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CURRICULUM FOR THE BIOREGION

Analysis of the Curriculum for the Bioregion Initiative's Survey on Teaching about Climate Change at Campuses in the Puget Sound Bioregion

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Campus Executive Summary

Curriculum for the Bioregion, an initiative of the Washington Center for Improving the Quality of Undergraduate Education at The Evergreen State College, is planning a curriculum- and faculty-development project, "Teaching Climate Solutions." To learn how climate change and climate solutions are being taught now at campuses in the Puget Sound bioregion and to assess interest in a large, inter-institutional project, we created an online survey in the Spring of 2013. The survey contained 15 questions. 383 individuals from 29 colleges and universities accessed the survey; of these, 347 responses were judged complete enough to include in the overall analysis.

Major survey findings were the following:

1. Climate change and associated issues are being taught at a wide array of classes at the 30 campuses represented by faculty members who completed our survey. Predictably this topic is taught the most extensively in science or applied science classes at both the introductory and advanced level. Climate change is a highly complex scientific phenomenon that has yet to be taught in depth at the secondary school level; therefore, in many classes, faculty members have to start from scratch, introducing the science of the phenomenon of climate change to students. That the science of the phenomenon and its possible ramifications/impacts is taught most heavily in science classes makes sense. However, it is heartening that climate change is also being taken up by faculty members in social sciences and, to a small extent, in the arts and humanities as well.
2. Faculty members in different academic fields (especially science and non-science faculty) emphasize different topics in their climate-change teaching. The respondents from the 2-year schools emphasized what individuals can do along with energy issues more than the 4-year respondents, while the 4-year respondents gave more attention to social justice, collective responses, climate policy processes, and responses from the arts and humanities. Some dimensions of climate change appear not to be taught very much at all or are only taught in depth by a few faculty members; these topics are climate/energy policy; the moral and inter-generational dimensions of climate change; climate change communications and discourse about climate change in the media; as well as collective responses and social movements related to climate change.
3. Tellingly, human's emotional responses to climate change appear to get very little coverage by any faculty except those in arts and humanities. This bears further investigation, in that throughout our eight years of faculty development activities with Curriculum for the Bioregion, large numbers of faculty have told us anecdotally that one of the most challenging aspects of teaching about climate change is students' emotional responses to a very frightening future and how challenging it is for them to handle these emotions in class.
4. It is understandable that unless faculty members are teaching an entire course devoted to climate change, they cannot address every dimension of the subject when they take it up as a topic for a week or two within a larger course. Climate change is a complex topic to teach and perhaps the only emphasis many faculty members can give it is simply "climate change, the phenomenon and its role in the discipline or course I am teaching." The real risk here though is that students may be left with

the perception—*or rather, the misperception*—that little is being done about climate change, or little *can* be done to mitigate its worst effects.

5. Only a very small number of those who teach about climate change carry out community-based learning or service-learning. Those who do involve their students in such activities do not, for the most part, focus them directly on climate change related sites or projects—perhaps reflecting the fact that they are unaware of field sites or service-learning opportunities in their respective communities. This presents a problem—and a huge opportunity.

6. Only a small number of faculty development or curriculum development initiatives related to climate change are occurring on these campuses, even though 19 out of the 30 campuses are signatories to the American College and University Presidents Climate Commitment, which requires campuses to carry out broad-scale climate change education and sustainability-across-the-curriculum initiatives.[1] These campuses include:

    - **Seattle University**, which has recently created a Center for Environmental Justice and Sustainability and has awarded fellowships for faculty and student research and action-projects related to environmental justice and sustainability;
    - **The Evergreen State College** whose faculty reported that the institution has created a new faculty position in "Climate Justice" and will hire for that position in the next academic year (2013-14);
    - **University of Washington Bothell,** where faculty members reported that UWB has created a new undergraduate B.S. degree program in Climate Science and Policy;
    - **Western Washington University's Fairhaven College,** where plans are under way to devote a themed-quarter to climate change in Winter Quarter 2014.
    - **Whatcom Community College** which has, since 2010, required a course in sustainability as part of its AA degree requirements. It is the only college in the state of Washington to have implemented a curriculum requirement for all students in the liberal arts degree track to take a course that features sustainability content and concepts. Whatcom also reported that next year, as an institution, it will continue to strengthen course offerings by promoting sustainability content across-the-curriculum.

7. One quarter of the faculty respondents are doing some kind of research or scholarly work on climate change and they are pursuing a wide variety of topics. Furthermore, 20% of the faculty respondents are bringing special interests and expertise to their climate change teaching. Any climate change education project that we mount should create effective vehicles for these faculty members to serve as resource experts to others.

8. Among this group of interested faculty who completed the survey, there is substantial interest in participating in an inter-institutional effort to strengthen climate-change education: over 70% of the respondents said "Yes," or "Maybe" in answer to the question gauging interest in participating in a faculty and curriculum development project. The data reveals widespread interest both across campuses and disciplines.

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[1] Signatories to the ACUPCC promise to undertake "actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for **all students**." *[emphasis added]*

Introduction and Overview

Curriculum for the Bioregion, an initiative of the Washington Center for Improving the Quality of Undergraduate Education at The Evergreen State College, is planning a curriculum- and faculty-development project, "Teaching Climate Solutions." To learn how climate change and climate solutions are being taught now at campuses in the Puget Sound bioregion and to assess interest in a large, inter-institutional project, we created an online survey in the Spring of 2013. 383 individuals from 29 colleges and universities accessed the 15-question survey; of these, 347 responses were judged complete enough to include in the overall analysis.

