Department of Accelerated Programs

**IB Environmental Systems and Society SL Curriculum**

10.0 Credits
### IB LEARNER PROFILE

IB Programs aim to develop internationally minded people who are striving to become:

<table>
<thead>
<tr>
<th>Inquirers</th>
<th>Their natural curiosity is nurtured. They acquire the skills necessary to conduct constructive inquiry and research, and become independent active learners. They actively enjoy learning and this love of learning will be sustained throughout their lives.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledgeable</td>
<td>They explore concepts, ideas and issues, which have global relevance and importance. In so doing, they acquire, and are able to make use of, a significant body of knowledge across a range of disciplines.</td>
</tr>
<tr>
<td>Critical thinkers</td>
<td>They exercise initiative in applying thinking skills critically and creatively to approach complex problems and make reasoned decisions.</td>
</tr>
<tr>
<td>Communicators</td>
<td>They understand and express ideas and information confidently and creatively in more than one language and in a variety of modes of communication.</td>
</tr>
<tr>
<td>Risk-takers</td>
<td>They approach unfamiliar situations with confidence and forethought, and have the independence of spirit to explore new roles, ideas and strategies. They are courageous and articulate in defending those things in which they believe.</td>
</tr>
<tr>
<td>Principled</td>
<td>They have a sound grasp of the principles of moral reasoning. They have integrity, honesty, a sense of fairness and justice and respect for the dignity of the individual.</td>
</tr>
<tr>
<td>Caring</td>
<td>They show empathy, compassion and respect towards the needs and feelings of others. They have a personal commitment to action and service to make a positive difference to the environment and to the lives of others.</td>
</tr>
<tr>
<td>Open-minded</td>
<td>Through an understanding and appreciation of their own culture, they are open to the perspectives, values and traditions of other individuals and cultures and are accustomed to seeking and considering a range of points of view.</td>
</tr>
<tr>
<td>Well-balanced</td>
<td>They understand the importance of physical and mental balance and personal well being for themselves and others. They demonstrate perseverance and self-discipline.</td>
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<tr>
<td>Reflective</td>
<td>They give thoughtful consideration to their own learning and personal development. They are able to analyze their strengths and weaknesses in a constructive manner.</td>
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Year Two - Unit One

IB Environmental Systems and Societies SL

Course Description

As an interdisciplinary subject, environmental systems and societies is designed to combine the techniques and knowledge associated with group 4 (the experimental sciences) with those associated with group 3 (individuals and societies). The prime intent of this course is to provide students with a coherent perspective of the interrelationships between environmental systems and societies; one that enables them to adopt an informed personal response to the wide range of pressing environmental issues that they will inevitably come to face. Students' attention can be constantly drawn to their own relationship with their environment and the significance of choices and decisions that they make in their own lives. It is intended that students develop a sound understanding of the interrelationships between environmental systems and societies, rather than a purely journalistic appreciation of environmental issues.
## IB Environmental Systems and Societies SL

### Pacing Guide

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Suggested Timing</th>
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<tbody>
<tr>
<td>Unit 1</td>
<td>Atmospheric systems and societies</td>
<td>10 Weeks</td>
</tr>
<tr>
<td>Unit 2</td>
<td>Climate Change and Energy Production</td>
<td>8 Weeks</td>
</tr>
<tr>
<td>Unit 3</td>
<td>Biodiversity Conservation</td>
<td>12 Weeks</td>
</tr>
<tr>
<td>Unit 4</td>
<td>Humans and Solid Domestic Waste</td>
<td>5 Weeks</td>
</tr>
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</table>
Educational Technology Standards


- **Technology Operations and Concepts**
  - Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources
  - Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.

- **Creativity and Innovation**
  - Apply previous content knowledge by creating and piloting a digital learning game or tutorial.

- **Communication and Collaboration**
  - Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.

- **Digital Citizenship**
  - Demonstrate appropriate application of copyright, fair use and/or Creative Commons to an original work.
  - Evaluate consequences of unauthorized electronic access and disclosure, and on dissemination of personal information.
  - Compare and contrast policies on filtering and censorship both locally and globally.

- **Research and Information Literacy**
  - Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.

