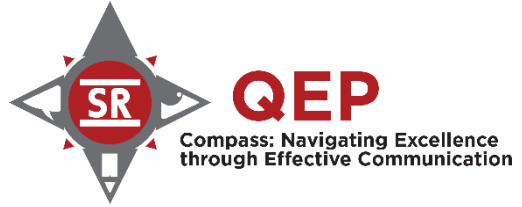


**BIO 3309 Foundations of Elementary Science II**  
**Spring 2022**  
**Course Syllabus**



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<b>Instructor:</b>	Kevin V. Young, PhD
<b>Office Hours:</b>	By appointment, via Zoom
<b>Office Location:</b>	Out of state-no in-person office hours
<b>Telephone:</b>	801-656-7531 (cell: find me on WhatsApp)
<b>Email Address:</b>	kevin.young@usu.edu
<b>Class Schedule:</b>	Mon/Wed 11 AM (via Zoom; all lectures recorded)
<b>Classroom Location:</b>	<a href="#">This Zoom Link</a>
<b>Required Texts:</b> (All are free)	<a href="#">CK-12 Middle School Earth Science FlexBook 2.0</a> <a href="#">CK-12 Middle School Life Science FlexBook 2.0</a> <a href="#">CK-12 Middle School Physical Science FlexBook 2.0</a> <a href="#">The Wonder of Science Teaching Guide</a> Other resources on Blackboard

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**Welcome!** This is the second course in a series of two in required science content sequence for preservice elementary and middle school teachers. Topics covered will include the following TEA science competencies:

- Lab Processes, Equipment & Safety
- Students as Learners & Science Instruction
- Science Assessment
- Adaptions & Evolution
- Organisms & the Environment
- Structure & Function of Earth Systems
- Cycles in Earth Systems
- Energy in Weather & Climate
- Solar System & the Universe.

We will build lesson plans centered around problem-solving and science-based explorations. This course is meant to help you become familiar with a broad range of science subjects, gain experience in lesson planning, and gain confidence in testing in preparation for the Core EC-6 Science Exam. We will explore science concepts at grade levels Kindergarten through Middle School. You will design lesson plans that center on wonder, exploration, and experimentation. You will develop a portfolio that summarizes your learning and will serve as a useful resource to yourself in your future classroom.

### **Class Calendar (subject to change)**

<u>Week</u>	<u>Day</u>	<u>Date</u>	<u>Topic</u>
1	MON	10-Jan	<u>Introductions. Introducing Wonder of Science</u>
	WED	12-Jan	<u>Students as Learners</u>
2	MON	17-Jan	<u>Martin Luther King, Jr. Holiday</u>
	WED	19-Jan	<u>Science Instruction</u>
3	MON	24-Jan	<u>Lab Processes</u>
	WED	26-Jan	<u>Equipment &amp; Safety</u>
4	MON	31-Jan	<u>Science Assessment</u>
	WED	2-Feb	<u>Portfolio, lesson planning, &amp; testing practice</u>
5	MON	7-Feb	<u>Adaptations &amp; Evolution</u>
	WED	9-Feb	<u>Adaptations &amp; Evolution</u>
6	MON	14-Feb	<u>Adaptations &amp; Evolution</u>
	WED	16-Feb	<u>Organisms &amp; the Environment</u>
7	MON	21-Feb	<u>Organisms &amp; the Environment</u>
	WED	23-Feb	<u>Organisms &amp; the Environment</u>
8	MON	28-Feb	<u>Structure &amp; Function of Earth Systems</u>
	WED	2-Mar	<u>Structure &amp; Function of Earth Systems</u>
9	MON	7-Mar	<u>Spring Break-No classes</u>
	WED	9-Mar	<u>Spring Break-No classes</u>
10	MON	14-Mar	<u>Structure &amp; Function of Earth Systems</u>
	WED	16-Mar	<u>Portfolio, lesson planning, &amp; testing practice</u>

- 11 MON 21-Mar Cycles in Earth Systems  
WED 23-Mar Cycles in Earth Systems
- 12 MON 28-Mar Cycles in Earth Systems  
WED 30-Mar Portfolio, lesson planning, & testing practice
- 13 MON 4-Apr Energy in Weather & Climate  
WED 6-Apr Energy in Weather & Climate
- 14 MON 11-Apr Energy in Weather & Climate  
WED 13-Apr Portfolio, lesson planning, & testing practice
- 15 MON 18-Apr Solar System & the Universe  
WED 20-Apr Solar System & the Universe
- 16 MON 25-Apr Solar System & the Universe  
WED 27-Apr Last Day Games
- 17 MON 2-May Submit Portfolio, Lesson Plans, Grade Evaluation



## **Section II. Course Design: Communication Infused**

To be successful in college and beyond, many sources (e.g., Morrealle & Pearson, 2008) indicate that communication competencies are essential. Sul Ross recognizes that the current generation of undergraduate university students should receive training to navigate a global world as competent communicators in various contexts and channels of communication.