The survey was developed by Jean MacGregor and Larry Geri, with substantial input from members of the Curriculum for the Bioregion Steering Committee. It was open on Survey Monkey between March 11th and June 24th, 2013. Our campus contacts for on participating Curriculum for the Bioregion campuses volunteered to invite and encourage faculty colleagues on their respective campuses to take the short survey. Between mid-March and late June, they encouraged colleagues to participate between one and three times. Therefore, the survey respondents are not a random sample of faculty; rather, they represent a sample of faculty interested in the topic and willing to report on their teaching of it and, to a small degree, their interests in improving as teachers of climate change topics.

The hypotheses and questions for this inquiry were the following: (1) respondents of differing academic fields (especially science and non-science faculty) would teach different emphases in their climate-change teaching; (2) respondents from 2-year, and 4-year colleges might differ in their emphases in climate-change teaching; (3) the science of the phenomenon of climate-change and its predicted impacts would be taught in more depth than climate *solutions*; (3) involvement in service-learning and/or community-based research (with respect to climate-change mitigation or adaptation) would be developing but would not be widespread. Our questions included the following: (1) are there faculty development or curriculum development initiatives related to climate change or climate solutions already under way on these campuses? (2) are faculty members in the region conducting research about climate change and if so, does any of it focus on issues *in this region?* (3) among this group of interested faculty who completed the survey, is there interest in participating in an inter-institutional effort to strengthen climate-change education? Is there interest across the higher education sectors and across the disciplines? (4) is there expertise in certain dimensions of climate change education that we might call upon?

383 individuals began the survey, and 309 completely finished it. A total of 347 responses were judged complete enough to include in the overall analysis. Since many respondents did not answer all of the questions, the "n" for particular questions examined below will vary.

Although 3 ½ months is an unusually long time to leave a survey "open," it is unlikely that this had a demonstrable effect on the responses, since the questions asked respondents to describe their climate change related teaching, not their attitudes toward the topic. Respondents' willingness to further participate in the Curriculum for the Bioregion project may have been influenced by continuing severe weather/climate news over the past few months, but on balance, choices about further participation are more likely the result of other factors.

We want to express our gratitude to our Curriculum for the Bioregion campus contacts for inviting their colleagues to complete the survey.

Question 1. Participant's Names

Findings: This was an optional question, but over 97% of the participants provided their names.

Question 2. Campus Participation

Findings: Respondents who completed the survey represent 28 different campuses in the Puget Sound bioregion and one campus in the Columbia Plateau. 345 responses to this question were analyzed. 165 participants were from community (2-year) colleges; 180 were from 4-year schools in the state.

Table 1. Respondents' Campuses

a. Number of faculty members from 4-year institutions completing the survey.

[Currently, Curriculum for the Bioregion has no formal institutional contact at University of Washington; the faculty from UW Seattle who completed the survey found out about it through other channels. **Campuses participating in the American College and University Presidents Climate Commitment are shown in bold font**.]

The Evergreen State College	58
Western Washington University	24
Pacific Lutheran University	19
Seattle University	18
Saint Martins' University	16
University of Puget Sound	13
UW Tacoma	13
UW Bothell	11
Antioch University Seattle	3
Northwest Indian College	3
UW Seattle	2

b. Number of faculty members from 2-year institutions completing the survey.

[Currently, Curriculum for the Bioregion has weak institutional contacts at Shoreline, South Seattle, and Tacoma Community Colleges. This may explain the low numbers of participants from those institutions. **Campuses participating in the American College and University Presidents Climate Commitment are shown in bold font.**]

Edmonds CC	17
Centralia College	16
Highline CC	15
Pierce College	15
Cascadia CC	14
Everett CC	14
North Seattle CC	13
Olympic College	13
Seattle Central CC	11
Skagit Valley College	8

Green River CC	9
Whatcom CC	7
South Puget Sound CC	4
Bellevue College	3
Tacoma CC	3
Peninsula College	1
South Seattle CC	1
Spokane CC	1
Shoreline CC	0

Discussion: The degree of participation by faculty at a particular campus obviously does not correlate with a campus's size. Some smaller campuses had high degrees of survey-participation and some very large campuses had low survey-participation. **We think that the degree of participation can be explained by two factors: the initiative that each campus-liaison took to recruit colleagues to participate in the survey, and the degree of interest and engagement in climate change education on the particular campus.**

Question 3. "Primary disciplinary (or interdisciplinary) affiliation."

Findings: This question was open-ended, so respondents entered their own response. 346 responses to this question were analyzed. These responses were coded as follows: 1= science and math; 2= social

science; 3 = arts/humanities; 4= professional/technical; 5 = self-reported as interdisciplinary. Most of the coding was straightforward, but a number of respondents either explicitly entered more than one discipline or implied that they were not tied to a single discipline. These respondents were counted as interdisciplinary.

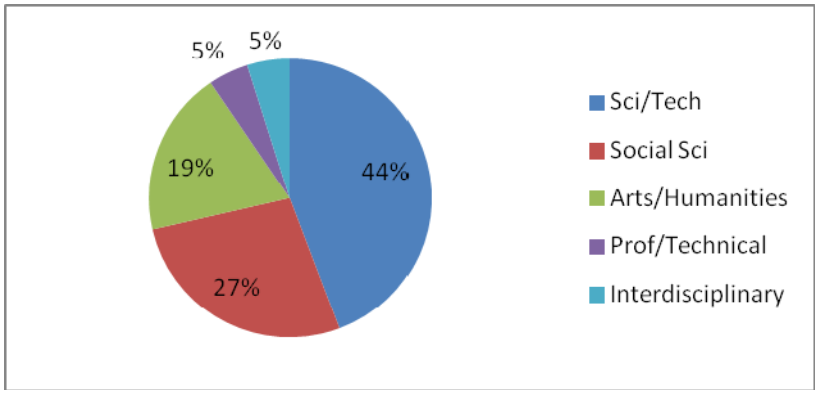
Counts

153 = Science and math;
94 = Social science;
66 = Arts/humanities;
16 = Professional/technical;
17 = Self-reported as interdisciplinary.

