

FOR TEACHERS

tips + tricks

Groupings:

- Pair groups carefully with students who can each contribute their strengths to the lessons.
- Help students with goals and objectives for each section
- Have groups share out with their finding or questions

Role Play:

- Pre-teach roles by having students investigate what each role looks like in real life.

Reading Materials:

- Students may be at varying levels of reading and may need scaffolding or help when understanding content in scientific journals. Breaking reading into jigsaws and talking about comprehension will be beneficial.
- Print out the additional resources and articles so students can interact with them.

Math:

- Students may need help with statistics and graphing. A review of mean, median and mode will be beneficial along with a review of graphing and plotting.
- Use both printed graph and formatted excel sheet for plotting data as a class.

Evaluation:

- Share rubrics with students so they are aware of grading and expectations.
- Reflection on work may help with self-evaluation of experience with materials.

Engagement:

- Students loved the Hypoxia video game, allowing students to play games in their free time, helped increase engagement.
- The crossword puzzle is also a popular activity.

rubric



RUBRIC: SCIENTIST

	Exceeds	Meets	Close to meets	Does not meet
Understanding of scientific principles	Thorough summary of science involved.	Includes summary of science involved.	Summary of science is rudimentary.	No summary of science attempted.
Hypothesis development	At least one measurable, testable hypothesis given.	One hypothesis given that is either measurable or testable.	Hypothesis attempted but it isn't measurable or testable.	No hypothesis attempted.
Deliverable	At least 3 additional ideas for further study included.	At least one additional idea for further testing given.	No additional ideas given.	No additional ideas offered.



RUBRIC: POLICYMAKER

	Exceeds	Meets	Close to meets	Does not meet
Public service announcement idea development	PSA includes thorough information of climate change and how it is related to our coastal ocean.	PSA includes basic information on climate change and how it relates to our coastal ocean.	PSA includes information about climate change OR how it relates to our coastal ocean.	PSA not attempted.
Writing quality	PSA is free of grammar/spelling errors.	PSA includes 2-3 grammar and/or spelling errors.	PSA contains more 4-6 grammar and/or spelling errors.	Contains more than 6 spelling and/or grammar errors.
Inclusivity + target audience	PSA targets communities that do NOT live near the ocean.	PSA only targets communities who live adjacent to the coast.	PSA is for a broad but unspecified audience.	Audience was not considered in PSA development.



RUBRIC: FISHERPERSON

	Exceeds	Meets	Close to meets	Does not meet
Community engagement	Student's plan includes guaranteed community engagement.	Plan seeks to engage community.	Community engagement attempted.	Community engagement not attempted.
Inclusivity	Plan is inclusive of community members scientific community and non-scientific community alike.	Plan seeks to engage all community members.	Plan is not inclusive of all members.	Inclusivity not attempted.

Student + Teacher Resources for 5 E Science Methods

Engage:

Student Behaviors

- Ask questions such as, “Why did this happen?” “What do I already know about this?” “What can I find out about this?” “How can this problem be solved?”
- Shows interest in the topic through curiosity and expression of wonderings
- Demonstrates engagement by expressing ideas, sharing observations, and creating initial models
- Expresses current understanding of a concept or idea

Teaching Strategies

- Raises questions or poses problems
 - Elicits responses that uncover students’ current knowledge
 - Helps students make connections to previous work
 - Posts learning outcomes and explicitly references them in the lesson
 - Invites students to express what they think
 - Invites students to raise their own questions
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Explore:

Student Behaviors

- Tests predictions and hypotheses; Forms new predictions and hypotheses
- Discusses problems with others
- Plans and conducts investigations in which they observe, describe, and record data
- Tries different ways to solve a problem or answer a question
- Creates initial models
- Compares ideas with those of others

Teaching Strategies

- Provides or clarifies questions or problems
- Provides common experiences
- Observes and listens to students as they interact
- Acts as a consultant for students
- Encourages student-to-student interaction
- Asks probing questions to help students make sense of their experiences and redirect them when necessary
- Provides time for students to puzzle through problems

Explain:

Student Behaviors

- Applies new labels, definitions, explanations, and skills in new, but similar, situations
- Uses previous information to ask questions, propose solutions, make decisions, design experiments, or complete a challenge
- Draws reasonable conclusions from evidence
- Critiques the models, explanations, or arguments made by others using evidence and reasoning
- Makes conceptual connections between new and previous experiences
- Communicates understanding to others

Teaching Strategies

- Expects students to use vocabulary, definitions, and explanations provided previously in new contexts
 - Encourages students to apply the concepts and skills in new situations
 - Provides additional evidence, explanations, or reasoning
 - Reinforces students' use of scientific terms and descriptions previously introduced
 - Asks questions that help students draw reasonable conclusions from evidence and data
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Elaborate:

Student Behaviors

- Shows models, explanations, answers, or possible solutions, to other students
- Listens critically to and questions explanations offered by others
- Explains using evidence from investigations
- Uses labels, terminology, and formal scientific language
- Compares current thinking with former thinking
- Records ideas and current understanding
- Adjusts ideas, models, and explanations as new evidence or reasoning is presented

Teaching Strategies

- Encourages students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and information through mini-lecture, text, internet, or other resources
- Builds on student explanations
- Provides time for students to compare their ideas with others and if desired revise their ideas

Evaluate

Student Behaviors

- Gives feedback to other students
- Evaluates progress or knowledge
- Checks work with a rubric or against established criteria
- Assesses progress by comparing current understanding with prior knowledge
- Asks additional questions that go deeper into a concept or leads to additional learning
- Demonstrates understanding of Disciplinary Core Ideas, Crosscutting Concepts, and Science and Engineering Practices
- Answers open-ended questions by using observations, evidence, and previously accepted explanations

Teaching Strategies

- Asks open-ended questions such as, "Why do you think...?" "What evidence do you have?" "How would you answer the question?"
- Observes and records notes as students demonstrate individual understanding of concepts learned and performance of skills
- Uses a variety of assessments to gather evidence of student understanding
- Provides opportunities for students to assess their own progress