- **Critical Thinking, Problem Solving, Decision Making**
  - Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
## Career Ready Practices

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

<table>
<thead>
<tr>
<th>CRP1. Act as a responsible and contributing citizen and employee</th>
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<tr>
<td>Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.</td>
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<table>
<thead>
<tr>
<th>CRP2. Apply appropriate academic and technical skills.</th>
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<tr>
<td>Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation</td>
</tr>
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<tr>
<th>CRP3. Attend to personal health and financial well-being.</th>
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<td>Career-ready individuals understand the relationship between personal health, workplace performance and personal well-being; they act on that understanding to regularly practice healthy diet, exercise and mental health activities. Career-ready individuals also take regular action to contribute to their personal financial wellbeing, understanding that personal financial security provides the peace of mind required to contribute more fully to their own career success.</td>
</tr>
</tbody>
</table>
CRP4. Communicate clearly and effectively and with reason.
Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others’ time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP5. Consider the environmental, social and economic impacts of decisions.
Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.

CRP6. Demonstrate creativity and innovation.
Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP7. Employ valid and reliable research strategies.
Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
Career Ready Practices

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

CRP9. Model integrity, ethical leadership and effective management.
Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others’ action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management’s actions and attitudes can have on productivity, morals and organizational culture.

CRP10. Plan education and career paths aligned to personal goals.
Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.

CRP11. Use technology to enhance productivity.
Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
### Career Ready Practices

**CRP12. Work productively in teams while using cultural global competence.**
Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.
**Differentiated Instruction**

**Strategies to Accommodate Students Based on Individual Needs**

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<tr>
<th>Time/General</th>
<th>Processing</th>
<th>Comprehension</th>
<th>Recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra time for assigned tasks</td>
<td>Extra Response time</td>
<td>Precise step-by-step directions</td>
<td>Teacher-made checklist</td>
</tr>
<tr>
<td>Adjust length of assignment</td>
<td>Have students verbalize steps</td>
<td>Short manageable tasks</td>
<td>Use visual graphic organizers</td>
</tr>
<tr>
<td>Timeline with due dates for reports and projects</td>
<td>Repeat, clarify or reword directions</td>
<td>Brief and concrete directions</td>
<td>Reference resources to promote independence</td>
</tr>
<tr>
<td>Communication system between home and school</td>
<td>Mini-breaks between tasks</td>
<td>Provide immediate feedback</td>
<td>Visual and verbal reminders</td>
</tr>
<tr>
<td>Provide lecture notes/outline</td>
<td>Provide a warning for transitions</td>
<td>Small group instruction</td>
<td>Graphic organizers</td>
</tr>
<tr>
<td></td>
<td>Reading partners</td>
<td>Emphasize multi-sensory learning</td>
<td></td>
</tr>
</tbody>
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<thead>
<tr>
<th>Assistive Technology</th>
<th>Tests/Quizzes/Grading</th>
<th>Behavior/Attention</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer/whiteboard</td>
<td>Extended time</td>
<td>Consistent daily structured routine</td>
<td>Individual daily planner</td>
</tr>
<tr>
<td>Tape recorder</td>
<td>Study guides</td>
<td>Simple and clear classroom rules</td>
<td>Display a written agenda</td>
</tr>
<tr>
<td>Spell-checker</td>
<td>Shortened tests</td>
<td>Frequent feedback</td>
<td>Note-taking assistance</td>
</tr>
<tr>
<td>Audio-taped books</td>
<td>Read directions aloud</td>
<td></td>
<td>Color code materials</td>
</tr>
</tbody>
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<table>
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<tr>
<th>Recall</th>
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<th>Organization</th>
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<tr>
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<td>Color code materials</td>
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</table>
### Enrichment

**Strategies Used to Accommodate Based on Students Individual Needs:**

- Adaption of Material and Requirements
- Evaluate Vocabulary
- Elevated Text Complexity
- Additional Projects
- Independent Student Options
- Projects completed individual or with Partners
- Self Selection of Research
- Tiered/Multilevel Activities
- Learning Centers
- Individual Response Board
- Independent Book Studies
- Open-ended activities
- Community/Subject expert mentorships
## Assessments