Through our Quality Enhancement Plan (QEP) called *Compass*, Sul Ross aims to equip you to navigate excellence in the 21<sup>st</sup> century by developing your communication skills across multiple courses. This General Survey of Science course is designed to enhance your communication skills. Therefore, this course has the following QEP Student Learning Outcome:

## **Section III. QEP Student Learning Outcome**

QEP SLO: The student will create works that exhibit skill in prepared and purposeful communication (written, oral or visual).

## **Section IV. Course Objectives**

The objectives are simple: 1) that you understand more science than ever before, 2) that you improve in your ability and confidence in teaching science to children, 3) that you are prepared to pass the science section of your exam with flying colors, and that 4) you further develop your teaching philosophy to aid in your success as a teacher.

## **Section V. Student Learning Outcomes**

- Refine personal teaching philosophy through studying theories and methodologies of elementary instruction and science pedagogy.
- Distinguish science from pseudoscience and skeptically evaluate claims based on strength of evidence.
- Demonstrate understanding of basic Physics principles such as matter, energy, light, sound, electricity and magnetism.
- Demonstrate understanding of basic Chemistry. Distinguish chemical and physical changes to matter. Describe properties of atoms, how they interact, and how they are organized within the Periodic Table. Understand pH, types of bonds, and properties of some common molecules including water and food molecules.
- Describe the organization and functioning of living things, including the human body.
- Safely carry out demonstrations and experiments suitable for elementary students.
- Be prepared for the science-related questions on the TExES exam.
- Have fun, improve your attitude towards science, and increase your confidence that you can teach science to elementary students!

## **Section VI. Course Requirements and Grading**

*We are going gradeless.* I don't believe ranking and grading are helpful in the learning process, nor do I believe that a professor should impose one correct way to approach a subject, nor do I

believe that traditional testing gives accurate indicators of learning or knowledge, nor do I believe that students are widgets, that the classroom is a factory, or that we should be trying to make everyone achieve the same things. Finally, I do not believe that a person's mistakes should be punished, or that the threat of grades should be used as a form of coercion. If you want more details see: [Grading Philosophy 2021](#).

Going gradeless does not mean you have no accountability. It means that the structure of this course is flexible to suit your needs, that no two students will take the same path through this course, and that I will not artificially limit how much you can accomplish. Going gradeless does not mean there will be no feedback—as your guide I hope to give frequent feedback, and it will help if you tell me what you find difficult or confusing. I want to encourage you, support you in your challenges, and help speed your learning. I will not track percentages, and any quizzes or tests will be given with two goals: 1) to learn from our mistakes, and 2) to become better at taking tests. My goal is to help you progress as far as possible along your personal learning and teaching pathway.

You *will* receive a grade at the end of this course, and the expectations are high. I think the highest grade, an A, should reflect truly great dedication and effort, but this will not be defined by points. I will not grade your assignments, tests, lesson plans, or projects. You are in charge of your grade, and you can evaluate everything you have produced and all your efforts to decide on your course grade. You who will report your final grade to me, explaining through reflective writing why you feel that a particular grade is warranted. Your grade evaluation should be a logical argument, supported by evidence (provided in your portfolio). Your portfolio should be a record of your learning through the semester, and should be organized in a way that it will be useful for you later when you are teaching. Most people use PowerPoint or Google Slides to create their portfolio. I will show some examples in class, but ultimately you make it the way you think will be most helpful. I will ask for portfolio, lesson plans, and grade evaluations several times during the semester—you just submit the current version. You might grade yourself low in one area one time, and then you might grade yourself higher later on, after you have gone back and improved your understanding.

