

Canada, Climate Change and Education:

Opportunities for Public and Formal Education



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Introduction

The purpose of this national survey was to gain an understanding of current levels of knowledge and perceptions of climate change among the general public, parents, youth and educators as well as to assess how Canadians think the education system should respond to the climate crisis.

This report is a culmination of a collaborative effort to establish benchmarks and provide a snapshot of climate change education in Canada. The study considers many perspectives and dimensions of climate change and climate change education and is framed by numerous research questions:

- 1) What is the Canadian public's understanding of climate change?
- 2) How do Canadians perceive climate change has, and will, impact Canada?
- 3) What types of actions have Canadians already adopted, or do they plan to adopt, to reduce their contribution to greenhouse gas emissions or to advocate for stronger climate change policy?
- 4) What sources of information do Canadians use to inform themselves about climate change, and what sources are most trusted?
- 5) From different Canadian audiences' perspectives, how important is climate change education? What do different audiences think young people should learn in school about climate change?
- 6) Teacher specific research questions that focus on climate change education practices:
 - Are teachers integrating climate change education into their teaching practices, and if they are, in what subjects, covering what topics, and through which instructional strategies?
 - How confident are teachers in their knowledge and understanding? How do teachers address controversy around climate change in their classrooms?
 - What barriers do teachers face when integrating climate change education into classroom practice? What supports do they need?

Executive Summary

Snapshot of Findings

Moving Canada toward resilience and adaptability for climate impacts today and in the future will require support and action at all levels of Canadian society.

This study establishes Canada-wide baseline data reflecting different groups' knowledge and understanding of climate change, their perspectives on the importance of climate change and its risks, and views on the role of schools and climate change education. The main sample was a closed-sample, resulting in a representative group of students, parents, teachers, and members of the general public. The results are presented both nationally and from provincial/regional jurisdictions.

The survey also provides insights into climate change education practice from an opt-in teacher sample (open-sample - OS) and a representative teacher sample (closed-sample - CS) that was part of the main sample. The results on climate change educational practice provide the first comprehensive snapshot for Canada.

Perspectives of Canadians

Canadians are concerned about climate change

79% of Canadians are concerned about the impacts of climate change and 78% believe there are risks to people in Canada.

Canadians are certain that climate change is happening

85% of Canadians are certain that climate change is happening.

Canadians are less sure about the human impacts

In response to a question early in the survey, 46% of Canadians indicated that they think climate change is caused mostly by human activity. Further into the survey when asked if they think human beings are responsible for climate change, 73% agreed. We believe that even spending a short time focused on climate change and its impacts, as respondents did in the survey, can help people realize the human responsibility for climate change.

Almost ½ of Canadians have voted based on a party's position on climate change

Prior to the recent federal election, 31% of Canadians over 18 had voted for a party or politician in part because of their position on climate change.

Knowledge Understanding and Information

43% of Canadians failed the climate change knowledge test

43% of Canadians answered 4 or fewer of the 10 knowledge questions correctly.

Significant gap between perception and awareness

While 51% of Canadians feel they are well-informed about climate change, only 14% correctly answered 8,9, or 10 out of 10 basic knowledge questions. 86% indicated that they need more information on climate change.

Canadians get climate change information predominantly from television news

When asked which sources of climate change information Canadians trust the most, 72% of Canadians said scientists/academics; however Canadians get most climate change information from television news (54%), documentaries (48%), and conversations with friends and family (47%).

Impacts and Action

Canadians are already seeing the impacts of climate change

While only 36% of Canadians reported that they have personally experienced the effects of climate change, a majority feel that climate change is causing or making the following worse: droughts (72%), hurricanes (69%), wildfires (76%), coastline erosion (75%), river flooding (73%), and severe winters (70%).

Two thirds of Canadians are taking action to reduce climate change

⅔ of Canadians reported taking actions to reduce their personal contribution to greenhouse gas emissions.

There is doubt that technology will solve climate change

Only 30% of Canadians think that new technologies will solve the problem without individuals having to make big changes.

Systemic change is needed

57% of Canadians believe their actions have an impact on climate change and 79% indicated that, while personal actions are important, systemic change is needed to address climate change.

Role of Education

Canadians and educators agree that more should be done to educate young people about climate change

65% of Canadians, 76% of closed-sample educators and 82% of open-sample educators think the education system should be doing more to educate young people about climate change.

Limited class time spent on climate change content

Only 1/3 of closed-sample teachers reported teaching any climate change. Of teachers who do integrate climate change content, most teach 1 - 10 hours of instruction per year or semester.

Teachers need support

Only 32% of closed-sample educators feel they have the knowledge and skills to teach about climate change. Educators say they need professional development, classroom resources, current information on climate science, curriculum policy, information on the economics and politics of climate change, and national/provincial climate data.

All teachers should be teaching about climate change

While climate change content is predominantly taught in science and social studies, when it is taught, 75% of closed-sample teachers and 81% of open-sample teachers believe it is the role of all teachers to teach about climate change.

Students

Students are a key group to target with climate change education and action

46% of students ages 12-18 are categorized as “aware,” meaning they understand that human-caused climate change is happening, but they do not believe that human efforts to stop it will be effective. Climate change education can provide knowledge of what is needed and avenues to reduce greenhouse gas emissions.

Regional Responses

AB & SK frequently diverge from the rest of Canada

In general, levels of certainty that climate change is happening, overall knowledge of climate change, concern about impacts, acknowledgement of risks, and support for a greater focus on climate change education are lowest in Alberta and Saskatchewan.

Snapshot of Recommendations

Within formal education, Ministries of Education should embed core climate change expectations across subjects and release policy statements guiding climate change education for each regional jurisdiction. School boards and teachers’ unions should provide professional development to enhance teacher knowledge, tools, and strategies for teaching about climate change, including

providing teachers with current provincial/national data and resources. Faculties of Education should include climate change education across subjects in initial teacher education.

Within public education, Canadians should be provided with more information about climate change from trusted sources including scientists and academics utilizing television and radio news programming, online news and documentaries. The focus should be on predominant misconceptions about climate change and improving public understanding of its primary causes enabling citizens to understand the need for, and to advocate for, mitigation strategies such as greenhouse gas reduction policies. Lastly, public education should provide Canadians with information resources on high impact personal climate actions that they can integrate into their daily lives.

Summary of Findings

Perceptions

Canadians are concerned about climate change

While the majority of Canadians (79% of members of the general public, 75% of students, and 75% of parents) are concerned about climate change, an overwhelming majority of educators are concerned (96% of open-sample and 85% of closed-sample). Across the regions, Manitoba respondents most often expressed a high level of concern about the impacts of climate change (83%) while respondents from Alberta did so least often (64%). [See figure 8, 9.](#)

Canadians perceive climate change as a risk

There is high awareness that climate change poses a risk to Canadian citizens with 96% of open-sample educators and 92% of closed-sample educators in agreement. Remaining respondent groups also demonstrated high awareness but to a lesser extent: 79% of members of the general public, 76% of students and 72% of parents. When looking at the data regionally, among Canadians living in British Columbia, Manitoba, Ontario, Quebec, and the Atlantic provinces there is a perception of risk that climate change is affecting, or will affect, Canadians (averaged across provinces = 80%) whereas 62% of respondents from Alberta and 62% of respondents from Saskatchewan perceive that climate change poses risk to Canadians. [See figure 14, 15.](#)

A majority of Canadians are certain that climate change is really happening

Overall, the vast majority in all groups identify climate change as happening. Educators demonstrated the highest degree of certainty (97% OS and 95% CS) with other groups acknowledging the reality of climate change with a lesser degree of certainty: 83% of members of the general public, 80% of students and 84% of parents. Across Canada, there is a high level of certainty that climate change is happening (BC = 85%, MB = 84%, ON = 85%, QC = 88%, Atlantic provinces [ATL] = 86%); this acceptance drops to 73% in Alberta and 71% in Saskatchewan. [See figure 6, 7.](#)

A majority of Canadians agree that climate change has worsened droughts, hurricanes, wildfires, rivers flooding and severe winter storms

The majority of all respondents agree that climate change is already making the following worse: droughts= 72%, hurricanes=69%, wildfires=76%, coastline erosion=75%, river flooding =73% and winter storms=71%. While there is strong consensus across the provinces that climate has impacted these, recognition of these connections is significantly lower in Alberta and Saskatchewan. The lowest responses in AB are to the links between climate change and rivers flooding (54%) and hurricanes (57%) and in Saskatchewan the links between climate change and rivers flooding (58%), droughts (58%), and severe winter storms (58%). [See figure 20, 21.](#)

More educators have personally experienced climate change impacts

More than two-thirds (69%) of open-sample educators and just fewer than half (45%) of the closed-sample educators indicated that they had experienced climate change impacts.

Comparatively, only one-third of the members of the general public (37%) and student respondents (32%) indicated having personally experienced climate change impacts, with the fewest parents (28%) having experienced impacts. Regional responses are as follows: BC= 45%, AB= 29%, SK= 28%, MB=49%, ON= 39%, QC=29% and ATL= 30%. [See figure 12, 13.](#)

Voting and other climate change actions

When asked to select actions they have taken to discuss or learn about climate change with others, on average 33% of closed-sample respondents (educators - CS, parents, students and members of the general public) selected “none of the above.” Many, however, reported that they: talked with someone about climate change (52%), voted for a party or politician in part because of their position on climate change (31%— excluding students who cannot vote), liked or retweeted something about climate change on social media (30%), or signed an online petition about climate change (17%). Regionally, the data show variation when it comes to voting about climate change from 36% in BC to 15% in SK. [See figure 52, 53.](#)

Knowledge, Understanding & Information

43% of respondents failed the climate change knowledge test

Participants were asked 10 questions to assess their knowledge of climate change. These questions focused on general climate science, causes, and impacts for Canadians ([see questions](#)). On average, 43% of parents, students, and closed-sample educators answered 4 or fewer of the knowledge questions correctly: closed-sample educators (44%), parents (46%), students (45%), and the general public (41%). 12% of the open-sample educators answered 4 or fewer questions correctly. On average, 14% of closed-sample respondents correctly answered 8 or more of the 10 climate change knowledge questions: closed-sample educators (10%), parents (12%), students (10%), and members of the general public (16%). There is a gap between open-sample educators and other groups, with 37% of open-sample educators correctly answering 8 or more of the 10 climate change knowledge questions. Regionally, the percentage of respondents answering four or fewer correctly is as follows: BC =37%, AB=61%, SK=65%, MB= 48%, ON= 46%, QC= 29% and ATL=39%. Quebec scored the highest with 20% of respondents getting 8-10 correct and SK scored lowest with 5% of respondents getting 8-10 correct. [See figure 29, 30.](#)

Overall, less certainty in understanding that climate change is human-caused

When asked early in the survey whether climate change is human-caused, open-sample educators agreed (78%) more than the closed-sample educators (60%). Students agreed (54%) more than both members of the general public (46%) and parents (43%). Understanding that climate change is human-caused shifts across provinces with the following percentages: QC=57%, ATL=51%, BC= 47%, ON= 46%, AB=28%, and SK=29%. [See figures 22, 23.](#)

Further into the survey, respondents were asked if they think human beings are responsible for climate change. Markedly more people agree with this: 90% of open-sample educators and 83% of closed-sample educators. Students again agreed (73%) more than both members of the general public (69%) and parents (69%). Regional responses also differed with agreement that humans are responsible as follows: QC=79%, BC=72%, ATL=71%, ON= 71%, AB 51% and SK 51%. [See figures 24, 25.](#)

We believe the marked increase across all groups may be a result of spending time focused on climate change and its impacts as respondents completed the survey. A recent Abacus Data (2019) survey showed that climate impacts such as forest fires and floods increase the desire of the vast majority of Canadians to see action on climate change. We speculate that answering questions about the increase in these impacts increased respondents' reported belief in climate change being caused by humans.

Overall, less certainty that carbon dioxide and other GHGs cause climate change

In terms of understanding the scientific causes of climate change, 79% of open-sample educators responded correctly that carbon dioxide and other greenhouse gases are the primary cause of climate change. Only 48% of closed-sample educators correctly responded to this question. Only about half of the parents (46%), students (49%) and members of the general public (50%) correctly responded to the question, which suggests a need for improved public and formal education. Across provinces, there is variation in the knowledge that greenhouse gases cause climate change (BC=52%, AB=43%, SK=34%, MB=50%, ON=48%, QC=55%, and ATL=49%). [See figures 27, 28.](#)

Only 51% of Canadians feel well informed about climate change

When asked, "how well informed do you feel you are about climate change?", those who indicated "very well" or "fairly well" include: open-sample educators (75%), closed-sample educators (63%), parents (42%), students (50%), and the general public (54%). Regional responses for those feeling "very well" or "fairly well" informed are as follows: BC=50%, AB= 52%, SK=40%, MB=58%, ON=54%, QC=48% and ATL=38%. [See figures 33, 34.](#)

In general, Canadians report knowing more than they actually know.

The closed-sample respondents reported moderate levels of confidence (selected 3 or 4 on Likert Scale from 1 to 5) in their answers to the knowledge and understanding questions (closed-sample educators=50%, parents=54%, students=52%, members of the general public=49%). However, large percentages of these groups only answered 0 to 4 questions correctly: closed-sample educators=44%, parents=46%; students=45%, members of the general public=41%. The open-sample of educators were the most accurate in their assessment of their knowledge and understanding across the range of confidence, with 45% selecting high levels of confidence and 38% correctly responding to 8,9, or 10 of the knowledge questions. [See Table 2.](#)

Respondents identify the need for more information in order to form a firm opinion on climate change

Most respondents in all groups indicated that more information on climate change is required for them to form a firm opinion on climate change. The fewest respondents indicating the need for additional information were open-sample educators (72%), while others were nearly unanimous on the need for more information: 88% of students, 87% of parents, 86% of closed-sample educators, and 84% of members of the general public. Across the provinces, 87% of Canadians identified that they need more information in order to form a firm opinion on climate change. [See figure 37, 38.](#)

Canadians trust scientists and NGOs over media and government as sources of information

When asked which sources of climate change information respondents trust the most, 72% of closed-sample respondents indicated scientists/academics; 36% non-governmental organizations, 28% traditional media, 25% government, 25% friends/family and 15% social media. [See figure 41.](#)

TV and online news, documentaries and movies are the go-to sources for information

On average, 51% of closed-sample respondents inform themselves about climate change through television news, documentaries and movies (46%), online news (45%) and conversations with friends and family (43%). For students, only 48% hear about climate change from their teachers and 36% learn about climate change from classroom resources. [See figures 39, 40.](#)

Taking Action: Mitigation & Adaptation

Varying beliefs in personal actions to influence climate impacts

Respondent groups differed significantly in their beliefs on the influence that personal actions have on climate change. While the majority of open-sample educators believed that personal actions influence climate impacts (86%), only 69% of closed-sample educators felt similarly. Amongst the remaining respondents, students were in highest agreement (61%), while just over half of parents (57%) and members of the general public (55%) believed the same. The conviction that personal actions can influence climate change also varied from region to region. Less than half of respondents from Saskatchewan (44%) and Alberta (47%) believe that their actions are influential, while almost two-thirds (64%) of respondents from Quebec (64%) reported believing that their personal actions could influence climate impacts. [See figures 42, 43.](#)

While personal actions are clearly insufficient to address the climate crisis, every personal reduction in greenhouse gas emissions means less greenhouse gasses emitted to the point in time when we collectively reach net-zero emissions. This means less damage; every action matters.

Two-thirds of all closed-sample respondents have taken actions to reduce greenhouse gas emissions

A majority in all respondent groups indicated having taken actions to reduce greenhouse gas emissions. 91% of open-sample educators and 75% of closed-sample educators indicated having

taken actions, as did parents (58%), students (57%), and members of the general public (69%). [See figures 54, 55.](#)

Many Canadians support allocation of time and resources for mitigation efforts; however, there is less certainty that climate change can be addressed

A large majority in both educator groups (OS and CS) indicated that taking action to combat climate change is not a waste of time and resources. 94% of open-sample educators and 86% of closed-sample educators *disagreed* that taking action was a waste of time and resources. 74% of members of the general public, 70% of parents, and 67% of students responded similarly. The majority of respondents from every province did not think that taking action on climate change was a waste of time and resources. Specifically, over three-quarters (77%) of respondents *disagreed* that taking action was a waste of time and resources. Alberta (64%) and Saskatchewan (64%) responded least consistently that climate change action was not a waste of time and resources with fewer than two-thirds of respondents *disagreeing* that taking action was a waste of time and resources. [See figures 50, 51.](#)

Nearly all open-sample educators (94%) disagreed that climate change is inevitable, meaning most believe that humans have agency in mitigating climate change. In contrast, less than half of closed-sample educators (49%) disagreed that climate change is inevitable. Among the remaining respondent groups, only 39% of parents, 38% of members of the general public, and 33% of students disagreed that climate change is inevitable. Many more people in these groups appear to believe that humans have no agency (or will not exercise their agency) in mitigating climate change. Responses were divided across the different regions in Canada. Respondents from Quebec (43%) most strongly disagreed with climate change being inevitable followed by the Atlantic region (40%). Alberta (34%) and Saskatchewan (30%) had the smallest percentage of respondents who disagreed that climate change is inevitable, and thus the lowest belief that humans have, or will exercise, agency in mitigating climate change. [See figures 48, 49.](#)

There is doubt that technology alone will solve climate change

A large majority in all respondent groups indicated that new technologies cannot solve climate change without individuals having to make big changes in their lives. Only 18% of open-sample educators agreed, 31% of closed-sample educators, 24% of parents, 38% of students and 26% of other respondents. Provincially, on average 26% of respondents in every region agreed: BC= 29%, AB=26%, SK=28%, MB=15%, ON=31%, QC=27% and ATL= 23%. [See figures 46, 47.](#)

A majority of Canadians see systemic changes as necessary for mitigation

A large majority in all respondent groups indicated that systemic change is required (in addition to personal actions) to address the challenges of climate change. Nearly all open-sample educators (94%) agreed with the need for systemic change, as well as the majority of closed-sample educators (89%). Approximately three-quarters of remaining respondent groups shared similar beliefs with members of the general public at 79%, parents at 76% and students at 74% agreement. In every region across the country, most respondents acknowledged that systemic change is required in

order to address the challenges posed by climate change. Quebec (82%), closely followed by BC (81%), had the highest percentage of respondents indicate that systemic change is required. Saskatchewan had significantly lower agreement, with only 55% of the respondents acknowledging that systematic change is a requirement to address climate change challenges. [See figures 44, 45.](#)

Climate Change Education

The education system should be doing more to educate young people about climate change

Most educators (OS=82% and CS=76%) strongly believe that the formal education system (grades 7-12) should be doing more to educate young people about climate change. Approximately two-thirds of students (62%) and members of the public (63%) indicated the same, while 57% of parents shared the same view. Across Canada, in most provinces, the majority of respondents think the school system should be doing more to educate about climate change (BC=64%, MB =74%, ON=65%, QC=67%, ATL=64%). Alberta (50%) and Saskatchewan (46%) had the lowest levels of support for the schools doing more to educate young people about climate change. [See figures 56, 57.](#)

Climate change education is the responsibility of schools

There was collective agreement amongst the majority of respondent groups that schools should educate students (in grades 7 – 12) about climate change. This was expressed by disagreeing with a statement that climate change is *not* the school's role. The majority of educators (OS 89% and CS 82%) disagreed that it is not the school's role. 71% of members of the public, 71% of parents, and 65% of students also disagreed that it is not the school's role (thereby expressing that it is the school's role). There was general agreement across regions in Canada, that schools should educate students about climate change. Respondents from Saskatchewan (61%) disagreed least that climate change education is *not* the school's role, while Quebec respondents (75%) disagreed most (thereby expressing most strongly that it is the school's role). [See figures 59, 60.](#)

Climate change education is important for grade 7 - 12 students to be learning in school

Approximately two-thirds of both groups of educators (CS 70% and OS 67%) felt that climate change education was a high priority for grade 7 - 12 students to be learning in school. To a lesser degree, the majority of remaining respondent groups shared similar sentiments, with members of the public at 60%, students at 57% and parents at the lowest agreement (53%). Regions across the country had differing opinions on the priority level that climate change education should have in schools. Quebec (69%) and British Columbia (66%) had the highest number of respondents who saw climate change as a high priority for schooling with over two-thirds of respondents agreeing that climate change is a high priority for students in grades 7-12, while Saskatchewan (33%) had only approximately one-third of respondents agree that it is a high priority. [See figures 61, 62.](#)

More focus in schools on climate change impacts now and in the future

When parents, students, teachers, and members of the general public were asked to explain what the school system should do more or less of, 1408 respondents provided their feedback. From the data several themes emerged: *More focus on climate change impacts now and in the future* was mentioned the most by parents, students and members of the public, while *ways to take collective action* was noted most by open-sample educators. [See figure 58.](#)

Only 1/3 of closed-sample teachers reported teaching any climate change. For teachers who do integrate climate change content, most students experience 1 - 10 hours of instruction per year or semester

23% of the open-sample and 26% of closed-sample educators indicated that they do not cover climate change, while 20% of the open-sample, and 38% of the closed-sample educators reported that climate change is not applicable to the grade/subject they teach. Of the educators who cover climate change (35% of closed-sample educators and 59% of open-sample educators) the most common amount of time spent was 1-10 hours (reported by 34% of open-sample educators and 25% of closed-sample educators). [See figure 73.](#)

Climate change is mostly taught through science-related subjects

Science-related subjects were the most chosen by both open-sample and closed-sample educators to discuss climate change topics, followed by social sciences. The arts, languages, math, technology, physical education, and business and economics courses were the least named, if named at all. However, 75% of closed-sample educators and 81% of open-sample educators believe that climate change education is the role of all teachers. [See figure 71, 72.](#)

Half of teachers indicate that they want more professional development on climate change education

Both groups of educators (OS 54% and CS 50%) responded that professional development is required to feel more equipped to teach climate change in their classroom. There is a disparity between the educator groups' reported level of preparedness for teaching climate change. Over half of open-sample educators (55%) indicated feeling prepared, compared to less than one-third of closed-sample educators (32%). [See figures 75, 76.](#)

According to teachers, top barriers for integrating climate change education into classrooms are lack of time, lack of classroom resources, and lack of professional knowledge

The largest barrier that educators reported when attempting to include climate change education in classrooms is "lack of time", followed by "lack of classroom resources", and "lack of personal knowledge" by both open-sample and closed-sample educators. Parental, colleague, or principal support, or lack of student concern about climate change, were identified as barriers by a small percentage of educators. [See figure 79.](#)

Key supports for teachers: climate change resources, professional development, and information on climate science

In terms of the supports that educators identified to teach climate change in their subjects, climate change resources including lesson plans, videos and books are the most needed, followed by professional development on climate change education, information on climate science, curriculum policy, information on the economics and politics of climate change, and national/provincial climate data. Least noted was time for planning. [See figure 80.](#)

Canadian teachers' professional views on climate change education supports best practice

We asked teachers a series of framing questions to help establish Canadian teachers' beliefs and conceptualization of climate change education. Most educators (81% OS and 75% CS) believe climate change education is the responsibility of all teachers, whereas few teachers (5% OS and 12% CS) believe science teachers are solely responsible for teaching climate change. This suggests that there is support from teachers to integrate climate change content across subjects, which aligns with research literature on climate change education. Further, the majority of Canadian teachers (94% OS and 87% CS) believe that climate change education provides opportunities to discuss social justice and world issues with students, which also supports an interdisciplinary or transdisciplinary framework. In addition, most educators believe (92% OS and 82% CS) that climate change education should encourage students to think about their own beliefs and values, which supports a deeper level of critical reflection and a consideration of societal and cultural drivers that underpin climate change. Most teachers (95% OS and 83% CS) indicated support for climate change education that focuses on developing student capacity to be critical thinkers and problem-solvers. Most educators (85% OS and 76% CS) also indicated support for climate change education to focus on behavioural change. This suggests that climate change education should be action-oriented with a problem-based learning focus.

Concerns with teaching practice that focuses on debating causes of climate change

About a third of educators (38% OS and 34% CS) encourage students to debate the likely causes of climate change and about a third of educators (34% OS and 31% CS) also encourage students to come to their own conclusions about the causes of climate change. Both of these are out of step with best practices for teaching about climate change, given the strong scientific consensus that humans are causing climate change (Cook et al., 2016; Plutzer, Hannah, Rosenau, McCaffrey, Berbeco & Reid, 2016).

A need to move teaching practice to focus on solutions and actions

Educator responses show that only some educators (35% OS and 29% CS) discuss policy solutions to address climate change with their class - things such as cap and trade or pricing carbon. 64% of open-sample educators indicated that they had discussed efforts to make current technologies more efficient with their class - things such as hybrid cars or alternative energy sources. (45%) of closed-sample educators responded similarly. Additionally, approximately one-third of educators (38% OS and 33% CS) stated that they had discussed climate change mitigation technologies, such as geoengineering, in their classrooms.

Educator respondent groups varied significantly in their reports of classroom discussion surrounding personal student actions, such as walking to school, eating less meat, or being critical of consumption habits. While nearly three-quarters (74%) of open-sample educators indicated discussing possible personal actions students can take, only about half (51%) of closed-sample educators did the same. When educators were asked whether they had discussed political actions citizens can engage in such as protests or contacting politicians, there was also variation between

the two educator groups. Over one third (35%) of open-sample educators mentioned discussing political actions that citizens can take within their classrooms, compared to less than a quarter (24%) of closed-sample educators. Lastly, educators were asked whether they discuss potential career opportunities related to conservation, new energy technologies, or policy; approximately half (47%) of open-sample educators and over one-third (37%) of closed-sample educators indicated they had.

Youth between 12 to 18 are a key group to engage in climate change education and action

46% of the student respondents in grades 7 - 12 understand that climate change is happening and that it is human-caused but they do not believe that human efforts in mitigation or adaptation will be effective. This is concerning when considering how having this mindset may affect youth in terms of how they frame their future quality of life, opportunities, or possibilities. This is also a clear indication that schools have a role to play in engaging youth with climate change education. This survey is the first benchmark of students' perspectives from grade 7 - 12 on climate change in Canada. [See figure 68.](#)

Recommendations

Through the analysis of the survey data, several opportunities for formal and public climate change education emerged. These recommendations are possible ways forward for federal, provincial and territorial policymakers, corporations, media, non-government and community organizations, faculties of education, teachers' unions, school boards, principals, teachers, and youth to consider learning opportunities at a crucial time for climate change learning and action.

Formal Education

- Ministries of Education should release policy statements guiding climate change education.
- Ministries of Education should revise curricula to embed core climate change expectations across subjects, with a focus on: multiple dimensions of climate change including scientific, environmental, social, cultural, and economic; climate impacts and risks; mitigation and adaptation strategies; and dimensions of justice and ethics.
- Ministries of Education should develop a consultation mechanism for youth to participate in curriculum development and review processes for climate change content.
- School boards and teachers' unions should provide professional development to enhance teacher knowledge and tools and strategies for teaching about climate change, thereby increasing teachers' confidence and ability to engage students.
 - Provide instructional strategies for handling different points of view on aspects of climate change and inquiry processes for fostering critical thinking and evidence-based dialogue.
 - Provide resources to help students understand citizen movements and the process of systemic change.
 - Provide teachers with current national/provincial climate data and classroom resources including lesson plans, videos and books to ensure students are learning up-to-date, locally-relevant information.
- To address apathy and eco-anxiety, school boards, schools and teachers should ensure student learning is authentic and relevant to local climate impacts, utilizing strategies including inquiry, experiential learning, opportunities for deliberative dialogue, and community partnerships for local climate action.
- School boards should provide information on emerging and already established green sector career pathways for teachers and guidance counsellors.
- Faculties of Education should ensure teacher-candidates' courses address best practices of climate change education.

Public Education

- Informal education should provide Canadians with more information about climate change from trusted sources including scientists and academics, utilizing television and radio news programming, online news, documentaries and movies.
- Informal education should address predominant misconceptions about climate change and improve public understanding of its primary causes, enabling citizens to understand the need for responses to climate change, such as greenhouse gas reduction policies, and the urgency of this need.
- Informal education should provide Canadians with information resources on high impact personal climate actions that they can integrate into their daily lives.
- Informal education agencies should provide a guide book and resources to help parents and grandparents to know how to talk to children and young people about climate change. This resource should draw upon current environmental psychology research.
- Informal education should share case studies of how stakeholders can work together to address climate change locally and nationally, focusing on collective processes that lead to systemic changes.

Climate Change Education Context

Human-caused climate change is a paramount global challenge and Canada is already experiencing significant impacts. Canada's climate is changing: since 1948, Canada's annual average land temperature has increased by 1.7°C—roughly double the global average level of warming (Natural Resources Canada, 2019). According to the Council of Canadian Academies' expert panel on climate change risks and adaptation potential, Canada faces substantial risk with a likelihood of significant losses, damages, or disruptions in the next 20 years in the following areas: agriculture and food; coastal communities; ecosystems; fisheries; forestry; geopolitical dynamics; governance and capacity; human health and wellness; Indigenous ways of life; northern communities; physical infrastructure; and water (2019). The impacts of climate change reach far beyond some severe extreme weather events and extend to potential food shortages and food price shocks, loss of opportunity for First Nations to practice cultural activities, children being at greater risk of asthma and Lyme disease (Doyle, 2019) and a hefty price tag to cover damages to homes and infrastructure. The cost of extreme weather events is noted with associated insurer losses: between 1983 and 2008 an average of 405 million per year compared to \$1.8 billion per year between 2009 and 2017. Moreover, for each dollar of insured losses, “three to four dollars are borne by governments and home and business owners” (Moudrak et al., 2018).

The already-occurring environmental, social, health, and economic impacts of climate change, and the potential long-term risks to livelihoods and human well-being if greenhouse gas reduction targets are not met, make climate change the most pressing issue facing global society. About 25% of the world's population is under 18 years old, and it is these children and youth, some more vulnerable than others, that are most at risk from climate impacts that will worsen over time. The climate strike movement, started by Greta Thunberg, mobilized an estimated 1.4 million students in 112 countries in March 2019 and an estimated 7 million citizens on September 27th, 2019. The climate strike movement is a symbol of the concern that young people have for their futures. Students hold their strikes at local municipal buildings or halls to advocate for strong climate policy and action.

There are many slogans that circulate on climate strike placards. This longer quote from Greta Thunberg articulates the tension that arises when knowledge is not enough to shape policy: “Why should I be studying for a future that soon will be no more, when no one is doing anything whatsoever to save that future? And what is the point of learning facts within the school system when the most important facts given by the finest science of that same school system clearly means nothing to our politicians and our society?” (2018).

Still, education is an essential element of a coordinated response to climate change because of the transformative role that teachers and educational institutions can play in preparing students for climate-altered futures (UNESCO, 2005), and because greater awareness and understanding of climate change is necessary for citizens to understand the need for greenhouse gas reduction

policies. Article 12 in the *Paris Climate Agreement* calls on the parties “to enhance climate change education” (UNFCCC, 2015, p. 16). Research has shown that climate action in schools is most likely to be successful when there is administrative support; expertise inside and outside the school; adequate teaching resources and materials; and sufficient financial support (Chopin, Hargis & McKenzie, 2018; Australian Sustainable Schools Initiative, 2017; UNESCO, 2016).

Within climate policy planning literature, sectors such as energy, agriculture, and transportation are typically the focus. Policymakers have not fully engaged the education sector as an effective focus for mitigation and adaptation strategies. The integration of climate change learning objectives within formal education is needed to meet the education and training objectives outlined in the United Nations Framework Convention on Climate Change (1992). For educational policymakers, there are opportunities to provide pathways for adapting and transitioning towards unknown climate futures and allowing children and young people to be involved in imagining, negotiating, and co-creating futures (Field, 2017); the question is how will our education systems respond at this critical time?

International comparative research conducted in ten countries (including Canada) showed that climate change education has peripheral status in both research and practice, and when addressed, is most often found within science education (Læssøe, Schnack, Breiting & Rolls, 2009). However, climate change is not solely an ecological or scientific phenomenon; its impacts and our efforts to mitigate and adapt to it require processes that engage with social, political, and cultural underpinnings and processes (Selby & Kagawa, 2013). Many argue that climate change education requires an interdisciplinary framework (Eames, 2017; Stevenson, Nicholls & Whitehouse, 2017) in which the natural sciences are used to learn about climate systems, while the social sciences are employed to engage in change-making processes (McKeown & Hopkins, 2010). When students only learn about climate change through a scientific lens, they miss learning opportunities to engage with the issue holistically as well as action-focused processes grounded in societal change-making.

According to a national evaluation of climate change education policy in Canada (Bieler, Haluza-Delay, Dale, McKenzie, 2017), provincial and territorial policies for formal education (K-12) demonstrate: “1) shallow engagement with climate change 2) an overwhelming focus on energy efficiency upgrades in schools and, 3) a lack of holistic responses to climate change” (p. 63). Another recent national evaluation of climate science curricula (Wynes & Nicholas, 2019) found that Canadian curricula focuses predominantly on human warming but does not sufficiently address the scientific consensus, climate impacts or solutions. In addition, a forthcoming curricula review (Field & Spiropoulos, in progress) shows that the majority of climate change curriculum expectations occur within scientific subjects and focus predominantly on knowledge and understanding. Elective courses offered in grades 11 and 12 do exist in some jurisdictions where there is more focus on project-based learning and opportunities for acting on climate change learning.

Evaluating curriculum policy is an important means to judge how a topic is substantively covered by teachers and integrated into subjects; however, research also needs to consider teacher beliefs

and views on curricula relevant to their teacher practices to develop a more holistic picture of practice. This is because teachers view policy, curriculum, and practice through their personal worldviews and sense of professional ability (Cotton, 2006; Cutter-MacKenzie & Smith, 2003; Nicholls, 2016; Stevenson, 1987).

Without clear policy, climate change education often relies on the competence, dedication, and enthusiasm of devoted teachers (Eames, 2017; Nicholls, 2017; Whitehouse, 2017). However, teaching climate change raises many challenges for teachers: pre-service and practicing teachers may avoid the topic due to lack of professional development and limited knowledge of the issue (Blum, Nazir, Breiting, Goh & Pedretti, 2013; Boon, 2010; Papadimitriou, 2004); the interdisciplinary qualities of the subject may mean teachers experience multiple knowledge gaps (Berger, Gerum & Moon, 2015; Monroe, Oxarart & Plate, 2013; Plutzer et al., 2016); teachers need to have sensitivity when engaging with climate change in their classrooms (Wise, 2010); and some pre-service teachers describe an underlying fear of engaging in climate change education due to its controversial nature and potential for conflict with students, parents, colleagues, or administrators (Berger et al., 2015).

Within this context of climate change education, this research focuses on investigating Canadians' knowledge and understanding of climate change, perceptions of risk, experience of climate change impacts, and actions they have taken, or plan to take. It documents views on the role that provincial and territorial education systems currently have, and should have, in regard to developing the knowledge and skills required for young people to respond to the challenges of climate change.

This research addresses a significant gap and establishes Canada-wide baseline data that describe different audiences' perspectives on climate change education, and reports on how teachers approach climate change in their classroom practices.

The guiding research questions for this study are:

- 1) What is the Canadian public's understanding of climate change?
- 2) How do Canadians perceive climate change has, and will, impact Canada?
- 3) What types of actions have Canadians already adopted, or do they plan to adopt, to reduce their contribution to greenhouse gas emissions?
- 4) What sources of information do Canadians use to inform themselves about climate change, and what sources are most trusted?
- 5) From different Canadian audiences' perspectives, how important is climate change education? What do different audiences think young people should learn in school about climate change?
- 6) Teacher specific research questions that focus on climate change education practices:
 - Are teachers integrating climate change education into their teaching practices, and if they are, in what subjects, covering what topics, and through which instructional strategies?

- How confident are teachers in their knowledge and understanding? How do teachers address controversy around climate change in their classrooms?
- What barriers do teachers face when integrating climate change education into classroom practice? What supports do they need?

For each research question, the Canadian public was segmented into different audiences: educators, parents, students, and members of the general public, as well as provincially segmented, to provide results that lead to more targeted insight.

Methodology

Survey Tool

This survey tool was developed in May 2018 by Dr. Ellen Field, with input from Learning for a Sustainable Future and Leger Research Intelligence. The majority of survey questions were adapted or modified from published surveys on climate change education (see LaChappelle, Mahéo, Nadeau, 2016; Leiserowitz, Maibach, Roser-Renouf & Smith, 2011; Nicholls, 2016; Plutzer, Hannah, Rosenau, McCaffrey, Berbeco & Reid, 2016), except for standard demographic questions, and some unique questions that were developed to specifically address Canadian climate impacts and teaching practice. The survey has seven unique sections consisting of: 1) demographic data, 2) personal knowledge and understanding of climate change, 3) respondents' assessment of their knowledge and understanding, 4) issue salience, 5) source of information respondents use to inform themselves about climate change, 6) education system's level of focus on climate change, and 7) teaching practice. The survey was available in both English and French.

Questions were non-mandatory; that is, respondents could skip over the questions they did not wish to answer. Therefore, base sample sizes fluctuate from question to question.

Population segmentation

For this research, the following populations were identified:

- Educators – includes public and private school teachers in formal K-12 education system, educational assistants, department heads, curriculum lead and curriculum consultants working for school boards, vice-principals, principals, district leaders/ school administrators
- Students – includes current students from grades 7 to 12 in the formal education system
- Parents – includes parents of students in K-12 education system
- Members of the general public – includes members of the general public who do not identify as educators, students, or parents.

Recruitment Procedures

Leger Research Intelligence owns and operates one of Canada's largest online survey panels of approximately 400,000 Canadians who have agreed to answer surveys for the company in exchange for a small incentive. Leger ensures that data collection complies with the following practices: 1) ensures that all sample material supplied to Leger meets the legal requirements of relevant data protection and other laws in the countries wherein the potential respondents are resident; 2) complies in all countries to the ESOMAR Code of Conduct and Guidelines; and 3) complies to MRIA standards.

Leger panelists received an email invitation to complete the survey with a unique link for each respondent. Each panelist agreed to informed consent parameters required by the Lakehead University Research Ethics Board and panelists under 18 required parental consent.

Due to the limits of the LegerWeb platform to survey the desired 1000 teachers, the survey relied on a mixed methods approach where responses from educators, students, parents, and members of the general public were collected from LegerWeb and responses from a further 1120 educators were collected through convenience and snowball sampling through an open survey link hosted on Learning for a Sustainable Future's [LSF] website. Respondents recruited through convenience and snowball sampling were also informed of, and agreed to, consent parameters.