### Suggested Formative/Summative Classroom Assessments

- Timelines, Maps, Charts, Graphic Organizers
- Teacher-created Unit Assessments, Chapter Assessments, Quizzes
- Teacher-created DBQs, Essays, Short Answer
- Accountable Talk, Debate, Oral Report, Role Playing, Think Pair, and Share
- Projects, Portfolio, Presentations, Prezi, Gallery Walks
- Homework
- Concept Mapping
- Primary and Secondary Source analysis
- Photo, Video, Political Cartoon, Radio, Song Analysis
- Create an Original Song, Film, or Poem
- Glogster to make Electronic Posters
- Internal and External IB Assessments
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<tr>
<th>Interdisciplinary Connections</th>
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<tbody>
<tr>
<td><strong>English Language Arts</strong></td>
</tr>
<tr>
<td>• Journal writing</td>
</tr>
<tr>
<td>• Close reading of industry-related content</td>
</tr>
<tr>
<td>• Create a brochure for a specific industry</td>
</tr>
<tr>
<td>• Keep a running word wall of industry vocabulary</td>
</tr>
<tr>
<td><strong>Social Studies</strong></td>
</tr>
<tr>
<td>• Research the history of a given industry/profession</td>
</tr>
<tr>
<td>• Research prominent historical individuals in a given industry/profession</td>
</tr>
<tr>
<td>• Use historical references to solve problems</td>
</tr>
<tr>
<td><strong>World Language</strong></td>
</tr>
<tr>
<td>• Translate industry-content</td>
</tr>
<tr>
<td>• Create a translated index of industry vocabulary</td>
</tr>
<tr>
<td>• Generate a translated list of words and phrases related to workplace safety</td>
</tr>
<tr>
<td><strong>Math</strong></td>
</tr>
<tr>
<td>• Research industry salaries for a geographic area and juxtapose against local cost of living</td>
</tr>
<tr>
<td>• Go on a geometry scavenger hunt</td>
</tr>
<tr>
<td>• Track and track various data, such as industry's impact on the GDP, career opportunities or among of individuals currently occupying careers</td>
</tr>
<tr>
<td><strong>Fine &amp; Performing Arts</strong></td>
</tr>
<tr>
<td>• Create a poster recruiting young people to focus their studies on a specific career or industry</td>
</tr>
<tr>
<td>• Design a flag or logo to represent a given career field</td>
</tr>
<tr>
<td><strong>Science</strong></td>
</tr>
<tr>
<td>• Research the environmental impact of a given career or industry</td>
</tr>
<tr>
<td>• Research latest developments in industry technology</td>
</tr>
<tr>
<td>• Investigate applicable-careers in STEM fields</td>
</tr>
</tbody>
</table>
Next Generation Science Standards (NGSS):

**HS-ESS2-1.** Develop a model to illustrate how Earth’s internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

**HS-ESS2-2.** Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

**HS-ESS2-3.** Develop a model based on evidence of Earth’s interior to describe the cycling of matter by thermal convection.

**HS-ESS2-4.** Use a model to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate.

**HS-ESS2-5.** Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

**HS-ESS2-6.** Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

**HS-ESS2-7.** Construct an argument based on evidence about the simultaneous coevolution of Earth’s systems and life on Earth.

**HS-LS2-1.** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

**HS-LS2-2.** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

**HS-LS2-6.** Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*

HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species’ chances to survive and reproduce.

HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.*
### Course: ESS  
#### Unit: 1 Year II  
##### Grade Level: 11-12

**Unit Overview:** This unit examine how the behavior, structure and composition of the atmosphere influence variations in all ecosystems.

