# **GRADE 10 SCIENCE**

**Debating Environmental Issues**

## **Curriculum Expectations**

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| **SNC 2D Earth and Space Science: Weather Dynamics** | |
| **Overall Expectations** | |
| **ESV.02D** | Investigate and analyze trends in local and global weather conditions to forecast local and global weather patterns. |
| **ESV.03D** | Evaluate how technology has contributed to our understanding of the physical factors that affect the weather. |
| **Developing Skills of Inquiry and Communication** | |
| **ES2.01D** | Through investigations and applications of basic concepts, formulate scientific questions about weather-related phenomena, problems and issues (e.g., What is the effect of heat energy transfer within the hydrosphere?). |
| **ES2.03D** | Through investigations and applications of basic concepts, select and integrate information from various sources, including electronic and print resources, to answer the questions chosen. |
| **ES2.05D** | Through investigations and applications of basic concepts, select and use appropriate vocabulary and numeric, symbolic, graphic and linguistic modes of representation to communicate scientific ideas, plans, results and conclusions (e.g., use historical and current weather data to support a position on future weather patterns). |
| **ES2.06D** | Investigate factors which affect the development, severity and movement of global and local weather systems (e.g., the ozone layer, El Niño, bodies of water, glaciers, smog, rain forests). |
| **Relating Science to Technology, Society and the Environment** | |
| **ES3.01D** | Explain the role of weather dynamics in environmental phenomena and consider the consequences to humans of changes in weather (e.g., the role of weather in air pollution, acid rain, global warming and smog; the fact that smog aggravates asthma). |
| **ES3.02D** | Explain how people have utilized their understanding of weather patterns for various purposes (e.g., to harness wind as a power source; to participate in ocean sailing races). |

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| **SNC 2P Earth and Space Science: Weather Dynamics** | |
| **Overall Expectations** | |
| **ESV.01P** | Demonstrate an understanding of the factors affecting the fundamental processes of weather systems. |
| **Developing Skills of Inquiry and Communication** | |
| **ES2.04P** | Through investigations and applications of basic concepts, select and integrate information from various sources, including electronic, print and community resources, to answer the questions chosen (e.g., historical trend data, local weather records, rates of evaporation of water). |
| **ES2.05P** | Through investigations and applications of basic concepts, analyze the data and information gathered to clarify aspects of the questions chosen. |
| **ES2.06P** | Through investigations and applications of basic concepts, communicate the results of the investigation using a variety of oral, written and graphic formats (e.g., diagrams, group presentations to the class, flow charts, simulations, graphs). |
| **Relating Science to Technology, Society and the Environment** | |
| **ES3.01P** | Identify the impact of climate change on economic, social and environmental conditions. |

**Introduction**

The topic of Climate change provides ample opportunity to use debates in the science classroom. the topic fits very well in the unit of Grade 10. Specifically, students may debate the Paris Agreement.

Useful Resources

<https://www.canada.ca/en/services/environment/weather/climatechange.html>

<https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

<https://ec.europa.eu/clima/policies/international/negotiations/paris_en>

## SCIENCE IN THE CLASSROOM

Introducing the Art of Debating into your Science Classroom: ***Using Environmental Issues to Encourage Critical Thinking and Communication* by Sara McCormick**

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limate change, due to rising greenhouse gas concentrations, is of global concern. Human activities, both residential and industrial, contribute to this problem, which will ultimately have serious environmental and economic implications. At the Paris climate conference (COP21) in December 2015, 195 countries adopted the first-ever universal, legally binding global climate deal

Their task will be to decide whether to join other countries in signing the Paris Agreement. The decision-making process will take place in the form of a debate, through which advantages, disadvantages and logistics will be clearly outlined. Students will be assigned to a “pro” or “con” position and each team will have time to research and collaborate in advance of the debate. Following the debate, each student in the class will write a position paper, which clearly states his or her personal stance on the Agreement.

**PROJECT EXPECTATIONS**

In this activity, students will be provided with multiple opportunities to develop and/or broaden skills of scientific investigation and to make connections between science, technology, society and the environment. Assessment rubrics are shown for the debate and position paper sections. In order to meet overall and specific curriculum expectations, it is expected that students will investigate and address:

* Sources of air pollution (caused by residents and industry), including evaluation

– from a historical perspective – of the impact of technological advancements.

* The impact of air pollution on environmental health/homeostasis.
* The relationship between air pollution, the Greenhouse Effect and global warming.
* The relationship between population size/growth, air pollution, the Greenhouse Effect and global warming.
* The impact of air pollution on human health.
* The Paris Agreement and Canada’s commitment to reducing air pollution.
* Potential impacts of the Paris Agreement from a social, economic and environmental perspective.
* Methods by which the Paris Agreement regulations may be met (i.e., “Green Energy” sources, “Hybrid” automobiles, and development of the hydrogen cell).
* Future suggestions/steps, including consideration of alternatives to the Paris Agreement.

**ORGANIZING THE DEBATE**

The purpose of a debate is to sway an audience towards one point of view. The format of this informal debate, which will take place over one class period, involves:

* 1. statement of the question for debate
  2. an opening speech by each side (15-minute maximum per side)
  3. a 10-minute pause between the opening speeches and the rebuttals to allow teams to develop strategy
  4. rebuttals, which allow students to refute the points made by his/her opponents (10 min. maximum per side)
  5. presentation of subsequent arguments, which alternates between the two sides (3 min. maximum per argument as time allows)
  6. a closing speech (5 min. maximum per side)

It is recommended that teams be comprised of no more than six members. Each team member is expected to make five valid and supported points (as a minimum) during the introduction and five during the rebuttal. Points must be supported by facts and should be clear and concise. Teamwork is critical and speakers should be aware of their teammate’s strategy; points should not be repeated.