All respondents from the Leger panel are referred to as "closed-sample". This includes all students, parents, other members of the general public and some of the educators. The educators who responded via the LSF website are referred to as "open-sample"

Learning for a Sustainable Future promoted the survey through their newsletter, social media channels, teacher professional association publications through digital ads, and special interest group listservs. Snowball sampling, where respondents tell others about the survey, also helped in recruitment. The Canadian Teachers' Federation promoted the survey through their provincial and territorial networks, along with many teacher affiliations and education-related organizations (see Acknowledgements section for organizations that promoted the survey). The Council of Ministers of Education, Canada also promoted the survey through their provincial and territorial Ministers and Deputy Ministers of Education. The survey was circulated through the Territories in Northern Canada by both Leger and Learning for a Sustainable Future, but response rates were too low to be included in this report.

Data Collection and Statistical Reliability

From the Leger Web Survey, a total of 2,191 Canadians were surveyed online using Leger's panel, Legerweb.com. The survey was conducted from October 3 - 25, 2018 in English and French. The target respondents for this survey were:

- educators - includes public and private school teachers in the formal K-12 education system, educational assistants, department heads, curriculum leads and curriculum consultants working for school boards, vice-principals, principals, district leaders/ school administrators;
- students, from grades 7 to 12 in the formal education system;
- parents, of students in formal K-12 education system;
- and members of the general public, which includes members of the general public who do not identify as educators, students, or parents.

As a non-random internet survey, a margin of error is not reported (margin of error accounts for

sampling error). Had these data been collected using a probability sample, the margin of error for a sample size of 2,191 would have been ± 2.1 percentage points, 19 times out of 20. Leger sends invitations through the LegerWeb platform to Canadians that meet the demographic focus and provides a small incentive to panelists who complete the survey. The data are weighted by age, gender and province (based on Statistics Canada proportions) to ensure that data are representative of the Canadian public and reflective of Canadian opinion.

From the convenience sample that was collected through an open-link hosted on the Learning for a Sustainable Future website, a total of 2,184 completed surveys were received from October 5, 2018 – January 31, 2019. The target respondents for this survey were educators; however, the open link survey was publicly available and open to parents, students and the general public as well. Only the 1120 educator responses are included in this report.

In addition to these populations, the survey also identified two other groups: 1) school support staff, such as administrative assistants and custodians and 2) teacher-educators, such as professors teaching in Faculties of Education, educational researchers, and professors instructing courses in post-secondary institutions. These two groups are not specifically reported on as a segment in the national data but are included in the provincial data charts as members of the general public.

Due to the voluntary nature of the open-sample survey, a margin of error cannot be calculated. The data for the open-sample survey are not weighted. Leger's statistics team explored the differences between the Leger panel (closed-sample) and the open-sample survey responses to determine whether weighting the open-sample survey data was possible. After correcting for sociodemographic differences in both samples, variation in the response profiles led us to conclude that there is a bias in the open-sample. On average, participants in the open-sample had more knowledge of climate change than educators or any other group in the closed-sample. The tendency for people with knowledge of climate change to volunteer to take part in climate change related research has been documented (McNeal, Walker & Rutherford, 2014). Leger's analysis also revealed the weighting factors required for the open-sample survey would be far higher than is statistically reasonable.

Since the open-sample educator sample (educator - OS) is not representative and the closed-sample educator sample (educator - CS) is representative, they are reported separately within this report.

Response Rate

The survey was sent to 17, 872 respondents in the Leger Online Web platform and 2191 respondents completed the survey. Thus the response rate = 12.2% (2191/17,872).

When Leger conducts online surveys, the system does not send the survey to the entire panel. The system samples within the online panel to reach the sample size that has been agreed upon for the project (in this particular case, n =minimum of 2,000 respondents). The system pulls a random

distribution of respondents once audiences are defined and then potential respondents are contacted in batches so that the number of respondents can be monitored to ensure that the targeted sample size is met.

Completeness Rate

A completeness rate was calculated for every group for every question for this study. With the recognition that questions on climate change may foster anxiety from survey respondents, to mitigate harm, respondents could skip questions or exit the survey at any time and for any reason. To calculate the completeness rate, the number of respondents who saw the question was divided by the number who responded to the question. Both closed-sample educators and open-sample educators had 136 questions (not including open-text questions or branching questions) and parents, students, and the general public had 86 questions. There was little variation of completeness rates for each group across the questions (the lowest was 85.5%), so we have reported the average completeness rate for each group across all of their respective questions. The high rates of completeness within the closed-sample may be due to the incentives that LegerWeb offered for complete surveys; likewise, within the open-sample, respondents that completed the survey were entered into a lottery to win a portable photo printer.

Table 1. *Completeness rates across all questions*

Group	Completeness rate	Base size
Educator - OS	99.7%	1120
Educator - CS	96.4%	111
Parent	98.6%	571
Student	98.1%	486
General Public	99.6%	908

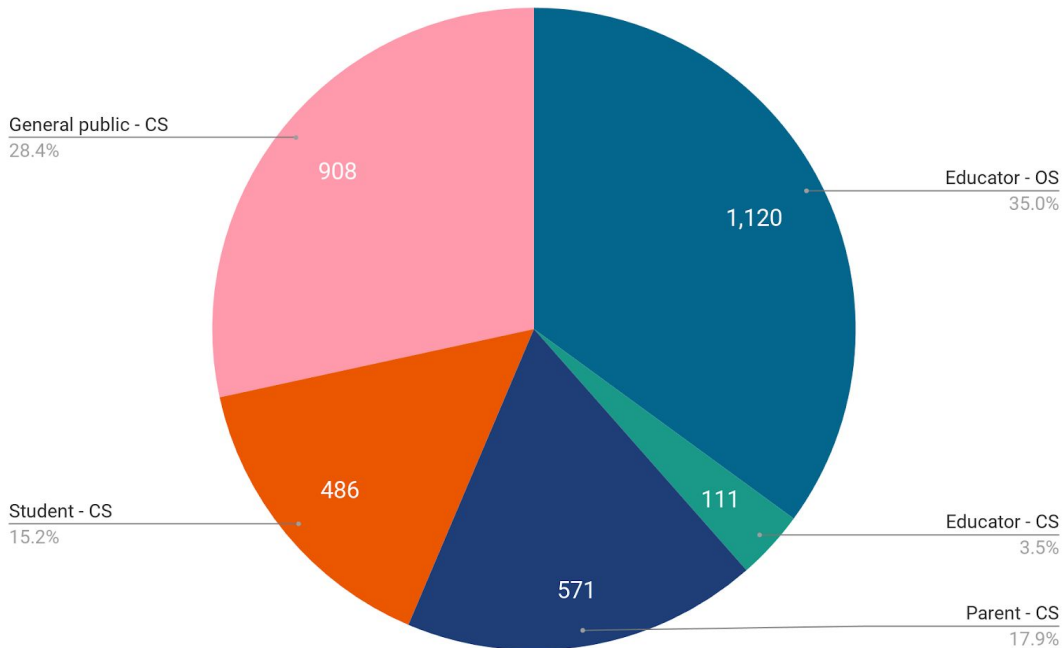
Survey Respondents

A total of 4375 respondents completed the survey from October 3rd, 2018 to January 31st, 2019.

This report presents data from the following groups:

- Educator respondents from the open-sample, referred to as “educator (OS)”;
- Educator respondents from the closed-sample, referred to as “educator (CS)”;
- Parent respondents from the closed-sample, referred to as “parent”;
- Student respondents from grade 7 to grade 12 from the closed-sample, referred to as “student”;
- Other respondents from the closed-sample, are members of the general public, who do not identify as educators, students, or parents; they are referred to as “members of the general public.”

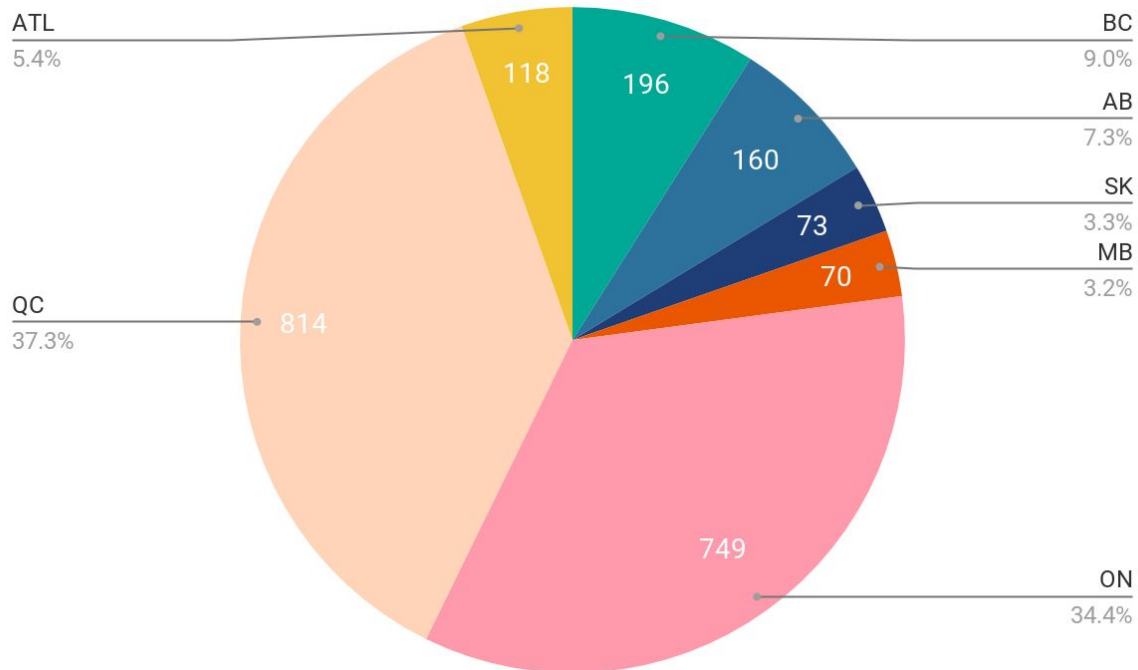
Data from respondents who identify as school support staff or teacher-educators were not included in the national data set from either the open-sample or closed-sample. In addition, responses from students, parents, and members of the general public from the open sample were not included because they were incidental respondents. The number of respondents that this report presents is 3196 of the total 4375 respondents.



$n=3196$ (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 1. Total number of respondents – national data

Provincial data are also included within this report and is comprised of closed-sample data from educators, parents, students, and members of the general public. Any teacher-educators or school support staff who completed the closed-sample survey are also included in this provincial data snapshot.



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 2. Total number of respondents – provincial data

Sociodemographics of survey respondents

Educators from the open-sample

The majority of educators (58%) from the open-sample are between 35 - 54 years old. The majority of open-sample educators hold a university certificate, diploma, or degree (50%), or a master's certificate, diploma, or degree (47%). The percentage of open-sample educators with a master's level of education (47%) is higher than the percentage of closed-sample educators who have completed a master's level of education (32%). 68% of open-sample educator respondents and 66% of closed-sample educator respondents identify as female.

Parents

The majority of parent respondents are 35 to 44 years old (40%) with some parents (28%) in the 25 to 34 year-old range and some (26%) 45 to 54 years old. The majority of parents (49%) surveyed hold a college or undergraduate level of post-secondary education followed by 31% with a high school diploma, and 14% with a master's level of post-secondary education. 59% of parent respondents identify as female and 41% identify as male.

Students

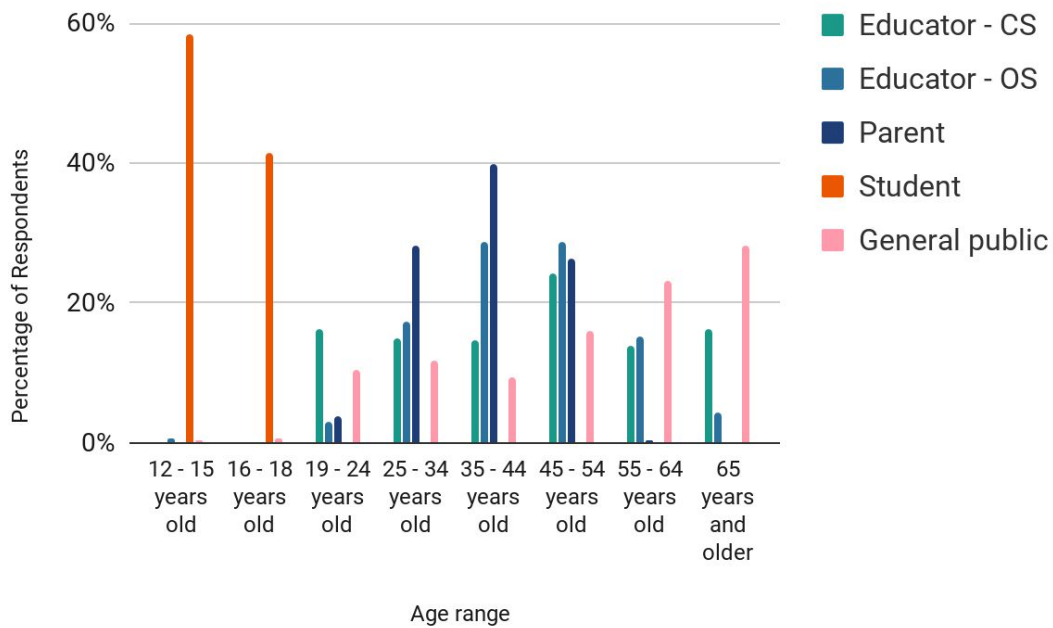
The majority of students surveyed are 12 to 15 year olds (58%) followed by 16 to 18 year olds (45%). Data on Canadian youth aged 12 to 18 years old is not typically included within Canadian polling that usually targets “youth” as 18 to 24 years of age. The youth survey data gathered in this report are significant for benchmarking knowledge and understanding, issue salience, risk perception, and youth perspectives on the efficacy of climate action. 12% of student respondents are not yet in grade 6, 49% are in junior high school, 35% are in high school, and 4% are in an undergraduate college certificate or diploma program. 51% of students identified as male, 46% identified as female, 2% identified as non-binary, and 1% preferred not to answer.

Members of the general public

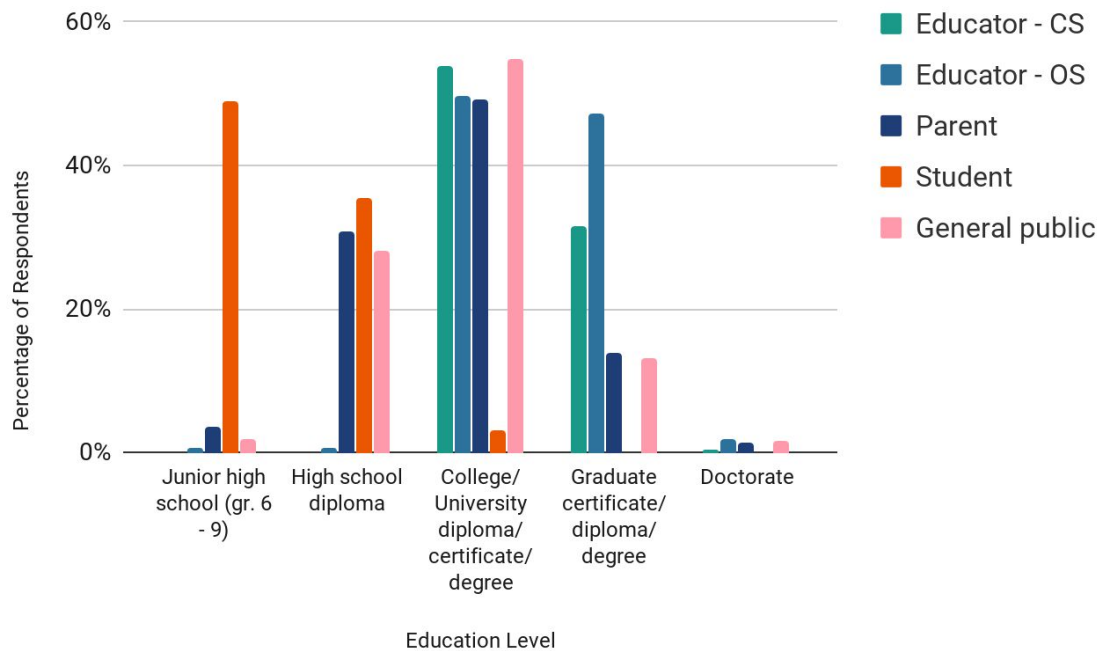
This segment is comprised of members of the general public who do not identify as educators, parents, or students. This group is of various ages with 10% between 19 and 24 years, 12% between 25 and 34 years old, 9% between 35 and 44 years old, 16% between 45 and 54 years old, 23% between 55 and 64 years old, and 28% 65 years of age and over. The general public respondents reported education levels with 28% attaining a high school diploma, 55% attaining an undergraduate level of post-secondary education, 13% attaining a graduate level of post-secondary education, and 2% holding doctorates.

Within the survey, type of employment and household income were also gathered. For the members of the general public group, 34% are retired, followed by 12% identifying as office workers, and 10% selecting professional, which is defined as: archeologist, architect, artist, lawyer, banker, biologist, accountant, consultant, foreperson, or dentist; the remaining 44% of members of the general public are in occupations such as personnel specialized in sales, personnel specialized in services, manual worker, semi-skilled worker, science and technologies worker, academic, manger/administrator/owner or homemaker. This group reported household income with 8% reporting less than \$19,999, 15% reporting between \$20,000 and \$39,900, 17% reporting between \$40,000 and \$59,999, 14% reporting between \$60,000 and \$79,999, 14% reporting between \$80,000 and \$99,999, and 20% reporting over \$100,000 in household income.

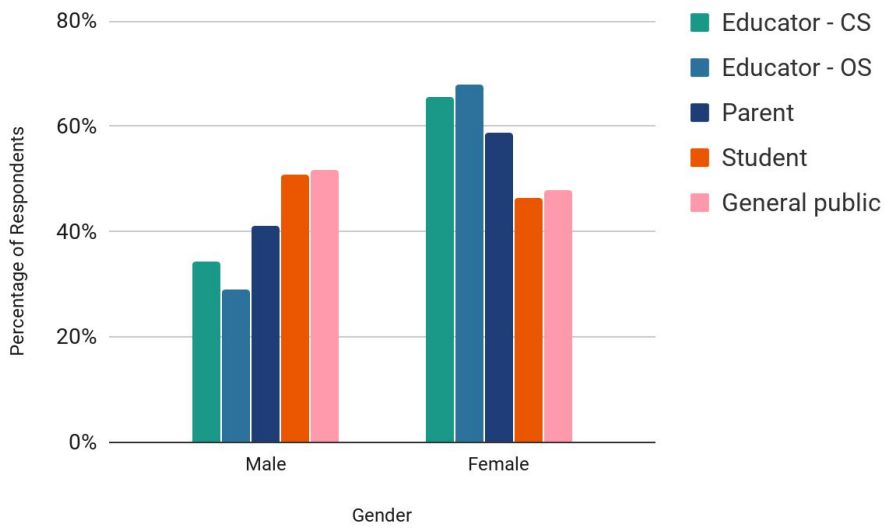
Below, demographic data from respondents used in the national survey report are presented in Figure 3 (age), Figure 4 (formal education level) and Figure 5 (gender).



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)
 Figure 3. Respondents by age



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)
 Figure 4. Respondents by education level



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 5. Respondents by gender

Survey Results

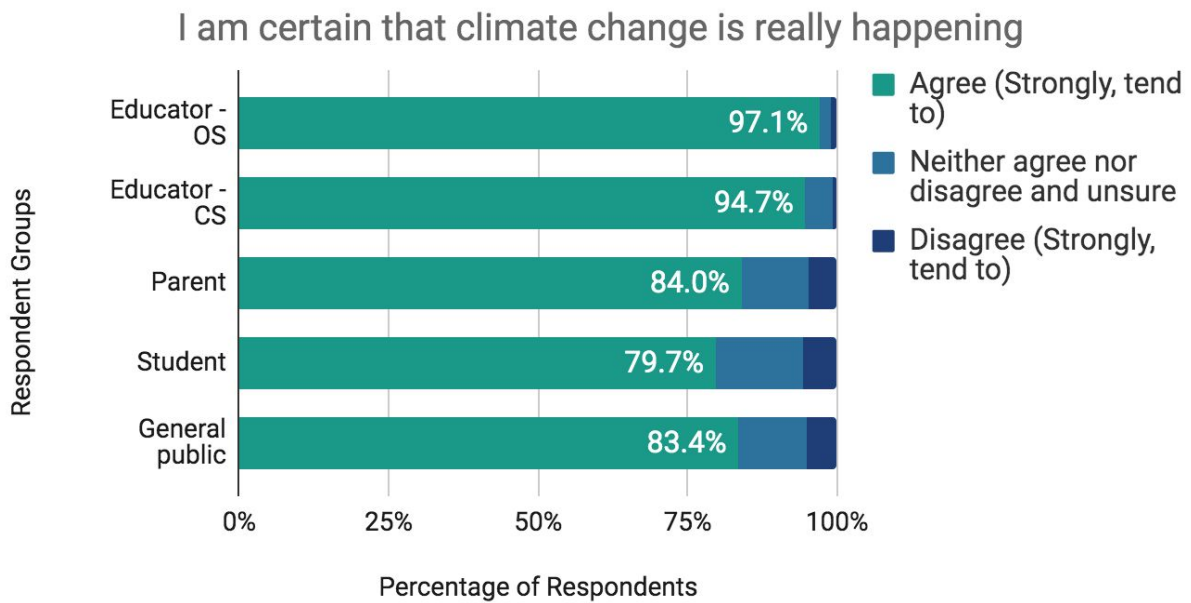
The survey findings present an extensive picture of climate change knowledge and understanding, risk perception, perspectives on mitigation and adaptation, and the importance of climate change education from various segmented audiences. This report presents national data from stakeholders' perspectives and secondly presents representative regional data where relevant. The regional data are comprised of representative samples from students, parents, teachers, and members of the general public. In addition to this National Report, there are forthcoming regional papers (not included in this report) which draw upon both closed-sample and open-sample data to provide a snapshot for the following regions: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, and the Atlantic provinces.

The section of the survey on climate change education completed by educators establishes a benchmark for climate change education in schools in Canada; the sample was large enough that the report provides a baseline from which future change can be measured.

PERCEPTIONS

Salience

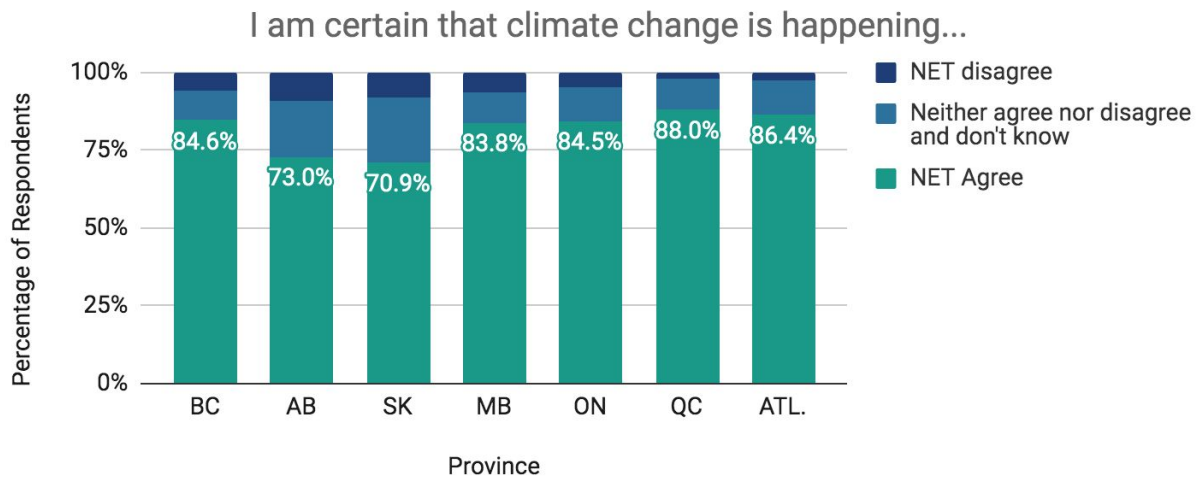
Overall, the vast majority in all groups identify climate change as happening. Educators demonstrated the highest degree of certainty (97% OS and 95% CS) with other groups acknowledging the reality of climate change with a lesser degree of certainty: 83% of members of the general public, 80% of students and 84% of parents.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 6. Certainty of climate change

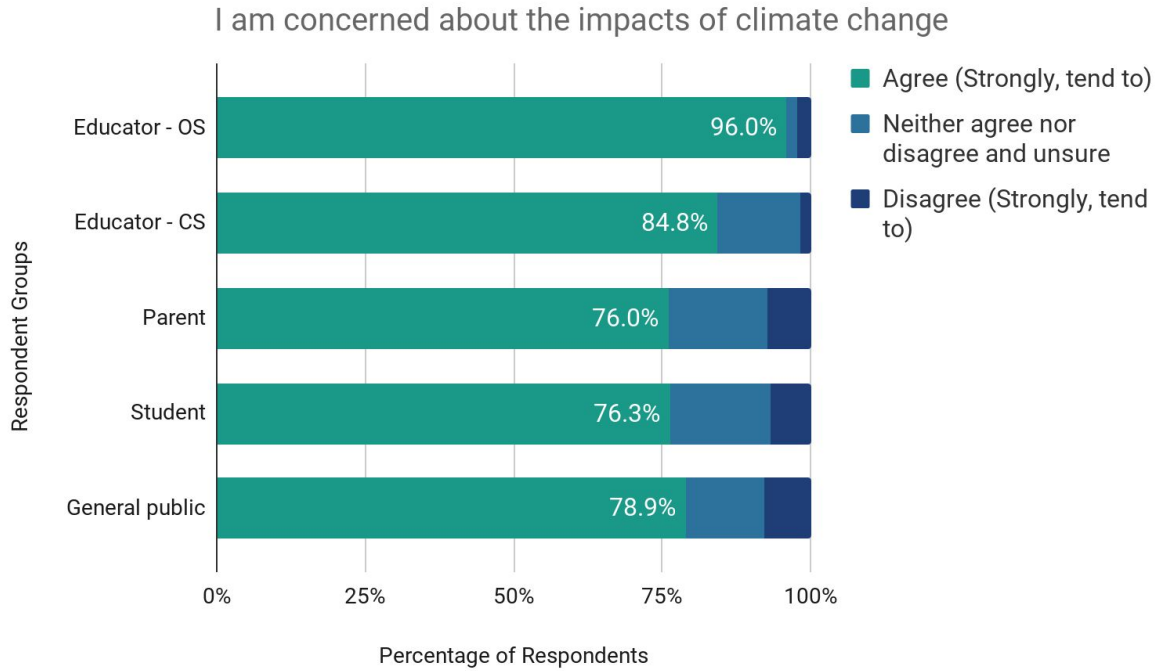
Across Canada, most educators, parents, students, and members of the general public in most provinces accept that climate change is happening (BC = 85%, MB = 84%, ON = 85%, QC = 88%, ATL = 86%); however, this acceptance drops to 73% in Alberta and 71% in Saskatchewan. The regional rates of acceptance of climate change are slightly below other public opinion polling on Canadians' acceptance of climate change, recorded as 88% (EcoAnalytics, 2018).



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 7. Canadians' certainty of climate change by region

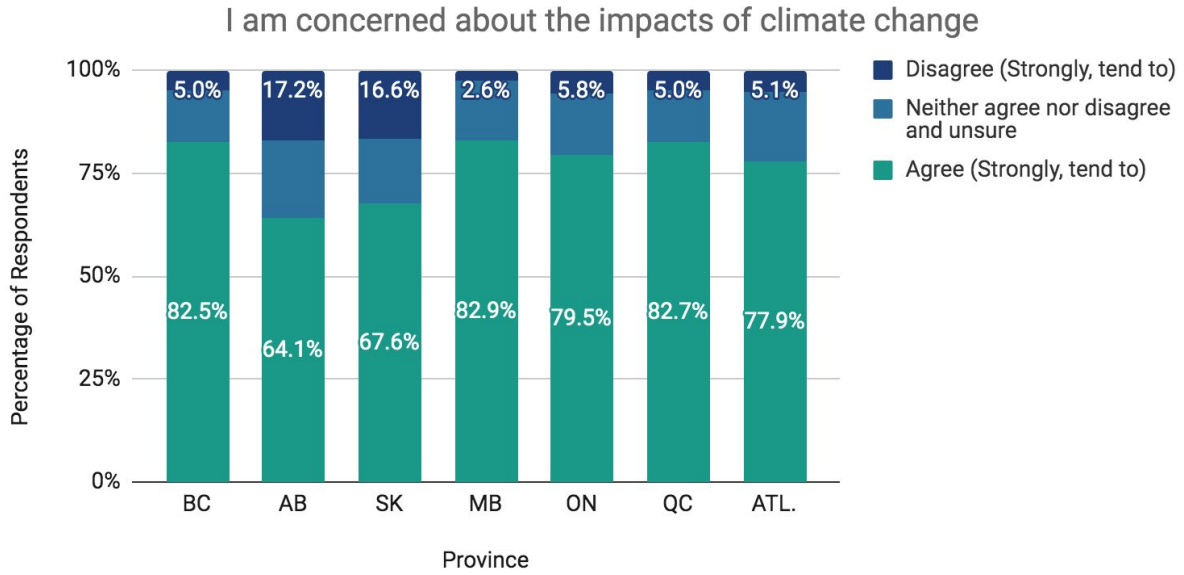
While the majority of Canadians (79% of members of the general public, 75% of students, and 75% of parents) are concerned about climate change, an overwhelming majority of educators are concerned (open-sample=96% and closed-sample=85%).



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 8. Climate change concern by respondent group

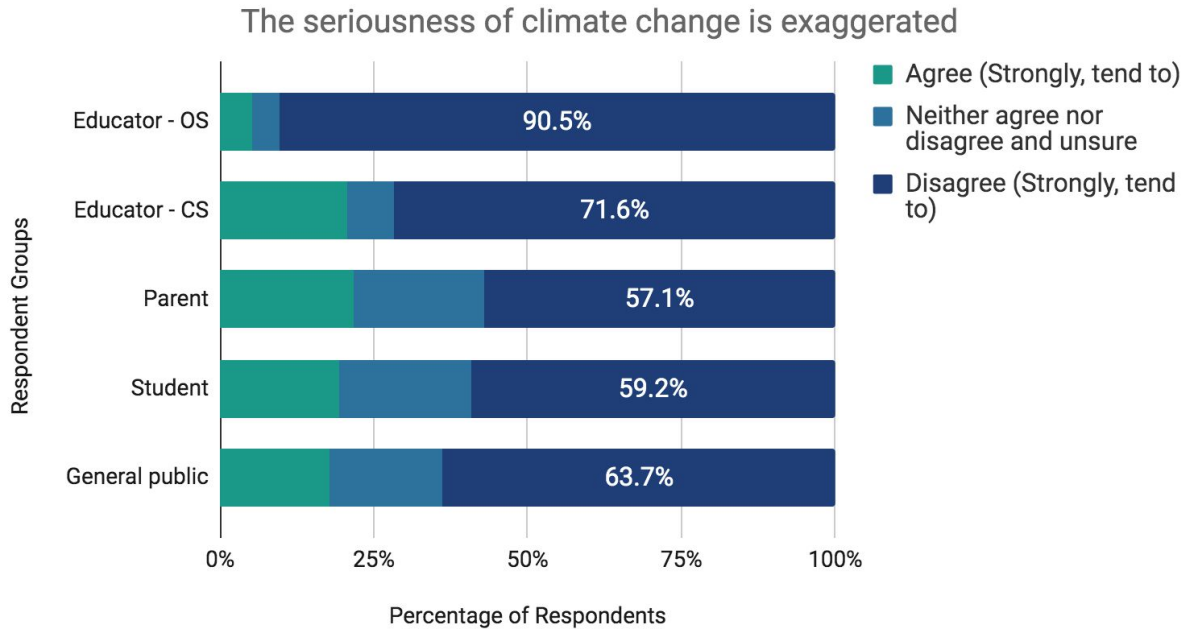
Across the regions, Manitoba respondents most often expressed a high level of concern about the impacts of climate change (83%) while respondents from Alberta did so least often (64%). Still, across all regions, a large majority indicated that they are concerned.



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 9. Climate change concern by region

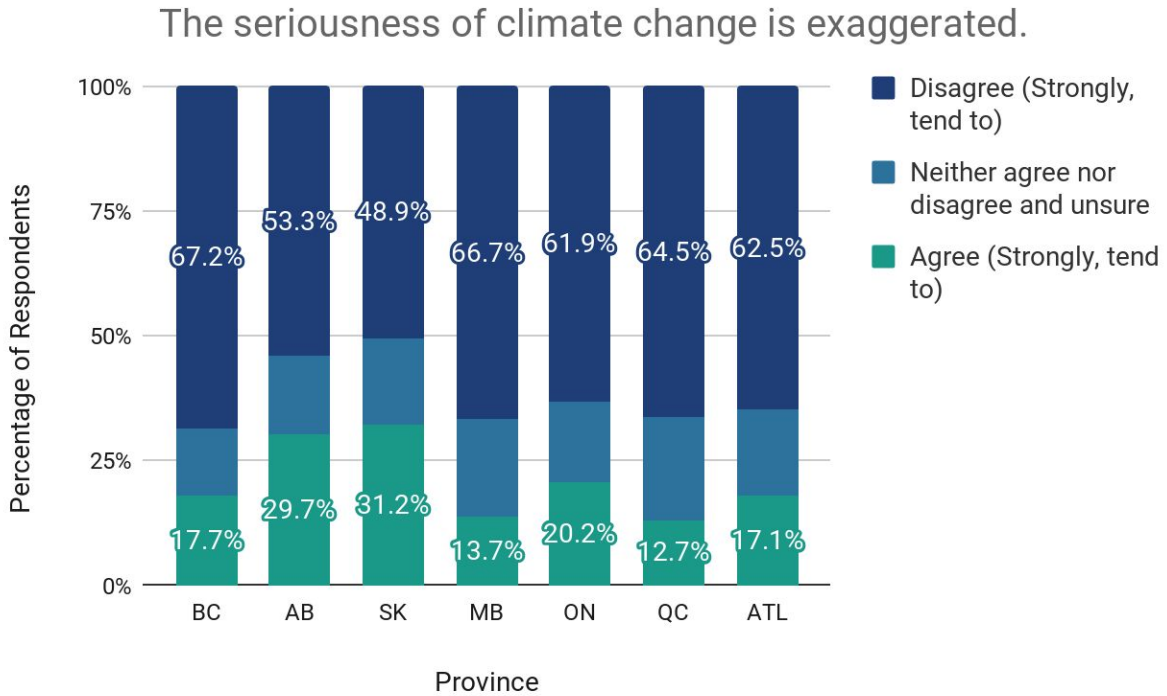
The majority in all respondent groups reported that the seriousness of climate change is not exaggerated; however, there was less certainty among parents (57%), students (59%) and members of the general public (64%). Nearly all (91%) of open-sample educators felt that the seriousness of climate change is not exaggerated, compared to 72% of closed-sample educators.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 10. Seriousness of climate change

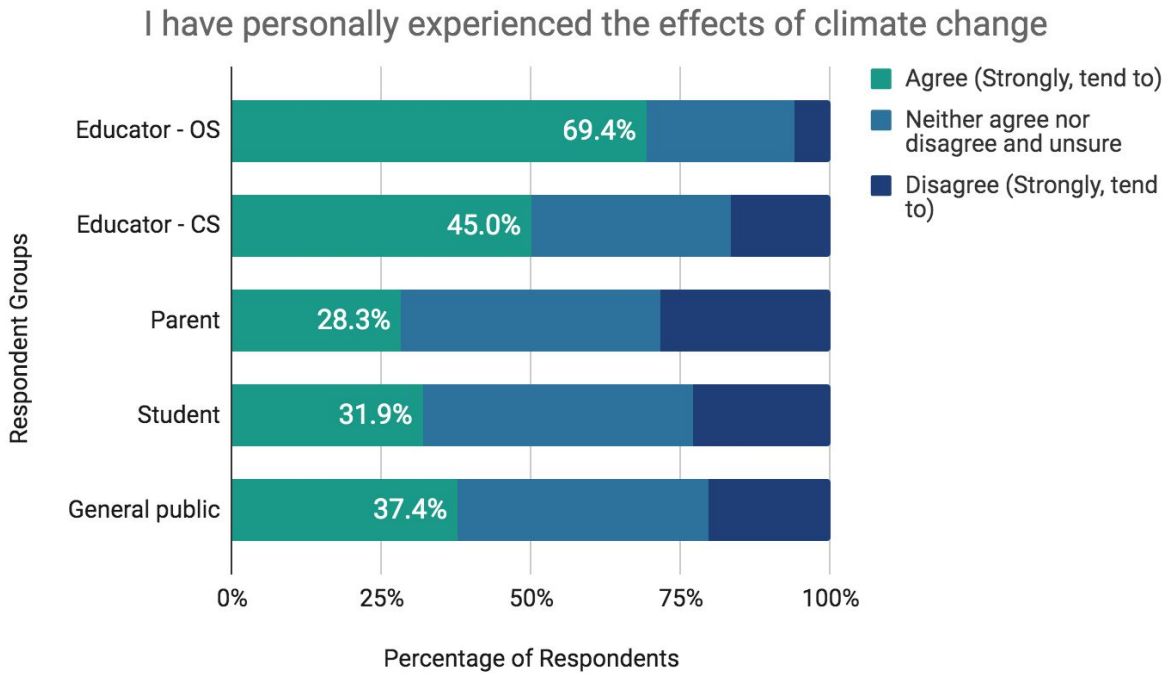
In the different regions across Canada, the majority of respondents do not think that the seriousness of climate change is exaggerated, except for Saskatchewan and Alberta where, respectively, 49% and 53% of respondents disagreed that the seriousness is exaggerated. In Manitoba and Quebec, only 14% and 13% of respondents felt that the seriousness of climate change is exaggerated compared to more than double that number in Saskatchewan (31%) and Alberta (30%).