Table 2. Disciplinary Breakdown of Respondents Teaching about Climate Change or Not

	Total responses	Yes, teaching climate change topics	No, not teaching now about climate change
Science/math	153 (44%)	125 (46%)	28 (37%)
Social sciences	94 (27%)	72 (26%)	22 (29%)
Arts & humanities	66 (19%)	45 (17%)	21 (28%)
Professional/technical	16 (5%)	15 (6%)	1 (1%)
Interdisciplinary	17 (5%)	14 (5%)	3 (4%)
	346	**271**	**75**

Figure 1. Total Responses to Q3, Self-reported Academic Discipline.



Discussion: The data are fairly predictable in revealing that the majority of faculty who participated in the survey teach in the science/math disciplines. **We were pleased to have fairly good participation from faculty in other disciplines because our project goal is to engage more faculty "across the curriculum" in teaching about climate change and climate solutions.**

Question 4. "Are you teaching about climate change, climate impacts, and/or climate solutions in any of your classes?"

Findings: 345 individuals responded to this question. 268 (78%) reported that they were teaching about at least one of these topics. **77** (22%) reported that they were not teaching about these topics; Further analysis of Q4 and Q12 is included below.

Discussion: We were pleased that a fifth of the survey respondents who do not teach about climate change now were interested enough to complete the survey.

Question 5. "In which course or courses are climate change/impacts/solutions a significant emphasis (a week or more or emphasis) in your course? Please select all that apply."

Findings: The **268** individuals who answered this question indicated that they teach a diversity of both introductory and advanced courses that include climate change content. **Table 3** provides the breakdown of types of courses.

Table 3. Types of Courses in Which Respondents are Teaching about Climate Change

	2-year campuses	4-year campuses	Total number of courses
Course(s) that are introductions to a discipline (which might or might not meet general education requirements at your institution).	66	53	119
Discipline-specific course(s) that meet general education requirements at your institution.	66	43	109
Interdisciplinary courses/programs that serve entering students or lower division students.	37	72	109
Course(s) or interdisciplinary programs beyond the introductory level that serve upper division students and/or undergraduate majors.	18	86	104
Courses (s) for graduate students.	0	21	21
TOTAL			462

Discussion: This data reveals that courses in which climate change is being taught appear across the undergraduate curriculum. Predictably, at the four-year campuses, there are many more courses focusing specifically on climate-change for upper division or "advanced" students. It is notable that many faculty members (in Question 3) identified themselves as interdisciplinary, and that, in responding to this question and Question 6, many interdisciplinary courses and learning community programs were listed. An explanation for this is that many campuses and programs whose faculty members are active in Curriculum for the Bioregion activities have interdisciplinary missions (e.g., Evergreen, Fairhaven and Huxley Colleges at Western Washington University, and UW Tacoma and UW Bothell) and furthermore, many campuses in the region offer various types of learning communities (linked courses and team-taught interdisciplinary programs).

Question 6. "List the courses that you teach that have a significant climate-change component. For each course, please mention the name, course number, and disciplinary designation of the course."

Findings: 508 separate courses were listed by the **268** respondents who indicated they were teaching about climate change. Because many respondents neglected to state course numbers or disciplinary designations of their courses, and because course-titles and interdisciplinary programs often include overlapping disciplines and interdisciplinary themes, we did our best to sort them into conventional disciplines (when stated) and general categories, based on the course titles provided. On the next page, **Table 4**, summarizes this data, which reveals that the topic of climate change is appearing across a wide array of disciplines and fields of study.

Table 4. Types of Courses Offered that Include Significant Climate Change Components.

