the class, all students are expected to demonstrate respect for the diverse voices and individual differences in the class. Particularly, no person shall be excluded from participation in, denied benefits of, or be subject to discrimination under any program or activity sponsored or conducted by the University of Texas at El Paso on the basis of race, color, national origin, religion, sex, age, veteran status, disability, or sexual orientation. Any member of the University community who engages in discrimination or other conduct in violation of University policy is subject to the full range of disciplinary action, up to and including separation from the University. Complaints regarding discrimination should be reported to the University's Equal Opportunity Office. Inquiries regarding applicable policies should be addressed to the University's Equal Opportunity Office, Kelly Hall, 3rd Floor, 915.747.5662 or eoaa@utep.edu <<mailto:eoaa@utep.edu>>