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

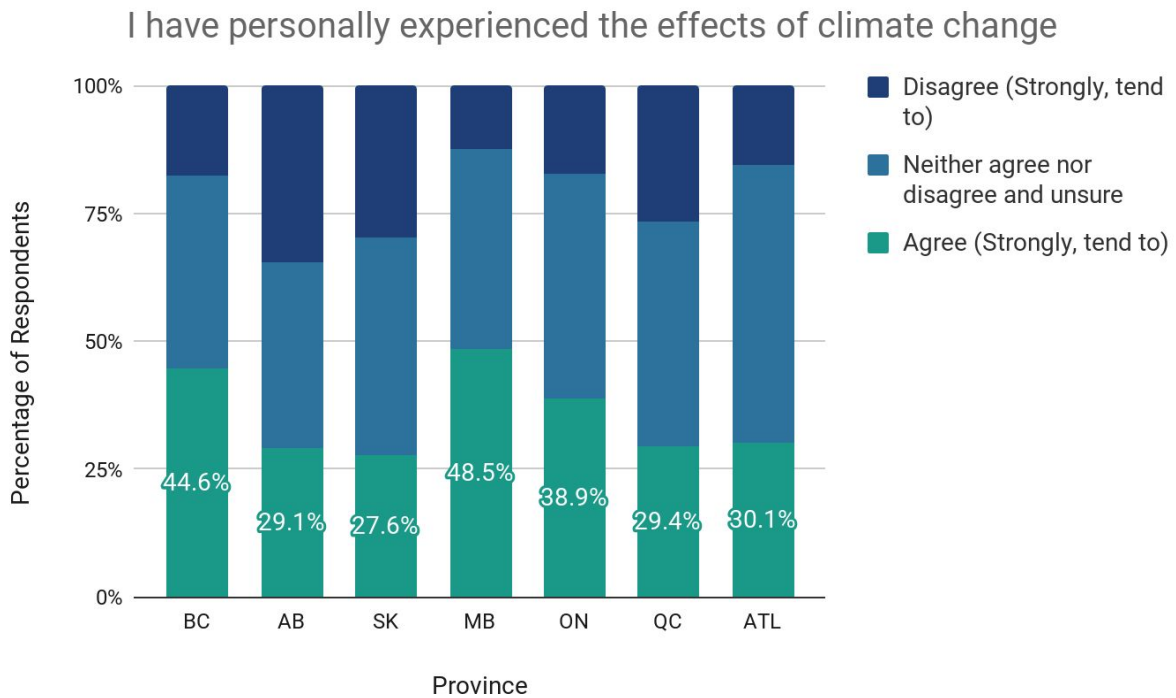
Figure 11. Seriousness of climate change by region

More than two-thirds (69%) of open-sample educators and just fewer than half (45%) of the closed-sample educators indicated that they had experienced climate change impacts. Comparatively, only one-third of the members of the general public (37%) and students (32%) indicated having personally experienced climate change impacts, with the fewest parents (28%) having experienced impacts.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)
 Figure 12. Personally-experienced impacts

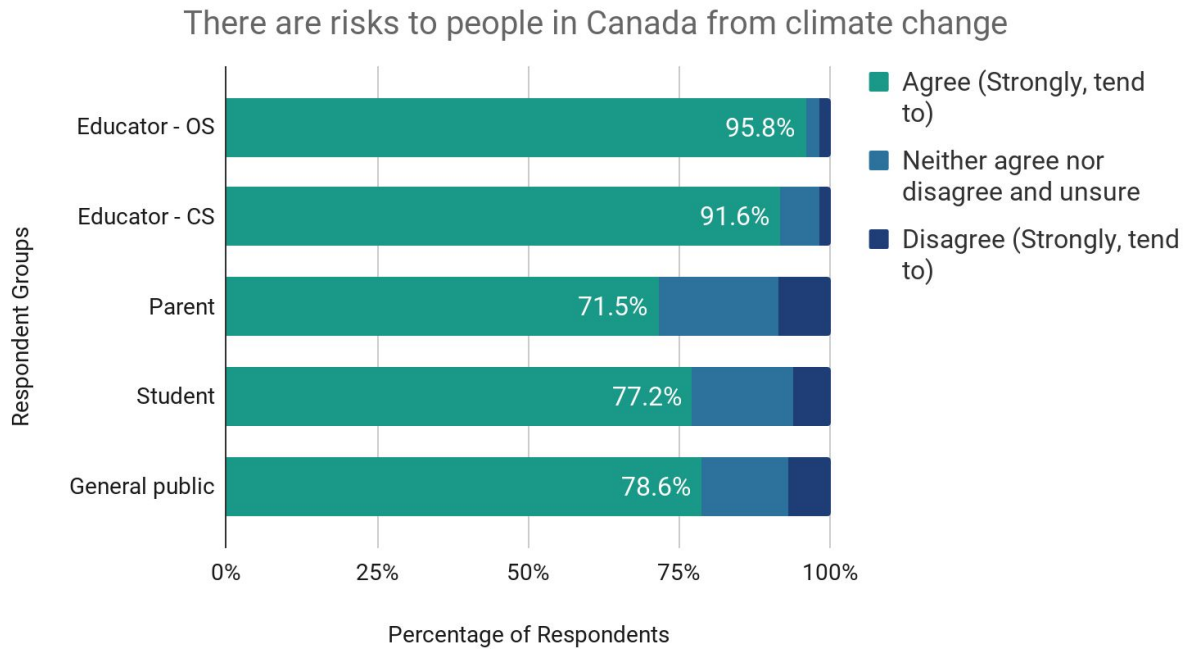
Regionally, with regards to having experienced the effects of climate change, BC and Manitoba had a significantly higher number of respondents who had personally felt climate impacts (45% and 48% respectively). In contrast, around one quarter of respondents in Saskatchewan (27%) reported experiencing the effects of climate change, and just slightly more in Alberta (29%) and Quebec (29%).



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)
 Figure 13. Personally-experienced impacts by region

Risk perception

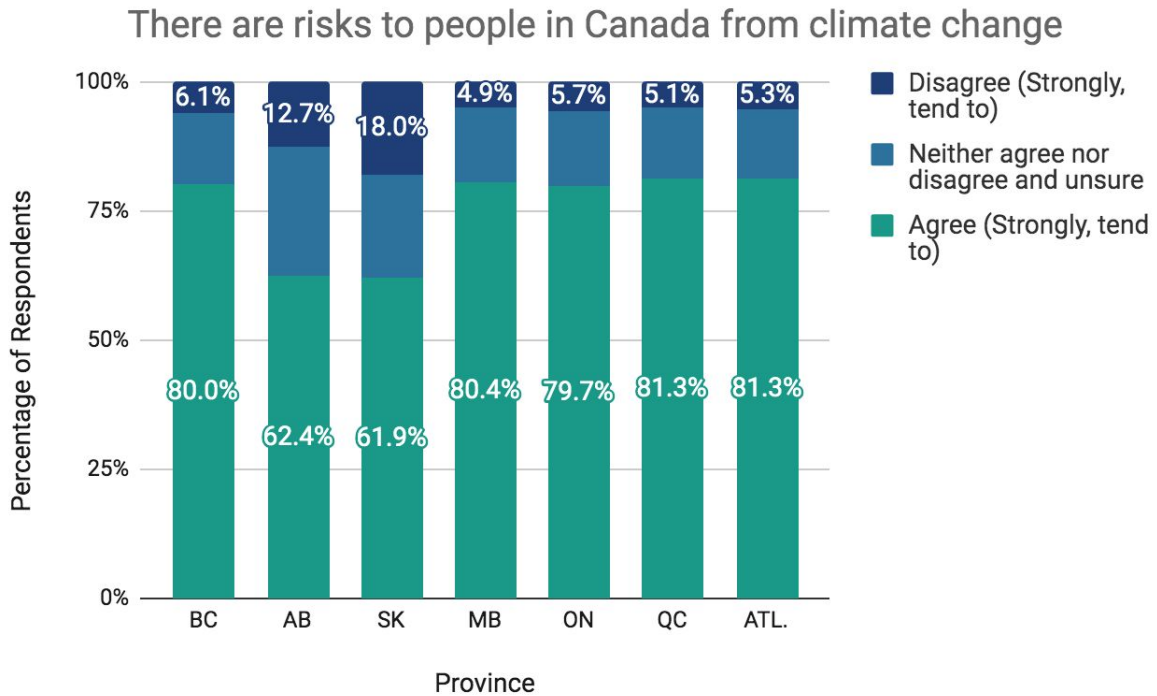
There is high awareness that climate change poses a risk to Canadian citizens with 96% of open-sample educators and 92% of closed-sample educators in agreement. Remaining respondent groups also demonstrated high awareness but to a lesser extent: 79% of members of the general public, 76% of students and 72% of parents.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS = 486, General public = 908)

Figure 14. Risk perception of climate impacts for Canadians

Among Canadians living in British Columbia, Manitoba, Ontario, Quebec, and the Atlantic provinces there is a widespread perception of risk that climate change is affecting, or will affect, Canadians (averaged across provinces = 80%) whereas only 62% of respondents from Alberta and 62% of respondents from Saskatchewan perceive that climate change poses risks to Canadians.



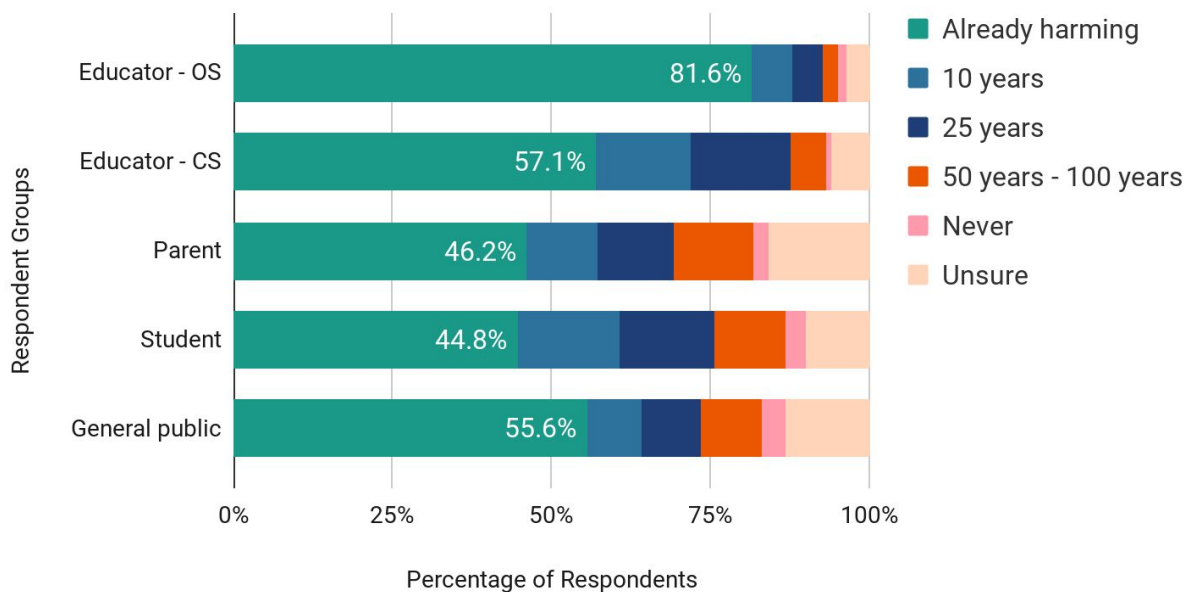
n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 15. Risk perception of climate impacts for Canadians by region

82% of open-sample educators identified that climate change is already harming people in Canada. The majority of closed-sample educators and members of the general public recognize that climate change is already harming Canadians, but in these groups fewer recognize this: 57% and 56%, respectively. However, among parents (46%) and students (45%), less than the majority of respondents indicated current harm. Many respondents in the latter categories (closed-sample educators, parents, students, and members of the general public), however, indicated that they believe climate change will begin causing Canada harm in 10 years or in 25 years.

At the time of the survey, there had been many climate-change-related extreme weather events reported in Canada, although the linkage of these events to climate change had often been understated or missing entirely. Citizens need accurate reporting including relevant linkages to be explicitly made. There is a great need for public education on the harms and costs already being borne by Canadians due to climate change.

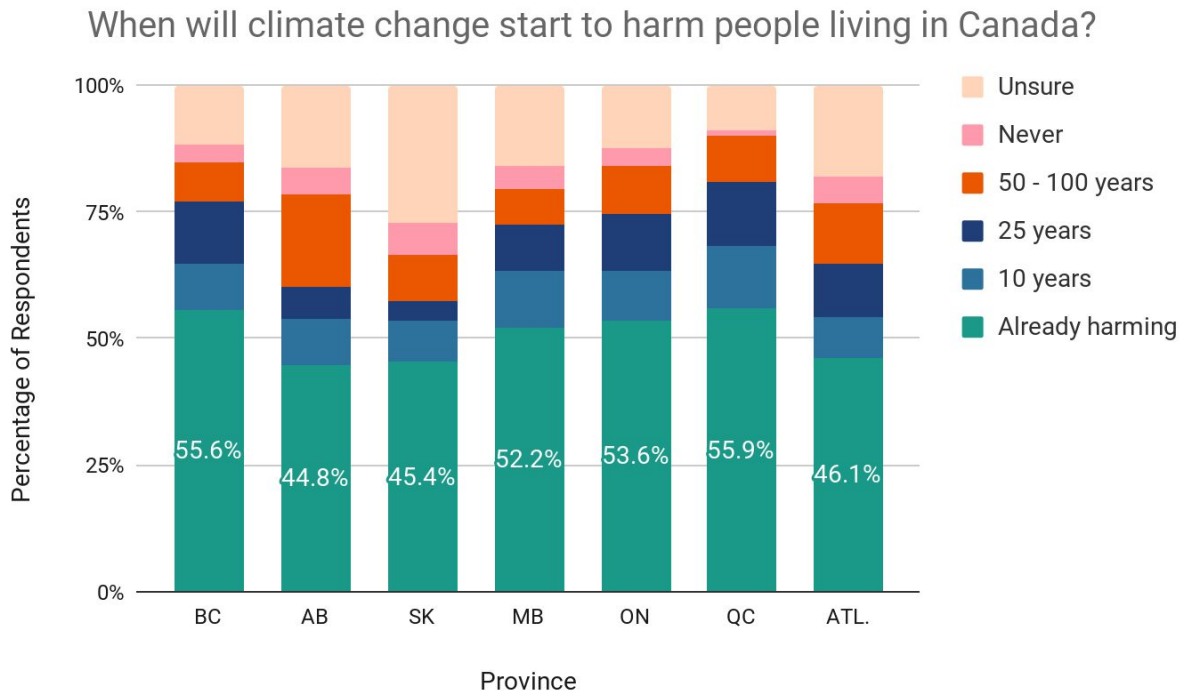
When do you think climate change will start to harm people living in Canada?



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 16. Risk perception: When will harm occur

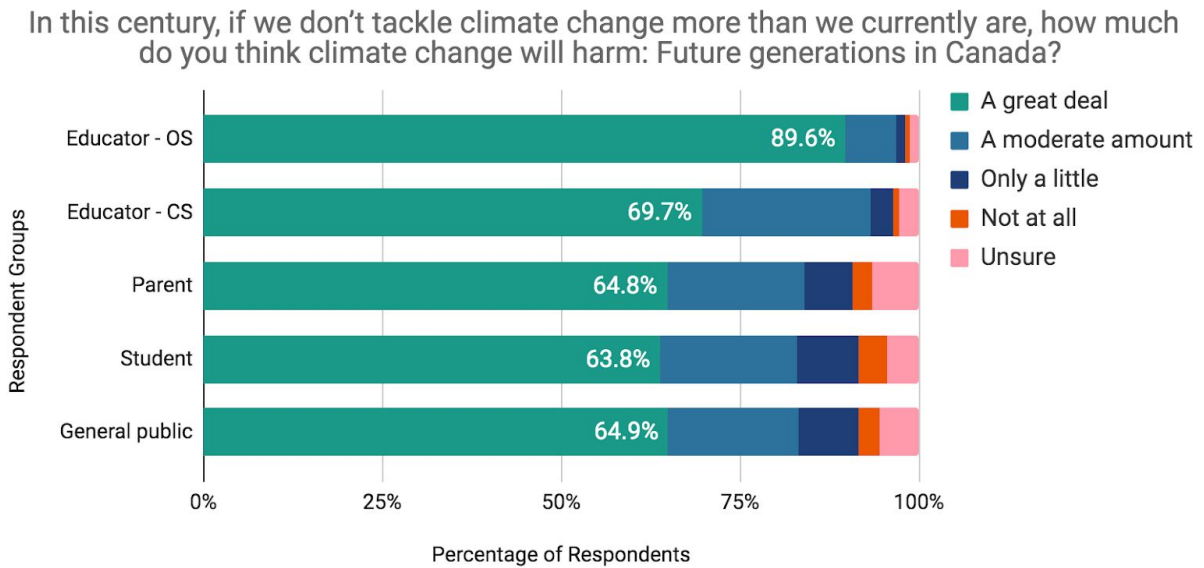
On average, 51% of Canadians recognize that climate change is already affecting people in Canada. There is some regional variation with more respondents from the Atlantic provinces, Alberta and Saskatchewan attributing climate change to a distant future than in other regions.



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 17. Risk perception: When will harm occur by region

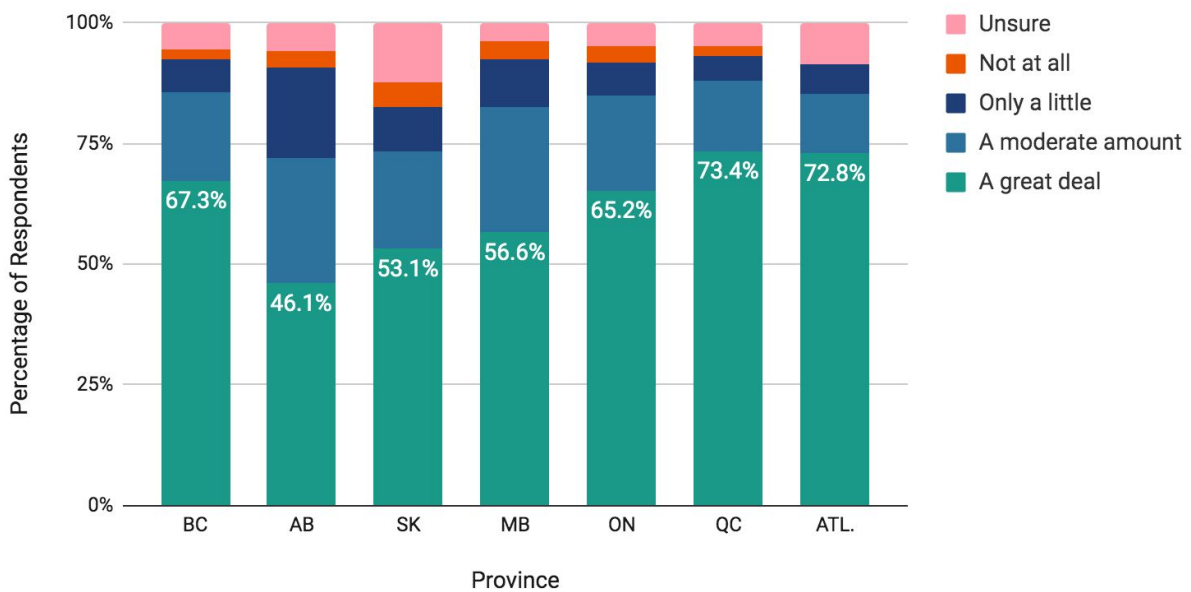
When it comes to predicting the amount of harm that climate change will have on future generations, 90% of open-sample educators expect a great deal of harm, compared to 70% of closed-sample educators expressing the same belief. Remaining stakeholders share similar beliefs to closed-sample educators with 65% of members of the public, 65% of parents, and 64% of students anticipating future generations will be greatly harmed by climate change.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)
 Figure 18. Risk perception: Future generations

If climate change is not tackled “more than we are” in this century, a large majority of respondents across Canada indicated that future Canadian generations will experience a great deal of harm. Almost three quarters of respondents in Quebec (73%) and the Atlantic provinces (73%) indicated “a great deal” of harm, compared to less than half of respondents in Alberta (46%). Still, almost 3/4 of respondents in Alberta indicated either “a great deal” or “a moderate amount” of harm would come to future generations if we don’t tackle climate change more than we are.

In this century, if we don't tackle climate change more than we are, how much do you think climate change will harm: Future generations in Canada?

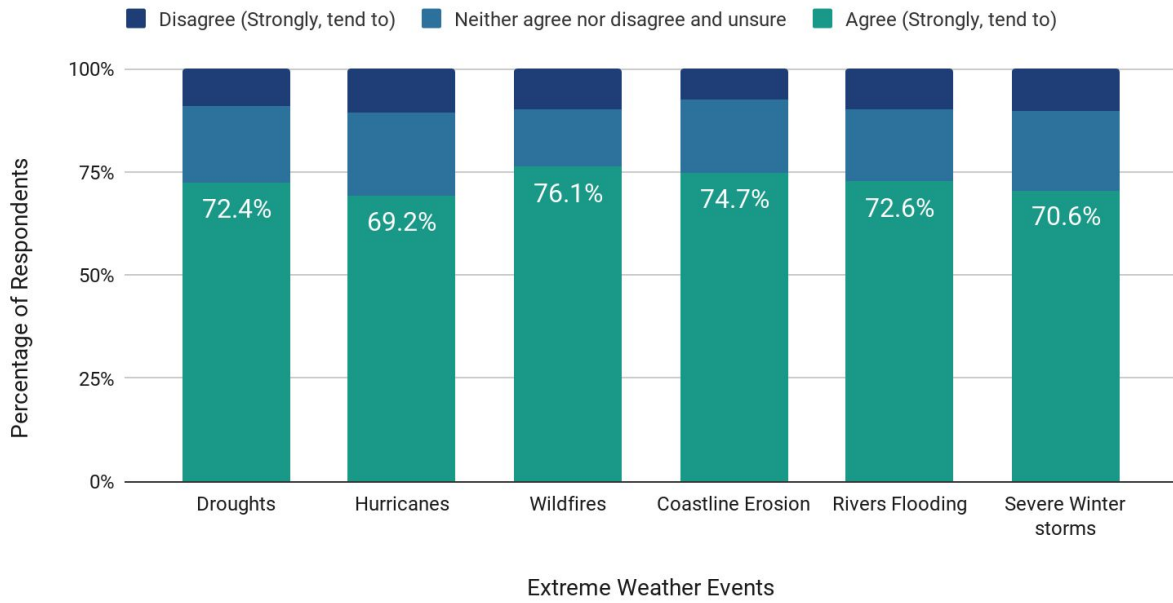


n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 19. Risk perception: Future generations by region

The majority of respondents indicated that climate change is already making the following worse: droughts (72%), hurricanes (69%), wildfires (76%), coastline erosion (75%), river flooding (73%) and winter storms (71%).

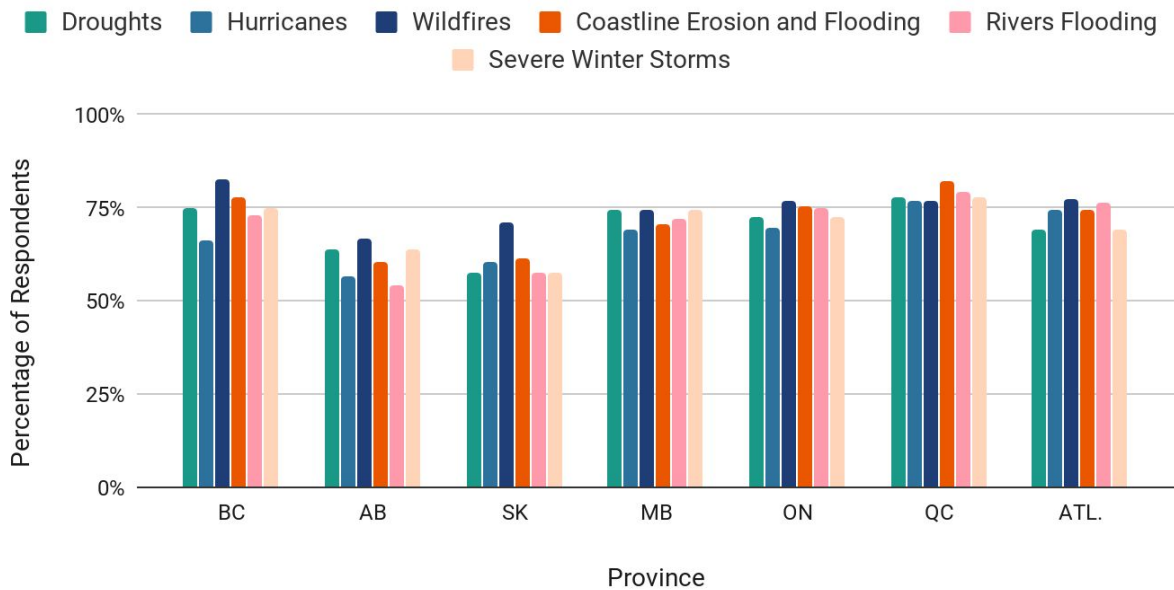
Do you agree that climate change is already causing or making the following things worse: droughts, hurricanes, wildfires, coastline erosion, rivers flooding



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS = 486, General public = 908)
 Figure 20. Climate change impact: droughts, hurricanes, wildfires, rivers flooding, severe winter storms [aggregated]

While there is strong consensus across the provinces that climate change is causing extreme weather events, recognition of these connections is lower in Alberta and Saskatchewan. The lowest responses in Alberta are to the links between climate change and rivers flooding (54%) and hurricanes (57%) and in Saskatchewan the links between climate change and rivers flooding (58%), droughts (58%), and severe winter storms (58%).

Do you agree that climate change is already causing or making the following things worse?



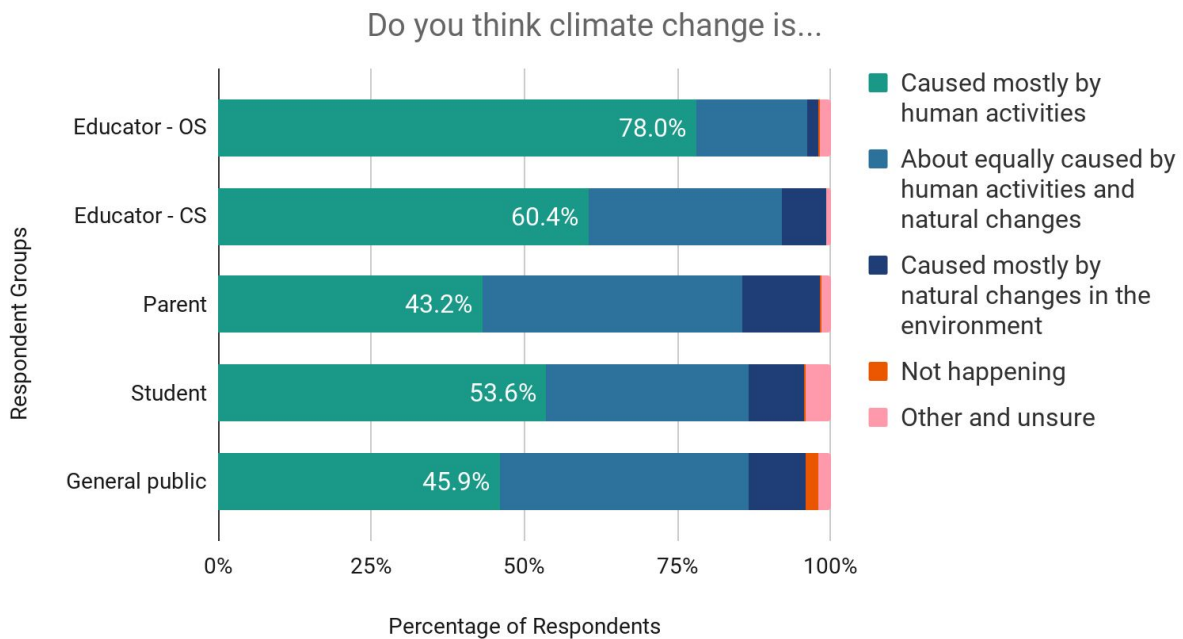
n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 21. Climate change impact: droughts, hurricanes, wildfires, rivers flooding, severe winter storms by province

KNOWLEDGE, UNDERSTANDING & INFORMATION

Knowledge & Understanding

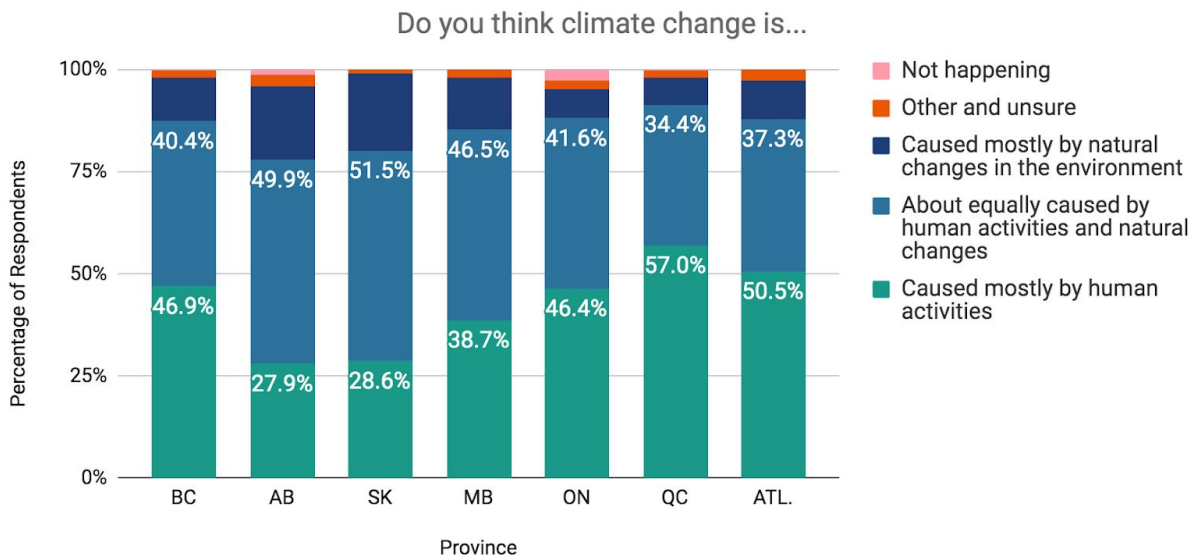
When asked early in the survey whether climate change is human-caused, open-sample educators agreed (78%) more than closed-sample educators (60%). Students agreed (54%) more than both members of the general public (46%) and parents (43%).



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 22. Perception of anthropogenic climate change

The understanding and acceptance that climate change is anthropogenic varies across regional jurisdictions. This suggests that other underlying factors such as fossil fuel resource-dependence for livelihoods may influence the acceptance of climate change as being caused by humans. For example, from our survey of students, teachers, parents, and members of the general public from a representative closed-sample, 47% of BC respondents accept climate change is anthropogenic whereas only 28% of Alberta respondents and 29% of Saskatchewan respondents accept this. A substantial percentage of respondents indicated that climate change is “about equally caused by human activities and natural changes” with percentages ranging from 34% in Quebec to 52% in Saskatchewan. Public education that prioritizes educating the public on the difference between natural changes in the climate and human-caused climate change is recommended to address this predominant misconception. Understanding that climate change is human-caused shifts across provinces with the following percentages: QC=57%, ATL=51%, BC= 47%, ON= 46%, AB=28%, and SK=29%.

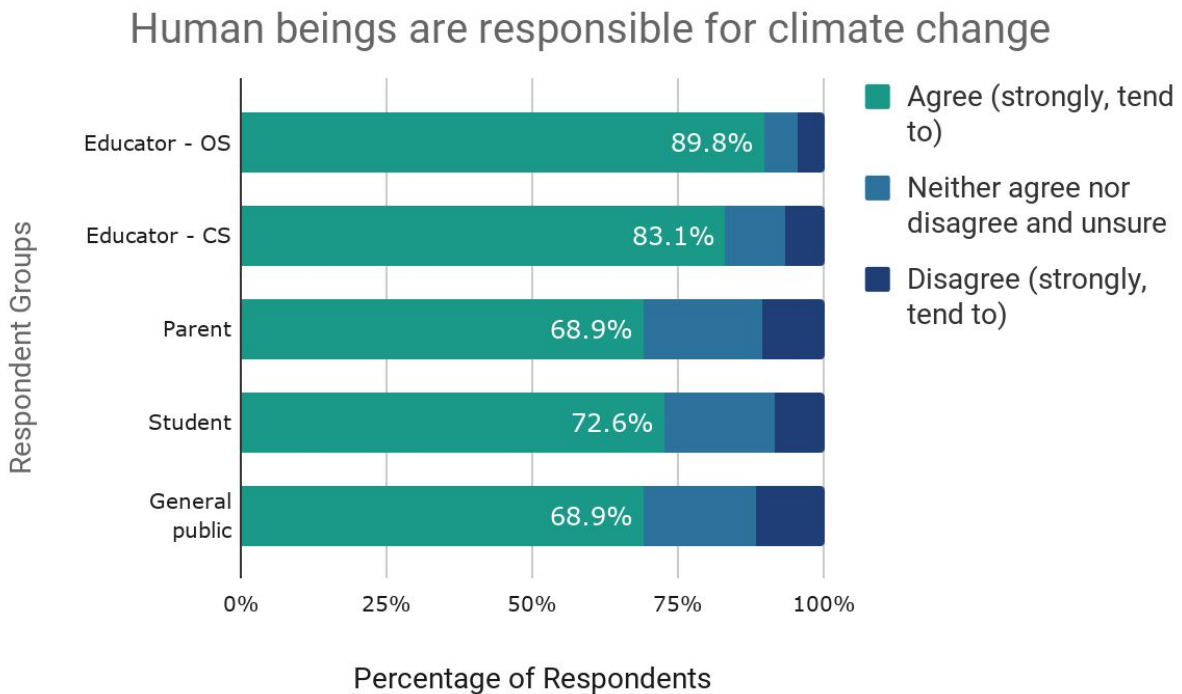


n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 23. Canadians perception of anthropogenic climate change by region

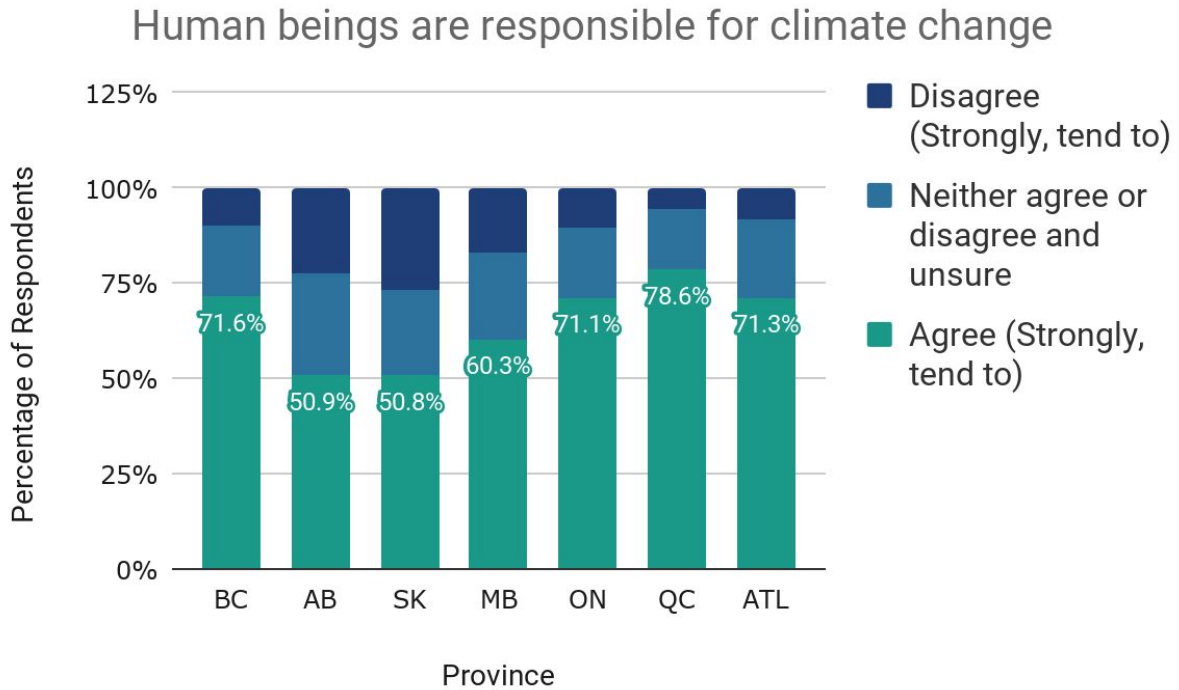
A similar, but differently worded question was asked three-quarters of the way through the survey: “Please select the response that best indicates your level of agreement for each statement below: Human beings are responsible for climate change.” Markedly more people agreed with this: 90% of open-sample educators and (83%) of closed-sample educators. Students again agreed (73%) more than both members of the general public (69%) and parents (69%).

This difference in responses from the first question to this question three-quarters through the survey may be due to priming effects, where the process of going through the survey and engaging with the questions has caused respondents to shift their thinking on human-caused climate change. A recent Abacus Data (2019) survey showed that climate impacts such as forest fires and floods increase the desire of the vast majority of Canadians to see action on climate change. We speculate that answering questions about the increase in these impacts increased respondents’ reported belief in climate change being caused by humans.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)
 Figure 24. Human beings are responsible for climate change

Regional responses also differed with agreement that humans are responsible as follows: QC=79%, BC=72%, ATL=71%, ON= 71%, AB=51% and SK 51%.

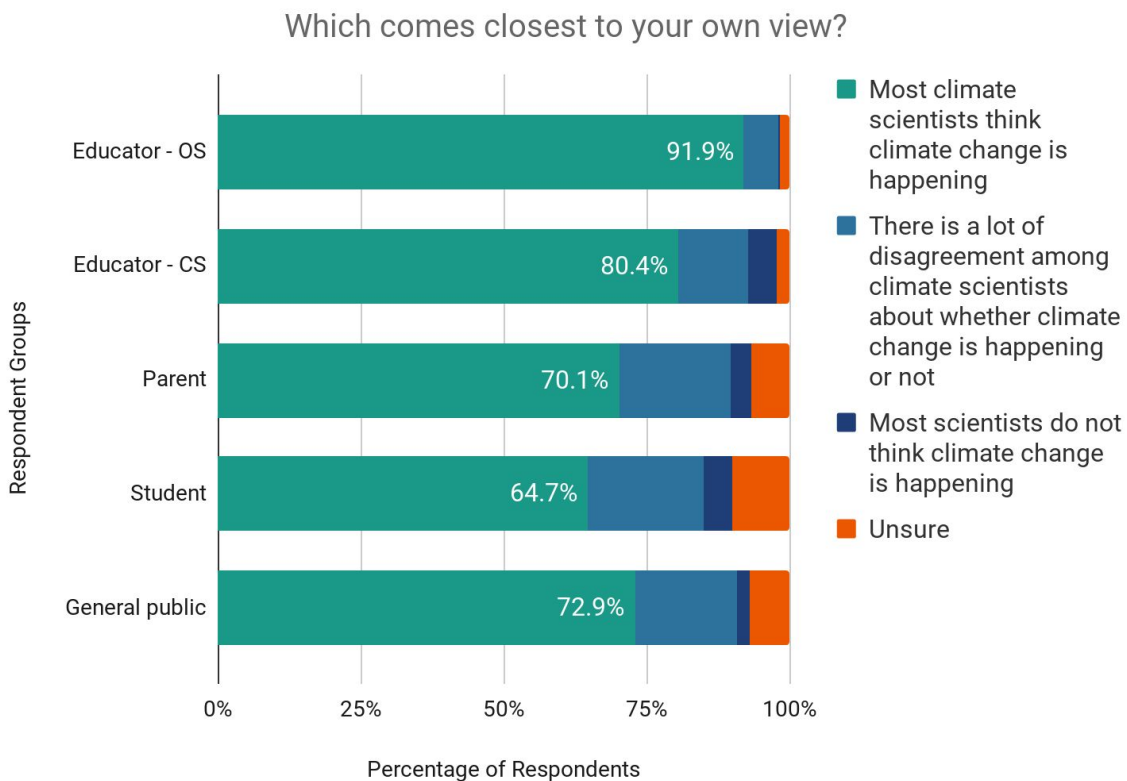


n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 24a. Human beings are responsible for climate change by province

When respondents were asked about the scientific agreement on human-caused climate change, 91% of open-sample educators responded that most climate scientists think that climate change is happening. Among the closed-sample educators, this recognition dropped to 80%, which signals an uncertainty of understanding on the scientific consensus. Other stakeholder responses showed lower percentages indicating knowledge of the scientific consensus (general public = 73%; parents = 70%, and students = 65%).