Discipline or interdisciplinary topic	Intro-ductions to discipline	Courses that meet general education requirements	Interdisciplinary courses that serve entering or lower div students	Courses or programs that serve upper div students	Courses that serve grad students	Professional or technical courses	TOTALS
Climate change – entire courses or programs			**11**	**16**	**5**		**32**
Biology	**11**	**17**		**2**			**30**
Ecology	**2**	**6**	**4**	**17**			**29**
Sustainability	**2**		**7**	**14**	**3**	**2**	**28**
Environmental studies	**2**	**1**	**18**		**2**		**23**
Chemistry	**11**	**10**	**1**				**22**
Geology	**6**	**8**	**5**	**3**			**22**
Environmental science	**9**	**7**	**5**				**21**
Geography	**7**	**10**	**2**	**1**			**20**
Energy studies	**4**		**3**	**6**		**6**	**19**
Writing/composition	**5**	**4**	**6**	**1**	**1**		**17**
Interdisc. Environmental topical courses (air, water, waste)			**2**	**10**			**12**
Philosophy	**4**	**3**	**3**	**2**			**12**
Oceanography	**6**	**2**	**1**	**2**			**11**
History	**3**	**5**	**1**	**1**			**10**
Anthropology	**1**	**5**			**3**		**9**
Decision-making and policy				**9**			**9**
Earth Science	**1**	**6**	**1**	**1**			**9**
Economics	**2**	**5**		**2**			**9**
Meteorology	**4**	**4**	**1**				**9**
Education					**3**	**4**	**7**
Horticulture	**1**	**2**				**4**	**7**
Social issues/ movements			**5**		**2**		**7**
Astronomy	**6**						**6**
Business		**1**	**3**	**1**	**1**		**6**
Health			**4**	**2**			**6**
Law		**2**		**1**	**3**		**6**
Nursing						**6**	**6**
Sociology	**3**	**3**					**6**
Civic Issues			**2**	**3**			**5**
Literature	**1**		**1**	**3**			**5**
Conservation biology	**1**		**1**		**2**		**4**
Dev'l reading-writing	**4**						**4**
English as a 2nd language	**4**						**4**
Env. or natural resource mgt		**1**	**2**	**1**			**4**
Food and agriculture			**4**				**4**
Marine science/studies	**1**		**1**		**2**		**4**
Native American studies				**3**	**1**		**4**
Political sci/political economy	**3**		**1**				**4**
Policy/ decision-making		**1**			**3**		**4**
Religious studies	**2**		**1**	**1**			**4**
Climatology	**1**	**2**					**3**
Design						**3**	**3**
Environmental analysis			**1**	**2**			**3**
GIS and cartography		**2**	**1**				**3**
Mathematics	**2**			**1**			**3**
Natural history			**3**				**3**
Agriculture	**1**			**1**			**2**
Area studies			**2**				**2**
Career prep/coop education			**2**				**2**
Culinary arts						**2**	**2**
Human ecology				**2**			**2**
Nutrition	**1**	**1**					**2**
Physics		**1**	**1**				**2**
Psychology		**1**		**1**			**2**
Astrobiology			**1**				**1**
Community-based research				**1**			**1**
Computer Science	**1**						**1**
Construction	**1**					**1**	**1**
Engineering					**1**		**1**
Global studies				**1**			**1**
Hospitality/Tourism						**1**	**1**
Social work					**1**		**1**
						TOTAL NUMBER OF COURSES MENTIONED	**508**
						TOTAL NUMBER OF COURSES IN PURE OR APPLIED STEM DISICPLINES	**348**

Discussion: As we assumed, climate change is appearing strongly in introductory and general-education courses in the sciences: biology, chemistry, environmental science, geography, and geology. In more advanced coursework, climate change is being taught in environmental science, environmental studies, and various ecology/ecosystems courses. Of the 508 courses cited, 348 (68.5% of the courses) are in pure or applied science. However, climate change also appears in a wide variety of other disciplines—a promising development. A number of faculty mentioned that they are teaching entire courses on climate change (with a variety of emphases, such as geology, meteorology, policy, and human rights) and also, entire courses on the topic of sustainability, but nearly all of these courses are taught by faculty members whose appointments are in the sciences. Our campus liaisons did not make any special effort to reach out to business or engineering faculty—which could and should be significant sites for climate-change material; thus, we don't have data about the degree to which climate change is now emphasized in those or other appropriate fields where climate change and climate solutions might be featured.

Question 7. "What aspects of climate change do you emphasize in these courses? What do you focus on the most? For each topic below, please rate the degree of emphasis you give it in any of your courses, using the following scale:"

Findings: A total of 17 topics were listed, plus an optional "other" option with a text-box. The scale for responses to this question included four options, summarized here as no emphasis of the topic, "make mention" of the topic, modest emphasis, and significant emphasis.

The choice of possible answers on survey	Value
I give this no emphasis at all in any of my courses.	0
I make mention of this but not in any depth in any of my courses.	1
I give this modest emphasis in at least one or more of my courses.	2
I give this significant emphasis in at least one or more of my courses.	3

The data first were sorted by campus type, 2-year vs. 4-year. Then, the responses were broken out by disciplinary affiliation. As shown in **Table 5,** for the 2-year school respondents, three topics, science of climate change, science of the predicted impacts, and what individuals can do, generated an average of greater than two, suggesting a modest emphasis in their classes. Two other topics, carbon footprints and energy issues, generated an average of 1.9 or greater; and two others, mitigation strategies and adaptation, had an average greater than 1.5, suggesting they were emphasized to a small extent.

For the 4-year respondents, no topics generated a mean response of greater than 2, although three, climate change science, climate change impacts, and carbon footprints, were close to 2, suggesting they received modest emphasis. Five other topics generated a mean of 1.5 or more, suggesting that they were emphasized somewhat by the 4-year faculty. The pattern of responses by participants from the 2-year vs. the 4-year schools suggests subtle differences between the two groups of respondents, as measured by average difference for a topic of greater than 0.25. The respondents from the 2-year schools emphasized energy issues and what individuals can do more than the 4-year respondents, while the 4-year respondents gave more attention to social justice, collective responses, climate policy processes, and responses from the arts and humanities.

Table 5. Analysis of Question 7 on Aspects of Climate Change Emphasized in the Courses that Faculty Members Teach, at 2-year and at 4-year Campuses.

Aspects of climate change emphasized in course(s)	2-year Campuses	4-year Campuses	Overall Mean
a. Science of the phenomenon of recent, anthropogenic climate change.	2.15	1.92	2.04
b. Science of the predicted impacts of climate change/climate disruption	2.10	1.96	2.03
c. Ecological and/or carbon footprints of individuals, communities, countries	1.96	1.88	1.92
d. Mitigation strategies (controlling/ reducing greenhouse gas emissions, policy initiatives such as carbon-trading, carbon taxes)	1.78	1.67	1.73
e. The climate policy process (international, national, tribal, state/provincial, municipal)	1.10	1.38	1.24
f. Geo-engineering solutions	0.94	0.80	0.87
g. Energy issues and energy alternatives associated with climate change	1.94	1.62	1.78
h. Adaptation: ways individuals, organizations, and communities are already acting to increase resilience of natural systems and human communities	1.65	1.64	1.64
i. Social justice issues related to climate impacts and policy choices	1.41	1.74	1.58
j. The moral dimensions of climate change, including intergenerational equity	1.29	1.41	1.35
k. Climate change denial	1.28	1.28	1.28
l. Climate change communications and discourse about climate change in the media	1.21	1.30	1.26
m. Responses by the business community to climate change	0.92	0.93	0.93
n. Examining differing emotional responses to the issue…exploring apathy, despair, hope, and resolve	0.87	0.98	0.92
o. Collective responses and social movements associated with climate change	1.10	1.43	1.27
p. What individuals can do and are doing now about climate change	2.03	1.61	1.82
q. Responses to climate change coming from the arts and humanities	0.57	0.87	0.72