## **Section VII. Course Assignments**

Most of our work will be aimed at preparing you to be a better teacher. We will go through TEA Science Standards for Kindergarten through Middle School. We will do this subject by subject, so over the semester we will revisit each grade level. For each grade I want you to study the standards and think about how you would teach them at that grade level. For each unit I would like you to prepare a lesson plan with activities, experiments, etc. You can work in groups to do this, and I encourage you to test out your lesson plans on children if you have the chance. Your lesson plans should include experimentation, and I would like you to carry out several experiments on your own.

I want you to maintain a **portfolio** that you update regularly to document your activities, what you are learning, what you are struggling with, good resources you find, content you produced, etc. You might include things like notes you have written, websites you visited, lesson plan

ideas, quizzes or tests you have taken, good phenomena and story lines you have found, concepts you are struggling with, etc. Most people choose to use PowerPoint or Google Slides.

I would like 4 finished lesson plans (you decide which four topics). Choose your best lesson plan to fulfill the QEP requirement of “creating works that exhibit skill in prepared and purposeful communication (written, oral or visual).” The rubric included at the end of this syllabus will be your guide. It emphasizes Organization, Content Development, Purpose, Academic Language, Supporting Material, and Technique.

**At week 4, 10, & 14, the topic is “Practice Test and lesson planning. Submit Portfolio”** On these days we will work on testing skills and lesson planning, and by the weekend I would like you to submit 1) your updated portfolio, 2) your lesson plans so far, and 3) your grade evaluation for the material we have covered. NOTE: you are NOT turning in something for me to grade—you are just sharing your work and your evaluation of your work. Please also share with me ways I can be more supportive or helpful or make the class more effective. You will turn everything in for the final time by May 2.

**Quizzes & Tests:** I aim to provide frequent quizzes and occasional tests, plus we will take practice tests for the science section of the EC-6 exam. Please include results in your portfolio and discuss them as part of your grade evaluation, but do not base your grade only on test percentages! The more important thing to do with quizzes and tests is to learn from them and take them again! Since tests are a part of your academic life and you will have to pass tests in order to be a teacher, we will practice becoming better test takers (I will teach you how to be better guessers too!).

## **Section VIII. Policies**

**Attendance.** Attendance is encouraged so we can learn together and share ideas, but each lecture will be recorded and the recording posted.

**Classroom Demeanor.** This class is meant to be cooperative and interactive (i.e. **not** sitting still and listening quietly). You are all adults and I trust that we can enjoy working together. The most important principle in our classroom is respect, so the only behaviors that would concern me most would be anything that is disrespectful towards me or a fellow student. Please help us have a great semester. I love when your cameras are on, but it’s OK to keep them off as well.

**Academic Integrity.** There will be no incentive to cheat, since there are no high-stakes tests. I will provide you with quizzes and tests, but they will simply be tools to help your learning and my teaching. I expect you to look far and wide for great ideas—just try to document where they come from as you put them all together. It is important for you to express your own creativity and skills.

**Grading.** Earn your knowledge, earn your grade. I will be your teacher; you will be your grader. You will provide a portfolio that supports your argument for your particular grade. Your grade should mainly be a representation of how well you understand the material and have met the

course objectives, but you may want to factor in amount of effort, amount of learning, the amount of curiosity, dedication, teamwork, or other factors. Grades do not define you.

**Late Work.** Most work will be time sensitive, but there will be no punishment for late work. There will be a few times when I will ask for work to be finished by a certain day, but my goal is to lead and inspire without coercion, and that includes not punishing late work.

## **Section IX. Notes on University Programs and Services**

**ADA.** It is Sul Ross University policy to provide reasonable accommodations to students with disabilities. If you would like to request such accommodations because of a physical, psychological, or learning impairment/disability/challenge, please contact the ADA Coordinator for Program Accessibility located in FH 112 or call 837-8203. E-mail: [mschwartz@sulross.edu](mailto:mschwartz@sulross.edu)

**Technical Support.** <https://www.sulross.edu/bb> has lists and links for various kinds of technical support. Blackboard is a beast and we will use it, but we can expect problems.

## **Section X. Additional Resources**

Blackboard will be used to post links to videos or other resources we use in class. Additionally there will be quizzes and tests on Blackboard. Tests and quizzes will be used to help you uncover misunderstandings or knowledge gaps. They will be scored, but will not be directly used in determining your course grade. You will have unlimited attempts at these assessments.

