ASIA SOCIETY'S GRADUATION PORTFOLIO SYSTEM

Science

Asia Society®

Partnership for Global Learning

Science Rationale

Climate change, population growth, pandemic diseases, nuclear arms proliferation, and pollution. Green technologies, new mobility systems, and advances in biotechnology. The globally-focused science classroom is a powerful place for students to explore the implications of these worldwide problems and opportunities.

Globally-focused teachers create a place where students learn science from interdisciplinary and global perspectives. Using a science curriculum with a global focus engages students in problem-based learning tasks and scientific investigations founded upon research in scientific literature.

Empowered by a global science curriculum, students investigate the complex biological, chemical, physical, earth-environmental, and human world systems, recognize and consider the power of divergent perspectives, communicate about science effectively with diverse audiences around the world, and translate their scientific ideas and findings into actions that make a difference in their local community and the world.

In globally-focused schools, students explore the language, symbols, tools, technologies, and processes of science inquiry and literacy as the foundation for understanding and advancing science knowledge. Science inquiry shows students how to initiate the inquiry, design and conduct experiments, present and analyze data, and interpret results and draw conclusions. Science literacy teaches them how to discuss a science-related issue, put the issue into context, conduct research, develop and support a thesis, discuss the implications, and communicate about the work.

Science offers the potential for medical cures and doing things better, faster, and with fewer materials. Science, however, can also be at the center of complex interrelationships between scientific results, unforeseen consequences, and ethical, legal, and social implications. To understand the impact of global issues and their current solutions, students need experience with questioning current scientific understandings and technological practices, engaging with scientists around the globe and collaborating on potential solutions to existing problems.

In a globally-focused science classroom, students learn to think like scientists. Students observe natural phenomena that cause them to wonder, ask their own questions, and test their ideas. When they interpret their data, new questions arise leading them into focused, purposeful research of the literature and to further inquiry.

The result is students who can understand, analyze, apply, and evaluate existing scientific knowledge in the context of global cultural perspectives, politics, economics, and history. Students learn to ask essential questions:

- How are the results of each action changing the global system dynamics?
- What are the complex interrelationships between local causes and worldwide effects?
- Do the benefits outweigh the costs?
- Are we reflecting on the known impacts and inquiring into the unknown effects?

Students probe for deeper understanding and reflect on the results and unforeseen consequences of scientific progress. They take a position, argue it, and take innovative actions that make a difference in the world.

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The goal of the ISSN Science program is to develop an individual's capacity to research and investigate scientific ideas using the vocabulary, symbols, and conventions of science, and to explain the local and/or global implications of human interactions with natural phenomena. Students analyze, interpret, evaluate, and discuss the significance of biological, chemical, physical, or earth-environmental scientific conclusions in the context of complex global systems.

Investigate the World

Students use scientific procedures and disciplines to investigate natural and human global phenomena.

- Formulate and refine questions that lead to a testable hypothesis or research thesis about a global issue.
- Search, compare, analyze, and evaluate background information from scientific disciplines and a variety of primary, secondary, and global sources to support a hypothesis or thesis.
- Evaluate the reliability, credibility, and limitations of existing theories and models related to an experimental hypothesis or research thesis.
- Design a controlled experiment to test a hypothesis using appropriate technology and data.

Recognize Perspectives

Students interpret and discuss scientific data in the context of complex global systems.

- Compare multiple points of view or schools of thought, and explain how the interaction of ideas across scientific disciplines, cultural perspectives, or diverse contexts and audiences influence the issue.
- Identify and interpret data patterns, trends, sources of error, outliers, and inconsistencies to make connections and draw conclusions about an experimental hypothesis or research thesis.
- Form new questions based on experimental or research results in the context of complex global systems.

Take Action

Students translate scientific inquiry or research results into actions intended to increase awareness and improve global conditions.

- Develop an individual or collaborative plan using scientific inquiry or research results to identify possible actions and implications for positive change.
- Determine how selected actions are influenced by available technology and personal or alternate viewpoints of a global issue.
- Act creatively and innovatively, collect data, and evaluate the impact of actions on the global issue and expose potential unintended consequences.
- Reflect on the influence of experimental or research projects on personal thinking, choices, or actions.

Communicate Ideas

Students discuss global implications of scientific ideas, research, or inquiry results and personal reflections.

- Document experimental and research procedures and cite sources so that the work can be replicated.
- Present accurate numerical and observational data organized in tables, graphs, charts, and/or journal entries following standard conventions.
- Communicate and collaborate to express and discuss scientific ideas using appropriate vocabulary, symbols, conventions, technology, and media.
- Discuss the significance of a science issue, including local or global implications and personal reflections.