Table 6 examines the mean responses after the surveys were sorted by disciplinary affiliation. Respondents with a science/math background (Row 1 below), predictably, emphasized the scientific elements of the phenomenon and put less emphasis on other elements, although "what individuals can do" (1.71) was a relatively strong emphasis. Social scientists put less stress on the science and more on every other topic than the scientists, with the exception of geo-engineering (a very technical topic). And the humanities/arts faculty were much more interested in many more non-science topics than the other groups, especially emotional responses to the issue (mean =1.66), collective responses, what individuals

can do, and how the arts and humanities have responded to the issue (1.89). The self-described "interdisciplinary" faculty had generally high scores across the board, but this reflected relatively few (17) respondents. On the following pages, Figures 2. – 5. portray the relative teaching emphases of different groups of faculty, from most emphasized to least emphasized.

Table 6. Responses to Q7, Aspects of Climate Change Emphasized in Courses, Sorted by Self-reported Disciplinary Affiliation.

Aspects of climate change emphasized in course(s)	Science and Math Faculty	Social Science faculty	Arts and Humani-ties Faculty	Prof Tech Faculty	Interdis-ciplinary Faculty
a. Science of the phenomenon of recent, anthropogenic climate change.	2.28	1.7	1.71	1.86	2
b. Science of the predicted impacts of climate change/climate disruption	2.26	1.81	1.65	1.86	1.93
c. Ecological and/or carbon footprints of individuals, communities, countries	1.93	1.95	1.97	1.43	1.86
d. Mitigation strategies (controlling/ reducing greenhouse gas emissions, policy initiatives such as carbon-trading, carbon taxes)	1.68	1.83	1.75	1.75	1.43
e. The climate policy process (international, national, tribal, state/provincial, municipal)	1.15	1.57	1.03	1.38	1.21
f. Geo-engineering solutions	1.03	0.64	0.69	1.25	0.54
g. Energy issues and energy alternatives associated with climate change	1.82	1.76	1.63	1.88	1.57
h. Adaptation: ways individuals, organizations, and communities are already acting to increase resilience of natural systems and human communities	1.52	1.73	1.88	1.86	1.64
i. Social justice issues related to climate impacts and policy choices	1.19	2.05	2.23	0.86	1.93
j. The moral dimensions of climate change, including intergenerational equity	1.04	1.57	2.06	0.71	1.62
k. Climate change denial	1.26	1.43	1.21	0.88	1.21
l. Climate change communications and discourse about climate change in the media	1.12	1.52	1.46	0.63	1.31
m. Responses by the business community to climate change	0.76	1.16	1.13	1.14	0.86
n. Examining differing emotional responses to the issue…exploring apathy, despair, hope, and resolve	0.61	1.08	1.68	0.63	1.14
o. Collective responses and social movements associated with climate change	0.85	1.73	2	0.75	1.54
p. What individuals can do and are doing now about climate change	1.71	1.87	2.22	1.29	1.57
q. Responses to climate change coming from the arts and humanities	0.4	0.66	1.91	0.29	1.00

Figure 2. Relative Climate Change Emphases Indicated by All Survey Respondents Teaching Now about Climate Change, from Greatest to Least Emphasis

