

# Responding to Climate Change: A Primer for K-12 Education



**Purpose of the primer:** To offer research-based understandings of how Ministries of Education, School Divisions, and Schools can help inform and empower climate action.

**Background:** Scientists are confident, beyond doubt, that humans are contributing to climate change.<sup>1,2,3</sup> With twelve years remaining to prevent climate catastrophe, immediate action is required to ensure global temperatures do not exceed 2°C above pre-industrial levels.<sup>1</sup> The scale of response required necessitates climate change education, training, and public awareness (CCE).<sup>1,4,5,6</sup> International calls for CCE have been ongoing since the development of the 1992 UN Framework Convention on Climate Change, with increasing attention following the 2015 launch of the UN Sustainable Development Goals and the 2015 Paris Agreement.<sup>7,8</sup>

Despite this international focus, a recent study found only 79% of Canadians believed climate change was occurring.<sup>9</sup> This belief was lowest among individuals living in provinces contributing the most to greenhouse gases, namely SK and Alberta.<sup>9</sup> Only 66% of SK residents acknowledged the existence of climate change, the lowest of all provinces.<sup>9</sup> Additionally, only 61% of Canadians believed climate change was partly or mostly due to human activities (see Figure 1).<sup>9</sup> Due to increasingly tight timelines to address climate change, and evidence public climate change belief is misaligned with scientific certainty levels, CCE is urgently needed. Despite recent calls for action from school strikes and other sectors of civil society,<sup>10</sup> broader political and moral will to avoid ecological disaster is still largely missing.<sup>11</sup>

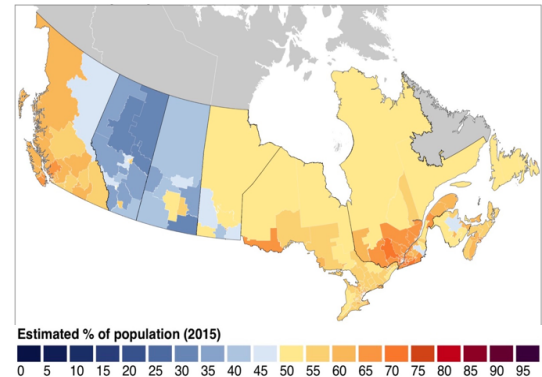


Figure 1. Percentage of Canadians who believed human activities contribute to climate change<sup>9</sup>

**What is 'good' climate change education (CCE):** Most CCE to date has focused on students' learning scientific facts about climate change, assuming that increased scientific literacy will lead to changed beliefs and behaviors.<sup>12,13,14,15</sup> Evidence suggests, however, that higher levels of scientific knowledge do not automatically change minds or mobilize feet, and that even belief in climate change only moderately affects actions<sup>16,17,18,19,20</sup> Recent research also found that a majority of Canadians think the education system should be doing more to educate young people about climate change.<sup>21</sup>

While the field of CCE is still new, research suggests 'good' climate change education should focus on the social and emotional considerations within which learning occurs (see Figure 2).<sup>14,16,22,23</sup> Evidence suggests the greatest predictors of climate belief and action are cultural and political affiliation,<sup>17</sup> with a recent study finding teachers' political views, as opposed to their content knowledge, more accurately predicted how CCE was taught within their classes.<sup>24</sup> The importance of considering political and cultural associations is also illustrated in a range of interdisciplinary work emphasizing the role of language and framing in making climate change matter in relation to the priorities of different communities in order to overcome prior climate change doubt and inaction.<sup>11,18,19</sup> In addition, social learning and place-based pedagogies have been found to be critical in moving beyond climate and environmental awareness to empowerment and action.<sup>20</sup>

## Climate Change Education Should:

Be Accurate and Critical	Be Local and Tangible	Include Social and Emotional Aspects	Support Action
<ul style="list-style-type: none"> <li>• Include accurate information and foster critical thinking skills and media literacy<sup>24</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Frame climate issues as local and relevant<sup>20,22,38</sup></li> <li>• Focus on individual and collective actions<sup>38</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Incorporate socio-emotional considerations to overcome feelings of eco-anxiety and foster action<sup>12,13,16,19,20,24,38</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Use methods that are inquiry-based, experiential, critical, and participatory<sup>4,20,29</sup></li> </ul>

Figure 2. Highlights key elements of 'good' CCE from the research.

to student confusion at best and mistrust of science at worst.<sup>14</sup> Educational approaches, such as critical media literacy, can teach students how to sort fact from fiction.<sup>29</sup> Additionally, inaccurate information in the classroom could further confuse students. Recent research analyzing Canadian science curriculum and textbooks found they focused on human warming as a debate, but not on the scientific consensus.<sup>30</sup> CCE should incorporate accurate information and encourage critical thinking skills.<sup>24</sup>

