Science and Engineering Practices

Common Core Reading Anchors

Grades 6-12 Literacy in Science and Technical Subjects

SCIENCE AND ENGINEERING PRACTICE: ENGAGING IN ARGUMENT FROM EVIDENCE

The study of science and engineering should produce a sense of the process of argument necessary for advancing and defending a new idea or an explanation of a phenomenon and the norms for conducting such arguments. In that spirit, students should argue for the explanations they construct, defend their interpretations of the associated data, and advocate for the designs they propose.
(NRC *Framework*, 2012, p. 73)

ENGAGING IN ARGUMENT FROM EVIDENCE – CONTINUED

Supporting CCSS Literacy Anchor Standards and Relevant Portions of the Corresponding Stands for Science and Technical Subjects	Connection to Science and Engineering Practice	Connection to Eco-Schools USA Pathways
CCR Reading Anchor #6: Assess how point of view or purpose shapes the content and style of a text. • **RST.6-8.6**: "Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text." • **RST.9-10.6**: "Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address." • **RST.11-12.6**: "Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved gaps or inconsistencies in the account."	The central motivation of scientists and engineers is to put forth what they believe is the best explanation for a natural phenomena or design solution, and to verify that representation through well-wrought arguments. Understanding the point of view of scientists and engineers and how that point of view shapes the content of the explanation is what Reading Standard 6 asks students to attune to.	Each person, from inside the school walls to outside, throughout the school community, come from a different point of view regarding sustainability. Eco-Action teams must understand their audience and work to construct solutions that will be understood, accepted, and implemented by the majority.
CCR Reading Anchor #8: Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence. • **RST.6-8.8**: "Distinguish among facts, reasoned judgment based on research findings, and speculation…" • **RST.9-10.8**: "Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem." • **RST.11-12.8**: "Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information."	Formulating the best explanation or solution to a problem or phenomenon stems from advancing an argument whose premises are rational and supported with evidence. Reading Standard 8 emphasizes evaluating the validity of arguments and whether the evidence offered backs up the claim logically.	As students begin researching the environmental issues they must separate fact from opinion, experts source versus propaganda in order to make logical, evidence based decisions that will improve the carbon footprint of the school. Beyond research, students must design and carryout science and engineering studies in order to implement cost efficient and effective changes on campus.

ENGAGING IN ARGUMENT FROM EVIDENCE – CONTINUED

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CCR Reading Anchor #9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take. • **RST.6-8.9**: "Compare and contrast the information gained from experiments, simulations, video or multimedia sources with that gained from reading a text on the same topic." • **RST.9-10.9**: "Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts." • **RST.11-12.9**: "Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible."	Implicit in the practice of identifying the best explanation or design solution is comparing and contrasting competing proposals. Reading Standard 9 identifies the importance of comparing different sources in the process of creating a coherent understanding of a phenomenon, concept, or design solution.	Eco-Action team members work in various arrangements, small and large group, as well as alone. Just as groups vary so do sources of information and how individuals react to that information lends itself to analyze text, data, media, etc. in more detail and in ways potentially not thought of before.

ENGAGING IN ARGUMENT FROM EVIDENCE - CONTINUED

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CCR Writing Anchor #1: Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence. • **WHST.6-8.1**: "...Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources..." • **WHST.9-10.1**: "...Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns..." • **WHST.11-12.1**: "...Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases..."	Central to the process of engaging in scientific thought or engineering practices is the notion that what will emerge is backed up by rigorous argument. Writing Standard 1 places argumentation at the heart of the CCSS for science and technology subjects, stressing the importance of logical reasoning, relevant evidence, and credible sources.	Before students can implement an action they must have the support of the building administrator, staff, and other students. Sometimes district level support is needed. An effective strategy utilizing claims and evidence is at the heart of transforming and creating a culture of change.

ENGAGING IN ARGUMENT FROM EVIDENCE - CONTINUED

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CCR Speaking & Listening Anchor #1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. • **SL.8.1**: "... Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented." • **SL.9-10.1**: "...actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented." • **Sl.11-12.1**: "...Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task."	Reasoning and argument require critical listening and collaboration skills in order to identify the best explanation for a natural phenomenon or the best solution to a design problem. Speaking and Listening Standard 1 speaks directly to the importance of comparing and evaluating competing ideas through argument to cooperatively and collaboratively identify the best explanation or solution.	Eco-Action teams work with a variety of individuals and through the process of designing solutions to problems students engage in dialogue that allows them to evaluate, dispute, and support the evidence at hand.

ENGAGING IN ARGUMENT FROM EVIDENCE - CONTINUED

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CCR Speaking & Listening Anchor #3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric. • **SL.8.3**: "...evaluating the soundness of the reasoning and sufficiency of the evidence, and identifying when irrelevant evidence is introduced." • **SL.9-10.3**: "...identifying fallacious reasoning or exaggerated or distorted evidence." • **SL.11-12.3**: "...assessing the stance, premises, and links among ideas, word choice, and points of emphasis."	Evaluating the reasoning in an argument based on the evidence present is crucial for identifying the best design or scientific explanation. Speaking and Listening Standard 3 directly asserts that students must be able to critique the point of view within an argument presented orally from the perspective of the evidence provided and reasoning advanced by others.	Discerning points or view, fact versus opinion, and distortions of the truth play a critical role in addressing sustainability. Separating fact based evidence over bias is crucial in solving issues on campus.
CCR Speaking and Listening Anchor #4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience. • **SL.8.4**: "Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning..." • **SL.9-10.4**: "Present information, findings, and supporting evidence clearly, concisely, and logically..." • **SL.11-12.4**: "Present information, findings, and supporting evidence, conveying a clear and distinct perspective... alternative or opposing perspectives are addressed..."	The practice of engaging in argument from evidence is a key ingredient in determining the best explanation for a natural phenomenon or the best solution to a design problem. Speaking and Listening Standard 4 stresses how the presentation of findings crucially relies on how the evidence is used to illuminate the line of reasoning embedded in the explanation offered.	Eco-Action teams and working groups rely on a dynamic skill set which includes, speaking and listening, to communicate the results and actions associated with the Seven Step Framework.