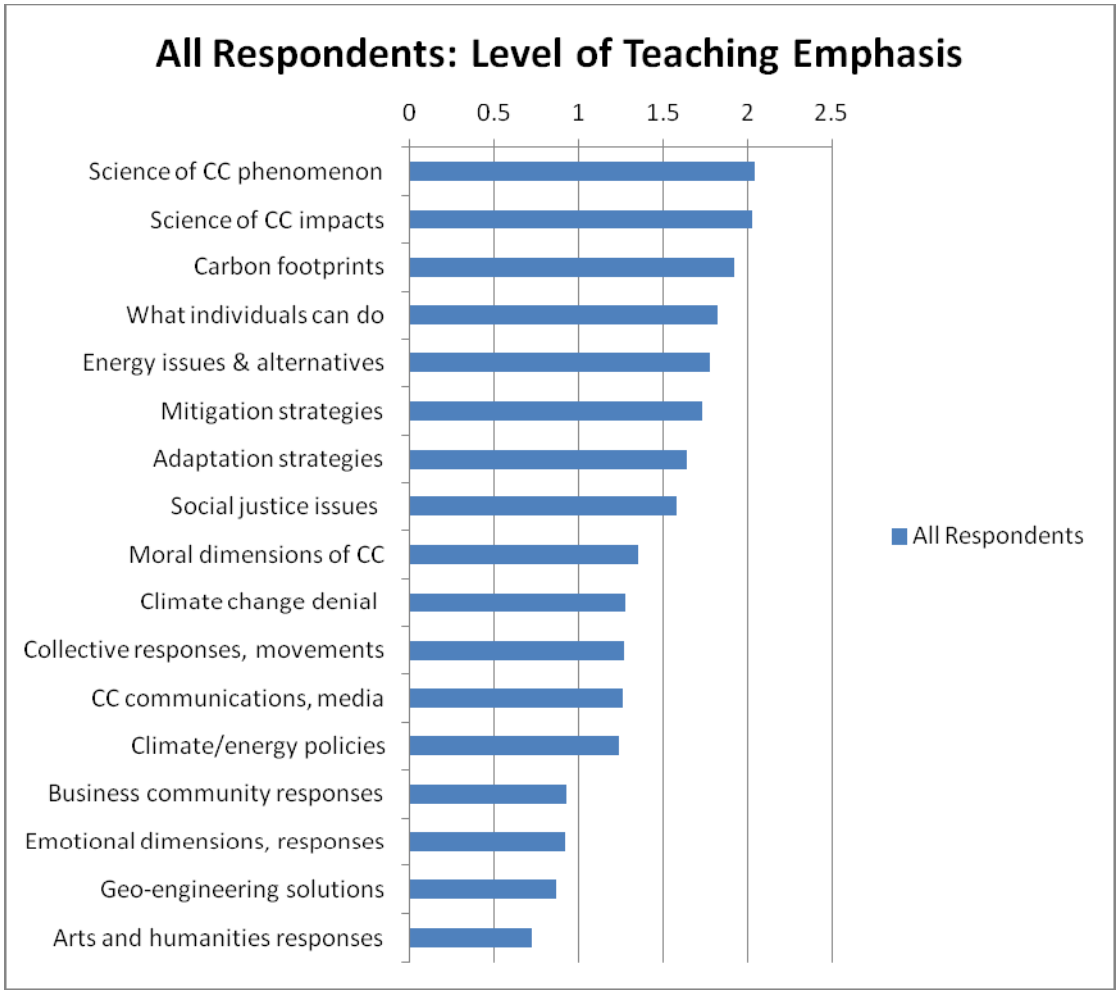


Figure 3. Relative Climate Change Emphases Indicated by Science and Math Faculty Teaching Now about Climate Change, from Greatest to Least Emphasis

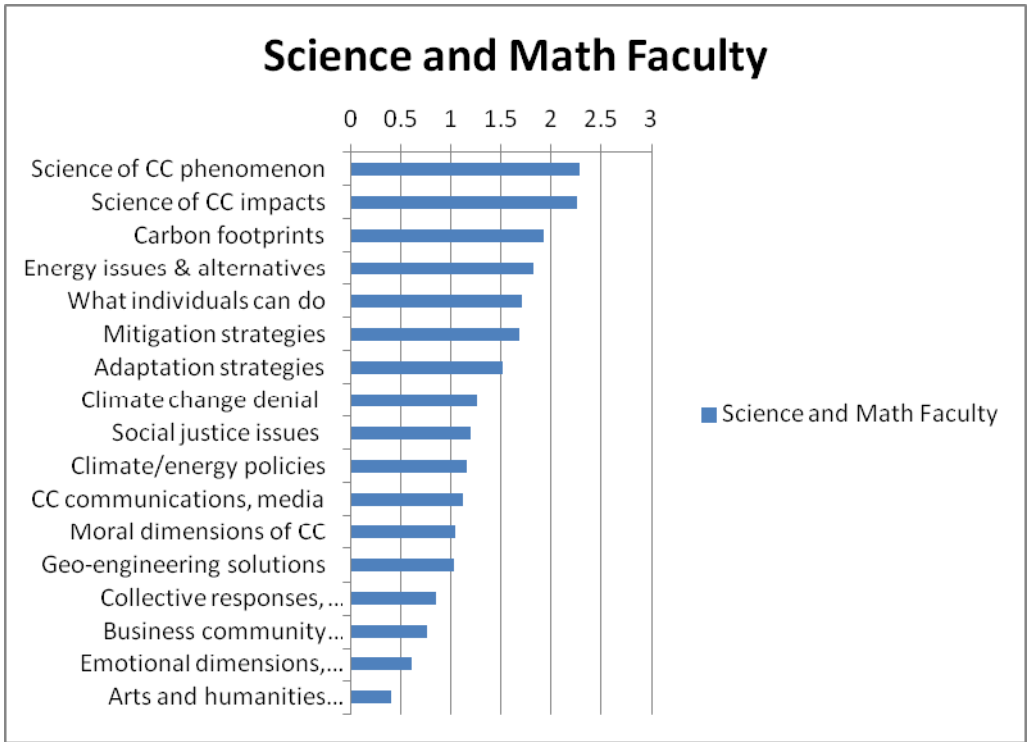


Figure 4. Relative Climate Change Emphases Indicated by Social Science Faculty Teaching Now about Climate Change, from Greatest to Least Emphasis