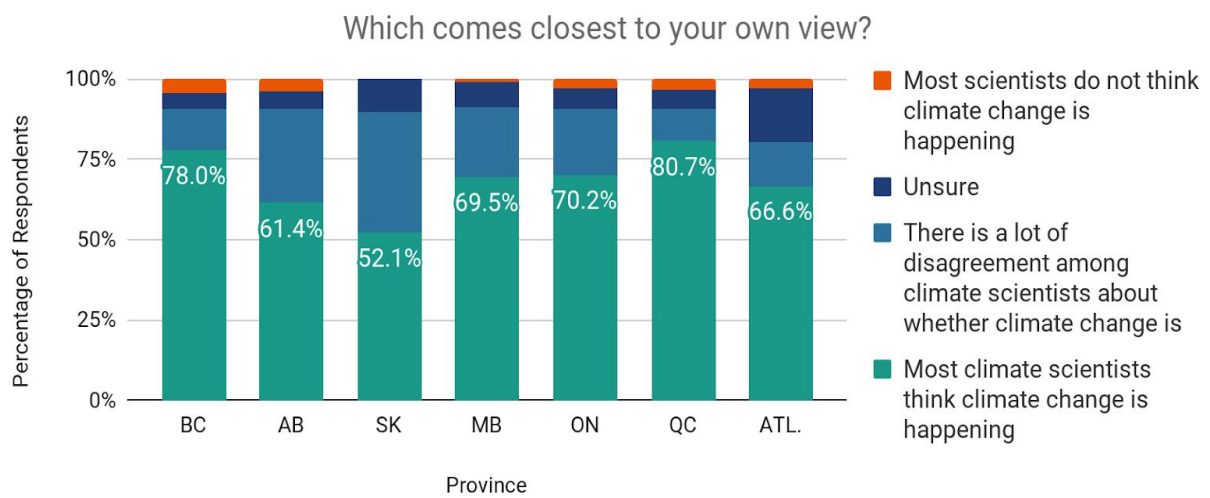
The scientific consensus on anthropogenic climate change has evolved since the first work to assess the consensus was conducted (Oreskes, 2004) and subsequent studies continued to build the evidence base (Anderegg et al., 2010; Doran & Zimmerman, 2009). In 2013, evidence of the consensus was presented by a research team who reviewed 11,944 climate abstracts from 1991–2011 and found that 97% of the peer-reviewed papers endorsed the ‘consensus’ position that humans are causing global warming (Cook et al., 2013). In 2014, in its Fifth Assessment Report, the Intergovernmental Panel on Climate Change wrote that climate change is anthropogenic: “Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on humans and natural systems” (p. 2). In 2016, Cook et al. synthesized studies on the consensus and confirmed the figure of 97% agreement among climate scientists.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS = 486, General public = 908)

Figure 25. Perception of scientific agreement on climate change

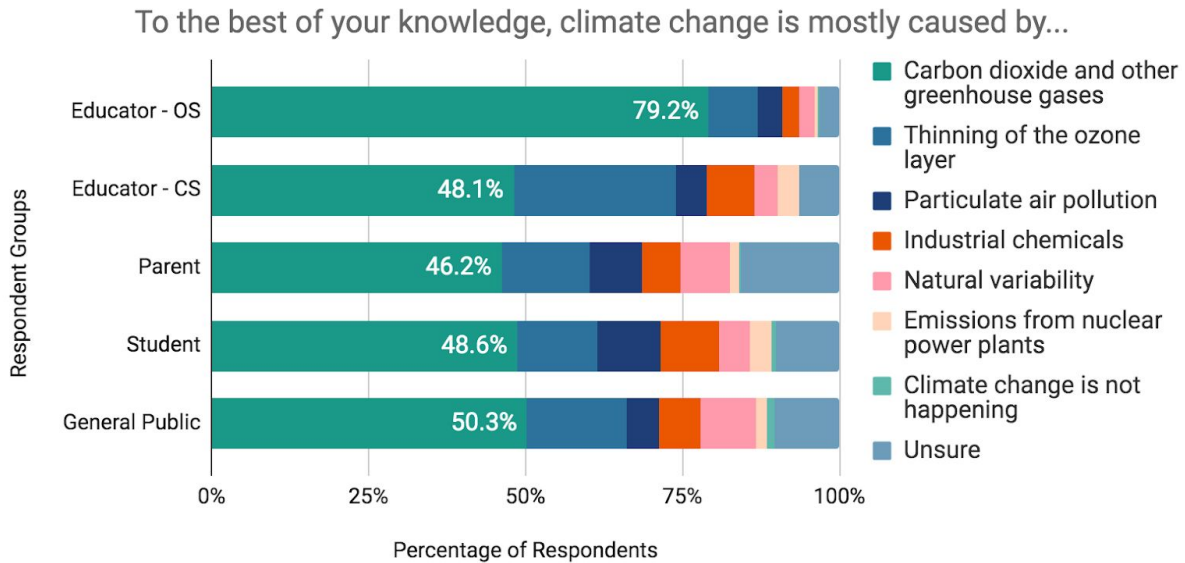
Across regional jurisdictions, the majority of Canadians recognize that there is a scientific consensus on climate change; however, lower rates of acceptance remain in Alberta (61%) and Saskatchewan (52%). In a recent review of climate change learning objectives within provincial and territorial curriculum documents, Wynes and Nicholas (2019) found that Saskatchewan is the only regional jurisdiction that covers the expert consensus on anthropogenic climate change; however, this coverage occurs in a non-mandatory course. In the United States, Plutzer et al. (2016) found that most science teachers were not aware of the scientific consensus. From the present survey findings and from Wynes and Nicholas' (2019) work, this is an area for improvement within curriculum policy. In addition, public education should continue to include and prioritize the scientific consensus that climate change is anthropogenic - caused by humans.



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

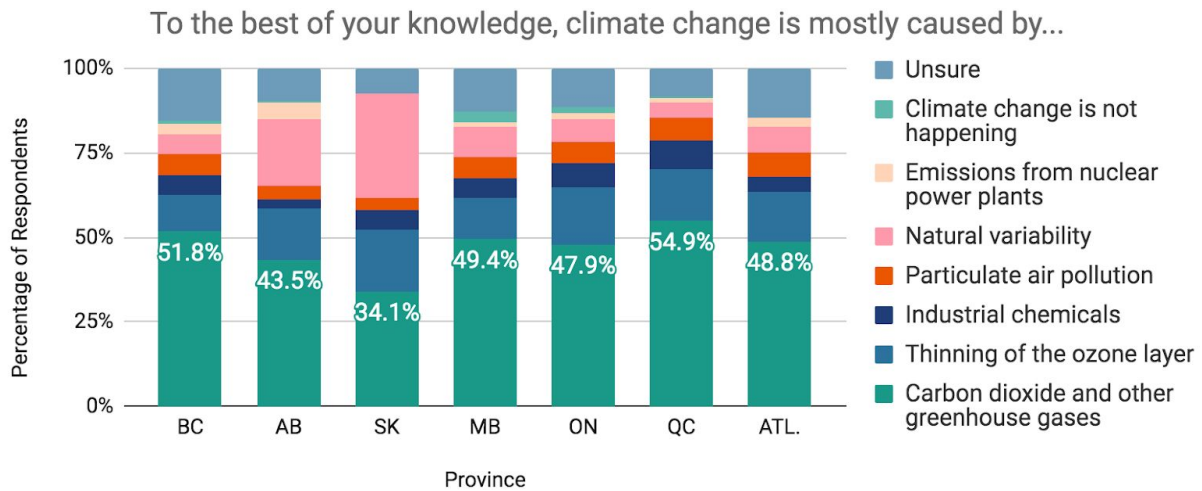
Figure 26. Canadians perception of scientific agreement on climate change by region

In terms of understanding the scientific causes of climate change, 79% of open-sample educators responded correctly that carbon dioxide and other greenhouse gases are the primary cause of climate change. Only 48% of closed-sample educators correctly responded to this question, which suggests a need for professional development for educators across Canada on foundational climate science knowledge and understanding. Only about half of the parents (46%), students (49%) and members of the general public (50%) correctly responded to the question.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)
 Figure 27. Perception of cause of climate change

Across regional jurisdictions there is variation in the knowledge that carbon dioxide and other greenhouse gas emissions are the principal cause of climate change (BC=52%, AB=43%, SK=34%, 50%, ON=48%, QC=55%, ATL=49%). Public education should continue to focus on addressing predominant misconceptions, such as thinning of the ozone layer and natural variability, as principal causes of climate change. Public understanding that greenhouse gases are the main cause of climate change is a necessary precondition to having an informed national conversation about greenhouse gas reduction policies.



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 28. Canadians perception of cause of climate change by region

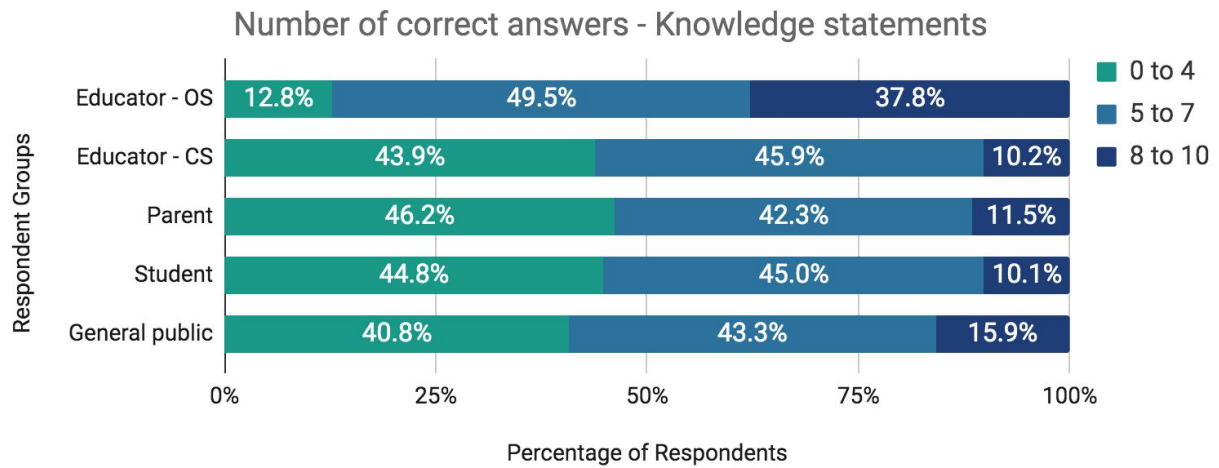
The three previous questions are from a set of 10 knowledge and understanding questions that pertain to climate science and climate impacts, outlined below. These ten questions are one means of measuring a respondent’s conceptual understanding of climate science and impacts and have not been tested for validity to measure climate understanding. Two questions were taken verbatim from the Six Americas survey (Leiserowitz, Maibach, Roser-Renof & Smith, 2011) and eight were created based on information provided on the Environment and Climate Change Canada Federal website (<https://www.canada.ca/en/services/environment/weather/climatechange/causes-effects.html>). Correct answers are indicated in bold (more than one answer was accepted as correct for some questions, as shown; question 10 required both correct choices to be indicated to be judged correct).

Table 2. *Knowledge and Understanding Questions and Answers*

Questions	Answers	Source
1. Do you think climate change is...	Caused mostly by human activities Caused mostly by natural changes in the environment About equally caused by both human activities and natural changes Not happening Other (please specify) Unsure	Six Americas Survey - Self-perceived knowledge and beliefs about cause of global warming
2. Which comes closest to your own view?	Most climate scientists think climate change is happening Most climate scientists do not think climate change is happening There is a lot of disagreement among climate scientists about whether Climate change is happening or not Don't know enough to say	Six Americas Survey - Perception of scientific agreement
3. To the best of your knowledge, climate change is mostly caused by...	Carbon dioxide and other greenhouse gases Emissions from nuclear power plants Thinning of the ozone layer Particulate air pollution Industrial chemicals Natural variability Climate change is not happening Unsure	Environment and Climate Change website
4. To the best of your knowledge, the main process behind climate change is...	An increase in gasses in the Earth’s atmosphere that trap heat Letting more of the sun’s heat into the Earth’s atmosphere through a thinner ozone layer An increase in solar activity Particle pollution in the air reflecting heat back to Earth Climate change is not happening Unsure	Environment and Climate Change website

5. To the best of your knowledge, Canada's average temperature has ... since 1948.	<p>Increased by 1 – 1.5 degrees Celsius Increased by 0.5 – 0.99 degrees Celsius Increased by 0 – 0.49 degrees Celsius Decreased by 1 – 1.5 degrees Celsius Decreased by 0.5-0.99 degrees Celsius Decreased by 0-0.49 degrees Celsius Stayed the same Unsure</p>	Environment and Climate Change website
6. To the best of your knowledge, in Canada (between 1990 – 2015), what sector was the largest greenhouse gas emitter?	<p>Oil and gas Transportation Agriculture Heavy industry Electricity Buildings Waste Unsure</p>	Environment and Climate Change website
7. To the best of your knowledge, Canada, as an Arctic nation, is more affected by the impacts of climate change	<p>True False Unsure</p>	Environment and Climate Change website
8. To the best of your knowledge, in the next 20 years Canadian winters are predicted to be colder and to have more snow.	<p>True False Unsure</p>	Environment and Climate Change website
9. Scientists predict that the amount of temperature increase the Earth system can tolerate is...	<p>0-0.49 degrees Celsius 0.5 – 0.99 degrees Celsius 1.0 – 1.49 degrees Celsius 1.5 – 1.99 degrees Celsius 2.0 – 2.49 degrees Celsius 2.5 – 3.0 degrees Celsius Unsure</p>	Environment and Climate Change website
10. What do the world's countries need to do in order to ensure temperatures stay within the range that the Earth system can tolerate?	<p>Select all that apply: Significantly decrease emissions Move to net zero emissions (balancing a measured amount of carbon released with an equivalent amount of sequestered or offset carbon emissions) Significantly increase emissions Moderately Increase emissions Do nothing Moderately decrease emissions</p>	Environment and Climate Change website

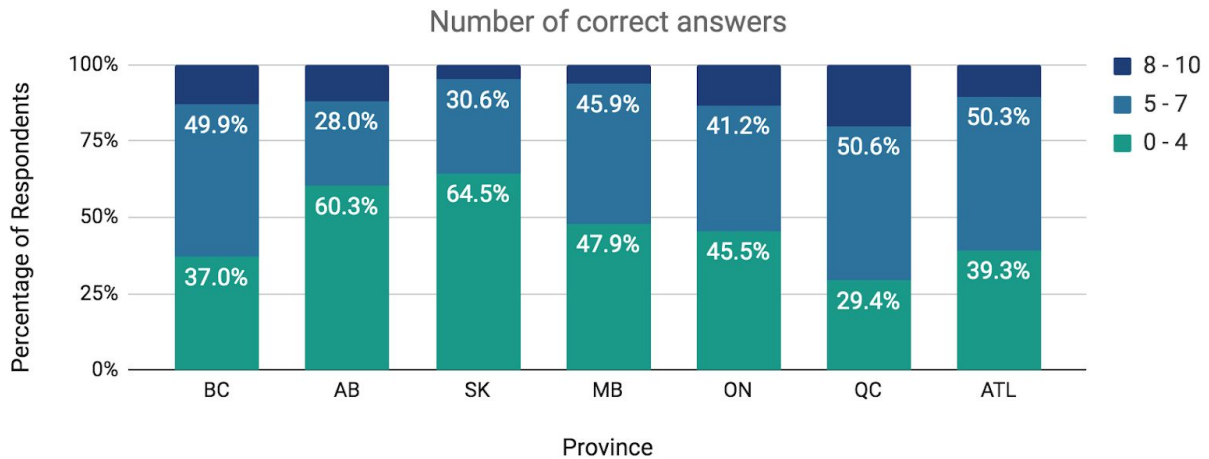
On average, 43% of parents, students, and closed-sample educators answered 4 or fewer of the knowledge questions correctly: closed-sample educators (44%), parents (46%), students (45%), and the general public (41%). 12% of the open-sample educators answered 4 or fewer questions correctly. On average, 14% of closed-sample respondents correctly answered 8 or more of the 10 climate change knowledge questions: closed-sample educators (10%), parents (12%), students (10%), and members of the general public (16%). There is a gap between open-sample educators and the other groups, with 37% of open-sample educators getting 8 or more of the 10 questions correct.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 29. Correct responses to knowledge statements

Regionally, the percentage of respondents answering four or fewer correctly is as follows: BC =37%, AB=61%, SK=65%, MB= 48%, ON= 46%, QC= 29% and AL=39%. QC scored the highest with 20% of respondents getting 8 to 10 correct and SK scored lowest with 5% of respondents getting 8 to 10 correct.

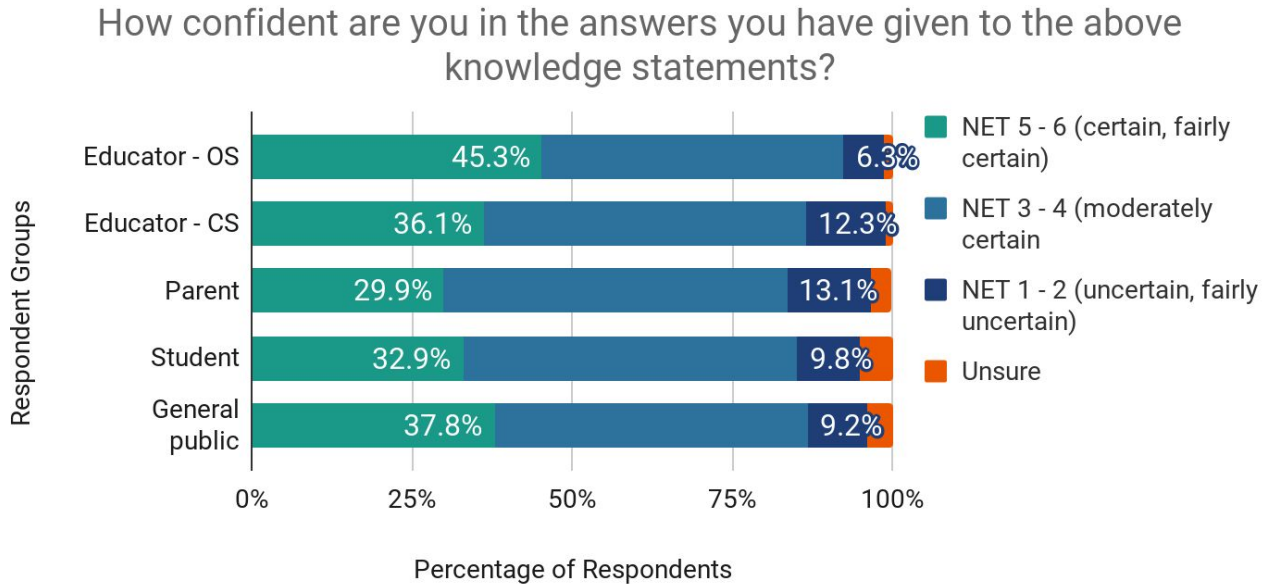


n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 30. Canadians' correct responses to knowledge statements by region

Self-assessment on knowledge of climate change

When respondents were asked to self-evaluate their answers to the knowledge and understanding questions, open-sample educators demonstrated the highest certainty, with other stakeholders showing much less certainty and confidence in their knowledge and understanding.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 31. Confidence in answers to knowledge questions

When respondents' confidence in their answers is compared to the number of correct responses on the knowledge and understanding questions, the open-sample of educators were the most accurate in their assessment of their knowledge and understanding across the range of confidence and correct responses. The closed-sample of educators, parents, students, and members of the general public reported higher levels of confidence (selected 5 or 6 on the Likert scale) (respectively, 36%, 30%, 33%, 38%); however, according to the knowledge and understanding questions, far fewer correctly responded to 8 or 10 of the questions correctly (closed-sample educators=10%, parents=11%, students=10%, members of the general public=16%).

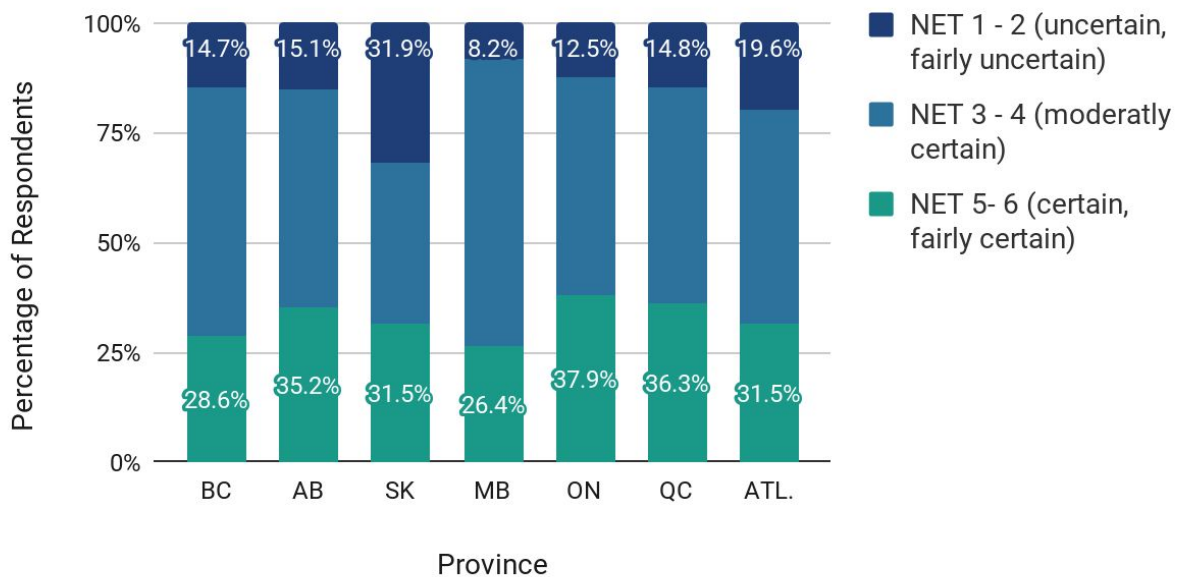
These findings suggest that many people overestimate their knowledge of climate change. Formal and public education efforts are needed to help citizens learn about the primary causes of climate change, current and future impacts, and possible responses to tackle climate change.

Table 2. *Correct Responses and Levels of Confidence in Knowledge and Understanding Questions*

	Correct 8 to 10	Certain (NET 5 - 6)	Correct 5 to 7	Moderately certain (NET 3-4)	Correct 0 to 4	Uncertain (NET 1 - 2)	Unsure
Educator - OS	37.8%	45.3%	49.5%	47.1%	12.8%	6.3%	1.3%
Educator - CS	10.2%	36.1%	45.9%	50.5%	43.9%	12.3%	1.2%
Parent	11.5%	29.9%	42.3%	53.6%	46.2%	13.1%	3.3%
Student	10.1%	32.9%	45.0%	52.3%	44.8%	9.8%	5.1%
General public	15.9%	37.8%	43.3%	49.1%	40.8%	9.2%	3.9%

Respondents across the regions were fairly consistent in their certainty in their answers to the knowledge questions with an average of 33% indicating they were certain about their answers (the lowest was 26% in Manitoba and the highest is 38% in Ontario). There is variation in the regions when reporting uncertainty in the confidence to their answers to the knowledge questions. 32% of respondents in Saskatchewan reported uncertainty; however, among other regions this is much lower (average of uncertainty not including Saskatchewan=14%).

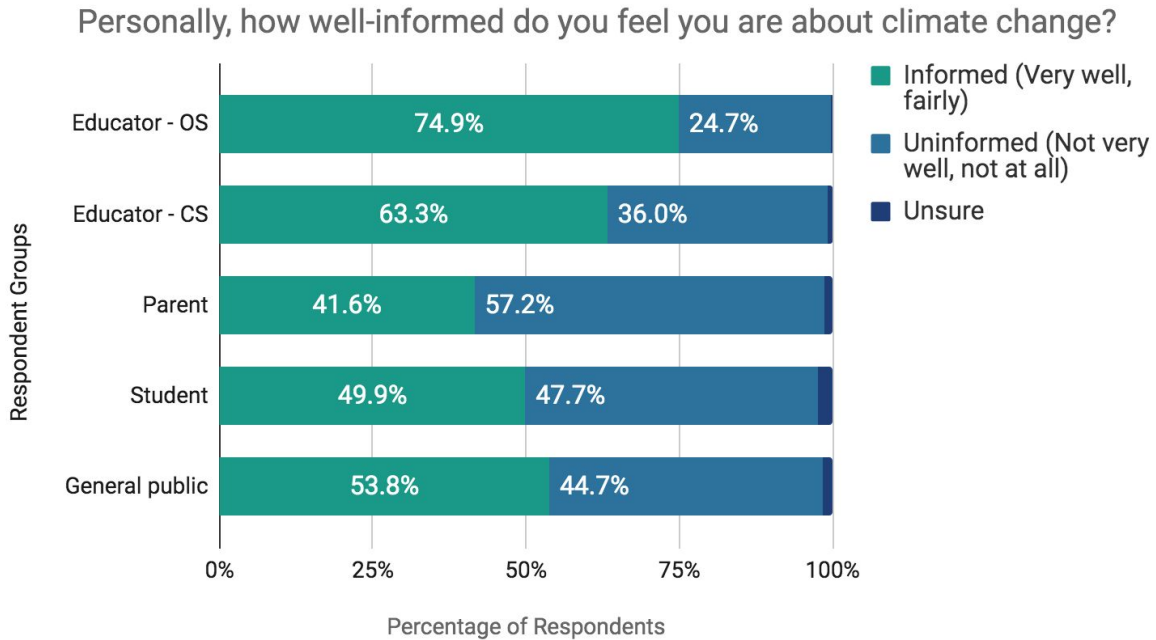
How confident are you in the answers you have given in the above knowledge statements?



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 32. Confidence in answers to knowledge questions by region

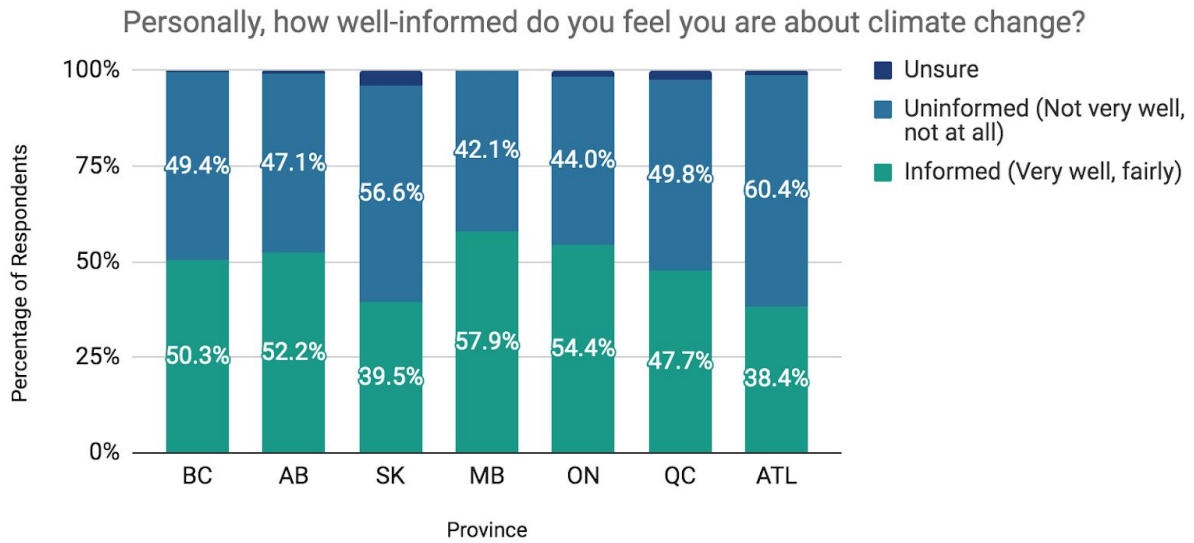
When asked, “how well informed do you feel you are about climate change?”, those who indicated “very well” or “fairly well” include: open-sample educators (75%), closed-sample educators (63%), parents (42%), students (50%), and the general public (54%).



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 33. Self-assessment of knowledge on climate change

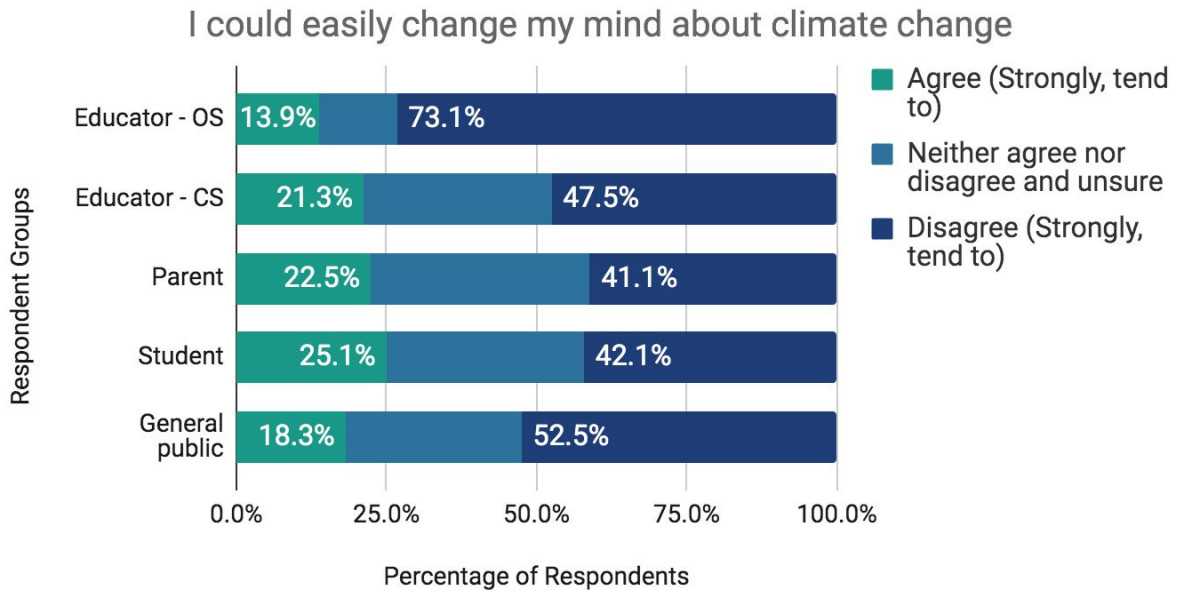
Regional responses for those feeling “very well” or “fairly well” informed about climate change are as follows: BC=50%, AB= 52%, SK= 40%, MB= 58%, ON= 54%, QC= 48% and ATL=38%.



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

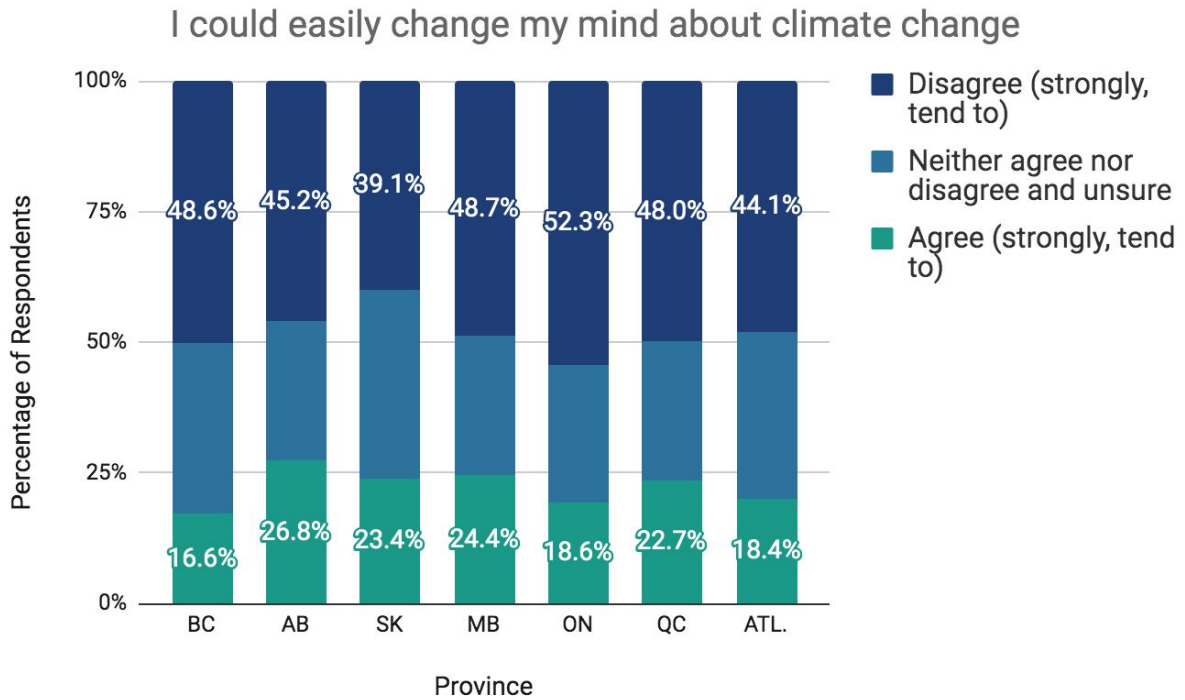
Figure 34. Canadians’ self-assessment of knowledge by region

Of all stakeholders, open-sample educators felt most decided on their view of climate change with 73% of respondents indicating attitudinal certainty about climate change. However there is less certainty amongst remaining stakeholders, with only 53% of members of the general public, 48% of closed-sample educators, 42% of students and 41% of parents disagreeing with “I could easily change my mind about climate change.”



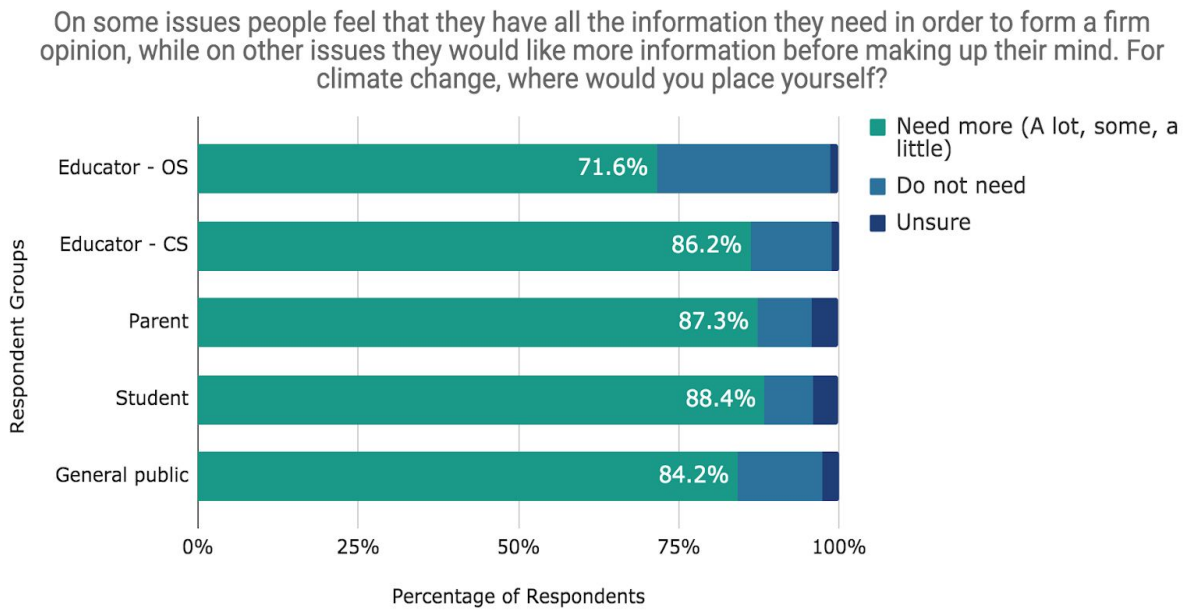
n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)
 Figure 35. Attitudinal certainty

Across the regions, there is some variation in attitudinal certainty about climate change, with 52% of respondents from Ontario indicating certainty compared to 39% of respondents from Saskatchewan. 27% of respondents from Alberta indicate they could easily change their minds about climate change.