Please join our [WhatsApp Group](#) for general discussions.

## **Texas Education Agency Science Competencies Covered in This Course**

- Lab Processes, Equipment, & Safety (001)
- Students as Learners & Science Instruction (005)
- Science Assessment (006)
- Adaptations & Evolution (013)
- Organisms & the Environment (014)
- Structure & Function of Earth Systems (015)
- Cycles in Earth Systems (016)
- Energy in Weather & Climate (017)
- Solar System & the Universe (018)

*The Competencies are covered in detail on the following pages*

**Competency 001 (Lab Processes, Equipment and Safety): The teacher understands how to manage learning activities, tools, materials, equipment and technologies to ensure the safety of all students.**

- A. Understands safety regulations and guidelines for science facilities and science instruction.
- B. Knows procedures for and sources of information regarding the appropriate handling, use, disposal, care and maintenance of chemicals, materials, specimens and equipment.
- C. Knows procedures for the safe handling and ethical care and treatment of organisms and specimens.
- D. Selects and safely uses appropriate tools, technologies, materials and equipment needed for instructional activities.
- E. Understands concepts of precision, accuracy and error with regard to reading and recording numerical data from a scientific instrument.
- F. Understands how to gather, organize, display and communicate data in a variety of ways (e.g., charts, tables, graphs, diagrams, written reports, oral presentations).
- G. Understands the international system of measurement (i.e., metric system) and performs unit conversions within measurement systems, including the use of nonstandard units.

**Competency 005 (Students as Learners and Science Instruction): The teacher has theoretical and practical knowledge about teaching science and about how students learn science.**

- A. Understands how developmental characteristics, prior knowledge and experience and students' attitudes influence science learning.
- B. Selects and adapts science curricula, content, instructional materials, collaborations, vocabulary and activities to meet the levels of interest, knowledge and understanding as well as the abilities, experiences and needs of all students, including English-language learners.
- C. Understands how to use situations from students' daily lives to develop instructional materials that investigate how science can be used to make informed decisions.
- D. Understands common misconceptions in science and has effective ways to address those misconceptions.
- E. Understands developmentally appropriate design and implementation of hands-on learning experiences in science and selects effective, appropriate instructional practices, activities, technologies and materials to promote students' scientific knowledge, skills and inquiry processes.
- F. Understands questioning strategies designed to elicit higher-level thinking and how to use them to move students from concrete to more abstract understanding.



G. Understands the importance of planning activities that are inclusive and that accommodate the needs of all students.

H. Understands how to sequence learning activities in a way that enables students to build on their prior knowledge and that challenges them to expand their understanding of science.

**Competency 006 (Science Assessment): The teacher knows the varied and appropriate assessments and assessment practices for monitoring science learning in laboratory, field and classroom settings.**

A. Understands the relationships between a science curriculum, assessment and instruction and bases instruction on information gathered through assessment of students' strengths and needs.

B. Understands the importance of monitoring and assessing students' understanding of science concepts and skills on an ongoing basis, including how to use formal and informal assessments of student performance and how to use products (e.g., projects, lab journals, rubrics, portfolios, student profiles, checklists) to evaluate students' understanding of and participation in the inquiry process.

C. Selects — or designs — and administers a variety of appropriate assessments (e.g., performance assessment, self-assessment, formal/informal assessment, formative/summative assessment) to monitor students' understanding and progress and to plan for instruction.

D. Understands the importance of communicating evaluation criteria and assessment results to students.

**Competency 013 (Adaptations and Evolution): The teacher understands adaptations of organisms and the theory of evolution.**

A. Demonstrates knowledge of adaptive characteristics and explains how adaptations influence the survival of populations or species.

B. Describes how populations and species change through time.

C. Describes processes that enable traits to change through time, including selective breeding, mutation and other natural occurrences.

**Competency 014 (Organisms and the Environment): The teacher understands the relationships between organisms and the environment.**

- A. Understands that organisms respond to internal or external stimuli and analyzes the role of internal and external stimuli in the behavior of organisms.
- B. Understands relationships between organisms and the environment and describes ways that living organisms depend on each other and on the environment to meet their basic needs.
- C. Identifies organisms, populations or species with similar needs and analyzes how they compete with one another for resources.
- D. Analyzes the interrelationships and interdependence among producers, consumers and decomposers in an ecosystem (e.g., food webs, food chains, competition, predation).
- E. Identifies factors that influence the size and growth of populations in an ecosystem.
- F. Analyzes adaptive characteristics that result in a population's or species' unique niche in an ecosystem.
- G. Knows how populations and species modify and affect ecosystems.