**Nest Generation Science Standards (NGSS):** HS-ESS2-3, 4, 6, 7; HS-LS2-1, 2, 6

<table>
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<tr>
<th>Student Learning Objectives (SLOs)</th>
<th>Essential Questions</th>
<th>Content</th>
<th>Activities and Assessments</th>
<th>Resources</th>
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</thead>
</table>
| Recognize that the atmosphere is predominantly a mixture of gases (i.e. nitrogen and oxygen, with smaller amounts of carbon dioxide, argon, water vapor and other trace gases) and is divided into layers based on temperature. | Why would we study the composition and condition of Earth's atmosphere?  
What are the essential components of the atmosphere? | ➢ Identify the composition of gases that compose the atmosphere.  
➢ Graph Temperature vs. Altitude  
➢ Describe why temperatures shift to form atmospheric layers.  
➢ Explain the role of atmospheric pressure. | Turning Point Response System  
Paper 1 style questions  
Debates  
Simulations  
Open Form Writing  
On-line quizzes  
Lab/Simulation Report  
Extended Essay Style question response | Environmental Systems and Societies for the IB Program  
ISBN 978-1-107-55643-0  
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| Explore how human activities impact atmospheric composition through altering inputs and outputs of the system and understand that changes in the concentrations of atmospheric gases has significant effects on ecosystems. | Why should we study the impact of human activities on Earth’s atmosphere? How would you recognize human impact in the atmosphere? | ➢ Examine how human activities impact atmospheric compositions.  
➢ Define inputs and outputs of the atmospheric system.  
➢ Understand that changes in the concentrations of atmospheric gases has significant effects on ecosystems. | Turning Point Response System  
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| Explain how most clouds form in the troposphere and play an important role in the albedo effect of the planet and understand that the greenhouse effect is a natural phenomenon maintaining suitable temperatures for living systems. | What influence do clouds have on the temperature on Earth? What is the relationship between the albedo effect and temperature on Earth? | ➢ Define albedo.  
➢ Explain how clouds play an important role in the albedo effect of the planet.  
➢ Explain the importance of the albedo effect in maintaining suitable temperature for life. | Turning Point Response System  
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| Explore how ultraviolet radiation from the Sun is absorbed by stratospheric ozone and evaluate how damage to the ozone layer has deleterious effects on living organisms. | How can we identify the role that stratospheric ozone plays in the prevention of deleterious effects on living organisms? What is the relationship between ground level ozone and stratospheric ozone? | ➢ Explain the impact differences, between tropospheric and atmospheric ozone.  
➢ Explain the relationship between ozone and halogenated organic gases.  
➢ Explain the effect of radiation of living tissue.  
➢ Analyze how the stratosphere prevents deleterious effects, such as, cancer, from occurring in living organisms. | Turning Point Response System  
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<td>Explain how the combustion of fossil fuels produces sulfur dioxide and oxides of nitrogen as primary pollutants and how these gases may be converted into secondary pollutants of dry deposition (such as ash and dry particles) or wet deposition (such as rain and snow).</td>
<td>What influence does the combustion of fossil fuels have on Earth’s atmosphere? What is the relationship between primary and secondary pollutants? How do primary pollutants interact with secondary pollutants?</td>
<td>➢ Categorize the effects the combustion of fossil fuels has on the atmosphere. ➢ Differentiate between primary and secondary pollutants. ➢ Explain photochemical smog. <strong>Case Study:</strong> Air pollution in Delhi</td>
<td><strong>Turning Point Response System</strong>  <strong>Paper 1 style questions</strong>  <strong>Debates</strong>  <strong>Simulations</strong>  <strong>Open Form Writing</strong>  <strong>On-line quizzes</strong>  <strong>Lab/Simulation Report</strong>  <strong>Extended Essay Style question response</strong>  <strong>Test with Paper 1&amp;2 style test questions.</strong></td>
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| Explore the possible effects of acid deposition on soil, water and living organisms. NGSS: HS-LS2-6 | What effects can acid deposition have on soil, water and living organisms? How does acid rain impact populations of fish? What are the most effective ways to mitigate the effects of acid deposition? | ➢ Explain how precipitation become acidified. ➢ Explain the direct effects of acid deposition in forests. ➢ Describe the nutrient effect on soil. ➢ Explain the toxic effect on fish. ➢ Explain how acidification affects human populations. | Turning Point Response System  
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http://3rdworldfarmer.com/ |
## Unit 1 Vocabulary

- Ozone
- Refrigerants
- Pollution
- Volatile organic compounds
- Air quality indices
- Photochemical Smog
- Acidification
- Anticyclones
- Acid Deposition
### TOK Connections

The atmosphere is a dynamic system—how should we react when we have evidence that does not fit with an existing theory?

### Contribution to the Development of Students’ Approached to Learning Skills

This course enhances student thinking skills as they approach topics relevant to their lives in the 21st century. They cultivate self-management as they research and explore solutions to the global environmental problems facing society today. Their social and communication skills are honed as they strive to effect change.

### Contributions to the Development of the Attribute(s) of the Learner Profile

Environmental issues are a concern for every person living on this planet. This course encourages students to become open-minded inquirers and thinkers so that they may become knowledgeable. It fosters a desire to communicate these important issues to others. It promotes caring as it encourages them to reflect and focus concern on others. As risk takers students are encouraged to seek and employ solutions to the problems facing our society in the 21st century.

### Contribution to the Development of International Mindedness

Impact to the atmosphere from pollutants can be localized, as evidenced by the destruction of the ozone layer over the poles of the Earth. Pollutants released to the atmosphere are carried by currents in the atmosphere and may create damage in a location other than where they are produced.