As student's knowledge about climate change grows, they may develop eco-anxiety.<sup>28,31,32</sup> While small doses of concern can provide motivation for action, feeling anxious can result in passivity and hopelessness, especially if the learner is not provided with tools for taking action.<sup>33</sup> In light of growing reports of youth experiencing eco-anxiety,<sup>34,35,36</sup> educational approaches must bolster the agency and empowerment of students to feel they, and society, can and is taking meaningful climate action.<sup>4,37</sup> Finally, students may also disengage with climate change issues if they are perceived as distant and unsolvable.<sup>11,22,38</sup> Inclusion of local problems and solutions, demonstrates that climate change issues are both local and actionable. Thus, how CCE is taught is just as important as the content.<sup>39</sup>

To go beyond cognitive learning to socio-emotional and action engagement on climate change, CCE ideally will occur in all subject areas. For example, if CCE only occurs in science classrooms, students may think climate change has only scientific or technical solutions, rather

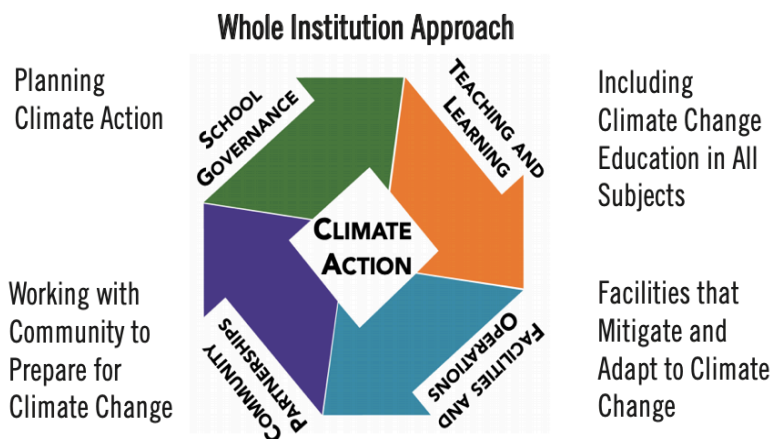


Figure 3. Overviews a whole institution approach to CCE.

As students learn more about climate change within classes and from media, there is also growing urgency for educators to be equipped with tools to help students overcome feelings of climate confusion, pessimism, and hopelessness.<sup>25,26,27</sup> For instance, media trends to suggest there are two 'sides' to climate change<sup>28</sup> can contribute

than also requiring social and political analysis and action.<sup>16</sup> To maximize learning and to model climate action, CCE should also involve all areas of institutional activity. A 'whole institution' or 'whole school' approach to climate change involves engagement in each of the areas of teaching and learning, facilities and operations, community partnerships, and governance (see Figure 3).<sup>40,41</sup>

## How can ministries of education respond?

Climate change should be considered at all educational levels. Our research suggests that each level of education policy is important in ensuring sustainability policies and practices are strong at 'lower' levels.<sup>42</sup> A recent census of sustainability-specific policy within Canadian ministries of education found 54% of provinces had such policies, most often in relation to curriculum.<sup>43</sup> For example, within the province of Saskatchewan, sustainability was only addressed at the policy level in relation to curriculum, indicating an opportunity for broader inclusion.<sup>43</sup>

While all 13 Canadian provinces mention education within their climate policies, only 46% of provinces specifically mention climate change within their educational policies.<sup>41</sup> When climate change is included, it is often only in relation to reducing school greenhouse gas emissions (an operations-related action), representing a missed opportunity to include other whole institution areas.<sup>41</sup> When developing policies, Ministries of Education can also meaningfully engage with policy actors at school and division levels to ensure broad support for policies developed, and to encourage school division and school level policy.<sup>44</sup>

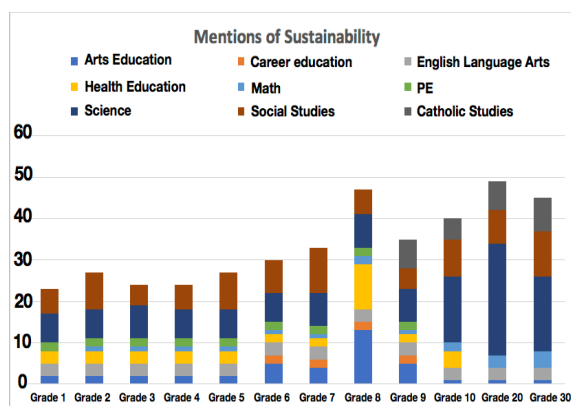


Figure 4. Mentions of sustainability in SK curriculum text searchable documents across grades and subjects.