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)
 Figure 36. Attitudinal certainty by region

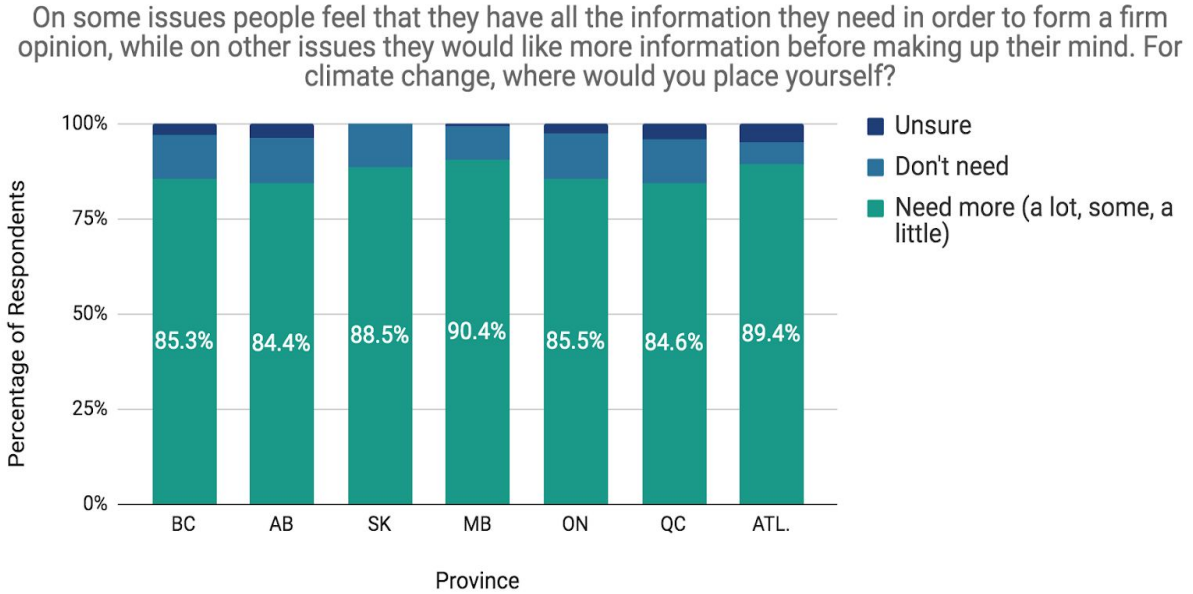
Most respondents in all groups indicated that more information on climate change is required for them to form a firm opinion on climate change. The smallest percentage of respondents indicating the need for additional information were open-sample educators (72%), while others were nearly unanimous on the need for more information: 88% of students, 87% of parents, 86% of closed-sample educators, and 84% of members of the general public. We interpret this result as meaning almost everyone would benefit from more information about climate change and believe these data support the need for increased public education and professional development for teachers on climate change education.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 37. Self-assessed information needs

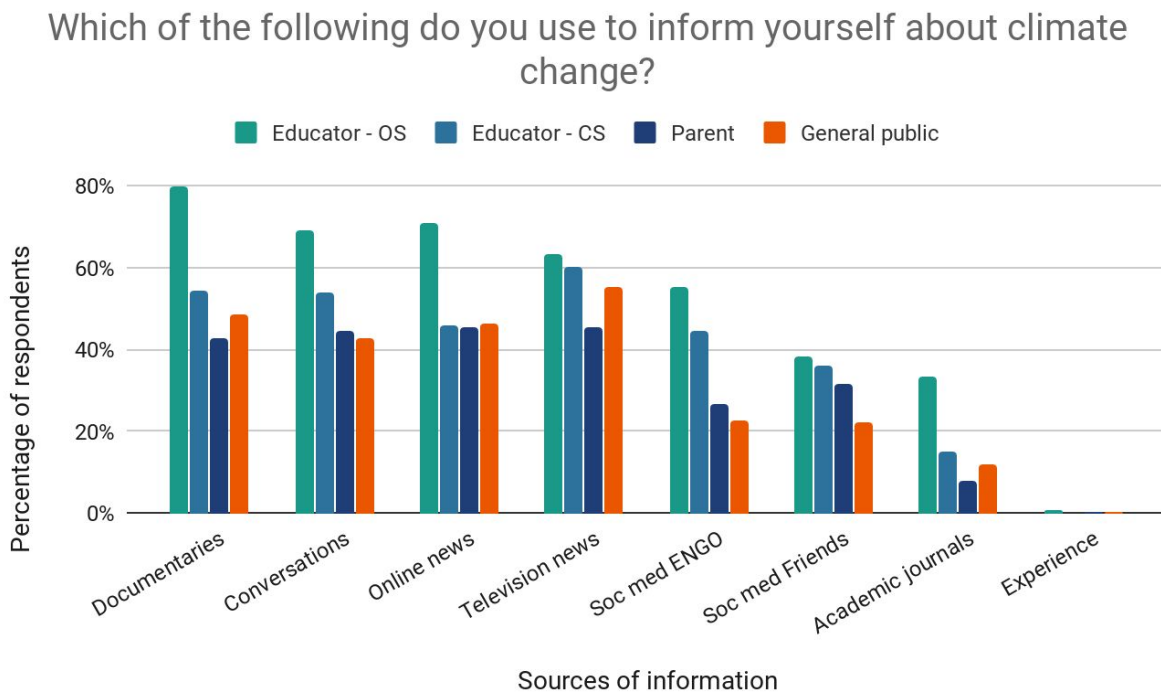
Across the provinces, 87% of Canadians identified that they need more information in order to form a firm opinion on climate change.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)
 Figure 38. Canadians' self-assessed information needs on climate change by region

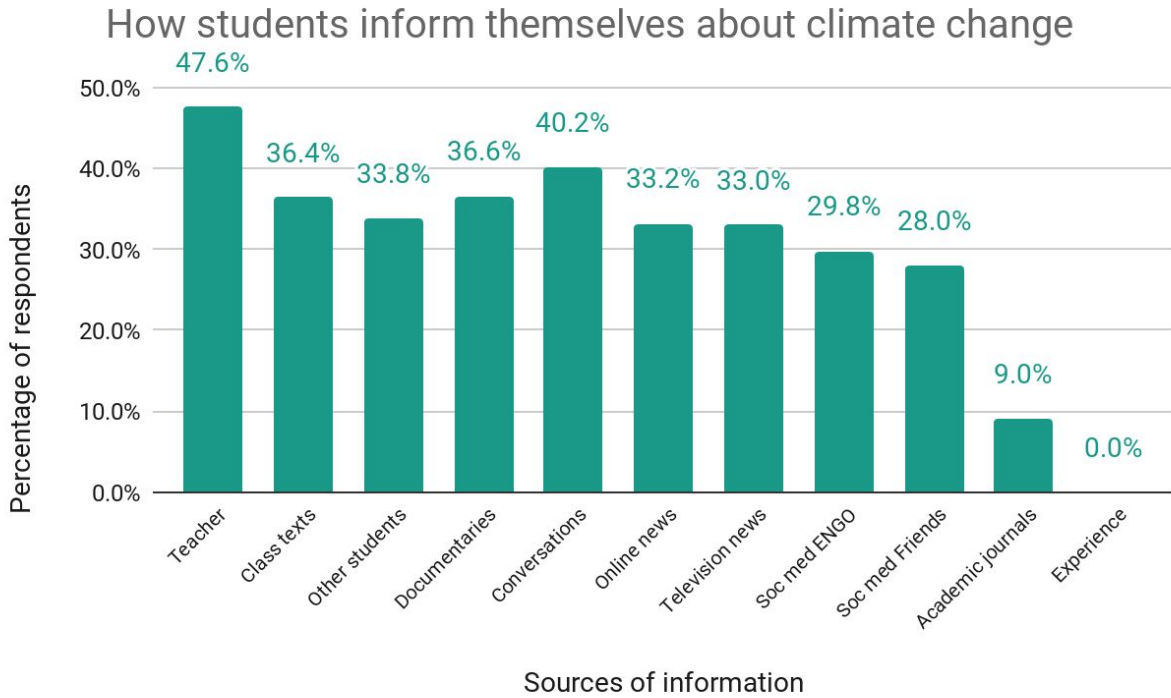
Sources of information

Educators turn to documentaries, conversations with friends and family and both online news and television news to learn about climate change. Parents and members of the general public cited television news and online news followed by documentaries and then conversations with friends and family as sources of information for learning about climate change. Almost no respondents indicated that they learn about climate change through experience or observation.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)
 Figure 39. Sources of information used for learning about climate change

Students indicated that they learn about climate change primarily through their teacher (48%), conversations (40%), class texts (37%), documentaries (37%), and other students (34%). These data highlight how important educational spaces are for students to learn about climate change, its impacts, and mitigation strategies.

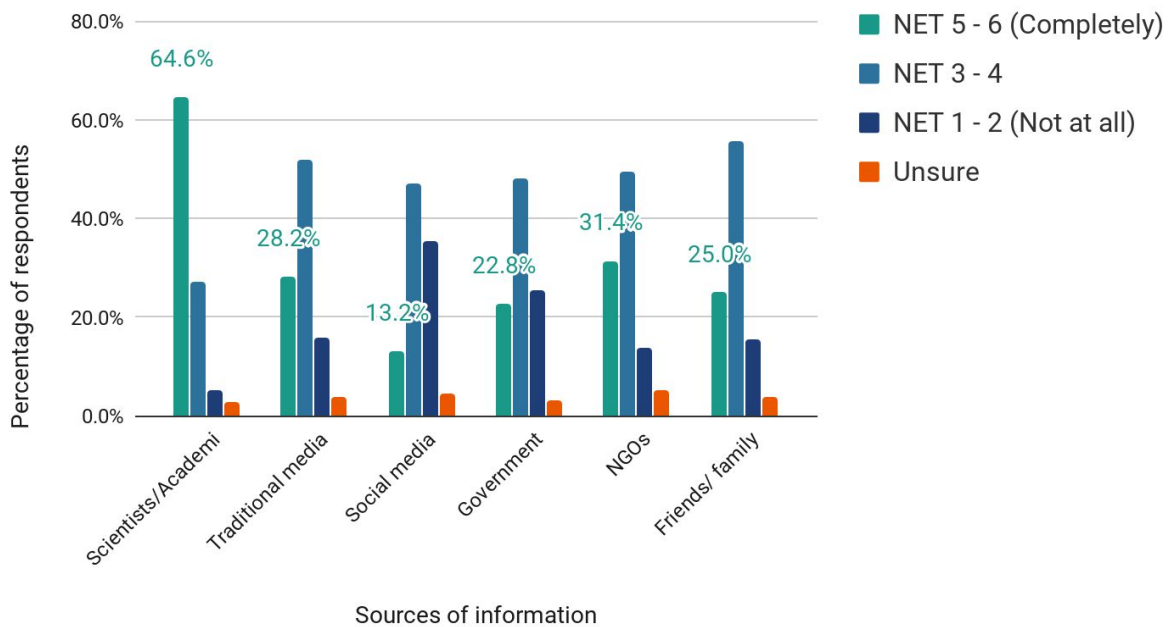


n= 483 Students

Figure 40. Sources of information students use to learn about climate change

While documentaries, conversations with friends and family, and both online news and television news were top sources of information on climate change for all groups, respondents did not have a high degree of trust in these sources. When asked which sources of climate change information respondents trust the most, 65% of closed-sample respondents indicated scientists/academics; 31% indicated non-governmental organizations, 28% indicated traditional media, 25% friends/family and 23% indicated government.

How much do you trust what different sources say about climate change?



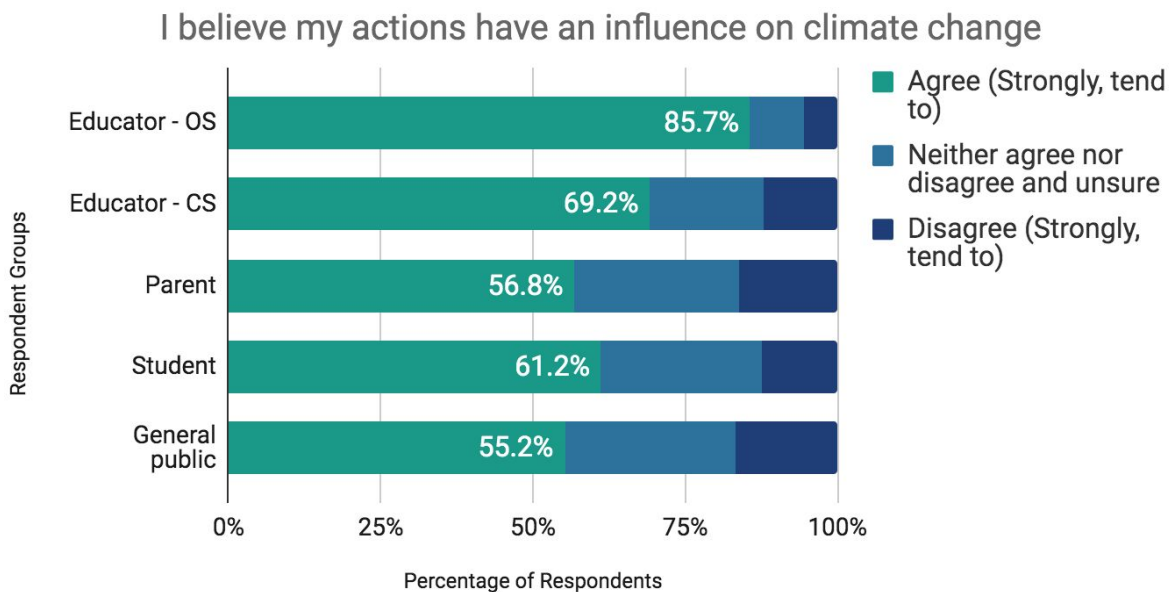
n=2076 (Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 41. Trust in sources of information [aggregated]

There is an opportunity here to provide Canadians with more information about climate change from trusted sources including scientists and academics, utilizing television and radio programming, online news, documentaries and movies.

TAKING ACTION: MITIGATION & ADAPTATION

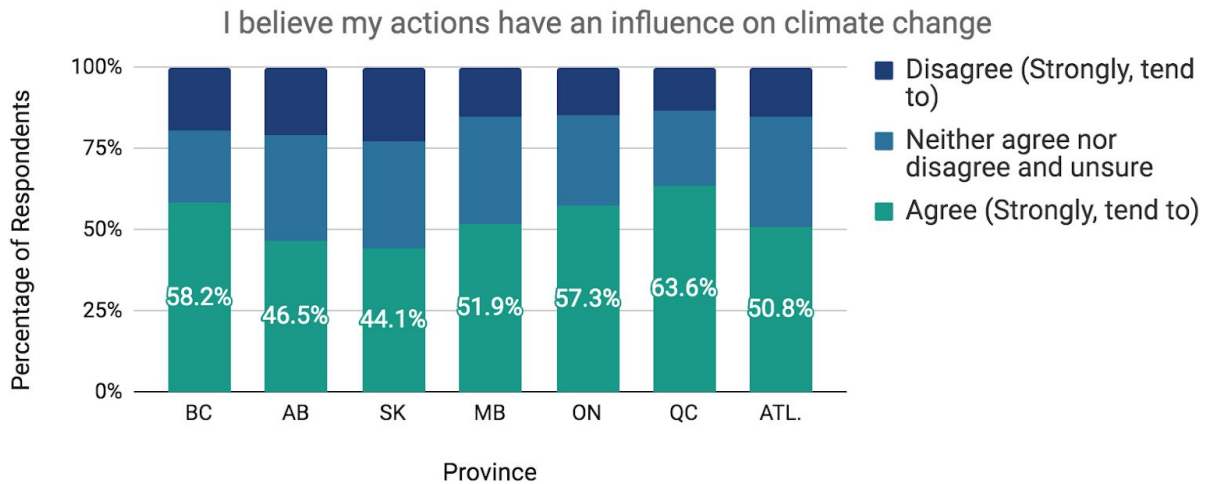
Respondent groups differed significantly in their beliefs on the influence that personal actions have on climate change. While the majority of open-sample educators (86%) believed that personal actions influence climate impacts, only 69% of closed-sample educators felt similarly. Amongst the remaining respondents, students were in highest agreement with 61% of respondents, while just over half of parents (57%) and members of the general public (55%) believed the same.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 42. Personal actions have an influence on climate change

The conviction that personal actions influence climate change varied from region to region. Less than half of respondents from Saskatchewan and Alberta believe that their actions are influential (44% and 47%, respectively), while almost two-thirds of respondents from Quebec (64%) reported believing that their personal actions could influence climate change.

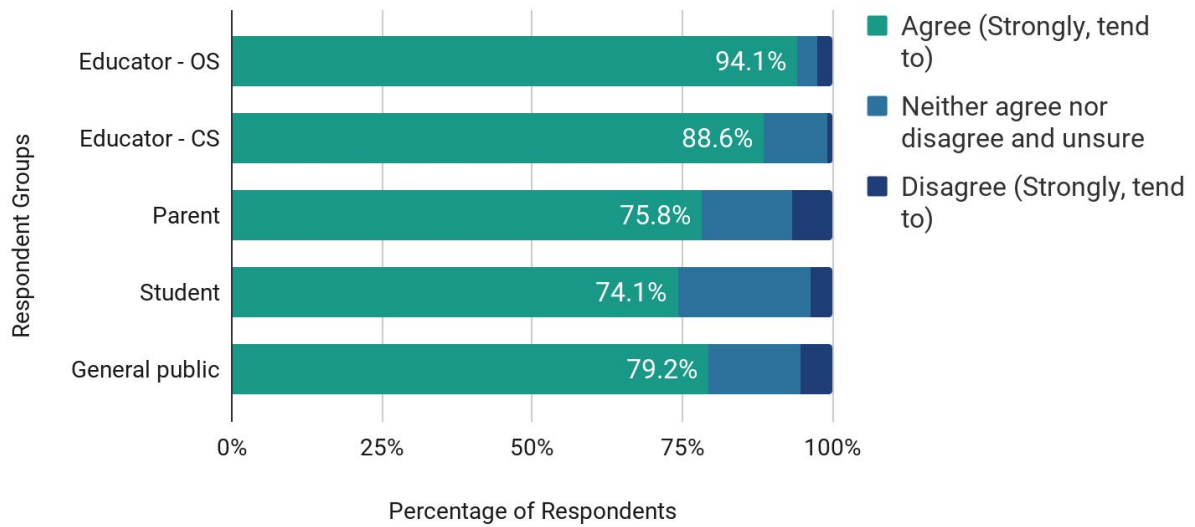


n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 43. Personal actions have an influence on climate change by region

A large majority in all respondent groups indicated that systemic change is required (in addition to personal actions) to address the challenges of climate change. Nearly all open-sample educators (94%) agreed with the need for systemic change, as well as the majority of closed-sample educators (89%). Approximately three-quarters of remaining respondent groups shared similar beliefs with members of the general public at 79%, parents at 76% and students at 74% agreement.

I understand personal actions are important but systemic change is required to address climate change challenges

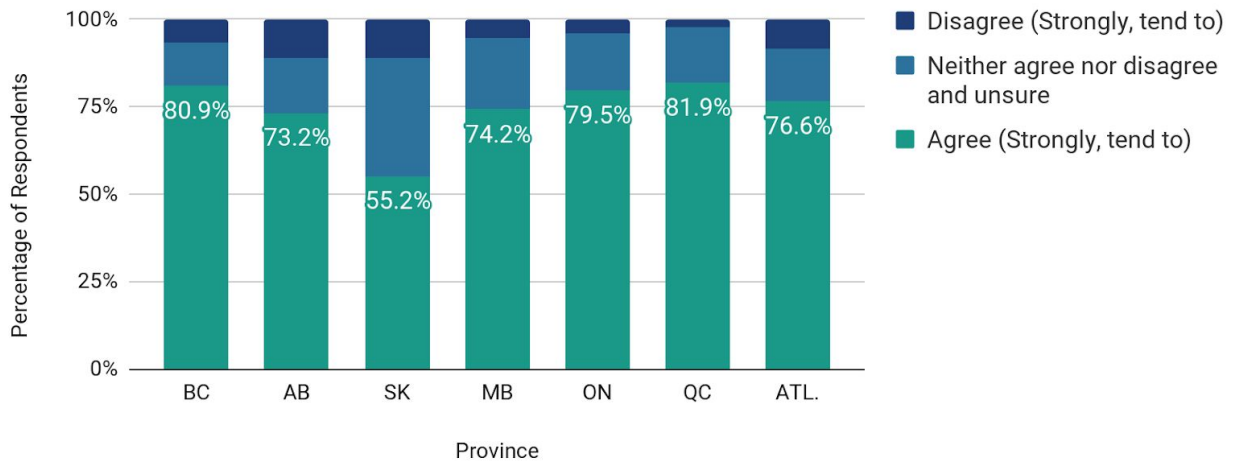


n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 44. Belief in the need for systemic change

In every region across the country, most respondents acknowledged that systemic change is required in order to address the challenges posed by climate change. Quebec (82%), closely followed by BC (81%) had the highest percentage of respondents agree that systemic change is required. Saskatchewan had significantly lower agreement, with only 55% of the respondents acknowledging that systematic change is a requirement to address climate change challenges.

I understand personal actions are important but systemic change is required to address climate change challenges

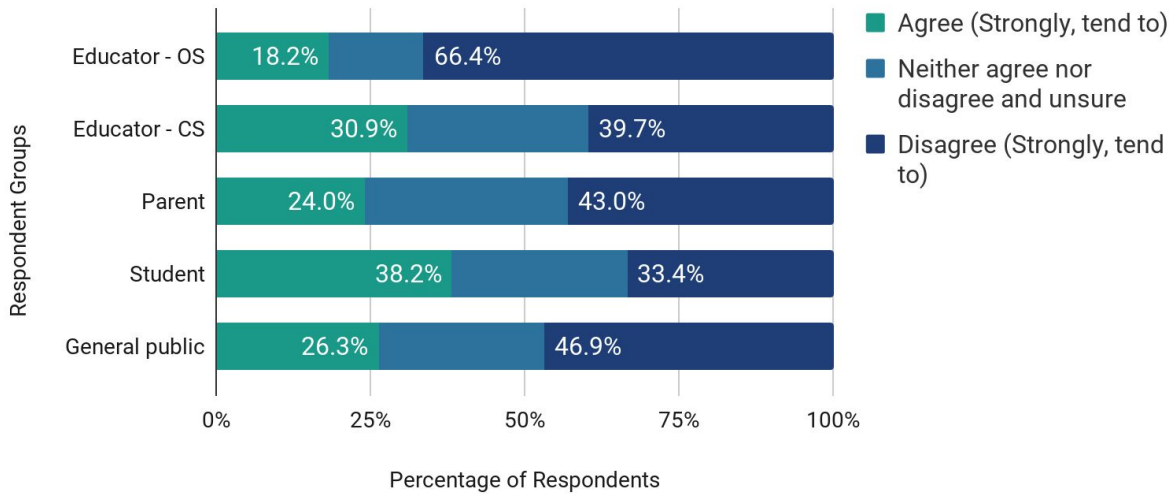


n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 45. Belief in the need for systemic change by region

A large majority in all respondent groups indicated that new technologies cannot solve climate change without individuals having to make big changes in their lives. Only 18% of open-sample educators agreed that they could, 31% of closed-sample educators, 24% of parents, 38% of students and 26% of members of the general public.

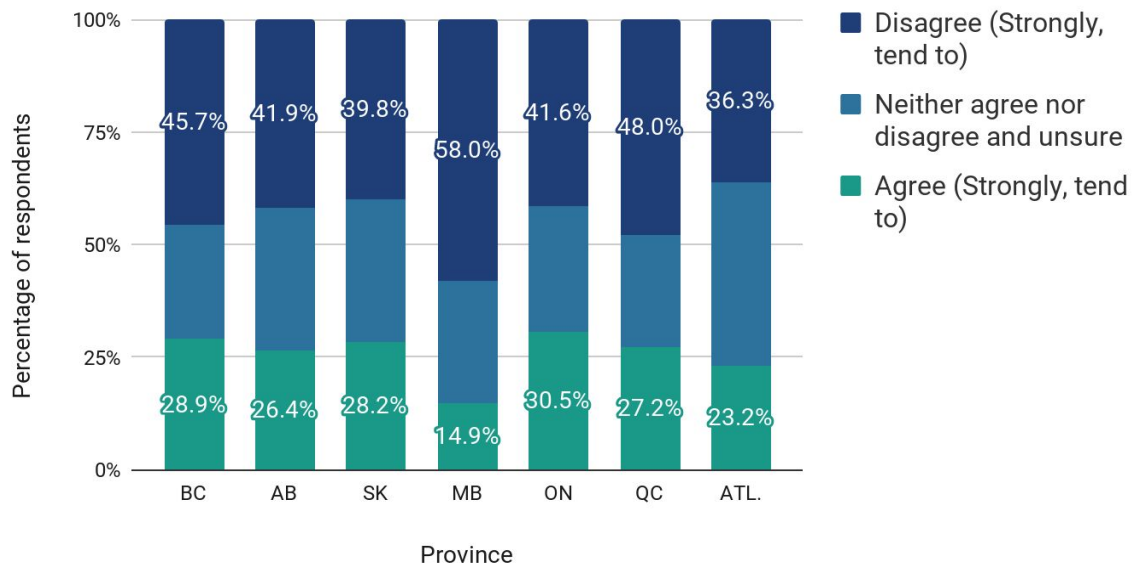
New technologies can solve climate change without individuals having to make big changes in their lives



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)
 Figure 46. Belief in new technologies solving climate change

Overall, on average 26% of respondents across Canada believe that new technologies alone can solve climate change without individuals having to make big changes in their lives. Agreement is highest in Ontario (31%) Saskatchewan (28%) and lowest in Manitoba (15%)

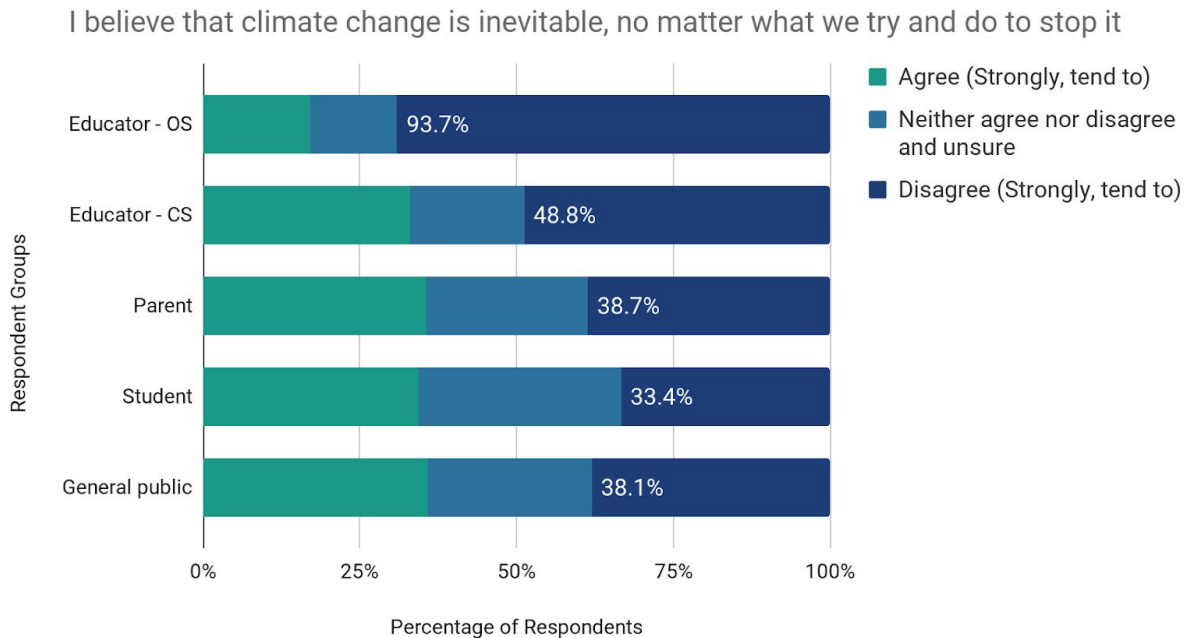
New technologies can solve climate change without individuals having to make big changes in their lives



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 47. Belief in new technologies solving climate change by region

Nearly all open-sample educators (94%) disagreed that climate change is inevitable, meaning most believe that humans have agency in mitigating climate change. In contrast, less than half of closed-sample educators (49%) disagreed that climate change is inevitable. Among the remaining respondent groups, only 39% of parents, 38% of members of the general public, and 33% of students disagreed that climate change is inevitable. Many more people in these groups appear to believe that humans have no agency in mitigating climate change.

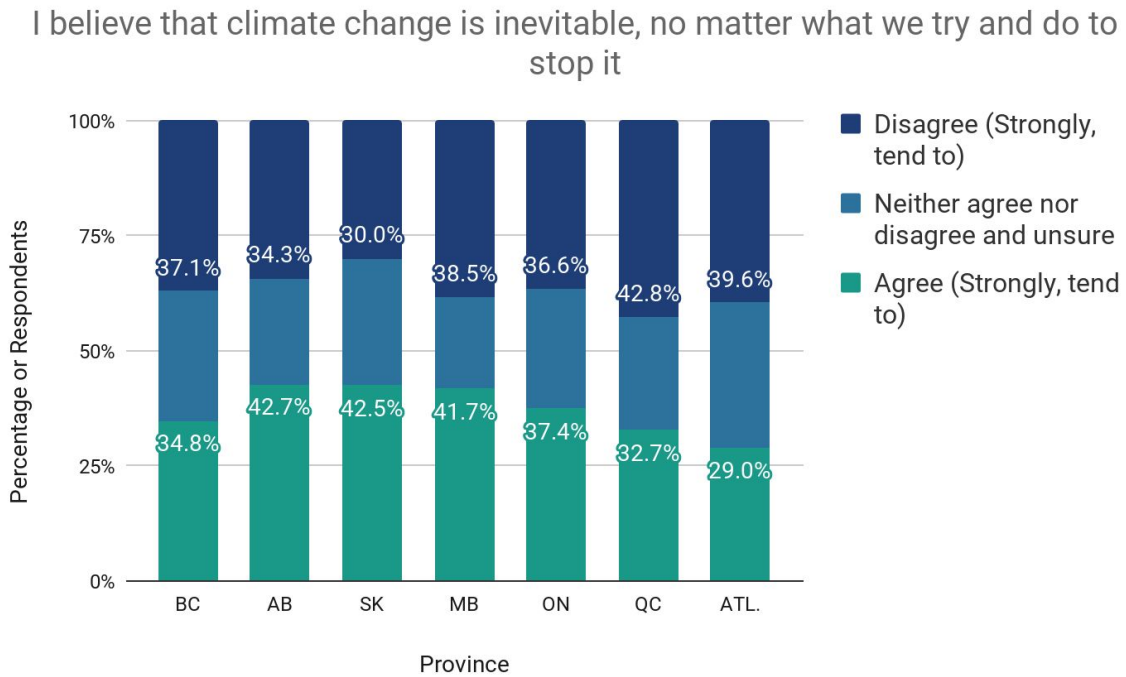


n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 48. Belief on mitigation viability

However, it is possible that many people interpreted this question as “some climate change is inevitable,” which is of course true since temperature increases lag behind emission of greenhouse gasses and we will collectively, in any scenario, not be able to stop emissions immediately. A more precise question would have asked whether catastrophic climate change that threatens widespread societal breakdown is inevitable, or whether climate change could be slowed.

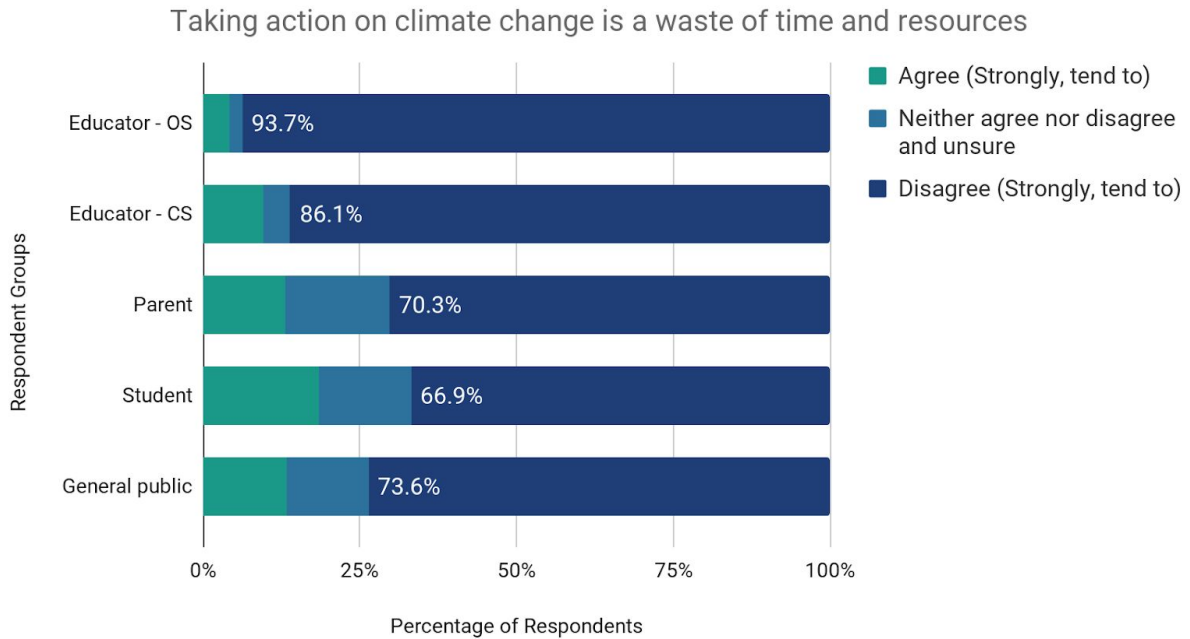
Responses were divided across the different regions in Canada. Respondents from Quebec (43%) most strongly disagreed with climate change being inevitable followed by the Atlantic region (40%). Alberta (34%) and Saskatchewan (30%) had the smallest percentage of respondents who disagreed that climate change is inevitable, and thus the lowest belief that humans will exercise their agency in mitigating climate change.



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 49. Belief on mitigation viability by province

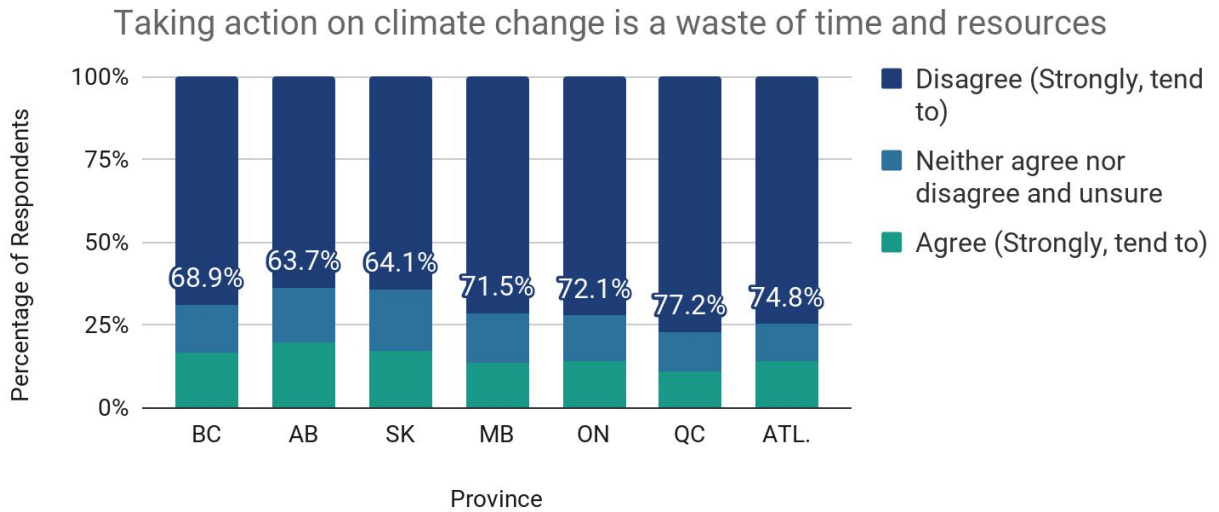
A large majority in both educator groups (OS and CS) indicated that taking action to combat climate change is not a waste of time and resources. 94% of open-sample educators and 86% of closed-sample educators *disagreed* that taking action was a waste of time and resources. 74% of members of the general public, 70% of parents, and 67% of students responded similarly.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 50. Belief on the efficacy of climate action

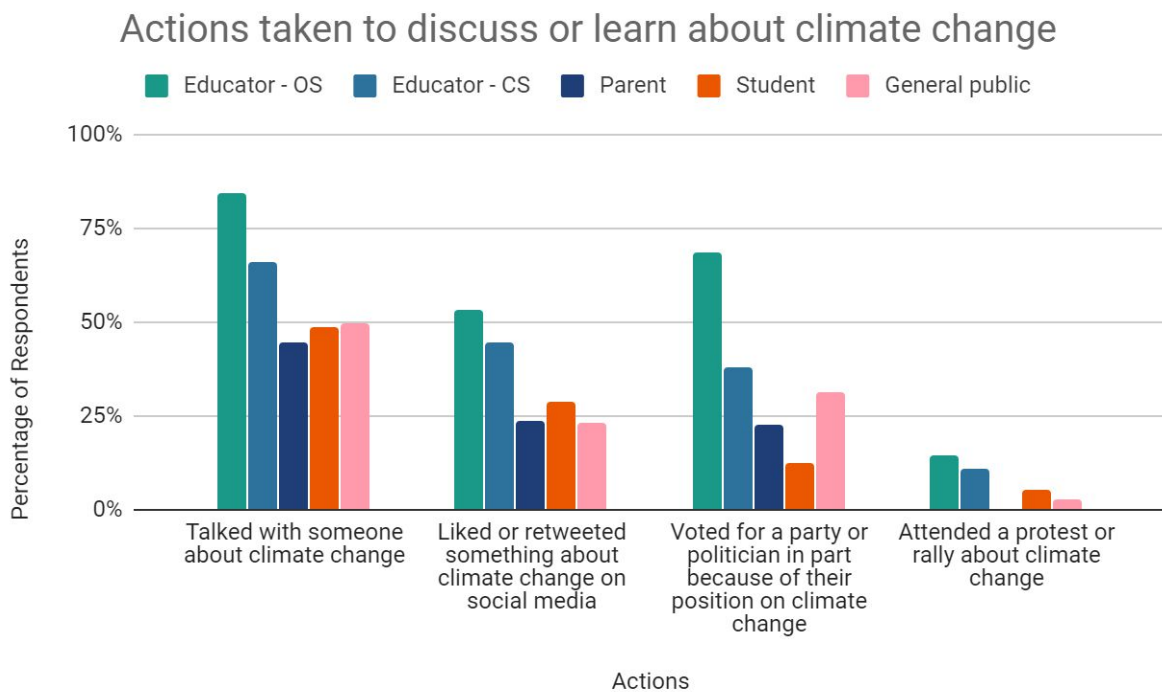
The majority of respondents from every province did not think that taking action on climate change was a waste of time and resources. Specifically, overall 77% of respondents *disagreed* that taking action was a waste of time and resources. Alberta (64%) and Saskatchewan (64%) responded with the least conviction that climate change was not a waste of time and resources with fewer than two-thirds of respondents *disagreeing* that taking action was a waste of time and resources.