**Competency 015 (Structure and Function of Earth Systems): The teacher understands the structure and function of Earth systems.**

- A. Understands the structure of Earth and analyzes constructive and destructive processes (including plate tectonics, weathering and erosion) that produce geologic change, including how these processes have affected Earth history.
- B. Understands the form and function of surface water and groundwater.
- C. Applies knowledge of the composition and structure of the atmosphere and its properties.
- D. Applies knowledge of how human activity and natural processes, both gradual and catastrophic, can alter Earth systems.

**Competency 016 (Cycles in Earth Systems): The teacher understands cycles in Earth systems.**

- A. Understands the rock cycle and how rocks, minerals and soils are formed, and their respective properties.
- B. Understands the water cycle and its relationship to weather processes.
- C. Understands the nutrient (e.g., carbon, nitrogen) cycle and its relationship to Earth systems.
- D. Applies knowledge of how human and natural processes affect Earth systems.
- E. Understands and describes the properties and uses of Earth materials (e.g., rocks, soils, water, atmospheric gases).

**Competency 017 (Energy in Weather and Climate): The teacher understands the role of energy in weather and climate.**

- A. Understands the elements of weather (e.g., humidity, wind speed and direction, air pressure, temperature) and the tools used for measurement.
- B. Compares and contrasts weather and climate.
- C. Analyzes weather charts and data to make weather predictions.
- D. Applies knowledge of how transfers of energy between Earth systems affect weather and climate.
- E. Analyzes how Earth's position, orientation, and surface features affect weather and climate.

**Competency 018 (Solar System and the Universe): The teacher understands the characteristics of the solar system and the universe.**

- A. Understands the properties and characteristics of objects in the sky.
- B. Applies knowledge of the Earth–Moon–Sun system and the interactions among them (e.g., day and night, seasons, lunar phases, eclipses).
- C. Identifies properties of the components of the solar system.

## QEP MAPPED CLASS CARDINAL RUBRIC

### Definition

The process of sending, receiving and interpreting messages through written, oral, or nonverbal communication channels to effectively convey information, and/or by which two or more people reach understanding.

### Framing Language

Communication is transmitted through a variety of modes (oral, written, or visual). This rubric is specifically designed to evaluate communication in an academic environment to determine that the central message is conveyed, reinforced by multiple supporting materials and purposefully organized. Communication in an academic environment may include: a variety of written works such as academic papers, lab reports, poetry, webpages, personal essays; oral presentations of sufficient length such that a central message is conveyed, supported and purposely organized; visual media, including but not limited to posters, PowerPoints, videos, graphic art, and infographics.

### Glossary

*The definitions below serve to clarify terms and concepts used in this rubric only.*

- **Organization:** The grouping and sequencing of ideas and supporting material. Organizational patterns supporting effectiveness typically include an introduction, one or more identifiable sections in the body and a conclusion. An organizational pattern should be purposeful and make the content easy to follow. Potential patterns might include a chronological pattern, a problem-solution pattern, or an analysis-of-parts pattern.
- **Content Development:** The ways in which a topic is explored and represented in relation to its audience and purpose.
- **Purpose:** The main point/thesis/"bottom line"/"take-away" of a message. A clear purpose is easy to identify. For example, is the message meant to persuade or to inform, to report or to summarize, or to amuse?
- **Academic Language:** Language supporting the effectiveness of a central message is appropriate to the topic, genre/discipline, audience, is grammatically correct, and clear. Language enhancing the effectiveness may also be vivid, imaginative, and expressive.
- **Supporting Material:** In communication, students draw upon sources to extend, develop, define, or shape their ideas. Digital citizenship, the careful consideration of copyright and fair use of images is important. The student considers reliability of communication to include an understanding of accuracy, applicability, currency, liability, and completeness.
- **Technique:** Execution or performance of communication skills given the mode of communication. For example, in writing, technique may include mechanics and use of style; in oral communication, it may include nonverbal cues and use of voice; in visual works, it may include the use of the medium.