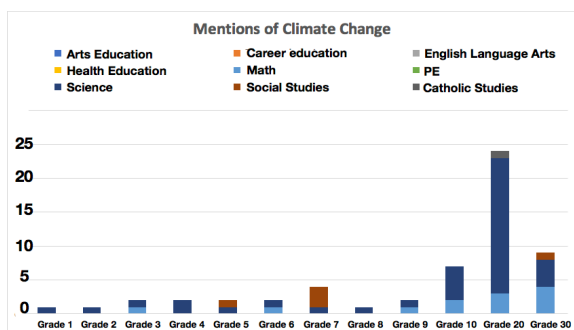


Figure 5. Mentions of climate change in SK curriculum text searchable documents across all grades and subjects.

Another way Ministries of Education can address climate change is including a climate change focus within curriculum documents across subjects. To assess how concepts of sustainability and climate change were included in the Saskatchewan provincial curriculum, for example, key word searches were conducted for mentions of sustainability and climate change. While the concept of sustainability is broadly incorporated into curriculum documents (see Figure 4), mentions of "climate change" mostly occur in science courses towards the end of students' K-12 education (see Figure 5). When "climate change" is rarely mentioned in the curriculum, the indirect message to students is climate change does not matter.<sup>36</sup> By choosing to mandate CCE within curriculum, Ministries of Education would be joining similar initiatives in other nations (i.e., Italy, New Zealand)<sup>45,46</sup> and cities (i.e., Islamabad).<sup>47</sup>

Ministries of Education can also implement provincial eco-certification programs for K-12 schools.<sup>48</sup> Environmental certification programs provide environmental, educational, and economic benefits to schools and divisions (see Figure 6) by

promoting the value of environmental education (and increasingly CCE),<sup>49,50</sup> supporting schools and divisions to make environmentally-friendly decisions, and rewarding schools that meet benchmarks along the way.<sup>48</sup> While eco-certification programs are created by a range of groups from provincial governments to non-profit organizations, research suggests the largest

and perhaps most successful eco-certification programs are supported by Ministries of Education (e.g., in Canada, British Columbia’s Green Schools and Manitoba’s EcoGlobe Program).<sup>48</sup>

<b>Environmental Benefits</b>	<ul style="list-style-type: none"> <li>• Community strengthening through joint initiatives such as vegetable gardens or waste free lunch programs</li> <li>• Enhanced biodiversity from green school grounds</li> <li>• Increased school aesthetics</li> <li>• Reduction of school’s ecological footprint</li> </ul>
<b>Educational Benefits</b>	<ul style="list-style-type: none"> <li>• Healthier students – socially, mentally, and behaviorally</li> <li>• Increase in student and teacher awareness of environmental issues and stewardship</li> <li>• Richer curriculum</li> <li>• Process of certification can lead to a new, collaborative vision for the school</li> <li>• Professional development and leadership opportunities for students and teachers</li> <li>• Whole-school participation and community ownership</li> </ul>
<b>Economic Benefits</b>	<ul style="list-style-type: none"> <li>• Savings due to reduced water and energy consumption due to various activities</li> <li>• Savings from reduced amount of waste due to recycling initiatives</li> </ul>

Figure 6. Environmental, educational, and economic benefits of eco-certification in K-12 Schools.<sup>48</sup>

## How can school divisions respond?

As mentioned, each level of education policy is important in ensuring sustainability uptake at subsequent levels, which includes sustainability and climate change policy in school divisions.<sup>41</sup>

Our research has found that 59% of Canadian school divisions have sustainability-specific policy of some type, usually focused on operations.<sup>42</sup> For example, within Saskatchewan, 17% of these policies focused on operations (see Figure 7).<sup>42</sup> An opportunity exists for school divisions to add climate-specific targets within these documents as well as develop policies in areas beyond operations, such as regarding curricular and pedagogical support, or community outreach.

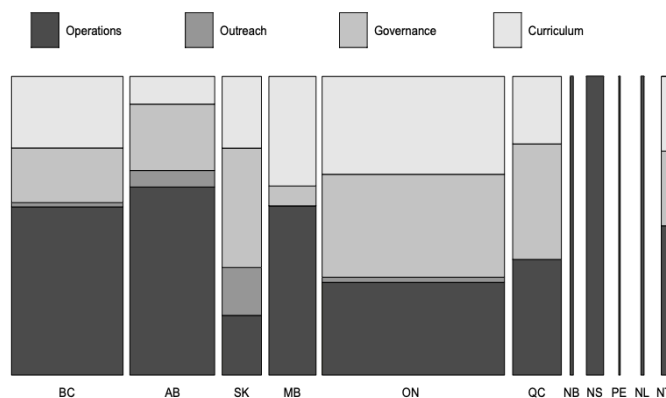


Figure 7. Whole institution areas covered by school division areas by province.<sup>41</sup>