**THE POSITION PAPER**

The goal of a position paper is to convince an audience (readers) that the author’s opinion is valid and feasible. The effectiveness of a position paper is reliant upon organization of the argument. The following is a suggested outline to assist students in the development of a position paper.

Students should be directed to:

1. Collect applicable and appropriate research materials. Include supportive evidence for the pro and con sides of the issue. Students must be instructed to provide a complete bibliography of all sources used.
2. Clearly state the position that will be taken in the paper and provide background information in an introductory paragraph.
3. Elucidate both sides of the issue in a clear and concise manner. A summary of one position must be provided and counterclaims refuted.
4. State the argument by providing a minimum of three points with supportive evidence that will ensure validity of the position.
5. Restate the argument and propose a course of action (which addresses discussion of appropriate technologies) in a conclusion.

In addition, students should include a reference page with all relevant information.

Note: The format of the paper is not necessarily essay-style and no stipulations on the length of the paper are set. Typically, a concise paper, in which the argument is clearly stated and supported, is most effective. As in debates, length is not often an attribute in the delivery of an argument.

**MODIFICATIONS AND ACCOMMODATIONS**

Some students may require this project to be modified to accommodate specific learning needs. The following are suggested modifications/accommodations for teachers to use.

* Introduce key concepts through introductory classroom lessons/discussions (i.e.,

elucidation of key concepts, such as the carbon cycle, greenhouse gases, the Greenhouse Effect, global warming).

* Provide supplementary reading materials (that may be read as a class), which clarify concepts presented in the aforementioned lessons/discussions.
* Modify the presentation format (i.e., less formal debate styles, concept map construction or artistic representations in place of position papers).
* Modify the presentation expectations based upon the selected project format.
* Pair/group of students (during research and presentation development) to encourage peer tutoring/support.
* Encourage inclusion of multicultural perspectives on the topic of the Paris Agreement.
* Conduct workshops on online researching skills (i.e., how to search, key word selection, referencing online resources), where applicable.
* Provide flexibility in timelines.
* Encourage use of translation tools, where applicable.
* Include staff from the ESL/special needs department in the project development.
* Schedule informal meetings to assess progress and provide direction.

# **ASSESSMENT AND EVALUATION: THE DEBATE**

It is recommended that each student receive a mark based upon his or her contribution to the debate. Using the following breakdown, a mark out of ten is appropriate. This same assessment is undertaken not only by the teacher, but also as a peer review, whereby members of the class “audience” apply this rubric with supporting examples. This is a good way to involve more students into the activity.

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| **Argument Organization:** | **0** | **1** | **2** |  |
| **Supportive Evidence** | **0** | **1** | **2** |
| **Communication (see rubric criteria)** | **0** | **1** | **2** | **3** |
| **Group Participation (see rubric criteria)** | **0** | **1** | **2** | **3** |

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| **Criteria** | **Level 1** | **Level 2** | **Level 3** | **Level 4** |
| Communication | Delivery of arguments confuses listeners and impedes understanding. | Arguments were read with no attempt to engage the audience. | Volume, tone and pace and eye contact were used to hold the audience’s attention. | Excellent use of voice and non-verbal cues. Visual aids were provided. |
| Group Participation | Some group members offered arguments infrequently during the debate. | All group members participated, yet some were more dominant. | All group members participated equally; some evidence of planning and rehearsal was present. | All group members participated equally, the group was well- organized and rehearsal was evident. |

Note: The debate rubric may be used as an assessment tool, or as an evaluation tool. Teachers may assign a grade using their own discretion. Unofficially, the “winner” of the debate may be determined by counting the number of supported points made by each team.

**THE POSITION PAPER**

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| --- | --- | --- | --- | --- |
| **Criteria** | **Level 1** | **Level 2** | **Level 3** | **Level 4** |
| Understanding of | Inadequate | The main points were | The topic was clearly | The topic was clearly |
| Topic and Position | understanding of | presented, yet the | understood and | understood and a well- |
| Development | the topic was | position was not clearly | presented, yet some | defined position was taken. |
|  | displayed. No | stated. | details were not fully | Creativity and extension of |
|  | position was |  | developed. | the project expectations were |
|  | evident. |  |  | evident. |
| Inclusion of | Supportive | Supportive evidence | Points were supported | Points were well supported |
| Supportive Evidence | evidence was | was provided, yet the | by reliable evidence. All | by relevant, current, reliable |
| and Referencing | lacking. No | validity was | sources were correctly | evidence. All source was |
|  | reference list was | questionable. All | referenced. | correctly referenced. |
|  | included. | sources were not |  |  |
|  |  | referenced, or |  |  |
|  |  | referenced incorrectly. |  |  |
| Organization of | Few ideas were | Ideas were connected, | Ideas were organized | Ideas were purposefully |
| Points | connected. No | yet focus was lost at | and connected. The | connected and logically |
|  | introduction or | times. Further | introduction and | organized. A convincing |
|  | conclusion was | development of ideas | conclusion require | introduction and conclusion |
|  | evident. | was required. | further development. | was included. |
| Writing Style, | Multiple errors | Errors were evident, yet | Occasional errors were | The paper was free of |
| Grammar and | interfered with the | did not interfere with the | evident; use of | errors; appropriate |
| Spelling | clarity of the paper. | clarity of the paper. | appropriate vocabulary | vocabulary was used |
|  |  |  | was attempted. | effectively. |

Note: the position paper rubric may be used as an assessment tool, or as an evaluation tool. Teachers may assign a grade using their own discretion. If a grade is assigned, it is recommended that the value of the position paper be equivalent to the total.