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 51. Belief on the efficacy of climate action by region

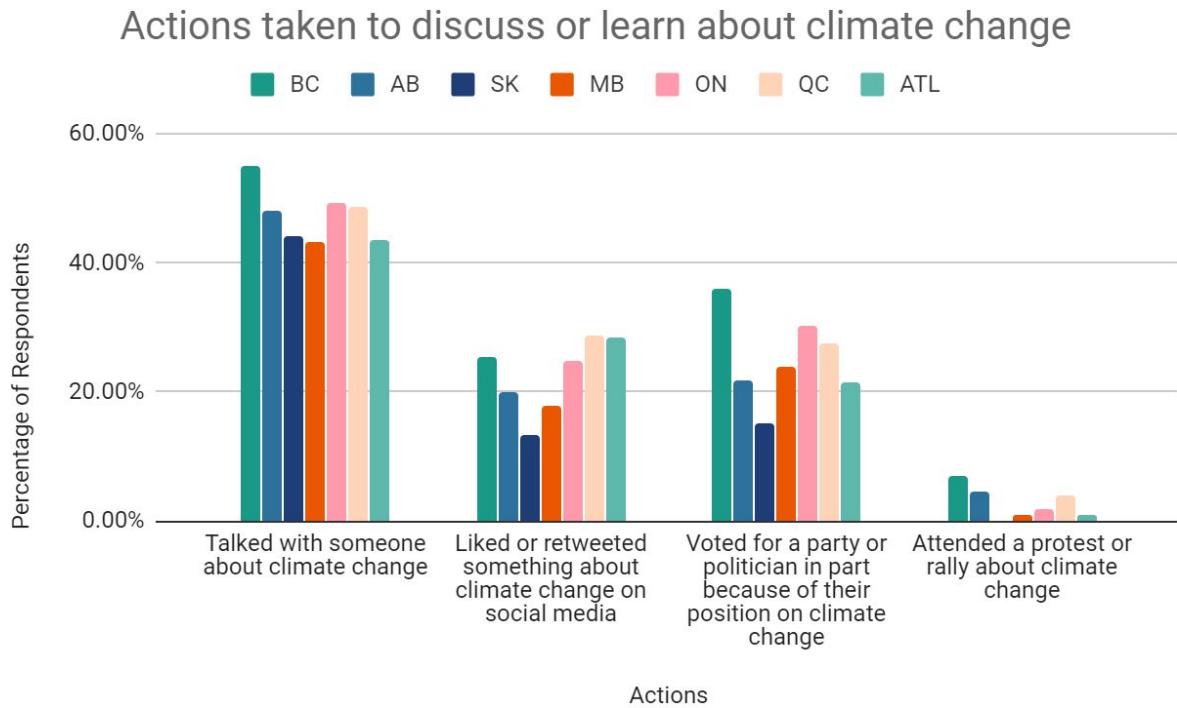
When it comes to taking action to discuss or learn about climate change, the action most reported by every respondent group was talking with someone about the subject. Closed-sample educators, parents and students second most selected action was liking or retweeting something about climate change on social media. Open-sample educators and the general public second-most selected action was voting for a party or politician due to their political stance on climate change (68% and 31% respectively). The two least selected options across all respondent groups were: emailing a politician and attending a climate change protest. It should be noted that these data are from October, 2018, before the widespread Fridays for Future climate strikes; we expect that if surveyed at the time of writing, more students, parents, and members of the general public would report participation in a protest.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 52. Actions taken to discuss or learn about climate change

Consistently across all provinces, the most prevalent action taken to discuss or learn about climate change was talking to someone about the subject. The second most likely action taken in the majority of provinces, was voting for a party or politician in part because of their position on climate change, with 36% of respondents in BC, and 30% in Ontario selecting this action.



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 53. Actions taken to discuss or learn about climate change by region

In the table below, actions that respondents have taken to discuss or learn about climate change with others are reported upon. The actions are organized by the level of popularity among respondents; most commonly occurring actions starting at the top. In contrast, averaged across closed-sample respondents, 33% of participants selected ‘none of the above.’ Across all respondent groups, the most common action was discussing climate change with another person, followed by: voted for a party or politician in part because of their position on climate change (31%— excluding students who cannot vote), liked or retweeted something about climate change on social media (30%), or signed an online petition about climate change (17%).

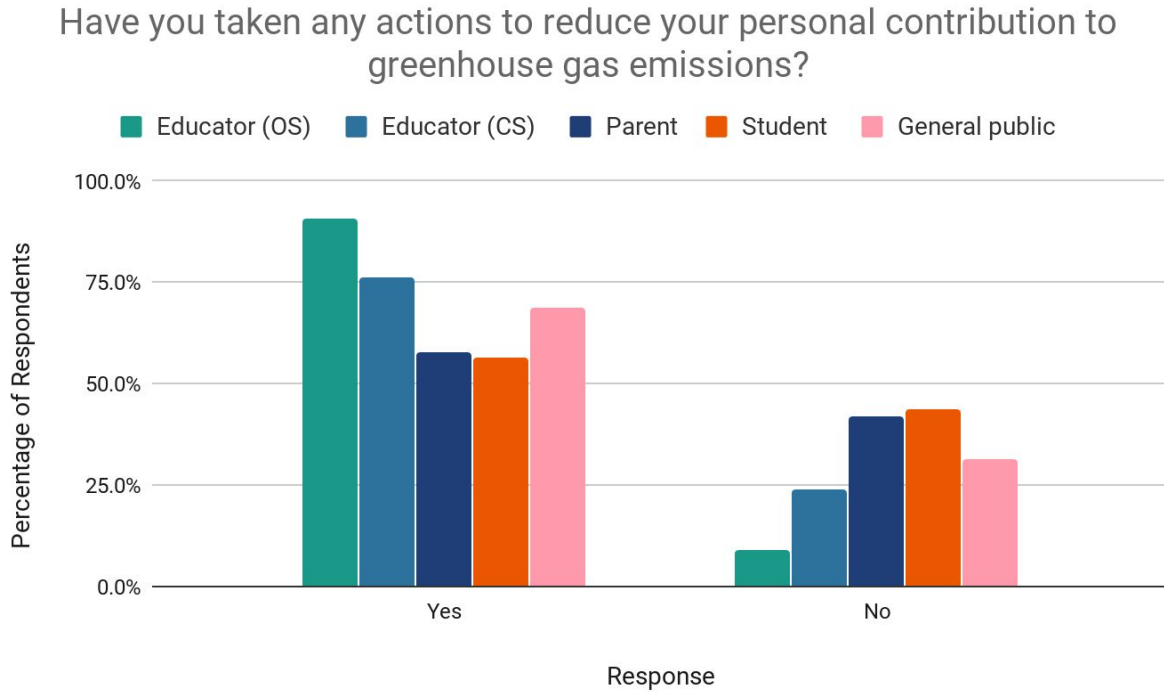
Table 3: *Actions taken to discuss or learn about climate change with others.*

	Educator - OS	Educator - CS	Parent	Student	General Public	Average across groups
Talked with someone about climate change	84.4%	65.8%	44.3%	48.6%	49.4%	58.5%
Liked or retweeted something about climate change on social media	53.2%	44.6%	23.5%	28.9%	23.0%	34.6%
Voted for a party or politician in part because of their position on climate change	68.6%	38.1%	22.6%	12.5%	31.4%	34.6%
Signed an online petition about climate change	47.0%	22.6%	15.5%	12.9%	16.8%	23.0%
Attended a public meeting on climate change	22.8%	15.0%	4.1%	5.8%	6.8%	10.9%
Written or emailed a politician about climate change	23.1%	15.2%	2.9%	3.0%	5.1%	9.9%
Attended a protest or rally about climate change	14.6%	10.7%	1.7%	5.0%	2.4%	6.9%
None of the above	6.9%	21.5%	40.3%	34.5%	35.6%	27.8%

n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Note: Respondents could select all actions that applied. An average for each action is provided in order to create an order of actions. Across the groups there is variation in applicability of the action.

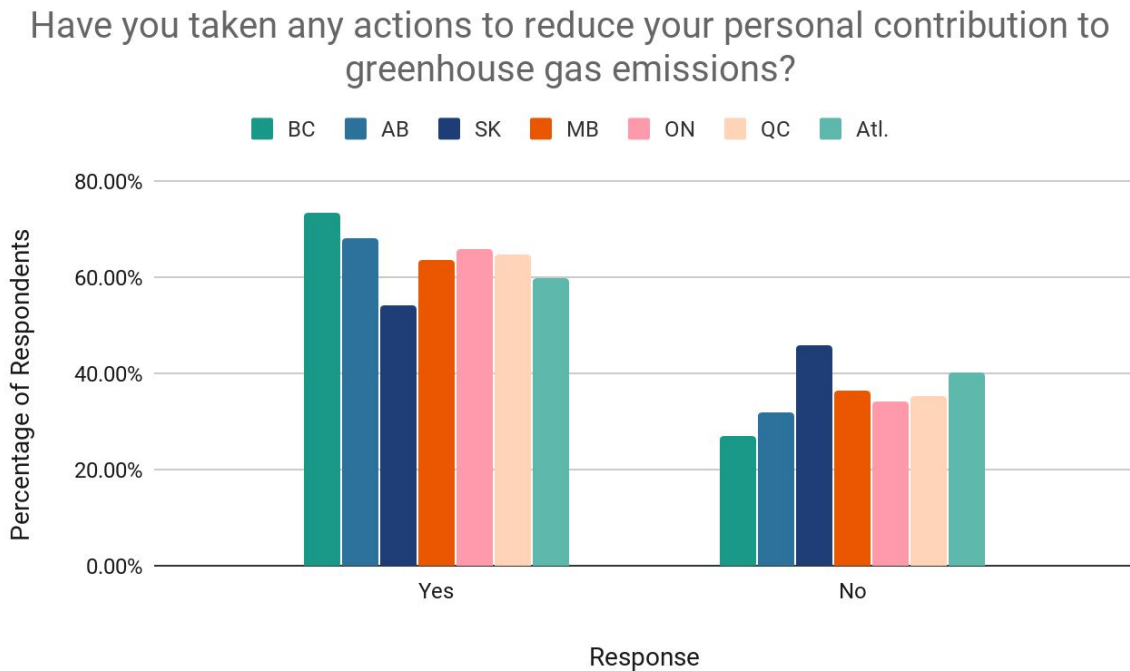
A majority in all respondent groups indicated having taken actions to reduce greenhouse gas emissions. 91% of open-sample educators and 75% of closed-sample educators indicated having taken actions, as did parents (58%), students (57%), and members of the general public (69%).



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 54. Actions taken to reduce personal contribution to greenhouse gas emissions

The highest number of respondents in British Columbia (73%), followed by Alberta (68%) and Ontario (66%), indicated having taken actions to reduce contributions to greenhouse gas emissions. In Saskatchewan and the Atlantic region, fewer respondents, 54% and 60% respectively, reported that they had taken actions to reduce their personal contribution to greenhouse gas emissions.



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 55. Actions taken to reduce personal contribution to greenhouse gas emissions

In the following table, actions that individuals reported having taken to reduce personal contribution of greenhouse gas emissions are recorded. Actions are reported in order of occurrence within the population rather than according to effectiveness of reducing greenhouse gas emissions. Actions that require owning a house, such as installing energy efficient appliances, installing a programmable thermostat, or improving insulation in a house, were less likely to be selected by youth whereas actions that are within their sphere of influence were selected more often, such as driving less or walking or biking more, switching off appliances when not in use, or carpooling or using public transit.

Table 4. *Actions taken to reduce personal contribution to greenhouse gas emissions.*

	Educator - OS	Educator - CS	Parent	Student	General Public	Average across groups
Switched off or unplugged appliances when not in use	81.2%	69.3%	67.5%	62.4%	65.4%	69.2%
Installed energy efficient lighting	78.4%	58.4%	61.5%	35.9%	62.2%	59.3%
Drove less by walking or biking more	55.0%	49.8%	50.1%	60.7%	55.4%	54.2%
Installed energy efficient appliances	70.9%	62.4%	56.4%	20.4%	50.9%	52.2%
Installed a programmable thermostat	67.4%	55.7%	50.8%	26.4%	45.6%	49.2%
Car pooled or used public transit	48.1%	36.9%	35.7%	50.0%	40.9%	42.3%
Minimized red meat consumption	61.0%	42.7%	37.6%	27.2%	44.1%	42.5%
Improved insulation in house	55.6%	45.8%	38.9%	23.3%	36.7%	40.1%
Minimized air travel	38.9%	35.1%	31.3%	23.5%	30.7%	31.9%
Installed efficient windows and / or doors	56.1%	53.9%	38.9%	23.3%	36.7%	41.8%
Had fewer children	33.9%	24.6%	13.8%	6.2%	20.4%	19.8%
Installed a renewable heating and/or cooling system	13.8%	21.5%	6.5%	15.0%	11.2%	13.6%

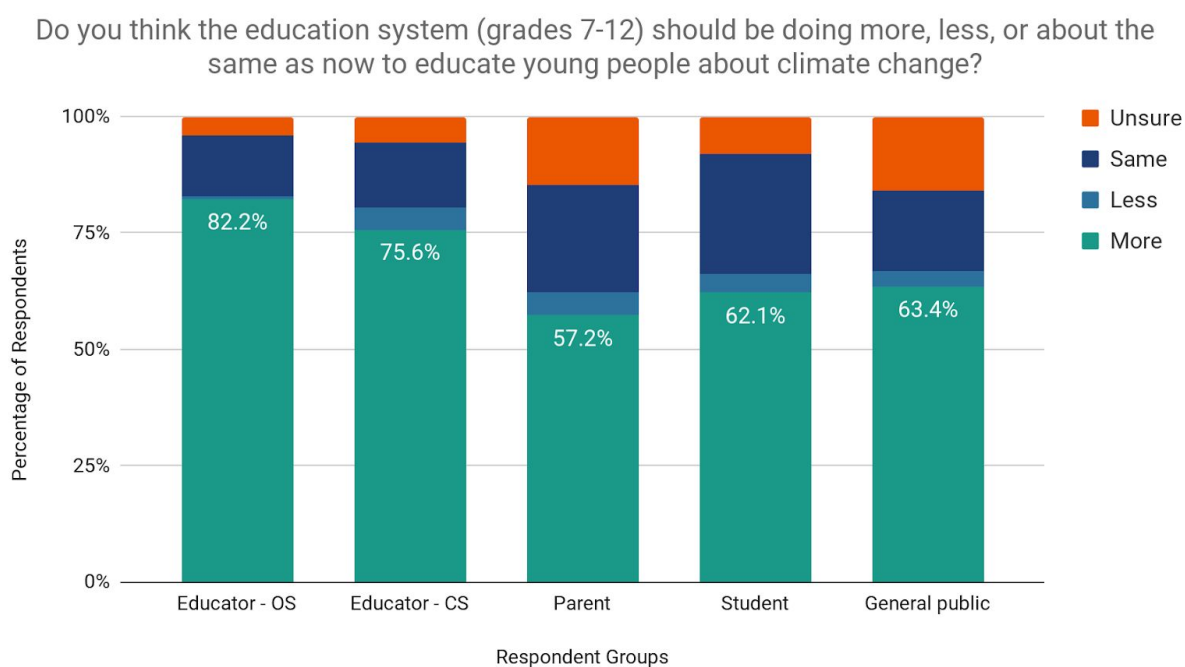
n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Note: Respondents could select all actions that applied. An average for each action is provided in order to create an order of actions. Across the groups there is variation in applicability of action.

CLIMATE CHANGE & THE EDUCATION SYSTEM

Canadians' perspectives on education systems' responses to climate change

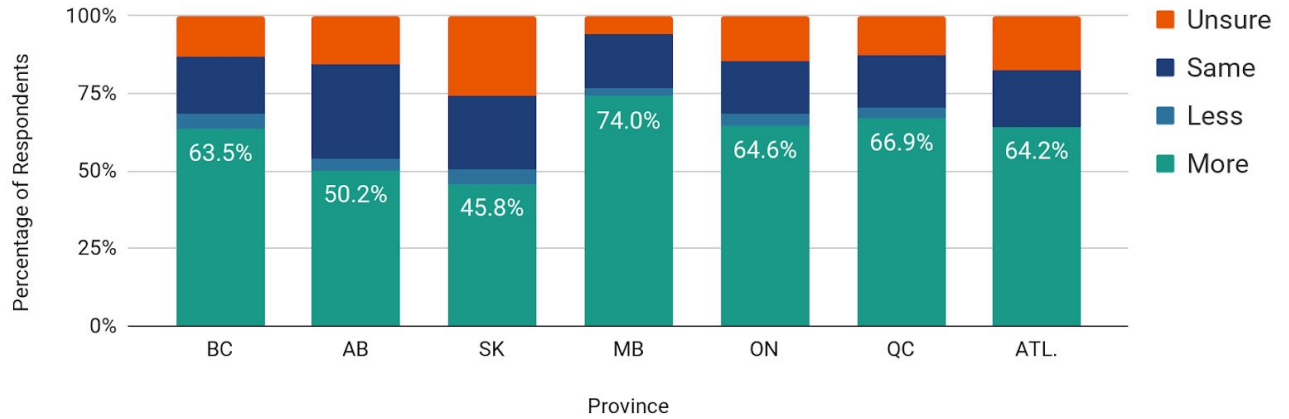
Most educators (OS 82% and CS 76%) strongly believe that the formal education system (grades 7-12) should be doing more to educate young people about climate change (82% and 76%). Approximately two-thirds of students (62%) and members of the public (63%) indicated the same, while 57% of parents shared the same view.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)
Figure 56. Education system responsiveness to climate change

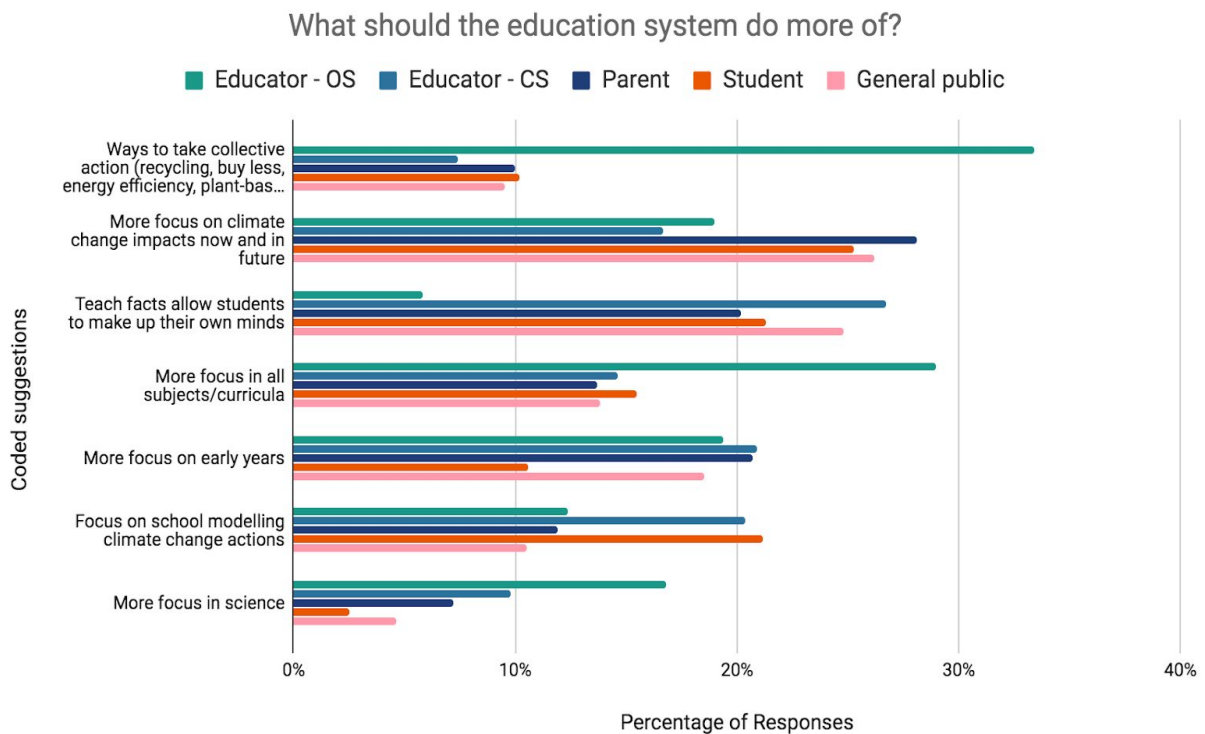
Across Canada, in most provinces, the majority of respondents think the school system should be doing more to educate about climate change (BC=64%, MB =74%, ON=65%, QC=67%, ATL=64%). Alberta (50%) and Saskatchewan (46%) had the lowest levels of support for the schools doing more to educate young people about climate change.

Do you think the education system (grades 7-12) should be doing more, less, or about the same as now to educate young people about climate change?



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)
 Figure 57. Education system responsiveness to climate change

When respondents were asked to explain what the school system should do more or less of, 1408 respondents provided their feedback. Several themes emerged from the data: *More focus on climate change impacts now and in the future* was mentioned the most by parents, students and members of the public, while *ways to take collective action* was noted most by open-sample educators. *Teaching facts that allow students to make up their own minds* was most noted by closed-sample educators and was least cited by open-sample educators. The tendency for some teachers to prefer to teach climate change with a “balanced approach” where both sides of the debate around the causes of climate change are presented and that students are left to make up their own minds was noted in an in depth study on teachers in North Queensland, Australia (Nicholls, 2016). The concern with this approach is that it is not in line with the established scientific consensus (IPCC, 2014) and students may not have the critical thinking skills or critical digital media literacy skills to weigh misrepresentative climate data.

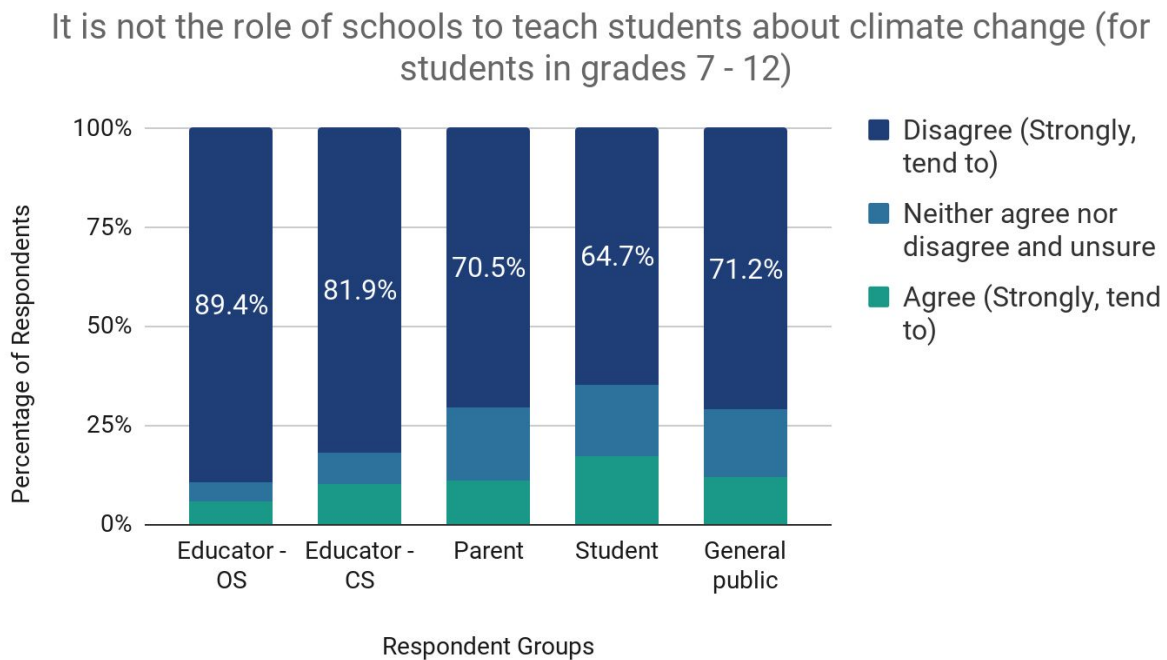


n=1398 (Educator-OS=548, Educator-CS=59, Parent=222, Student=184, General Public=385)

Figure 58. Coded suggestions for what the education system should do more of in terms of climate change education

To better understand various groups' perspectives on climate change education and the role of schools, respondents were asked to agree or disagree on several position statements.

There was collective agreement amongst the majority of respondent groups that schools should educate students (in grades 7 – 12) about climate change. This was expressed by disagreeing with a statement that climate change is *not* the school's role. The majority of educators (OS 89% and CS 82%) disagreed that it is not the school's role. 71% of members of the public, 71% of parents, and 65% of students also disagreed that it is not the school's role (thereby expressing that it is the school's role).

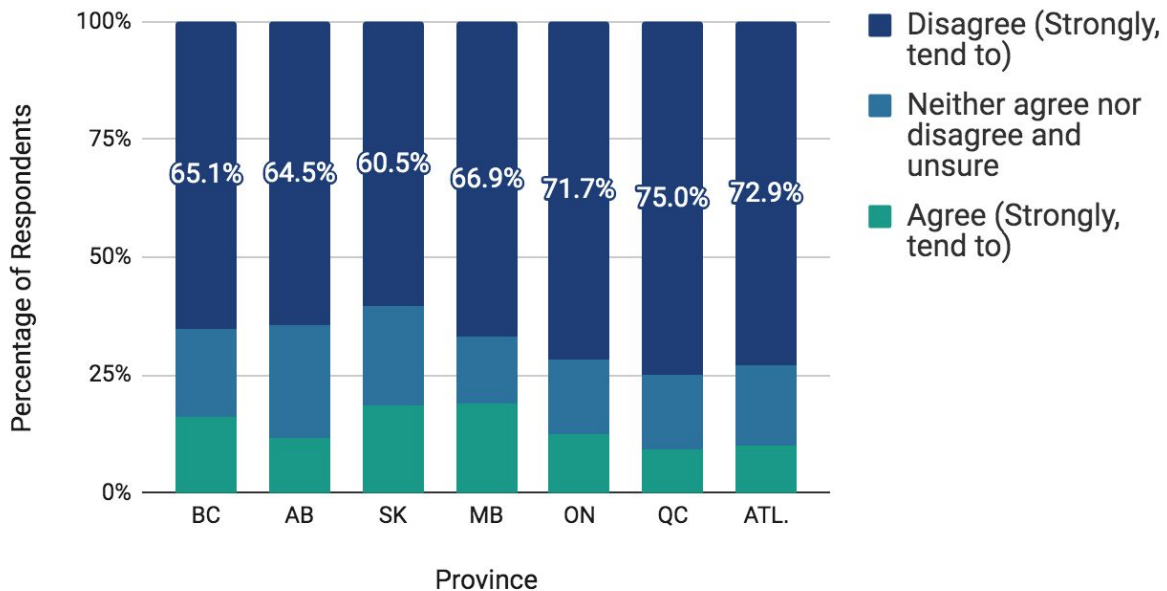


n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 59. Climate change education responsibility: schools

There was general agreement across regions in Canada that schools should educate students about climate change. Compared to other provinces, the smallest percentage of respondents from Saskatchewan (61%) disagreed that climate change education is *not* the school's role, while a much higher percentage of Quebec respondents (75%) disagreed with this statement (thereby expressing that it is the school's role).

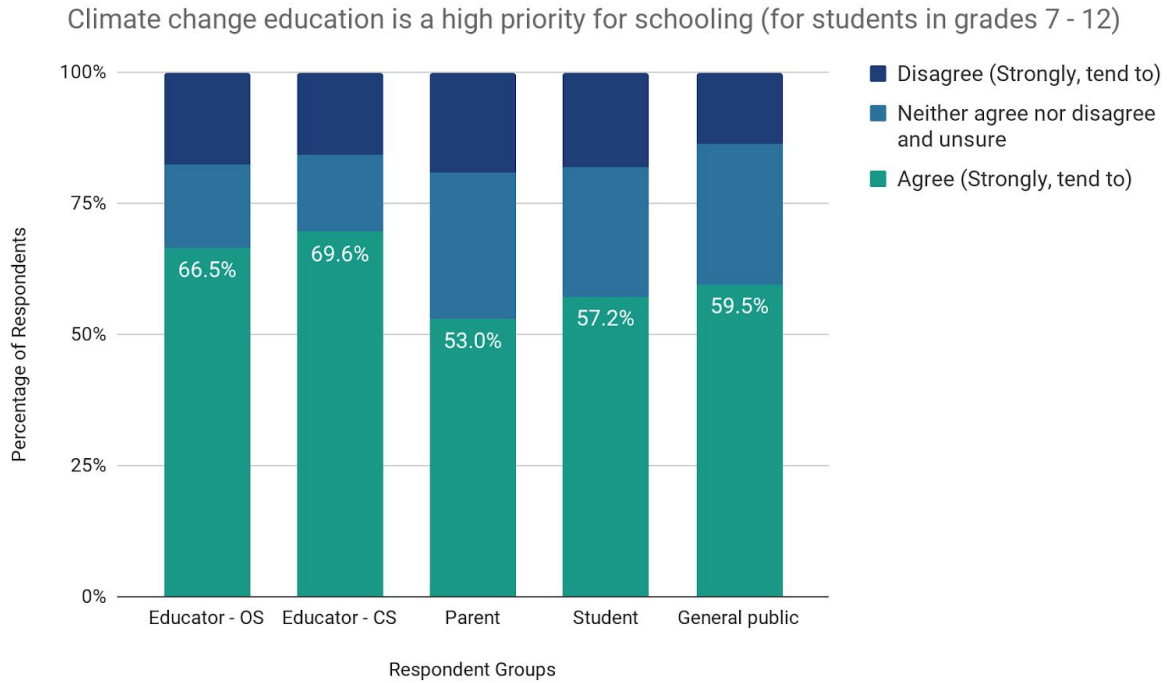
It is not the role of schools to teach students about climate change (for students in grades 7-12)



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 60. Climate change education responsibility: schools by region

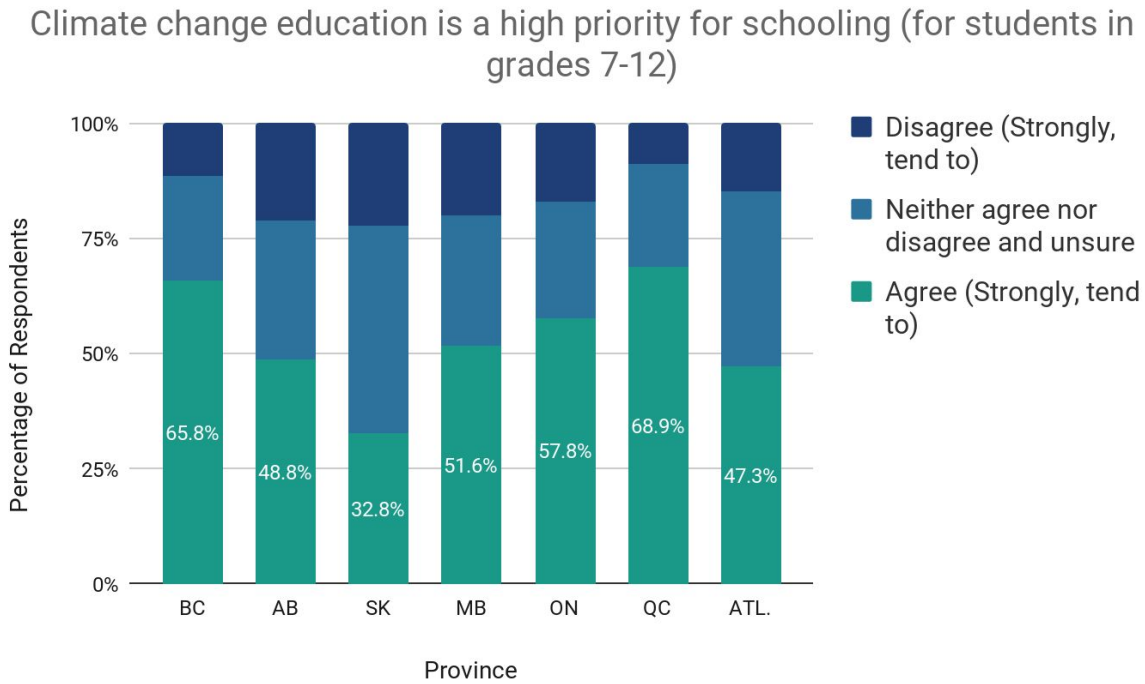
Approximately two-thirds of both groups of educators (CS 70% and OS 67%) felt that climate change education was of high importance for grade 7 - 12 students to be learning in school. To a lesser degree, the majority of remaining respondent groups shared similar sentiments with members of the public at 60%, students at 57% and parents at the lowest agreement (53%).



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 61. Climate change education priority

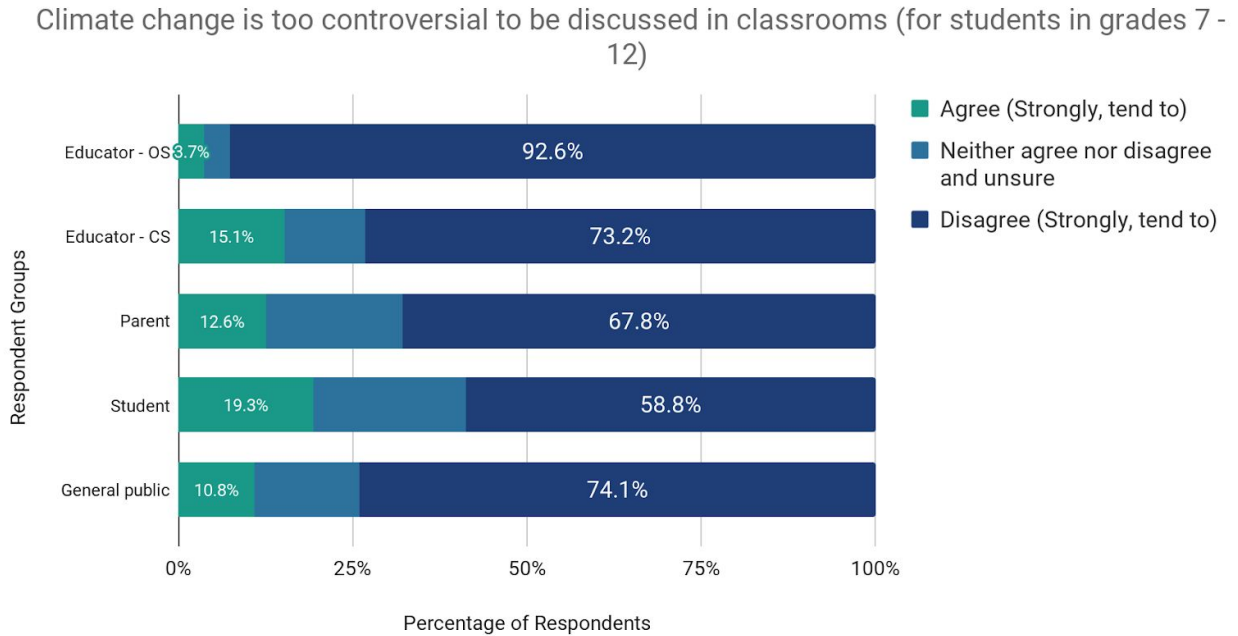
Regions across the country had differing opinions on the priority level that climate change education should have in schools. Quebec (69%) and British Columbia (66%) had the highest percentage of respondents who saw climate change as a high priority for schooling with over two-thirds of respondents agreeing that climate change is a high priority for students in grades 7-12, while Saskatchewan (33%) had only approximately one-third of respondents agree that it is a high priority.



n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 62. Climate change education priority by region

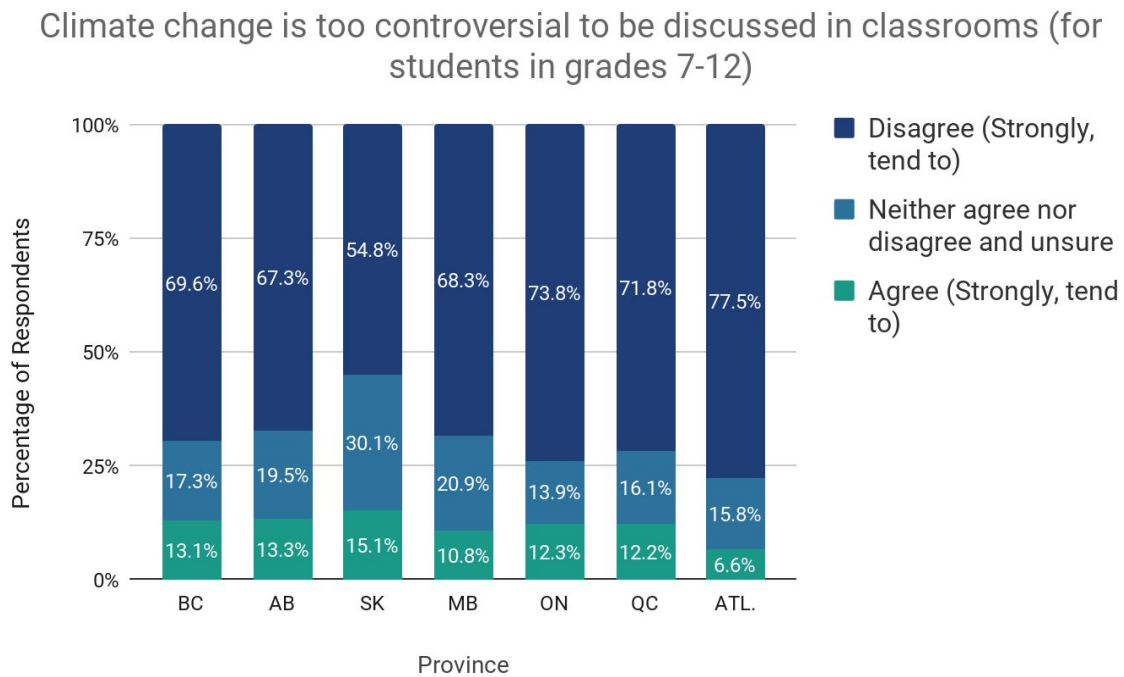
The majority of all respondent groups disagreed that climate change was too controversial to be discussed in middle and high school classrooms, although rates of disagreement differed substantially. Nearly all open-sample educators (93%) disagreed, compared to less than three-quarters of closed-sample educators (73%). Similarly, three-quarters of members of the public (74%) disagreed, followed by approximately two-thirds (68%) of parents and just over half (59%) of students.



n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)

Figure 63. Climate change education: too controversial

Although the majority of respondents from every region across Canada disagreed that climate change is too controversial to be discussed in classrooms (for students in grades 7-12), the strength of disagreement varied. The Atlantic provinces felt most strongly that climate change is not too controversial (78% of respondents) compared to Saskatchewan where only 55% of respondents disagreed.