Scoring Dimension
INVESTIGATE THE WORLD

What is the evidence that students use scientific procedures and disciplines to investigate natural and human global phenomena?

Emerging

- Questions are raised about a global science issue.
- Research thesis is stated.
- A prediction of expected results is articulated.
- Background information is gathered from one or more sources.
- Scientific content is irrelevant, contains inaccuracies, or is based on opinion.
- The credibility and reliability of the sources, ideas, theories, or models are not questioned.
- Experimental design is related to the stated problem.
- Data are based on opinions rather than observations and measurements.

Developing

- Questions are formulated about a significant global science issue and articulated in a way that leads to research or experimentation.
- Research thesis is strong and includes an arguable position.
- A prediction of expected results is articulated as an experimental hypothesis.
- Background information is gathered from a variety sources.
- Scientific content is relevant and accurate but limited in detail.
- The credibility and reliability of sources, ideas, theories, or models are questioned and evidence is offered to either support or refute the source.
- Experimental design is relevant to the stated problem and partially tests the hypothesis.
- Data are based on evidence, support the thesis or hypothesis, and are discussed.

Proficient/ College Ready

- Questions are refined around a significant global science issue and articulated as a research thesis or testable experimental hypothesis.
- Research thesis is specific, focused, and well developed. It includes a strong, definitive position supported by logical arguments that anticipate and refute counter arguments.
- A relevant prediction of expected results for the investigated question is explained in detail as an experimental hypothesis.
- Relevant background information is gathered from a combination of primary, secondary, and global sources.
- Scientific content is relevant, accurate, detailed, and organized.
- The credibility and reliability of sources, ideas, theories, or models are analyzed, questioned, evaluated, and evidence is provided to support or refute the sources.
- Experimental design proposes a detailed plan for investigating and testing the hypothesis using appropriate technology.
- Data from multiple sources are analyzed, and conclusions follow logically from the evidence to support the thesis or hypothesis.

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Advanced/ College Level

- Challenging, researchable questions about a significant global science issue are designed and investigated as a research thesis or testable experimental hypothesis.
- Research thesis is provocative, takes a contestable stand based on evidence, justifies the discussion, and displays a level of thought that introduces new ideas.
- The investigated question is explicitly stated as an hypothesis, based on background information, with a detailed description of expected relationships among variables.
- Extensive relevant information is gathered from a variety of primary, secondary, and global sources.
- Scientific content is relevant, accurate, detailed, organized, and integrated throughout the discussion of the issue.
- The credibility and reliability of sources, ideas, theories, and/or models are fully evaluated for valid contributions and limitations.
- Experimental design is comprehensive using multiple methods and technologies to test the hypothesis.
- Data synthesized from multiple sources are discussed including the student's own comparative analysis and creatively-structured defense of the thesis or hypothesis.

Scoring Dimension
RECOGNIZE PERSPECTIVES

What is the evidence that students interpret and discuss scientific data in the context of complex global systems?

Emerging

- A single context is used to explain a global issue.
- An alternate viewpoint is mentioned but not analyzed.
- Data are restated without mathematical or statistical analysis.
- Experimental error, outliers, or inconsistencies in the data, if present, are identified.
- Conclusion does not refer back to the hypothesis or thesis.
- Connections between findings and background information are limited.
- New questions are posed but may not be relevant.

Developing

- Two or more contexts are used to explain a global issue, but the discussion of interrelationships may be limited.
- One or more alternate views are presented and analyzed.
- Patterns or relationships in the data are identified with limited mathematical or statistical analysis or minor errors.
- Experimental error, outliers, and/or inconsistencies in the data, if present, are identified and discussed.
- Conclusion refers to the hypothesis or thesis, but does not include evidence from the data or misinterprets the data.
- Connections between findings and background information are detailed.
- New, relevant questions are posed and extend the original research question.

Proficient/ College Ready

- Multiple contexts are used to explain how competing interests or interrelationships affect a global issue.
- Both a supporting and an opposing view is presented and analyzed to understand alternate positions.
- Patterns and relationships in the data are analyzed by correctly applying mathematical or statistical techniques.
- Experimental error, outliers, and/or inconsistencies in the data and the impact are identified and interpreted.
- Conclusion evaluates the hypothesis or thesis based on evidence from the data.
- Connections between findings and background information are explicitly described to support the findings.
- New, relevant questions are posed and discussed in response to implications of experimental or research findings on a global issue.