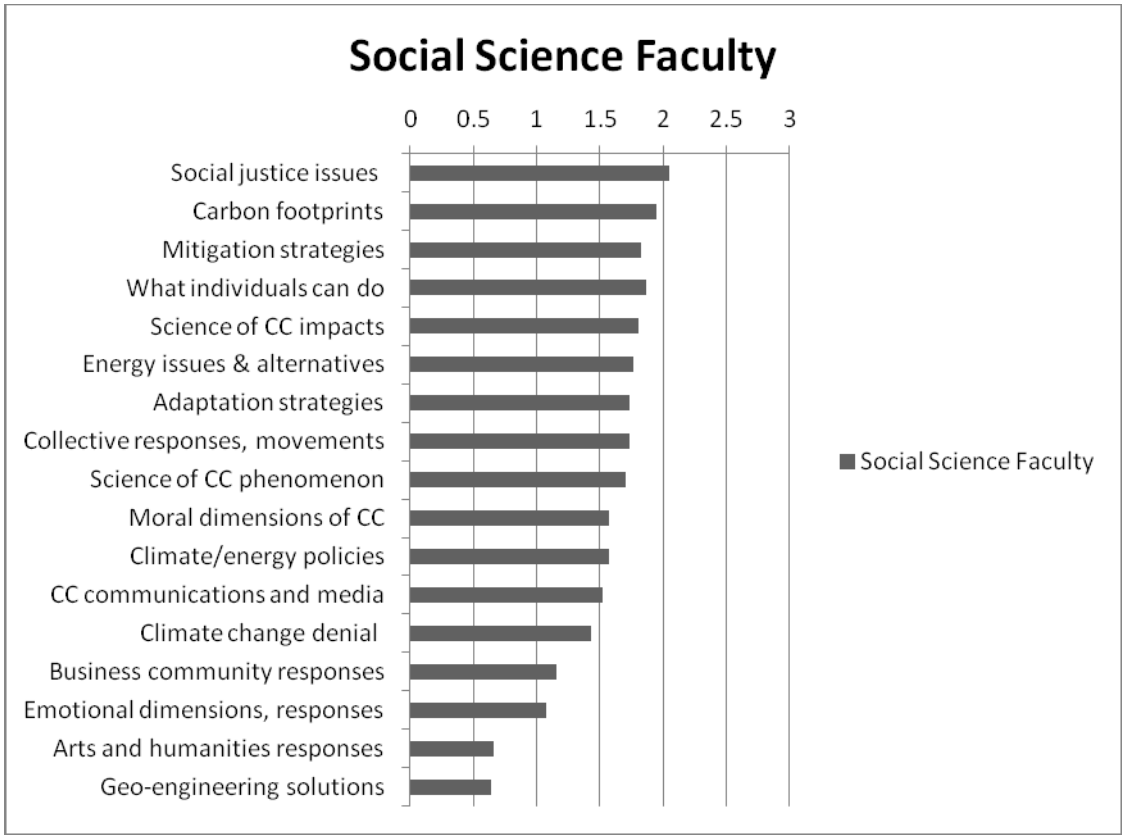


Figure 5. Relative Climate Change Emphases Indicated by Arts and Humanities Faculty Teaching Now about Climate Change, from Greatest to Least Emphasis

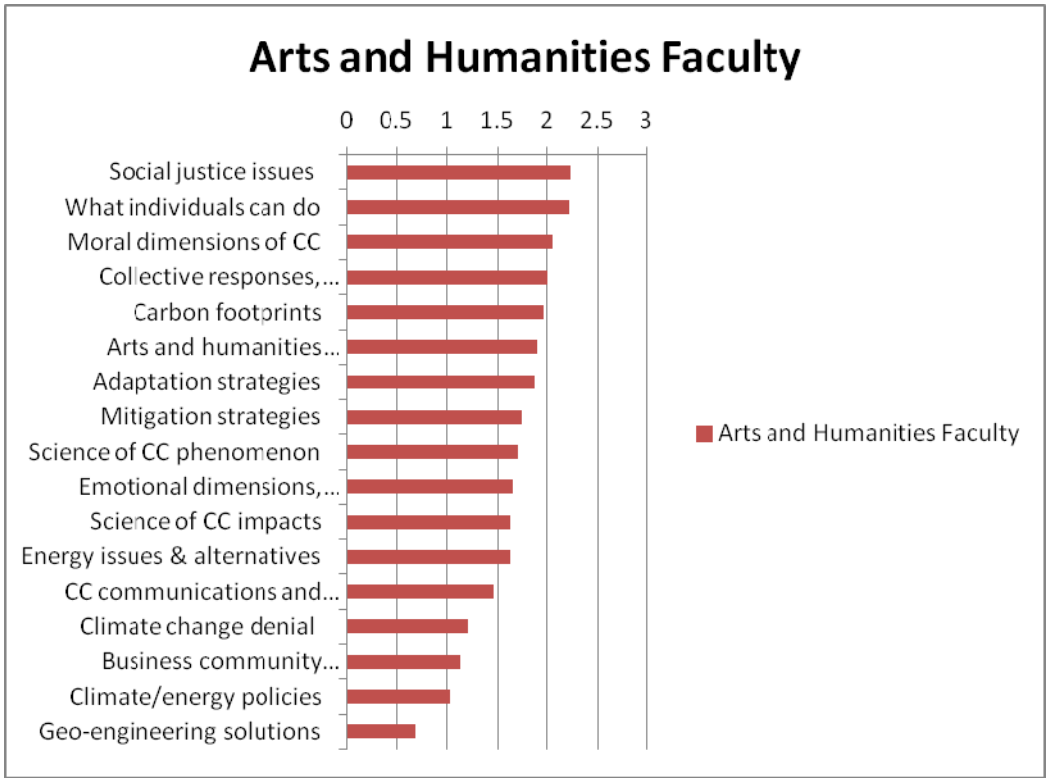


Figure 6. Relative Climate Change Emphases Indicated by Professional/Technical Faculty Teaching Now about Climate Change, from Greatest to Least Emphasis