Eco-certification programs are growing in popularity among school divisions too, with SEPN finding 43% of school divisions have participated in this programming.<sup>42</sup> If provinces and territories do not have an eco-certification program, opportunities exist for school divisions to



Figure 8. Youth protesting with Greta Thunberg during the Global Climate Strike in Montreal, Canada.<sup>10</sup>

participate in other country-wide certification programs (e.g., EcoSchools Canada and SEEDS Green Schools).<sup>48</sup> School divisions have also been responding to the climate crisis in other creative ways, including professional development for teachers and administrators, declaring climate emergencies, supporting climate strike participation, and passing climate change action resolutions.<sup>51</sup>

The Toronto District School Board runs an EcoSchools program through their sustainability office.<sup>52</sup> Currently over 300 schools within the Toronto District School

Board are certified.<sup>52</sup> The Board has also expressed commitments to improve student’s eco-literacy and encourages schools to include education related to climate change at all grade levels.<sup>52</sup> As Richard Christie, senior manager of sustainability at the Board stated, “Kids are living in an era of climate crisis and we don’t want to scare them. We want them to have the tools for citizenship and galvanize them.”<sup>52</sup> Toronto District School Board and Vancouver School Board also supported Global Climate Strike participation.<sup>53,54</sup> In 2010, The Toronto District School Board also developed and approved a climate change policy.<sup>55</sup>

Also in Ontario, the Rainbow District School Board declared a climate change emergency and created a Climate Change Action Plan that will see 100% of their schools EcoSchool certified

**Rainbow Board declares climate change emergency and commits to further action**

September 25, 2019



Figure 9. Rainbow District students in school garden.<sup>56</sup>

within the next three years.<sup>56</sup> In support of the Plan, all Rainbow District Schools participated in a Lights Out event, where schools unplugged for one hour and all K-12 students discussed potential individual, classroom, and school level actions to support immediate implementation of the Plan.<sup>56</sup> All Rainbow schools also committed to reducing their carbon footprint and improving their sustainable practices.<sup>56</sup> Additionally, the Rainbow District School Board’s Environmental Committee also presents monthly environmental challenges to staff and students and supports schools in achieving EcoSchool certification.<sup>56</sup>

American school boards are also drafting climate change resolutions. The Colorado Association of School Boards became the first school board association to pass a Climate Change Action Resolution, supporting school emphasis on carbon reduction in decision making and supporting climate change and environmental education.<sup>57</sup> This action follows that of 60 other American school boards who have passed similar resolutions since December 2017.<sup>58</sup> One of the more notable climate action resolutions is that of Portland, Oregon School Board, which called for removing text materials from schools that denied or downplayed human’s role in the climate crisis.<sup>59</sup> Additionally, the resolution committed to climate justice professional development opportunities for all schools.<sup>60</sup> Initially, the Board did little to implement the resolution.<sup>61</sup> In May 2019, however, following the participation of hundreds of

**Resolution: Climate Change Action**  
 The Colorado Association of School Boards supports school boards placing a high priority on reducing carbon consumption in making decisions regarding capital improvement, energy use, and transportation; and supporting climate change and environmental education. CASB also urges the Colorado General Assembly and federal government to take swift and effective action on climate change to protect current and future students.

Figure 10. Climate Change Action Resolution passed by the Colorado Association of School Boards.<sup>57</sup>

Portland students in climate strikes and a Board meeting where 50 students demanded the Board take action, they have since allocated \$200,000 to implement a climate justice curriculum.<sup>61</sup>

Where we are based in Saskatchewan, Saskatoon Public Schools and Greater Saskatoon Catholic Schools have been collaborating on the Student Action for a Sustainable Future program (SASF).<sup>62</sup> SASF is an inquiry and action project for Grade 5-8 students. Each year 12 schools are chosen to participate in the program, which is coordinated by the City of Saskatoon. Co-partners also include Saskatoon Public School Divisions, the Greater Saskatoon

Catholic School Divisions, the Saskatchewan Environmental Society, Saskatoon Light and Power, and the Sustainability Education Research Institute. Supported by these partners, students develop action projects within the areas of waste, water, energy, food, biodiversity, and transportation to reduce greenhouse gas emissions in Saskatoon and around Saskatchewan.<sup>62</sup> The figures below suggest additional steps that could be taken by School Divisions to advance action on climate change and sustainability.