Cardinal Rubric was adapted from the Association of American Colleges and Universities oral communication VALUE rubric, the National Communication Association's Speaking and Listening Competencies for College Students, Texas A&M University's Visual Communication rubric, Otis College of Arts and Design's Fine Arts rubric, Lane Community College Communicating Effectively Rubric, and Stephen F. Austin State University's assessment rubric for Oral and Visual Communication.



## QEP MAPPED CLASS CARDINAL RUBRIC

*Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet formative (cell one) level performance.*

	<b>4 = Exemplary</b>	<b>3 = Satisfactory</b>	<b>2 = Developing</b>	<b>1 = Formative</b>
<b>Organization</b>	Organizational pattern is clearly and consistently observable, skillful, and makes the content of the message cohesive.	Organizational pattern is clearly and consistently observable; contains elements of logical development; contains clear transitions; has a recognizable flow of ideas.	Organizational pattern is intermittently observable; lacks organization; it is sometimes disjointed and/or awkward.	Organizational pattern is not observable; has no discernible organizational structure; contains random unconnected elements.
<b>Content Development</b>	Uses appropriate, relevant, and compelling content to illustrate mastery of the topic, conveying understanding or a useful perspective.	Uses appropriate, relevant, and compelling content to explore ideas within the context. It is clear, accurate and appropriate.	Uses appropriate and relevant content to develop and explore ideas but may have inaccuracies or may be unclear at times. Provides limited insight or information.	Uses appropriate and relevant content to develop simple ideas in some parts of the work. May contain misinformation, or may be confusing or misleading.
<b>Purpose</b>	Demonstrates a thorough understanding of context, audience, and purpose that is responsive to the assigned task(s) and focuses all elements of the work. The purpose of the message is clearly conveyed.	Demonstrates adequate consideration of context, audience, and purpose and a clear focus on the assigned task(s) (e.g., the task aligns with audience, purpose, and context). The purpose of the message can be discerned with some effort.	Demonstrates awareness of context, audience, purpose, and to the assigned tasks(s) (e.g., begins to show awareness of audience's perceptions and assumptions). The purpose of the message is vague or unclear.	Demonstrates minimal attention to context, audience, purpose, and to the assigned tasks(s) (e.g., expectation of instructor or self as audience). The purpose of the message is not at all apparent or is missing.
<b>Academic Language</b>	Communication is grammatically correct. Language choices are imaginative, memorable, compelling, and demonstrate constructive knowledge, connects with audience and flows well. Error free.	Communication is grammatically correct. Language choices are thoughtful and generally effective, demonstrate constructive knowledge, connects with audience and flows well. Limited errors.	Grammar occasionally interferes with communication. Language choices are mundane, commonplace, and partially effective. Language is moderately appropriate to audience. Includes some errors.	Errors in grammar and format. Language choices are questionable and minimally effective. Language is not appropriate to audience. Uses language that sometimes impedes meaning.
<b>Supporting Material</b>	Demonstrates skillful use of a variety of supporting material that are high-quality, credible, relevant sources to develop ideas that are appropriate for the intended message or discipline.	Demonstrates consistent use of credible, relevant sources to support ideas that are appropriate for the intended message or discipline. Though limited, it refers to supporting information or analysis, or establishes credibility of authority on the topic. Generally attributes sources as appropriate.	Demonstrates an attempt to use credible and/or relevant sources to support ideas that are appropriate for the intended message or discipline. Makes reference to weak/partial supporting information or analysis. Sources are inconsistently attributed.	Demonstrates an attempt to use sources to support ideas but it insufficiently makes reference to information or analysis that minimally supports the intended message or topic. Fails to attribute sources as appropriate.
<b>Technique</b>	Demonstrates exemplary appropriateness and quality of technique for the chosen mode. For example, skillful execution of genre and disciplinary conventions on written works; skillful oral delivery; exemplary craftsmanship of visual works.	Demonstrates appropriateness and quality of technique for the chosen mode. For example, appropriate execution of genre and disciplinary conventions on written works; or, effective oral delivery; or, notable craftsmanship of visual works.	Attempts to demonstrate appropriateness and quality of technique for the chosen mode. For example, follows expectations of execution of genre and disciplinary conventions on written works; satisfactory oral delivery; satisfactory craftsmanship of visual works.	Marginal demonstration of appropriateness and quality of technique for the chosen mode. For example, attempts to execute basic genre and disciplinary conventions on written works; poor oral delivery; poor craftsmanship of visual works.