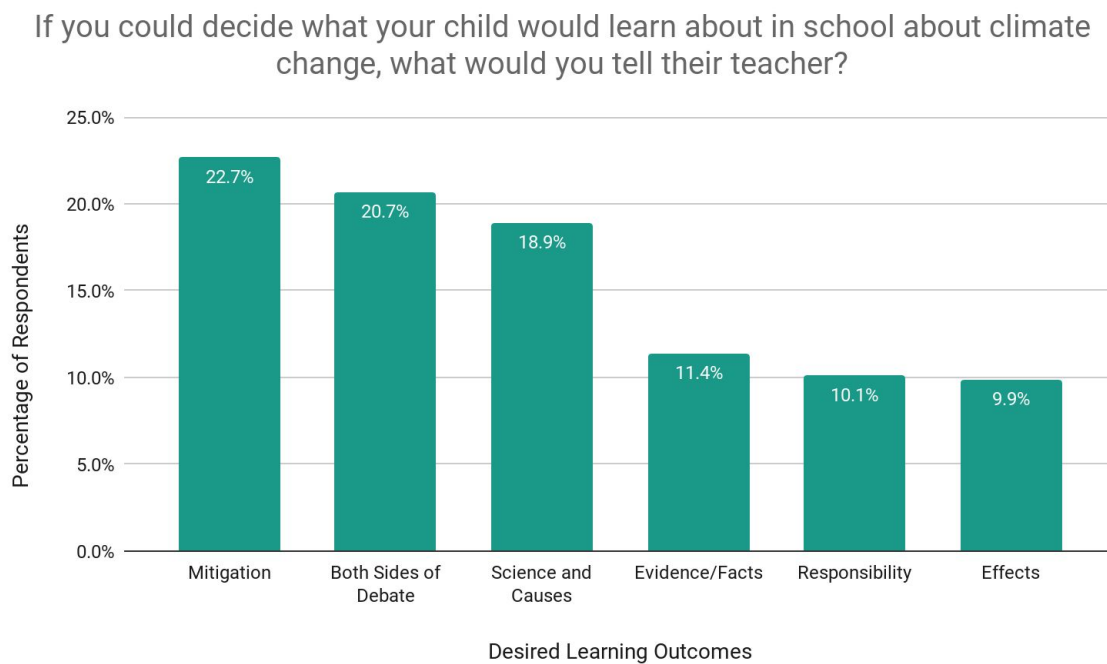


n=2180 (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 64. Climate change education: too controversial by region

Desired Learning Outcomes: Parents

We asked parents an open-text-response question and we coded their answers into themes. Asked if they could decide what their child(ren) would learn about in school about climate change, 23% of parents requested strategies for mitigation and 21% requested discussing “both sides” of the climate debate. 19% of parents specified wanting the science and causes of climate change to be discussed, and 11% requested evidence/facts about climate change. Topics such as energy efficiency, technological advances to reduce GHG emissions and the government’s role in reducing the carbon footprint were the least requested.

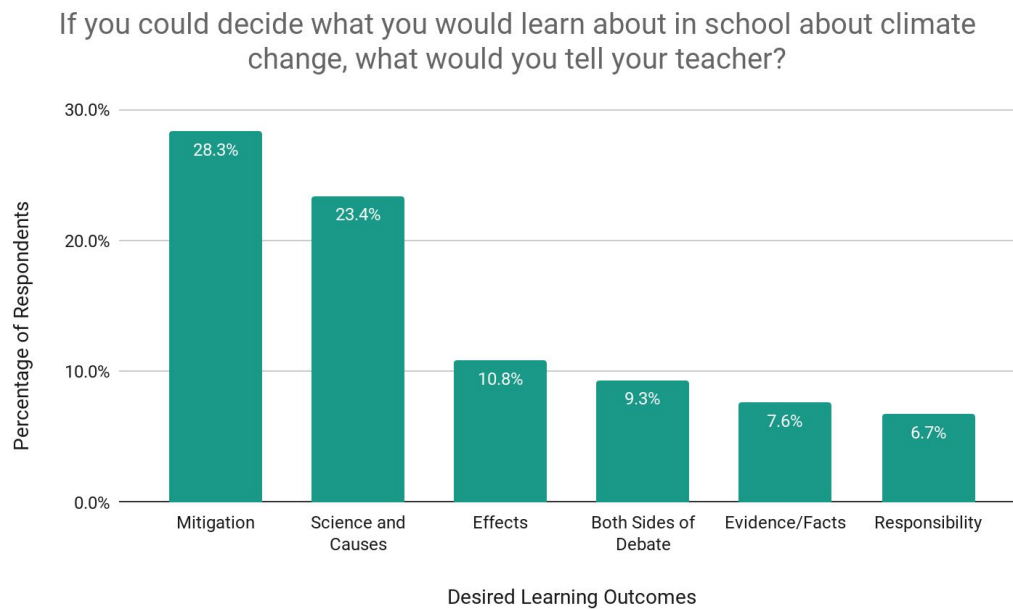


n=429 Parents responded to this open-text question

Figure 65. Parents’ desired climate change learning outcomes

Desired Learning Outcomes: Students

We asked students an open-text-response question and we coded their answers into themes. Education on climate change mitigation strategies including how to reduce greenhouse gases (GHGs), individual actions, renewable energy, as well as climate change causes and climate science were most requested within climate change education by students, while learning about recycling, technological advances and what the government's role is in reducing the carbon footprint were least requested.

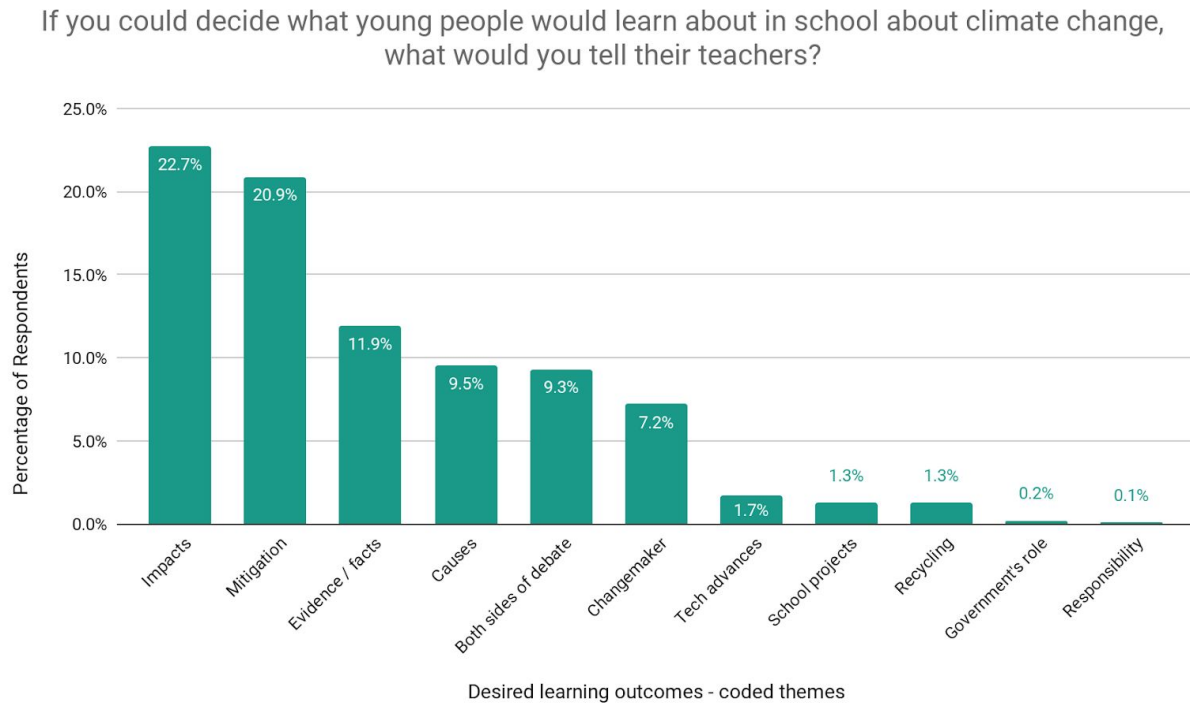


n=341 Students responded to this open-text question

Figure 66. Students' desired climate change learning outcomes

Desired Learning Outcomes: General Public

We asked the general public an open-text-response question and we coded their answers into themes. Climate change impacts including current, future, lifestyle and economic impacts were most requested by members of the general public. Climate change mitigation strategies were the next most requested, while school projects on climate change, learning about recycling, and learning what the government's role is in reducing the carbon footprint were least requested.



n=675 Member of the general public responded to this open-text question

Figure 67. Members of the general public's desired climate change learning outcomes

Canadians segmented into climate audiences

Over the last ten years, social science research into public climate change knowledge, attitudes, policy preferences, and behaviour, as well as the underlying psychological, cultural, and political factors that influence how the public perceives climate change, has developed a robust evidence-base and powerful methods to conduct this type of research.

The group EcoAnalytics has been mapping Canadian public opinion on climate change since 2016. As well, they have been providing additional analysis on specific segmented audiences in order to provide insights for communicators, educators, and policymakers for better targeting and engagement. Within this body of work, EcoAnalytics has put forward a Canadian ladder of engagement, which is a conceptual map to help groups engage audiences with more success (EcoAnalytics, 2016). The map is comprised of four audiences: dismissive, sceptics, aware, and empowered. This is a simplified model of engagement, as the authors cite: “In reality, the engagement process is non-linear, but for analytical purposes it helps to present groups of Canadians in a ranking from least to most likely to be “engaged” (p. 7). The four audiences are broadly categorized and paraphrased from the EcoAnalytics report as:

Dismissives - disagree that climate change is happening

Sceptics - agree that climate change is happening and do not think it’s caused by humans OR, neither agree nor disagree that climate change is happening

Aware - agree that climate change is happening and do think it’s caused by humans AND indicated that there is nothing that we can do to change it

Empowered - agree that climate change is happening and do think it’s caused by humans AND indicated that there are things we can do to change it

We chose to apply the ladder of engagement to segmented groups, to help policy makers, administrators, educators, and non-profit groups have a better understanding of how Canadians perceive and engage with climate change at a broad level.

We made some adjustments from the EcoAnalytics methodology in order to analyze our data for engagement, since the survey did not ask the exact same question on the role of government. The conditions for ascertaining difference in perspective and for mapping conditions which align with the ladder of engagement are found in Appendix B. Due to the differences in conditions between this methodology and that of EcoAnalytics, the datasets are not directly comparable.

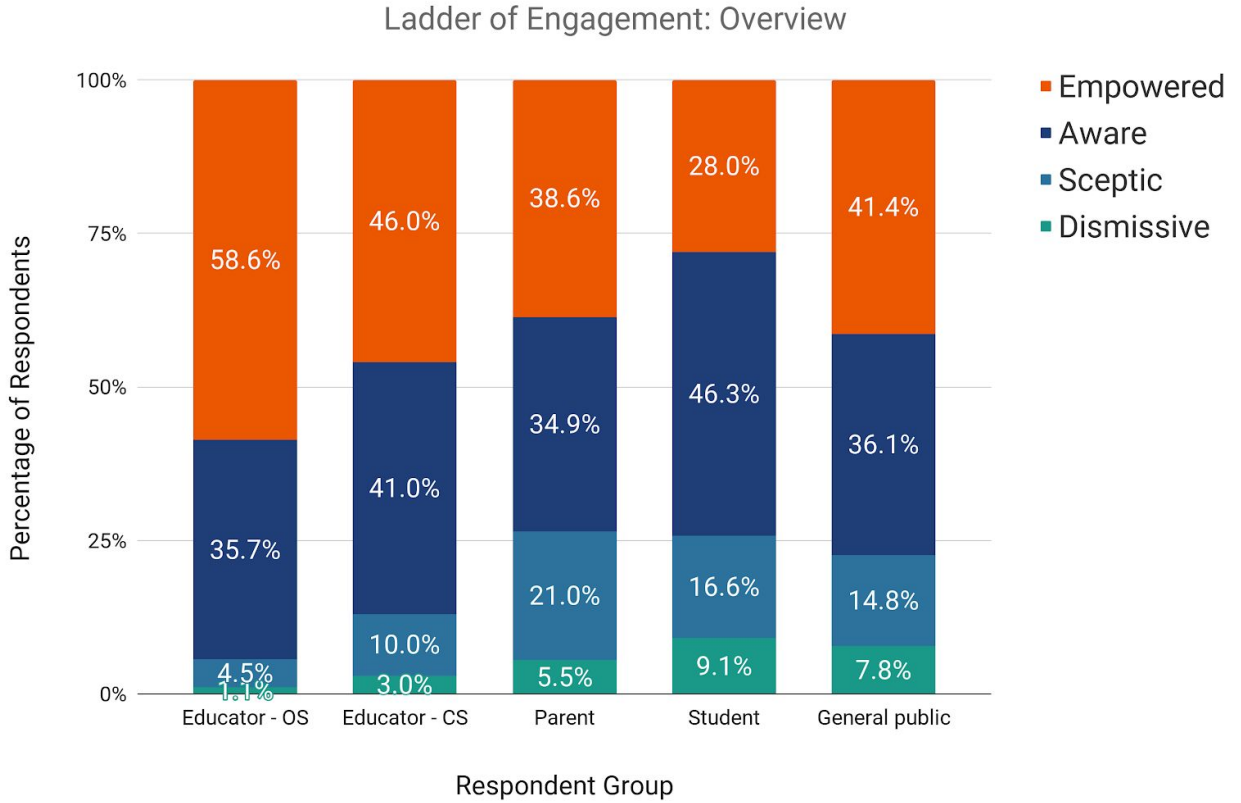
In the current study, students from grade 7 - 12 had the highest percentage within the Aware audience (46%). These students understand that climate change is happening and that it is caused by humans and do not believe that human efforts in mitigation or adaptation will be effective. This is concerning when considering how having this mindset may affect youth in terms of how they frame their future quality of life, opportunities, or possibilities. This survey provides the first benchmark of grade 7 - 12 students' perspectives on climate change in Canada. Previously, EcoAnalytics (2016) identified youth age 18 - 34 as the largest Aware group and therefore an important group to target with education programs to shift into the Empowered segment of the ladder of engagement.

This younger youth group, comprised of junior high and high school students, are an important group. They will be living with climate-altered futures and are still within an education system that is centrally governed. This suggests a moral obligation of schools to heed to the United Nations Convention on the Rights of the Child [UNCRC], wherein children have a right to survival, to develop to the fullest, to be protected from harmful influences, abuse, and exploitation, and to participate fully in family, cultural, and social life (1989). Additionally, Article 12 of the UNCRC also empowers children and young people to be actively involved in decisions that affect them and to have their opinions taken into account by adults, which implies that children can negotiate with adults and caregivers to determine the quality and nature of the services and infrastructure that is provided to them (Bala & Houston, 2015).

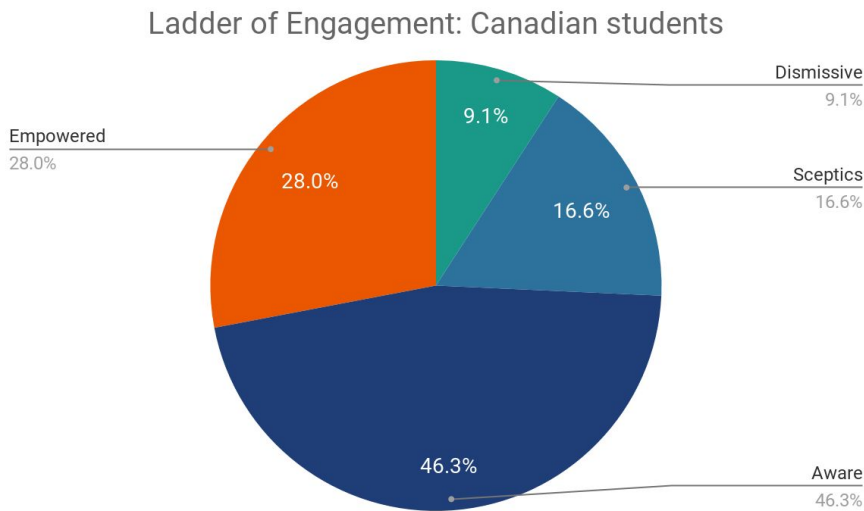
Open-sample educators had the highest percentage (59%) in the Empowered audience, the group that understands climate change is happening and that it is caused by humans, and thinks there are things we can do to change it. That they had the highest percentage is not surprising since these respondents self-selected to take this survey and are not representative of the general teacher population. Of the groups that are representative, 46% of closed-sample educators are Empowered, which is the second largest Empowered group, followed by 41% of the general public, 39% of parents, and only 28% of students from grades 7 -12.

We recommend providing education about personal and collective action for individuals in the Aware audience as these respondents understand climate change as human caused but do not think humanity can (or will) influence climate impacts through mitigation or adaptation efforts. Individuals in the Empowered audience need climate change education too. Through the findings of this study, as well as our experience teaching pre-service and in-service teachers about climate change, we have seen the strong desire for deeper knowledge and understanding of climate change and actions to address climate change.

A troubling percentage of respondents are in the Sceptics or Dismissive audiences. People in these groups may be particularly resistant to learning about climate change (Marshall, 2014). Schools must, however, teach the science and the scientific consensus (Plutzer et al., 2016) and must help students unlearn their misconceptions (McCuin, Hayhoe & Hayhoe, 2014).

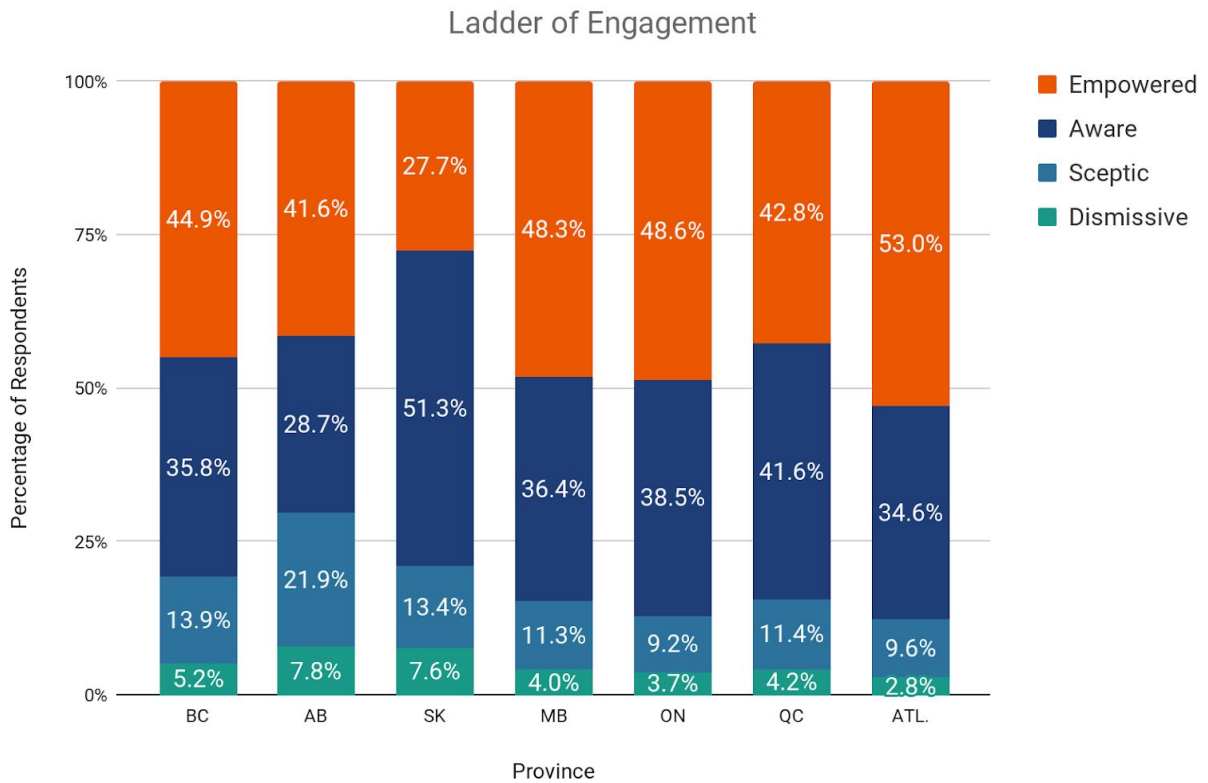


n=3196 (Educator OS = 1120, Educator CS = 111, Parent CS = 571, Student CS= 486, General public = 908)
 Figure 68. Ladder of engagement on climate change by respondent group



n=486
 Figure 69. Ladder of engagement: Canadian students

When the ladder of engagement is applied to representative data of students, parents, closed-sample educators and members of the general public ($n=3120$), across most provinces the empowered segment of the population is above 40%, except in Saskatchewan (28%). The segment of population that is dismissive of climate change is close to 5% or below except for Alberta and Saskatchewan (<8%).

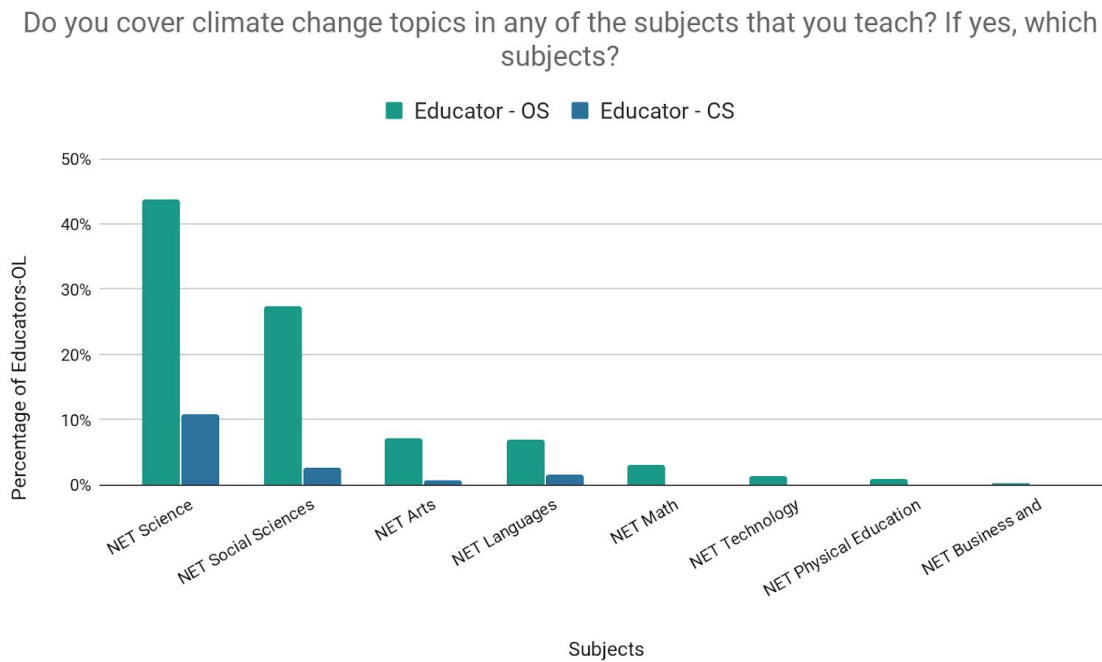


$n=2180$ (BC=196, AB=160, SK=73, MB=70, ON=749, QC=814, ATL=118)

Figure 70. Ladder of Engagement by province

Climate change education teaching practices

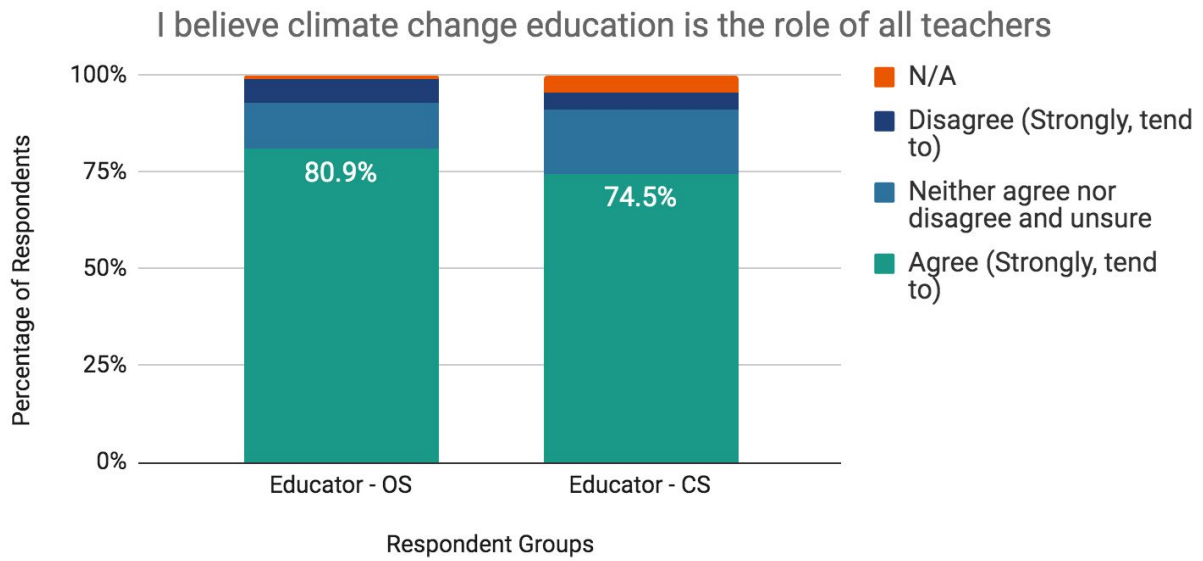
Science-related subjects were the most chosen by both open-sample and closed-sample educators as the places in which teachers most often integrate climate change topics, followed by social sciences. The arts, languages, math, technology, physical education, and business and economic courses were the least named, if named at all.



$n=1231$ (Educator OS = 1120, Educator CS = 111)

Figure 71. Subjects in which teachers integrate climate change topics

75% of closed-sample educators and 81% of open-sample educators believe that climate change education is the role of all teachers.



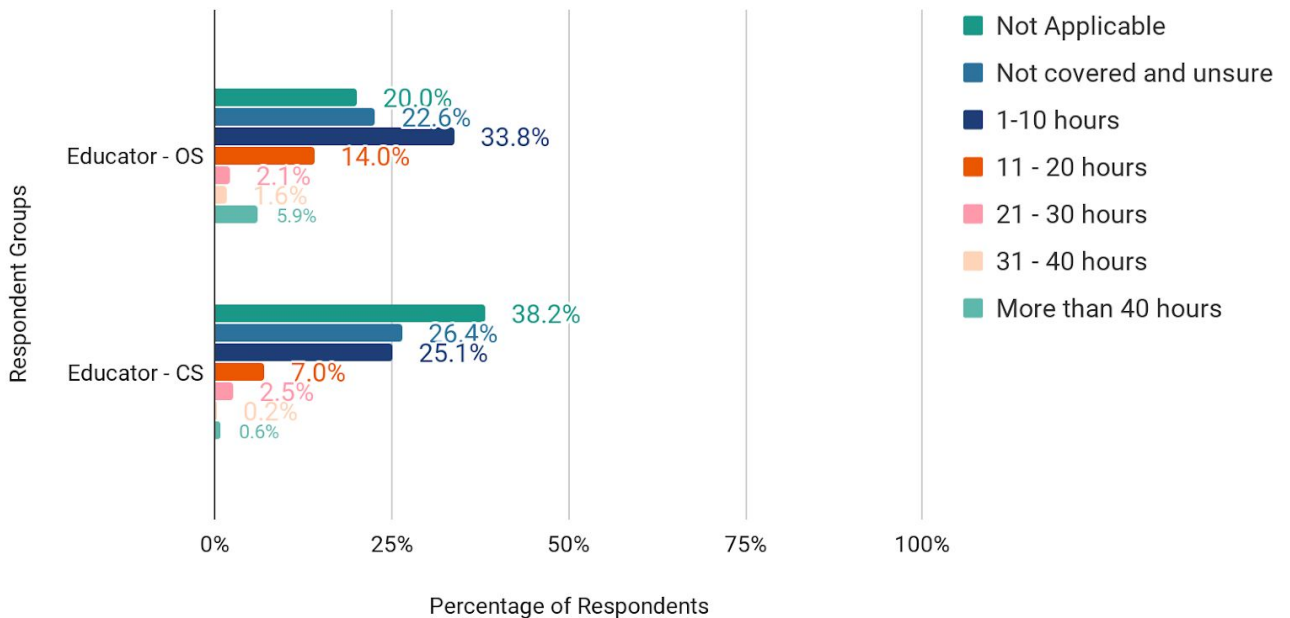
$n=1231$ (Educator OS = 1120, Educator CS = 111)

Figure 72. Climate change education role of all teachers

When asked how many hours in a semester or year educators focus on climate change, 23% of the open-sample and 26% of closed-sample educators indicated that they do not cover climate change, while 20% of the open-sample, and 38% of the closed-sample educators reported that climate change is not applicable to the grade/subject they teach. 34% of the open-sample and 25% of the closed-sample educators spend 1 to 10 hours of instruction per year or semester focused on teaching climate change. For what has become the defining issue of the 21st century, classroom instruction time focused on climate change is minimal in most cases.

Overall, 35% of closed-sample educators reported spending at least some time teaching about climate change. This compares with the American NPR/IPSOS poll from March of 2019, which found that 42% of teachers teach about climate change (Kamenetz, 2019).

How many hours over a school year / semester would you typically spend on covering topics related to climate change in your classroom [k-12]?

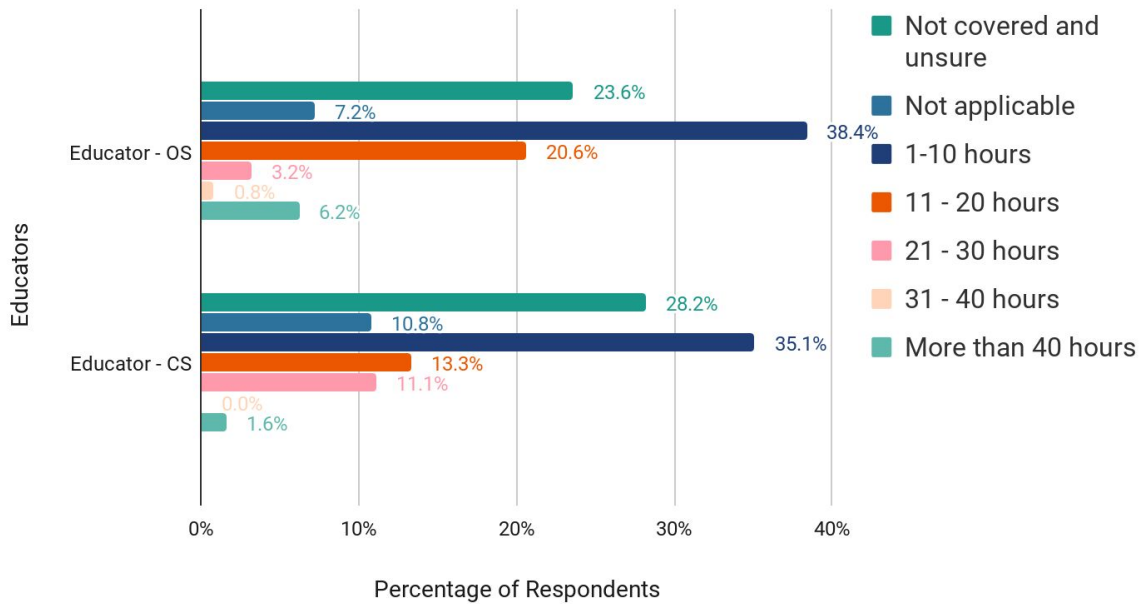


n=1231 (Educator OS = 1120, Educator CS = 111)

Figure 73. Climate change hours of instruction

Looking deeper into these data, when only educators who teach in grades 7 - 12 are selected, the predominant number of hours of instruction is 1-10 (38%). In this analysis there were not enough closed-sample educators who teach grades 7 - 12 to provide statistically reliable results.

How many hours over a school year / semester would you typically spend on covering topics related to climate change in your classroom [gr. 7 - 12]?



n= 558 (Educators OS =529, Educators CS =29; filtered for teachers who instruct grades 7 - 12)

Figure. 74. Climate Change hours of instruction (gr. 7 - 12 educators). Note: Caution to be used in interpretation of results for Educators - CS due to small sample size (<30 teachers)

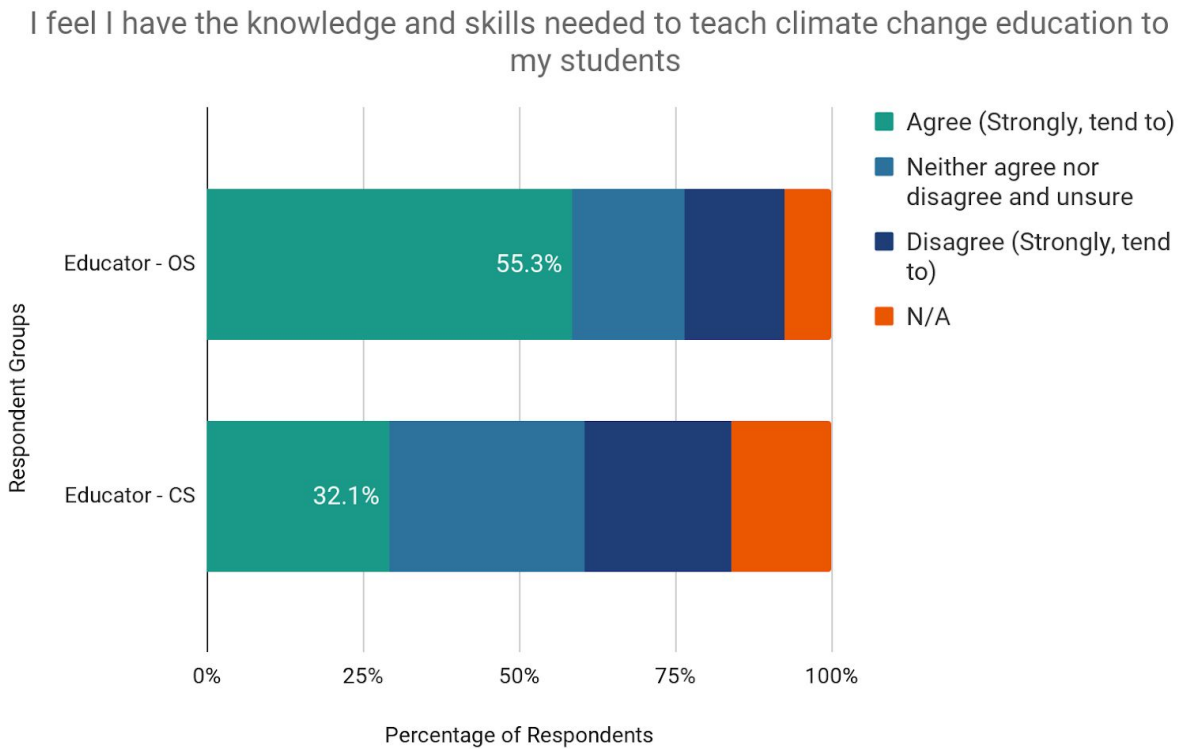
When educators were asked to respond with open-text responses on their approaches to teaching climate change education, coded responses ($n=568/1219$) indicate that open-sample educators integrate climate change into their subject matter (53% of responses), while closed-sample educators mostly noted educating on various issues (causes, effects, etc.). 16% of responses from open-sample educators focused on class projects, such as art or media, while 15% of responses from closed-sample educators focused on class discussions. 8% of responses from open-sample educators are focused on taking personal actions whereas closed-sample educators made no mention of taking personal actions.