### What school divisions can do now in each of the four whole institution areas

<p style="text-align: center;"><b>GOVERNANCE</b></p> <ul style="list-style-type: none"> <li>• Establish a sustainability portfolio and hire sustainability staff<sup>43,52</sup></li> <li>• Establish an environmental committee to support sustainable and climate friendly initiatives<sup>56</sup></li> <li>• Run an eco-certification program through the division office<sup>52</sup> and encourage schools to participate<sup>56</sup></li> <li>• Create a climate action plan with specific measurable targets within all four whole institution areas<sup>56</sup></li> <li>• Create grants for eco-friendly projects to incentivize schools<sup>63</sup></li> <li>• Declare a climate emergency<sup>56</sup></li> <li>• Pass a climate resolution<sup>57,58,59</sup></li> </ul>	<p style="text-align: center;"><b>TEACHING &amp; LEARNING</b></p> <ul style="list-style-type: none"> <li>• Provide environmental and climate change education resources, programs, workshops, and professional development opportunities<sup>52</sup></li> <li>• Support environmental education and climate change education within all subjects<sup>63</sup></li> <li>• Not penalize student participation in climate strikes<sup>53,54</sup></li> <li>• Develop eco-challenges for staff and students<sup>56</sup></li> <li>• Hold events where students develop climate solutions in line with the division’s climate action plan<sup>56</sup></li> </ul>
<p style="text-align: center;"><b>COMMUNITY PARTNERSHIPS</b></p> <ul style="list-style-type: none"> <li>• Partner with local organizations and/or provincial governments to install solar panels on school roofs and reduce carbon emissions<sup>64,65</sup></li> <li>• Partner with the municipality or region to co-develop climate solutions</li> <li>• Partner on CCE projects such as Student Action for a Sustainable Future<sup>62</sup></li> <li>• Create a program connecting farmers to schools to discuss local effects of climate change</li> <li>• Encourage schools to create gardens and share their crops with the school and local community</li> </ul>	<p style="text-align: center;"><b>FACILITIES &amp; OPERATIONS</b></p> <ul style="list-style-type: none"> <li>• Implement an anti-idling policy and use low emissions vehicles for school buses and division transportation<sup>66</sup></li> <li>• Install solar panels on schools,<sup>64,65</sup> water bottle fountains in all schools,<sup>67</sup> low-flush toilets, and light timers<sup>63</sup></li> <li>• Support schools to setup student led recycling and composting programs,<sup>63,68</sup> and implement similar programs in division offices</li> <li>• Issue carbon reduction challenges to encourage staff, students, and teachers to take eco-friendly transportation to school<sup>68</sup></li> <li>• Develop policies supporting access to local food in school cafeterias</li> </ul>

Note. This table highlights actions school divisions can take to address climate change within each of the four whole institutions areas. All actions that include footnotes have already been undertaken by other schools or school divisions.

## How can schools respond?

Our research with partner CCUNESCO identified good climate action practices within each of the four whole institution areas at the school level, as outlined in the following table.<sup>63,68</sup>

### What schools can do now in each of the four whole institution areas

GOVERNANCE	TEACHING & LEARNING
<ul style="list-style-type: none"><li>• Incorporate sustainability and climate change into school policies<sup>63,68</sup></li><li>• Environmental committees raise awareness about environmental issues<sup>63,68</sup></li><li>• Student committee members research environmental topics then educate other students and teachers<sup>63,68</sup></li><li>• Solar panel installation, reusable water bottle procurement and other school level initiatives built into governance and funding decisions<sup>68</sup></li><li>• Environmental awareness and action campaigns for students and staff<sup>63,68</sup></li><li>• Funding partnerships to apply for grants to support initiatives<sup>63,68</sup></li><li>• Funding provided to students to implement interdisciplinary research projects to improve school or community sustainability<sup>63,68</sup></li></ul>	<ul style="list-style-type: none"><li>• Education for sustainable development integrated across entire curriculum<sup>63,68</sup></li><li>• School-wide challenges to reduce climate change<sup>63,68</sup></li><li>• Classroom- and school-level projects on climate change developed<sup>63,68</sup></li><li>• Learning extended to outside the classroom through community partnerships<sup>63,68</sup></li><li>• Students learn about Indigenous cultures, the environment, and climate change<sup>63,68</sup></li><li>• Students research local actions for reducing community's impact in relation to climate change<sup>63,68</sup></li><li>• Workshops held on sustainability and climate change topics<sup>63,68</sup></li><li>• Foster connections to place by bringing classes outside<sup>36</sup></li></ul>
COMMUNITY PARTNERSHIPS	FACILITIES & OPERATIONS
<ul style="list-style-type: none"><li>• Develop website to track school's whole institution approach and support monthly climate change challenges<sup>63,68</sup></li><li>• Students taught about sustainable entrepreneurship and marketing through operating a greenhouse<sup>63,68</sup></li><li>• Students learn about reducing emissions then teach others, including their families, about eco-friendly lifestyles<sup>63,68</sup></li><li>• Students collaborate with partners to collect items to resell or recycle. Money raised pays for classroom sustainability workshops<sup>68</sup></li><li>• Gardens cared for with community partners<sup>68</sup></li><li>• Collaboration with partner, e.g., Recycle Everywhere, across school division<sup>68</sup></li></ul>	<ul style="list-style-type: none"><li>• Install industrial composter and give compost to other schools and teachers or use to enrich school garden's soil<sup>63,68</sup></li><li>• Students, teachers, board members, staff and spouses worked from home for Carbon Neutral Day, during which data were collected on transportation use<sup>63,68</sup></li><li>• Students taught proper waste sorting, including through field trips to local waste management site<sup>63,68</sup></li><li>• Student-led recycling and compost programs<sup>63,68</sup></li><li>• Install solar panels<sup>68</sup></li><li>• Students cook with local products in their cafeteria<sup>63,68</sup></li><li>• Carbon Reduction Challenge encourages students to find more eco-friendly methods of transportation<sup>68</sup></li></ul>