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Advanced/ College Level

- Multiple contexts are used to explain a global issue as a result of the complex interrelationships among scientific, cultural, social, economic, political, and historical pressures or interests.
- Several alternate views are explored in depth, and the strengths and weaknesses of each are discussed.
- Complex patterns and relationships among multiple variables are interpreted using sophisticated mathematical or statistical techniques.
- Experimental error, outliers, and/or inconsistencies in the data are discussed, and solutions are offered to minimize future errors.
- Conclusion evaluates the hypothesis or thesis based on evidence from the data and explores intended and unintended consequences.
- Experimental or research results are synthesized in the context of background information.
- New, relevant questions and suggestions for further research are developed and designed to explore implications related to the question in a global context further.

Scoring Dimension
COMMUNICATE IDEAS

What is the evidence that students understand and discuss global implications of scientific ideas, research or inquiry results, and personal reflections?

Emerging

- Lab procedures are generally described but cannot be replicated.
- Bibliographic format for references or citations is inconsistent.
- Data are presented with visual representations but reveal limited understanding of the issue.
- Experimental or research presentation partially follows the conventions of scientific communication.
- Technology and media are used to express ideas and collaborate within the classroom.
- Communication choices are limited and indicate partial understanding of a science issue.

Developing

- Lab procedures are detailed but some steps required to replicate the experimental design are incomplete.
- Bibliographic format is consistent for each type of reference or citation.
- Data are presented with visual representations that support explanation of the issue.
- Experimental or research presentation follows most conventions of scientific communication.
- Technology and media are used to express and discuss scientific ideas and collaboration beyond the classroom.
- Communication formats are selected to support discussion of scientific ideas and personal reflection.

Proficient/ College Ready

- Lab procedures are sufficiently detailed to be replicated and accurately test the experimental design.
- Bibliographic format is consistent for each type of reference and includes multiple sources and citations.
- Data are presented with visual representations that enhance understanding of the issue and findings for diverse audiences.
- Experimental or research presentation applies conventions of scientific communication to express ideas and learning.
- Technology and media are selected for specific purposes and applied effectively to express and discuss scientific ideas and global collaboration.
- Communication formats are effectively chosen to enhance discussion of the significance of a science issue, including global implications and personal reflections.

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Advanced/ College Level

- Lab procedures are detailed, complete, replicable, and describe multiple methods used to test the experimental design.
- Bibliographic format is consistent for each type of reference and systematically incorporates a variety of sources and citations.
- Data are presented in a professional format with visual representations that illustrate the relationships between the variables and support diverse audiences to understand and interpret the issue and findings.
- Experimental or research presentation consistently applies conventions of scientific communication to enhance audience understanding.
- Technology and media are selected for specific purposes and applied effectively to express and discuss scientific ideas and collaboration across global contexts and locations.
- A variety of communication formats are strategically chosen to enhance understanding and discussion of a significance science issue, including global implications and personal reflections.

Scoring Dimension
TAKE ACTION

What is the evidence that students translate scientific inquiry or research findings into actions that increase awareness and improve global conditions?

Emerging

- Project plan describes positive actions or policy, but it is not clear how it relates to scientific inquiry or research findings.
- Available technology and personal views are identified for selected actions.
- Action plan is implemented and discussed.
- Reflection mentions how student thinking about the issue was informed by the project.

Developing

- Project plan details collaborative actions or policy based on experimental or research findings that have potential to improve conditions.
- Available technology and personal views are identified for their impact on the selected actions.
- Action plan is implemented. Data is collected and discussed to identify changes in the science issue.
- Reflection describes specific ways student thinking about the issue or future choices were influenced by the project.

Proficient/ College Ready

- Project plan details collaborative actions or policy based on experimental or research findings that increase awareness and improve global conditions.
- Available technology and personal views are evaluated to determine the impact on actions, and to consider additional ways to address alternate viewpoints or solutions to the science issue.
- Action plan is implemented in creative or innovative ways. Data is collected and analyzed to determine the impact of actions on the science issue and identify possible unintended consequences.
- Reflection articulates how the project influenced student thinking, choices, actions, and awareness of alternative thoughts and ideas.

Advanced/ College Level

- Project plan recommends positive, collaborative actions and policies, explains its viability in relation to the experimental or research findings, and predicts the potential for positive global impact.
- Available technology and personal and alternate views are considered in designing actions that address solutions to the science issue.
- Action plan is implemented in creative or innovative ways. Data is collected and evaluated to measure the impact of actions on the science issue and to design responses to any unintended consequences.
- Reflection integrates a discussion of the issue throughout the project and indicates how student thinking evolved impacting choices, actions, and awareness of alternative thoughts and ideas.