Table 5. *Integration of climate change education within subjects*

How do you include climate change education within your subjects?		
	Educator - OS	Educator - CS
Integrated into the taught subject matter	53.0%	20.7%
Educating on the various issues (causes, effects, etc)	30.7%	45.2%
Class discussion(s)	27.5%	15.0%
Participating in projects (art, media creation, etc)	15.8%	7.4%
Taking actions	8.2%	0
Research	6.2%	0
Other and unsure:	8.9%	21.5%

$n= 595$ (Educator OS =564, Educator CS = 31 responded to this open-text question)

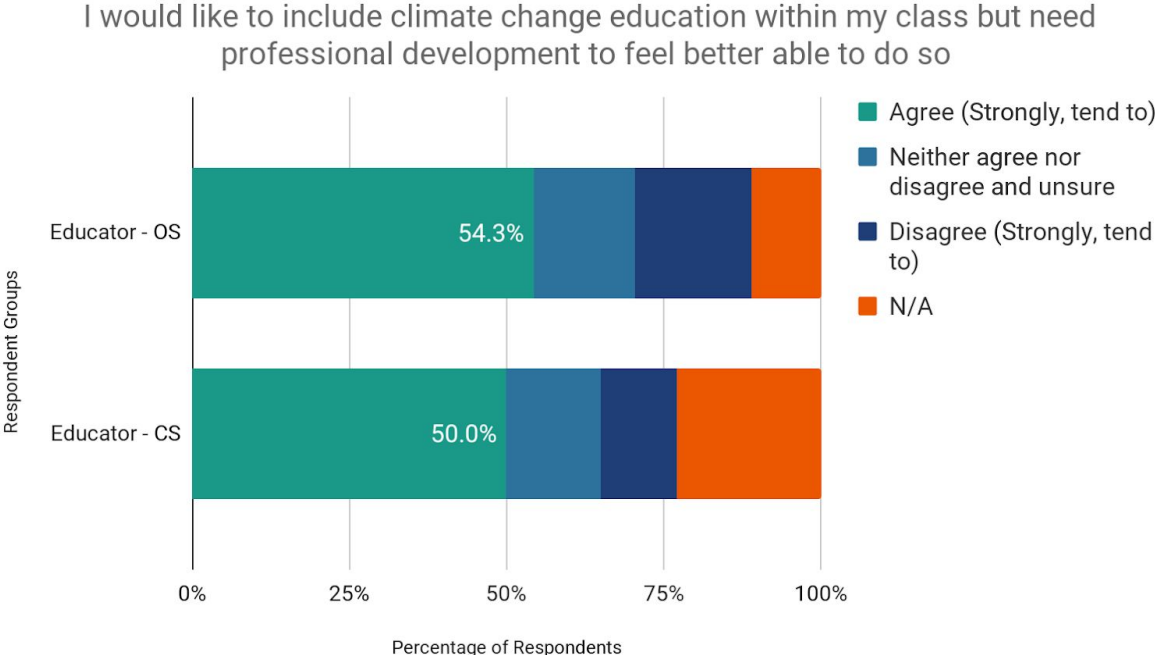
There is a disparity between educators' level of preparedness for teaching climate change. Over half of open-sample educators (55%) indicated feeling prepared, compared to less than one-third of closed-sample educators (32%).



n=1231 (Educator OS = 1120, Educator CS = 111)

Figure 75. Self-assessed climate change education: personal preparedness

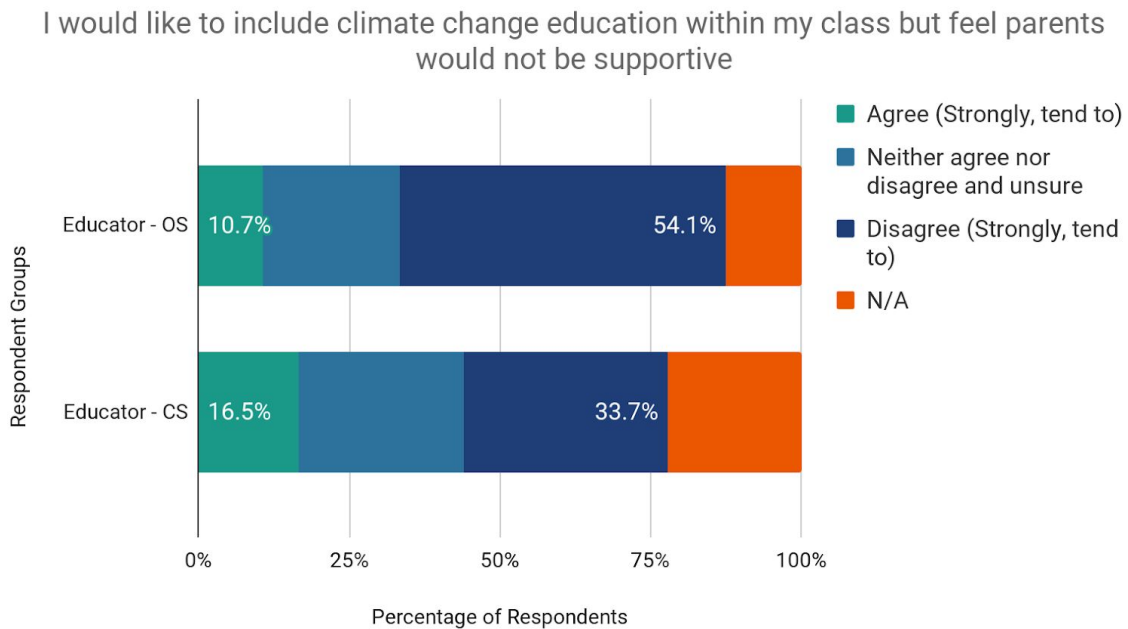
Both groups of educators (OS 54% and CS 50%) responded that professional development is required to feel more equipped to teach climate change in their classroom.



n=1231 (Educator OS = 1120, Educator CS = 111)

Figure 76. Self-assessed professional development needs

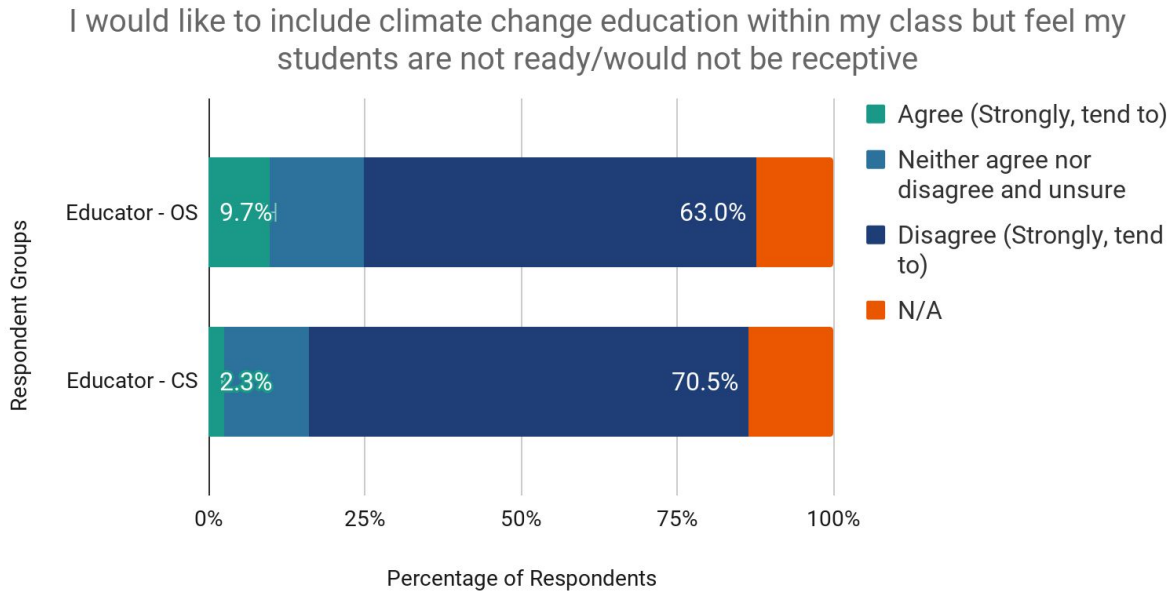
10% of open-sample educators and 16% of closed-sample educators agreed that they would like to include climate change education in their class but felt parents would not be supportive. Over half (54%) of open-sample educators and one-third (34%) of closed-sample educators disagreed that they would like to include climate change education in their class but felt parents would not be supportive. This discrepancy may suggest that more closed-sample educators perceive climate change to be controversial in their communities. Research suggests that teachers may hesitate or refrain from teaching climate change content if they perceive that it will create conflict or controversy from parents or the community (Berger et al., 2015; Chambers, 2011; Wise, 2010).



n=1231 (Educator OS = 1120, Educator CS = 111)

Figure 77. Self-assessed climate change education: parental support

Only 2% of closed-sample educators and 10% of open-sample educators indicated that student readiness and receptivity is a barrier to including climate change within their classrooms.

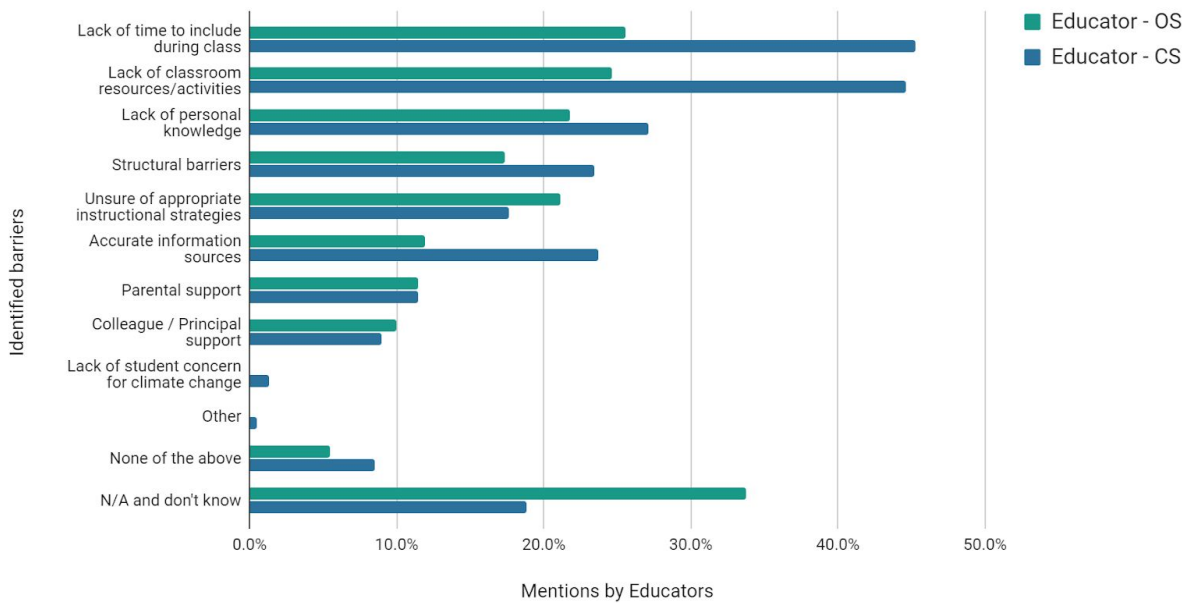


n=1231 (Educator OS = 1120, Educator CS = 111)

Figure 78. Self-assessed climate change education: student preparedness

Presented with a list of choices, the largest barrier that educators reported when attempting to include climate change education in classrooms was “lack of time”, followed by “lack of classroom resources”, and “lack of personal knowledge” by both open-sample and closed-sample educators. Parental, colleague, or principal support, or lack of student concern about climate change were not identified as barriers by a small percentage of educators.

What are some of the barriers you have experienced when attempting to include climate change education into your classroom?



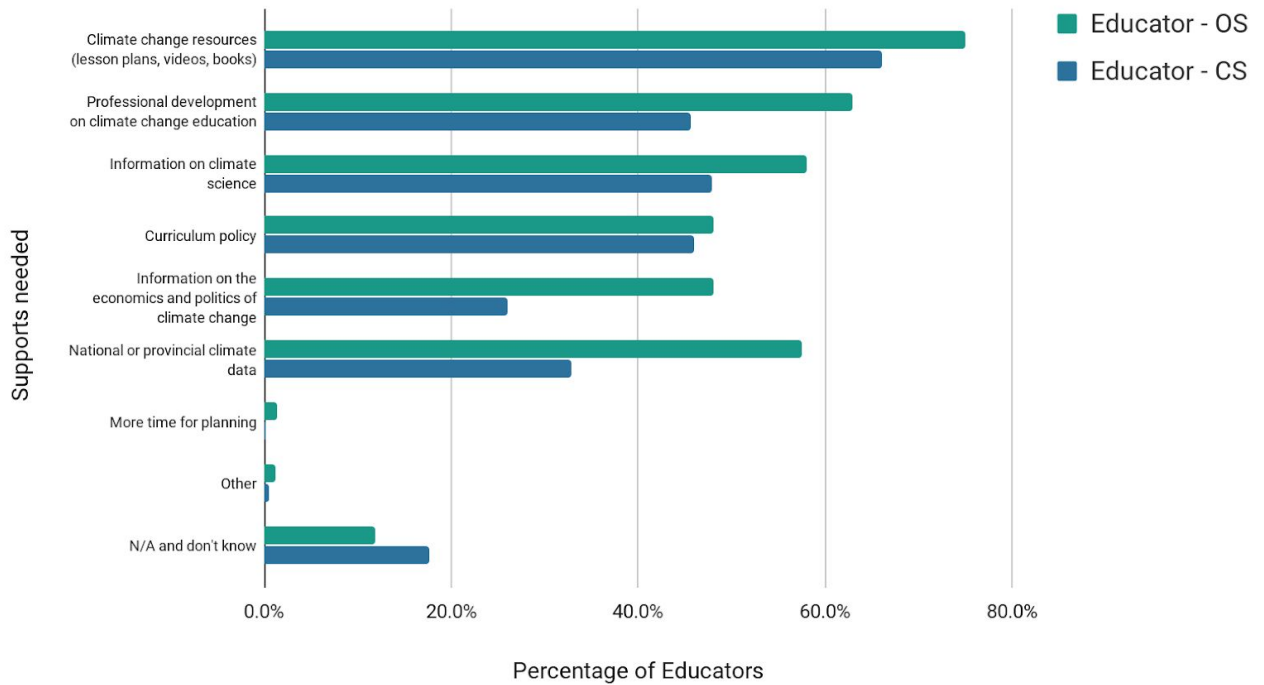
n=1231 (Educator OS = 1120, Educator CS = 111)

Figure 79. Barriers educators experience when attempting to include climate change education.

Note: Educators could select all that applied

Presented with a list of possible choices of supports educators might need to teach climate change in their subjects, climate change resources (including lesson plans, videos and books) were the most chosen, followed by professional development on climate change education, information on climate science, curriculum policy, information on the economics and politics of climate change, and national/provincial climate data. Least noted was time for planning.

What support(s) do you need to teach climate change in your subjects?



n=1231 (Educator OS = 1120, Educator CS = 111)

Figure 80. Supports educators identified for teaching climate change

Canadian teachers' views on climate change education

Teachers view curriculum policy through both their personal and professional beliefs (Thornton, 1989, p. 5) and their personal beliefs can influence how learning is directed and content addressed (Cotton, 2006; Cutter-McKenzie & Smith, 2013; Shulman, 1986). To help develop a conceptualization of how Canadian teachers view climate change education, we asked teachers a series of framing questions. The majority of educators (81% OS and 75% CS) believe climate education is the responsibility of all teachers, whereas few teachers (5% OS and 12% CS) believe science teachers are solely responsible for teaching climate change. This suggests that there is broad support from teachers to integrate climate change content across subjects.

Further, the majority of Canadian teachers (94% OS and 87% CS) strongly believe that climate change education provides opportunities to discuss social justice and world issues with students, which also supports an interdisciplinary or transdisciplinary framework. Most teachers believe (92% OS and 82% CS) that climate change education should encourage students to think about their own beliefs and values, which supports a deeper level of critical reflection and a consideration of societal and cultural drivers that underpin climate change. Teachers also indicated support (95% OS and 83% CS) for climate change education that focuses on developing student capacity to be critical thinkers and problem-solvers. This suggests that climate change education should be action-oriented with a problem-based learning focus. Teachers also indicated support (85% OS and 76% CS) for climate change education to focus on behavioural change. All of these statements by teachers suggest a conceptualization of climate change education that approaches climate change as a transdisciplinary issue, in which discussions of social justice and world issues are encouraged, along with critically examining both individual and normative cultural beliefs, while also focusing on active change-making processes.

Teachers focus on climate change content

Educators were asked a series of statements to identify areas of instructional focus on climate change. The majority of educators (71% OS and 51% CS) focus on personal actions that students can take to reduce their greenhouse gas emissions. Educators (60% OS and 45% CS) also indicated that they emphasize the scientific consensus that recent climate change is primarily caused by human release of greenhouse gases from fossil fuels. About half of educators (59% OS and 44% CS) indicated that they focus on consumption as a cause of climate change and about half of educators (56% OS and 45% CS) emphasize that average global temperatures have risen in the last 150 years.

About a third (38% OS and 34% CS) of educators encourage students to debate the likely causes of climate change and about a third of educators (34% OS and 30% CS) also encourage students to come to their own conclusions about the causes of climate change. This is concerning since there is an extensive evidence-base which has led to scientific consensus that climate change is anthropogenic (Cook et al., 2016, IPCC, 2014) and debating the causes or leaving students to come

to their own conclusions may lead students to believe that anthropogenic climate change is an area of debate or that the science is unsettled.

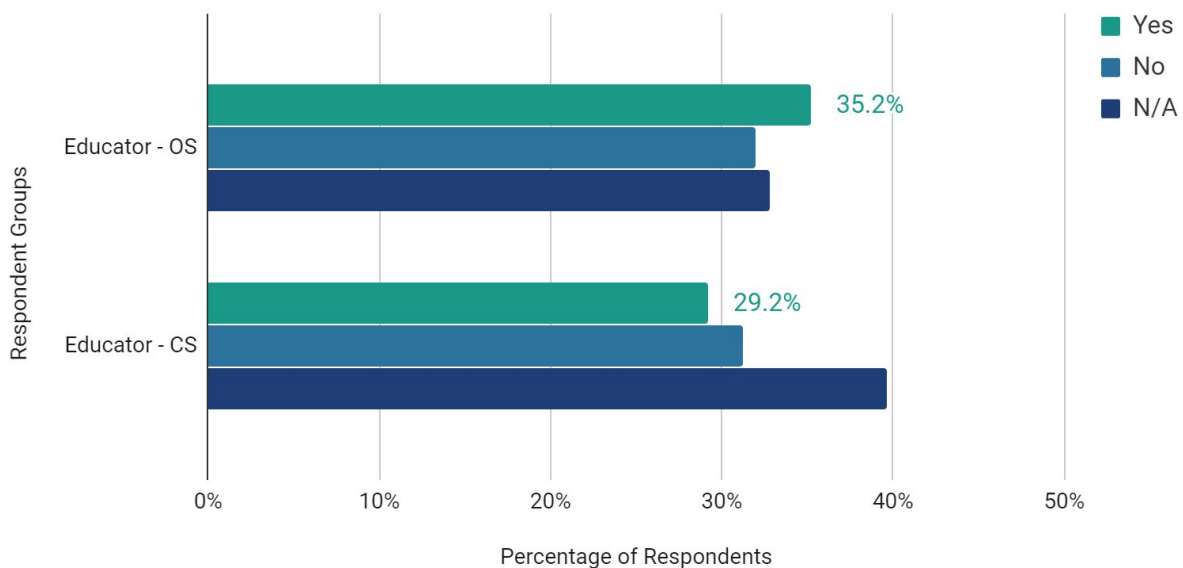
This is an area for growth and can be targeted through professional development workshops and clear messaging from school boards. If debate is a chosen pedagogy, a richer and more beneficial learning opportunity would involve researching and debating possible actions to mitigate climate change. About a third of educators (36% OS and 26% CS) indicated focus on political actions that people can take to influence climate change policy. Recognizing the importance of moving climate change education beyond understanding climate science to ensure it is personally relevant and meaningful, we asked educators if they had discussed topics that focus on potential solutions or actions that individual students can take.

Lastly, some educators (12% OS and 19% CS) did indicate that they emphasize that many scientists believe that recent increases in temperature are likely due to natural causes. This is concerning because it is false, with 97% of scientists in agreement with the consensus on anthropogenic climate change (Cook et al., 2016).

Focus on solutions and actions

Only some educators (35% OS and 29% CS) discuss policy solutions to address climate change, such as cap and trade or carbon taxes. Given the current politicization of carbon incentive policy within Canada, teachers may hesitate to discuss this with students to avoid conflict.

Please indicate whether or not you have discussed the following in your classes:
Policy solutions to address climate change incentives such as cap and trade or carbon taxes



n=1231 (Educator OS = 1120, Educator CS = 111)

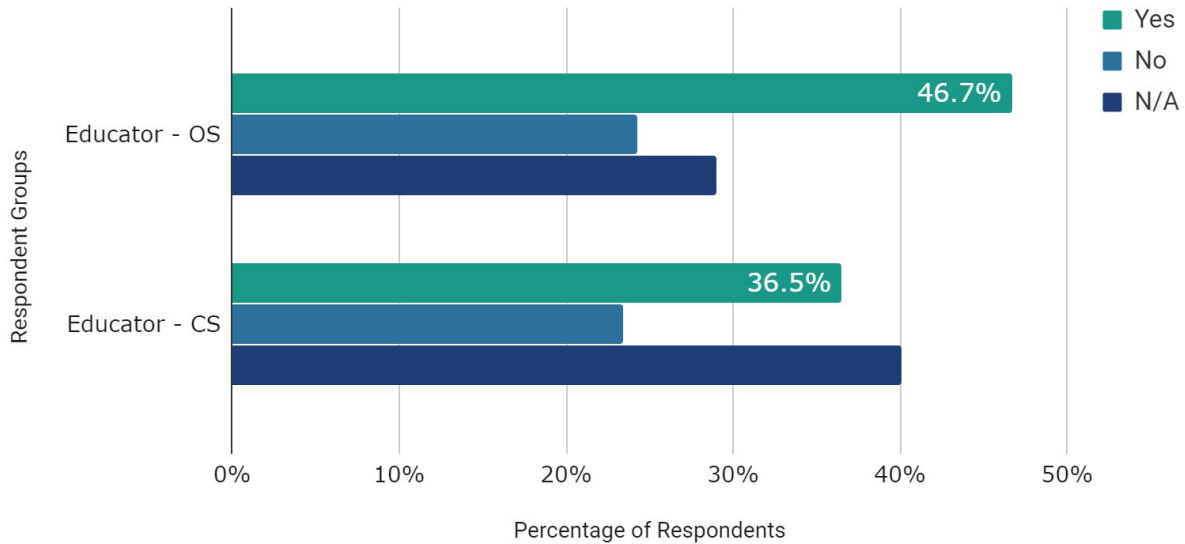
Figure 81. Policy solutions discussed in class

64% of open-sample educators and 45% of closed-sample educators discuss efforts to make current technologies more efficient such as hybrid cars or alternative energy sources. Additionally, approximately one-third (38% OS and 33% CS) of educators stated that climate change mitigation technologies, such as geoengineering, had been discussed within their classrooms.

Educator respondent groups varied significantly in their reporting of classroom discussion surrounding student action, such as: walking to school, eating less meat, or being critical of consumption habits. While nearly three-quarters (74%) of open-sample educators indicated discussing possible actions students can take, only about half (51%) of closed-sample educators indicated this. When educators were asked whether they had discussed political actions citizens can engage in such as protests or contacting politicians, there is some variation between the two educator groups. Over one third (35%) of open-sample educators mentioned discussing political actions that citizens can take within their classrooms, compared to less than a quarter (24%) of closed-sample educators. This question was asked before the student-led climate strike movement had gained momentum. This is significant since the climate strike movement has caused many educators to consider the role collective mobilization may have for young people to advocate for their future, and in turn this has raised questions about whether educators should support or penalize students who are absent from school while attending the *Fridays for Futures* strikes.

Educators were asked whether they discuss potential career opportunities related to conservation, new energy technologies, or policy, with approximately half (47%) of open-sample educators and over one-third (37%) of closed-sample educators indicating they had.

Please indicate whether or not you have discussed the following in your classes:
Potential career opportunities related to conservation, new energy technologies or environmental policy



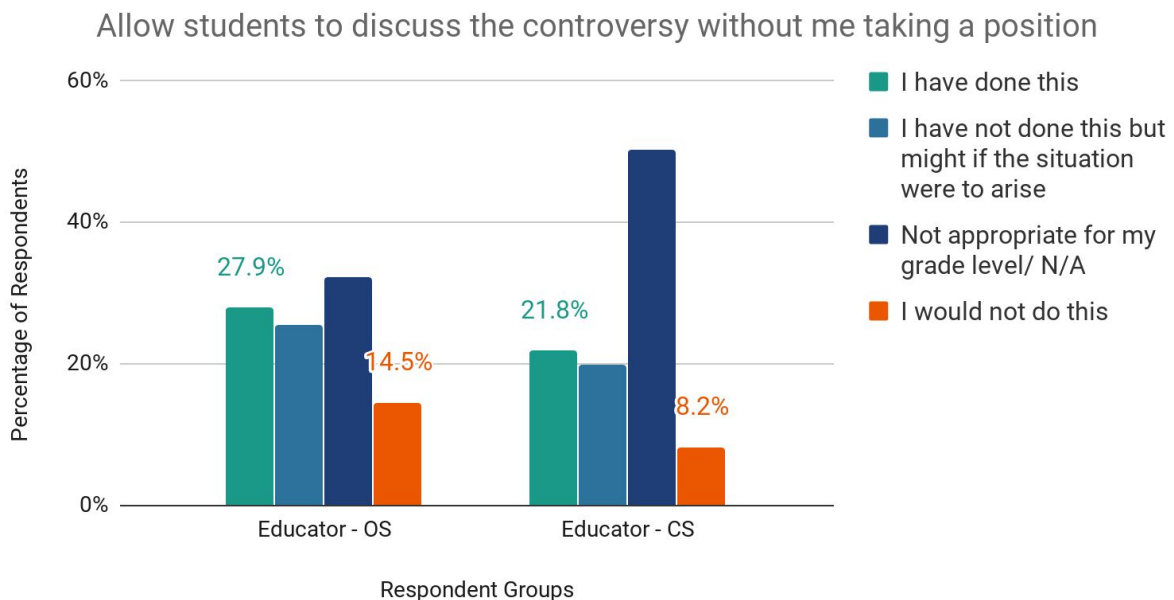
n=1231 (Educator OS = 1120, Educator CS = 111)

Figure 82. Class discussion: potential career opportunities related to conservation, new energy technologies or environmental policy

Strategies for handling controversy

We asked teachers a series of statements (from the National Survey of American Science Teachers) to help establish how Canadian teachers handle controversy in their classrooms.

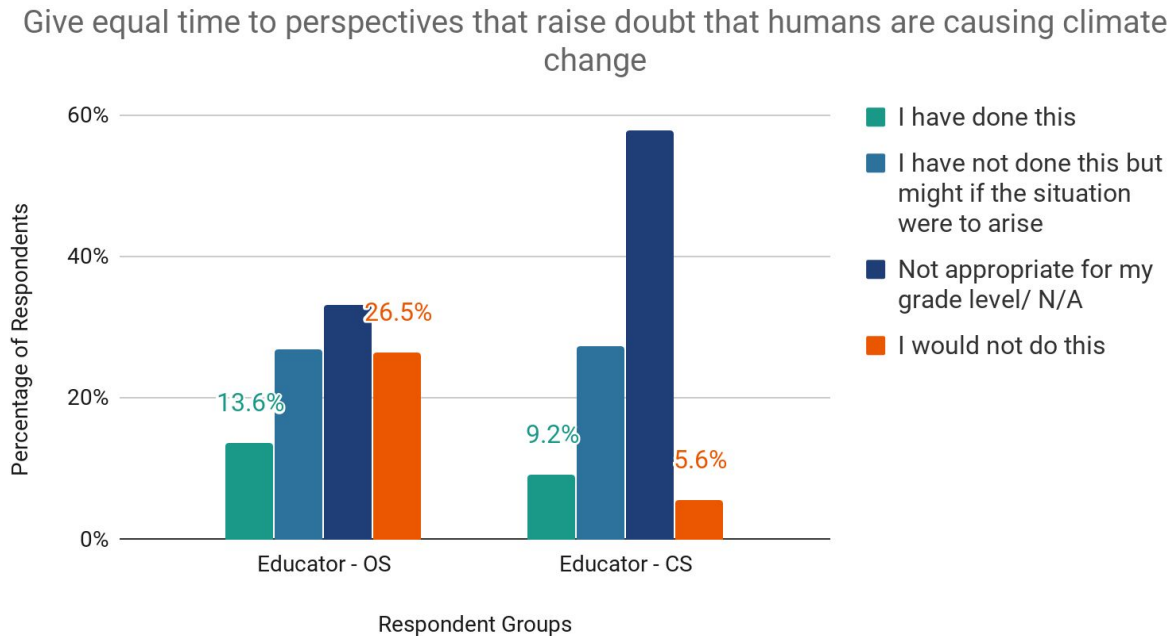
About a quarter of educators (28% OS and 22% CS) indicated that they have allowed students to discuss climate change controversies without themselves taking a position. As discussed above, if students are debating the causes of climate change and the teacher does not correct student misconceptions from the established scientific consensus, it is cause for concern. This may suggest a tendency for some teachers to refrain from perceived controversial issues to avoid conflict.



$n=1231$ (Educator OS = 1120, Educator CS = 111)

Figure 83. Climate change education strategies: teacher neutrality

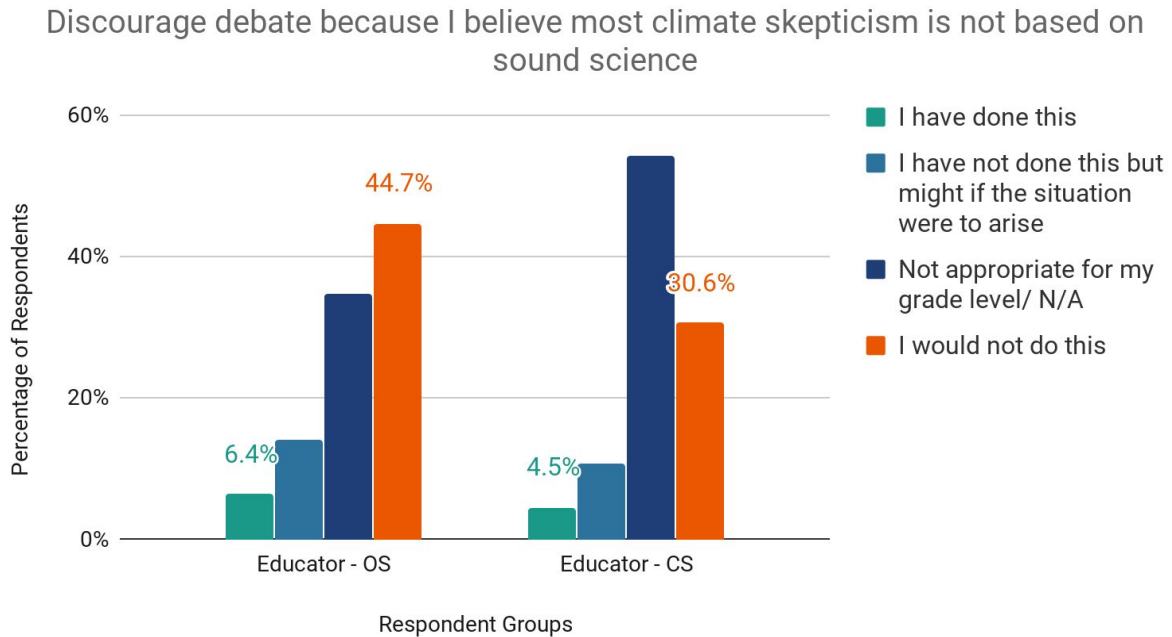
A small portion of open-sample (14%) and closed-sample (9%) educators stated that they have given equal time to the varying perspectives that raise doubt that humans are causing climate change. A substantial difference between the two groups was apparent as 27% of open-sample educators indicated that they would not do this compared to only 6% of closed-sample educators. This is an area of growth that can be targeted through professional development on inquiry processes for fostering critical thinking and evidence-based argumentation.



n=1231 (Educator OS = 1120, Educator CS = 111)

Figure 84. Climate change education strategies: perspective differences

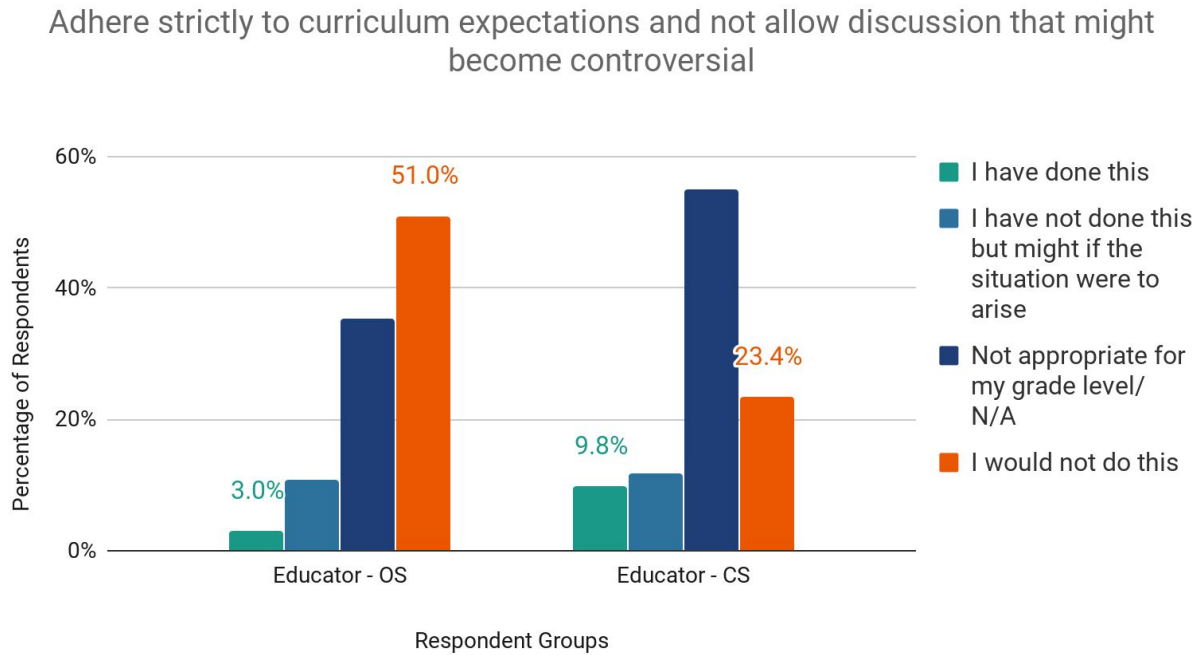
When teachers were asked whether they would discourage debate because most climate skepticism is not based on sound science, few educators indicated that they would (6% OS and 5% CS) and most indicated they would allow for the debate to occur (45% OS and 31% CS). Sometimes “knowing the other side” can be very helpful in understanding one’s own position on an issue and, with climate change, it can be very useful to have misconceptions about climate science corrected (McCuin et al., 2014). Still spending learning time debating what is not a scientific controversy is questionable, and carries with it the danger of reinforcing the idea that there is a controversy.



n=1231 (Educator OS = 1120, Educator CS = 111)

Figure 85. Climate change education strategies: self-assessed belief on scientific debate

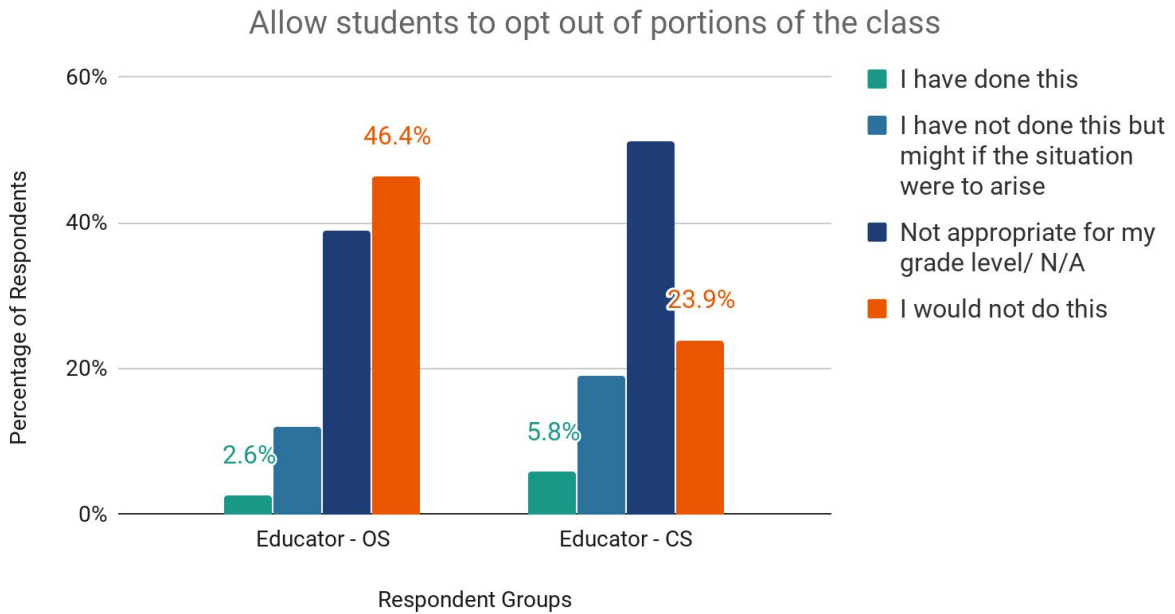
When asked whether educators adhere strictly to curriculum expectations and discourage the introduction of controversial conversations in their classrooms, only 3% of open-sample educators and 10% of closed-sample educators indicating having done so. In general, educators were much more likely to disagree with this statement, but to differing degrees between respondent groups. 51% of open-sample educators and 23% of closed-sample educators responded against strict adherence and avoidance of controversial subject matter.



n=1231 (Educator OS = 1120, Educator CS = 111)

Figure 86. Climate change education strategies: curriculum correspondence

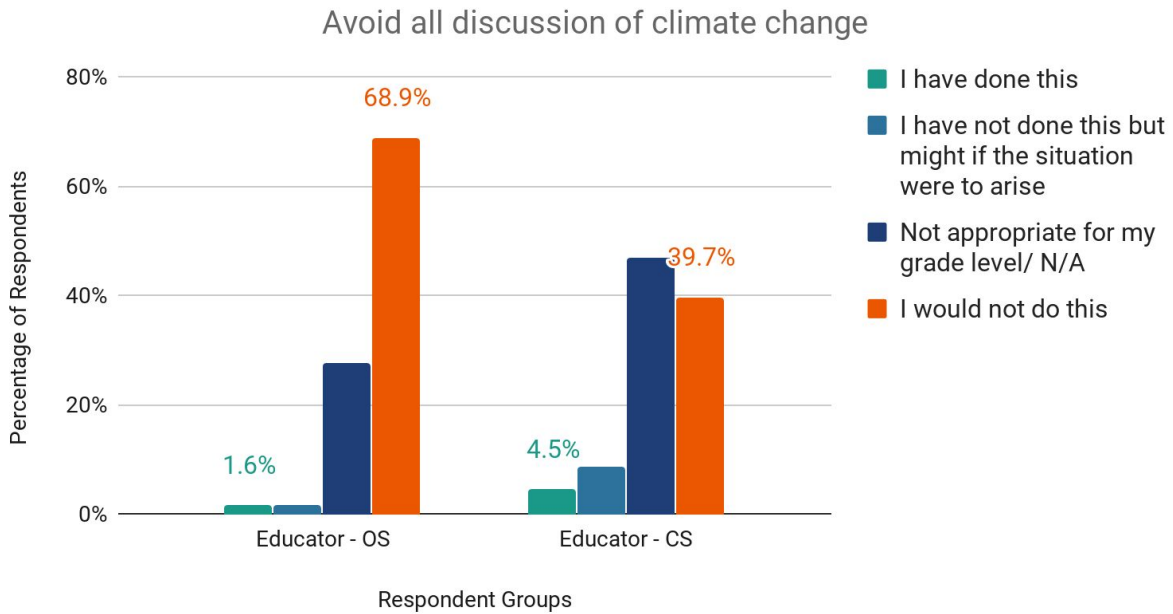
A small number (3% and 6%) of both educator groups (OS and CS) have permitted students to opt out from portions of class on climate change education. Almost half (46%) of open-sample educators reported not being willing to do so, compared to less than one-quarter (24%) of closed-sample educators.



n=1231 (Educator OS = 1120, Educator CS = 111)

Figure 87. Climate change education strategies: student opt-out

With regards to using the strategy of complete avoidance of climate change discussions, a negligible number of open-sample and closed-sample educators (2% and 5%, respectively) indicated using this strategy. More than two-thirds (69%) of open-sample educators stated they would not use discussion avoidance as a strategy; 40% of closed-sample educators shared similar beliefs.



$n=1231$ (Educator OS = 1120, Educator CS = 111)

Figure 88. Climate change education strategies: discussion avoidance

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Appendix B - Conditions for Engagement Ladder: segmented audiences

Dismissives = Respondents that disagree that climate change is happening or don't know (QD1_1=4, 5, or 9) **OR**, think that climate change is not happening (QB1=4).

Skeptics = Respondents that agree that climate change is happening (QD1_1=1,2) **and do not** think it's caused by humans (NOT QB1=1,3) **OR**, neither agree nor disagree that climate change is happening (QD1_1=3)

Aware = Agree that climate change is happening (QD1_1=1,2) **and do** think it's caused by humans (QB1=1,3) **AND agree** (1,2) to any **one** of the following conditions (that there is nothing we can do):

- o QD6_5: Humans have little control over the forces of nature such as climate change (QD6_5=1,2)
- o QD6_6: New technologies can solve climate change without individuals having to make big changes in their lives (QD6_6=1,2)
- o QD6_7: I believe that climate change is inevitable, no matter what we try and do to stop it (QD6_7=1,2)
- o QD6_8: Taking action on climate change is a waste of time and resources (QD6_8=1,2)

Empowered = Agree that climate change is happening (QD1_1=1,2) **and do** think it's caused by humans (QB1=1,3) **AND do not agree** (NOT 1,2) to **any** of the following conditions:

- o QD6_5: Humans have little control over the forces of nature such as climate change (NOT QD6_5=1,2)
- o QD6_6: New technologies can solve climate change without individuals having to make big changes in their lives (NOT QD6_6=1,2)
- o QD6_7: I believe that climate change is inevitable, no matter what we try and do to stop it (NOT QD6_7=1,2)
- o QD6_8: Taking action on climate change is a waste of time and resources (NOT QD6_8=1,2)