## Whole institution practice integration

While some example actions were listed above in each area, *a whole institution approach integrates actions across as many areas as possible*. For example, after a school implements a climate action plan (school governance), they could invite local experts (community partnerships) to the school to work with students to implement the plan (teaching and learning).

The Energy and Environmental Innovations course at Central Memorial High School in Calgary, Alberta puts climate change “front and centre.”<sup>36</sup> Students in the course negotiated with the City of Calgary and the Calgary Board of Education to convert a jointly owned piece of land into a community garden (community partnerships).<sup>36</sup> Students have also made benches from recycled materials, which will be placed in the community garden (teaching and learning; community partnerships).<sup>36</sup> Students in the course have also participated in policy initiatives, with some taking part in the Intergovernmental Panel on Climate Change meetings in Edmonton in 2018 (teaching and learning; community partnerships).<sup>36</sup> In previous years, a proposal from the course resulted in the former NDP provincial government committing \$9 million to install solar panels on school roofs (facilities and operations; community partnerships).<sup>36,65</sup> The class is also home to a living plant wall and a tank of tilapia (facilities and operations).<sup>36</sup> Many whole institution initiatives also cut across subjects, an important aspect of this approach.



Figure 11. Planning where the benches will go in the community garden.<sup>36</sup>

## Cross-curricular integration

Of the four whole institution areas, schools are primarily concerned with the area of teaching and learning. Within this whole institution area, the focus is on incorporating CCE into all subjects in line with curriculum outcomes. Several Canadian schools are going further than the provincial curriculum to integrate CCE and Education for Sustainable Development (ESD) within a range of subject classes.



Figure 12. Protest art created at Queen Elizabeth High School.<sup>68</sup>

In Edmonton, Alberta, Queen Elizabeth High school incorporates ESD and climate action across all subjects, with all classes including ESD at some point throughout the year.<sup>63</sup> For example, Art classes make “protest art” about climate change-related issues.<sup>63</sup> CCE is also integrated across subjects at Bruce Peninsula District School in Lions Head, Ontario (see Figure 13 for a sample of what this looks like).

Even in the absence of administrative or curricular support, some teachers are making the links with required curricular material. For instance, at Charles Gordon Senior Public School in Scarborough, Ontario, Lindsey Butson, a Grade 8 teacher incorporates ESD within all subjects.<sup>52</sup> Within science content, this has meant collecting water samples from a local creek to measure pH levels, dissolved oxygen, and turbidity.<sup>52</sup>

Subject	Activities
The Arts	Art installations, Protest art, Posters, Energy plays
English	Speeches, Monthly assembly presentations, Reflections
Agriculture	School garden, Orchard, Indigenous tree plantings
Biology	Biological adaptation in the local from climate change
Citizenship	Shoreline and roadside cleanup, Tree planting volunteers
Geography	Carbon footprint around the world
Health	Outdoor classrooms, Forest walks
History	History of resource management to present day extraction
Science	Inquiry based climate change projects
Math	Climate change related math problems
Vocation	Tech class created new raised beds for school garden

Figure 13. Sample of cross-curricular integration of climate change related topics at Bruce Peninsula District School.<sup>68</sup>

The results are then linked to climate change with connections made between increased freshwater acidity and carbon dioxide emissions.<sup>52</sup> In relation to English, students create podcasts exploring potential environmental solutions.<sup>52</sup> These learnings also extend beyond the classroom when the students create extra-curricular and activist groups to change local and school community behaviours (e.g., using active transportation and not buying water bottles).<sup>52</sup> According to Ms. Butson, “It has to look like it’s not so hard, then students can buy into it. If they learn the big picture at school, they may start to think it’s worth it to take five-minute showers, or not drive to school.”<sup>52</sup>

## Promising practices and next steps

Based on our research and reviews of related literature, we have identified the following promising practices and next steps for teachers, students, and educational leaders:

### 1. Establish or join a school network

Our research suggests that schools, divisions, and Ministries learn much from each other (e.g., two schools used climate change challenges<sup>63</sup>), illustrating the power of networking for climate action. Several networks already exist that schools can join, such as the EcoSchools program, SEEDS Green Schools, and the UNESCO Associated Schools Network. It’s also possible to attend annual environmental education conferences, hosted by organizations such as the Canadian Network for Environmental Education and the North American Association for Environmental Education. Schools can also connect to provincial specialist associations on environmental education or other schools in their surrounding area to form their own network. Such networks also often provide easily accessible online platforms to share ideas, problems, and resources.<sup>63,68</sup>

### 2. Engage diverse climate action actors

Engaging the entire school community (e.g., students of all ages, teachers, management), provides empowerment and makes integrated whole institution approaches possible.<sup>40,63,68</sup>

### 3. Make climate change local and relevant

Climate change can seem like a far-away issue of little relevance to students’ daily lives. Finding local meaning can make climate change more engaging.<sup>11,22,38</sup> Many schools connect CCE to local issues by discussing climate issues, participating in local action, and highlighting how Indigenous peoples are international leaders in climate action.<sup>63</sup>

#### **4. Use technology creatively**

Many schools and school divisions are using technology in new and exciting ways in addressing climate change (e.g., communicating about whole institution climate action approaches through websites or using technology to remotely 'go to school').<sup>63</sup>

#### **5. Provide concrete, feasible climate actions**

The complex issues associated with climate change can be overwhelming for students, and they need to experience concrete actions that make a difference. For example, teachers can have students discuss and develop input on their municipality's emissions reduction plan and then present their results to the city. Schools can also encourage climate justice discussions and support participation in climate protest marches.

#### **6. Connect to Indigenous knowledge**

Across our research, few schools, divisions, or Ministries linked Indigenous knowledge to climate action. Future climate action projects could be strengthened by incorporating Indigenous knowledge, which is deeply embedded in caring for the land for future generations. Indigenous knowledge often includes crucial locally relevant mitigation and adaptation strategies, which can bolster community resilience in the face of climate change. Meaningful engagement with local Indigenous communities can also make climate change education more relevant to students through connections to local place.

#### **7. Expand beyond individual-focused solutions**

Many climate actions in schools fall within the facilities and operations domain. These approaches rely on individuals changing their own behaviors (e.g., turning off lights). In the future, students could be encouraged to utilize critical thinking skills to determine the source of systemic problems contributing to climate change. Schools could also adopt climate action approaches to help address feelings of powerlessness associated with climate change and implement initiatives aimed at the broader systemic social structures that support climate inaction. For example, students could engage with representatives in municipal, provincial, and federal government to advocate for broader governmental and policy change.

K-12 education systems in Canada and elsewhere are taking significant steps to help mitigate climate change. The many exciting climate action initiatives taking place provide an inspiring reminder of the power and promise of collective action in addressing climate change.

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## Additional resources

SEPN's website ([www.sepn.ca](http://www.sepn.ca)) has infographics, research briefs, reports, open access data, and scholarly publications on topics related to sustainability and climate change education policy and practice.

### You may also be interested in the following resources:

#### CCed networks:

- [NAAEE Climate Change EE group](#)
- [Climate Literacy and Energy Awareness Network](#)
- [Climate Generation Mailing List](#)
- [Teach Climate Network](#)
- [Climate Literacy Network listserv](#): A research focused listserv you can join
- [Indigenous Environmental Network](#): Good source of information and possible support

#### Organizations and programs:

- [Climate Justice Saskatoon](#)
- [Student Action for a Sustainable Future](#)
- [350.org](http://350.org)
- [SaskOutdoors](#) focuses on outdoor and environmental education
- [Alliance for Climate Education](#)

#### Student led initiatives:

- [Friday's For Future](#)
- [Students Organizing for Sustainability](#)
- [Teach for the Future](#)
- [Indigenous Climate Action](#)

#### Resources for lesson planning:

- **General teaching resources**
  - [People's Curriculum for the Earth](#)
  - Resources for Rethinking's [climate change resources](#)
  - Green Learning [climate change resources](#)
  - Let's Talk Energy [climate change lesson plans](#)
  - Learning for a Sustainable Future's [Climate Change Resources for Teachers](#)
  - [Climate Atlas of Canada](#): Combines climate science, mapping, and storytelling to make climate change meaningful
  - Climate Generation's [experiential field trip](#): Provides steps for an experiential field trip using ARCGIS where the community is used as a place for climate action ([ARCGIS access for Canadian students](#))
  - [The Mystery of Three Scary Numbers](#) lesson by Bill Bigelow
  - UN CC:Learn develops [resources to support learning about climate change](#)
  - Project Drawdown
    - CNN's [interactive quiz on Project Drawdown results](#)
    - [Project Drawdown EcoChallenge](#): The challenges follow actions highlighted in the book Project Drawdown
    - Summary of [Project Drawdown solutions](#)



- Talking to climate change deniers
  - PBS YouTube video [Why People Don't Believe in Climate Science](#) references George Marshall's book *Don't even think about it: Why our brains are wired to ignore climate change*. You can read an excerpt from the book [here](#) with some ideas about how to talk with deniers. Also his YouTube video, [How to talk to a climate change denier](#) may be helpful.
- Climate change views in Canada
  - Yale Program on Climate Change Communication's [Interactive map of climate change views across Canada](#)
- Books for educators about CCE
  - Yale Climate Connection's [book recommendations](#)
  - Climate Generation's [recommendations for climate fiction and other readings](#)
  - National Science Teaching Association's book [Understanding Climate Change, Grades 7-12](#)
- Climate change documentaries
  - [This Changes Everything](#) documentary (available for a fee)
  - [Before the Flood](#) documentary (available for free)
  - [Chasing Ice](#) documentary (available for a fee)
- **Subject specific CCE resources**
  - Humanities
    - Climate Generation's [Humanities content for classrooms](#)
  - Climate Justice
    - [Climate Change Mixer](#) by Bill Bigelow
    - The Canadian Center for Policy Alternatives' BC office developed educator resources around climate justice in the publication [Climate Justice in BC: Lessons for Transformation](#)
    - Learning for A Sustainable Future's [Connecting the Dots](#)
    - [Zinn Education Project](#) has resources for teaching about climate justice
    - [Interview with Greta Thunberg](#)
    - Speech by [Severn Cullis-Suzuki](#) at the 1992 UN Rio Earth Summit
    - Global Oneness Project provides [climate change videos and lesson plans](#) to show impacts around the world.
  - Science
    - NASA's [resources for educators](#) to 'bring climate science to life'
    - CLEAN Network's [Guidance in Teaching about Climate and Energy](#)
    - US based resource called the [Teacher Friendly Guide to Climate Change](#) focuses on teaching about climate science but also considers issues of denial and communication
    - [Climate Change 101 with Bill Nye National Geographic](#) YouTube Video
    - BioInteractive's [Climate Change Resources](#)
    - WWF's [climate change educator](#) resources about climate change and other species
    - National Center for Science Education's [climate change lesson plans](#)
    - Connect students to the [MOSAiC](#) (Multidisciplinary drifting Observatory for the Study of Arctic Climate) expedition. The project's [MOSAiC Monday](#) initiative provides weekly classroom activities.

- Michael Mann’s [EDX course on climate science](#)
- Indigenous perspectives
  - [Indigenous Climate Action: Indigenous Peoples & Climate Change](#) YouTube video
  - [Acting on Climate Change: Indigenous Innovations](#)
  - The Centre for Global Education and Taking it Global’s [Let’s Talk Science! Indigenous Perspectives on Climate Change: Teachers Guide](#): Has lesson plans for incorporating Indigenous perspectives on climate change.
  - Connected North and Climate Action 150’s document [Why is Land Important? Indigenous Perspectives on Climate Change](#): Provides stories and resources from First Nations, Inuit, and Metis peoples’ perspectives.
- Music
  - [What climate change sounds like](#)
- **CCE-related competitions for students**
  - NAAEE’s [2020 Ocean Awareness Challenge](#). Students create artistic pieces exploring the effects of climate change on the ocean and the role of hope in creating solutions. Scholarships of up to \$1500 available.
  - Biomimicry Institute’s [Youth Design Challenge 2020](#). In teams, youth apply biomimicry to address a climate change mitigation or adaptation issue. Awards are given to students coming in 1<sup>st</sup>, 2<sup>nd</sup>, or 3<sup>rd</sup> place for both middle school and high school categories.
  - [One Earth Award](#) provides awards for creative art and writing works related to climate change (their website also provides additional CCE resources).
  - Green Learning’s [Solar Oven Challenge](#) for Grades 3-12. Teachers that register will be provided with a detailed package explaining what is needed to make a solar oven. Awards are given to students coming in 1<sup>st</sup>, 2<sup>nd</sup>, or 3<sup>rd</sup> place.

**Resources for action:**

- Schools for Climate Action: Their website has a [student council resolution toolkit and example school board emails and resolutions](#)
- Climate Generation: Their [Global Climate Strike Educator Toolkit 2019](#) is designed to empower teachers to talk about the Global Climate Strikes within their classes.

**Stories of action:**

- [“Climate Change Compels Schools to Improve Environmental Literacy:”](#) Article discusses how schools can incorporate CCE in multiple subjects
- [“Artist Uses Historic Markers to Raise Climate Awareness:”](#) Describes how an artist made historic markers based on climate change possibilities from scientific research to make climate change effects more tangible for his city.



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