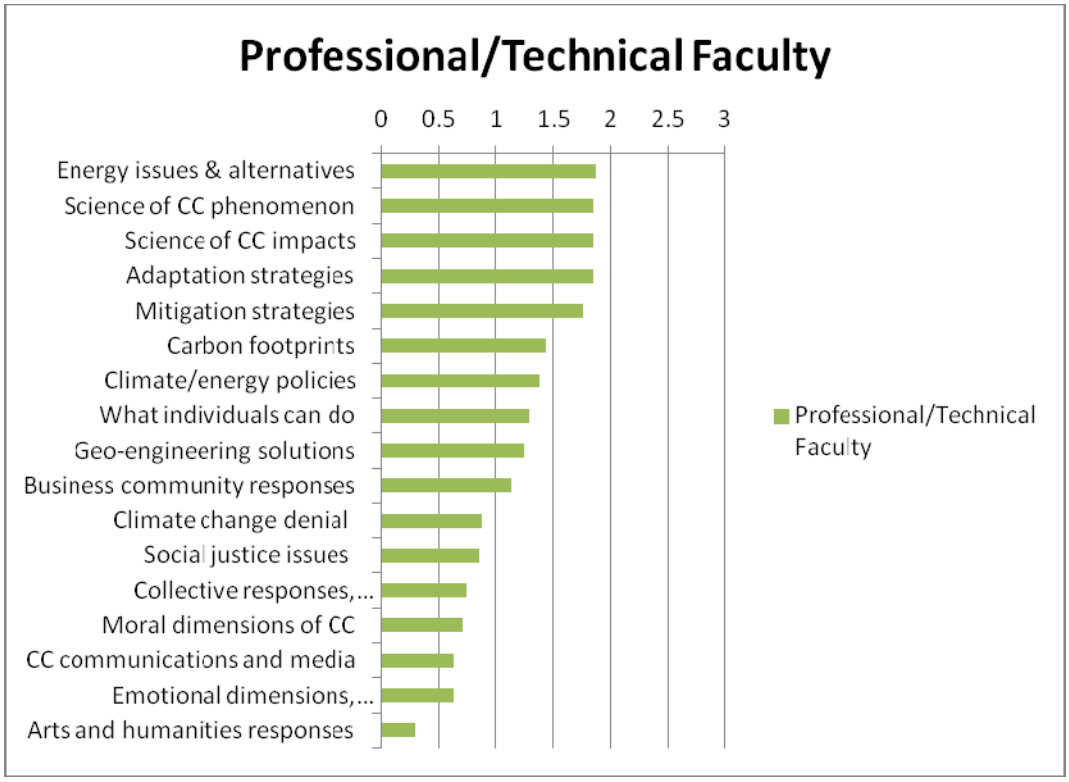


Figure 7. Relative Climate Change Emphases Indicated by Faculty Who Identify Themselves as "Interdisciplinary" Teaching Now about Climate Change, from Greatest to Least Emphasis

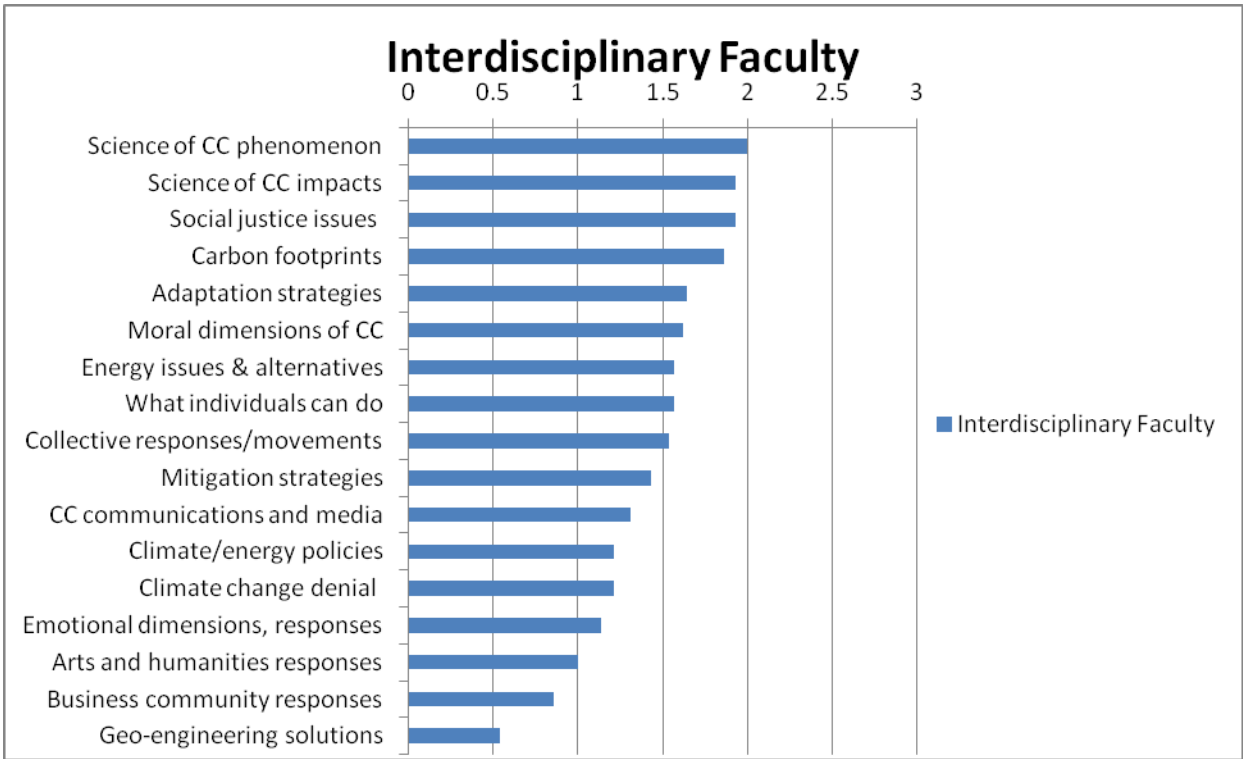
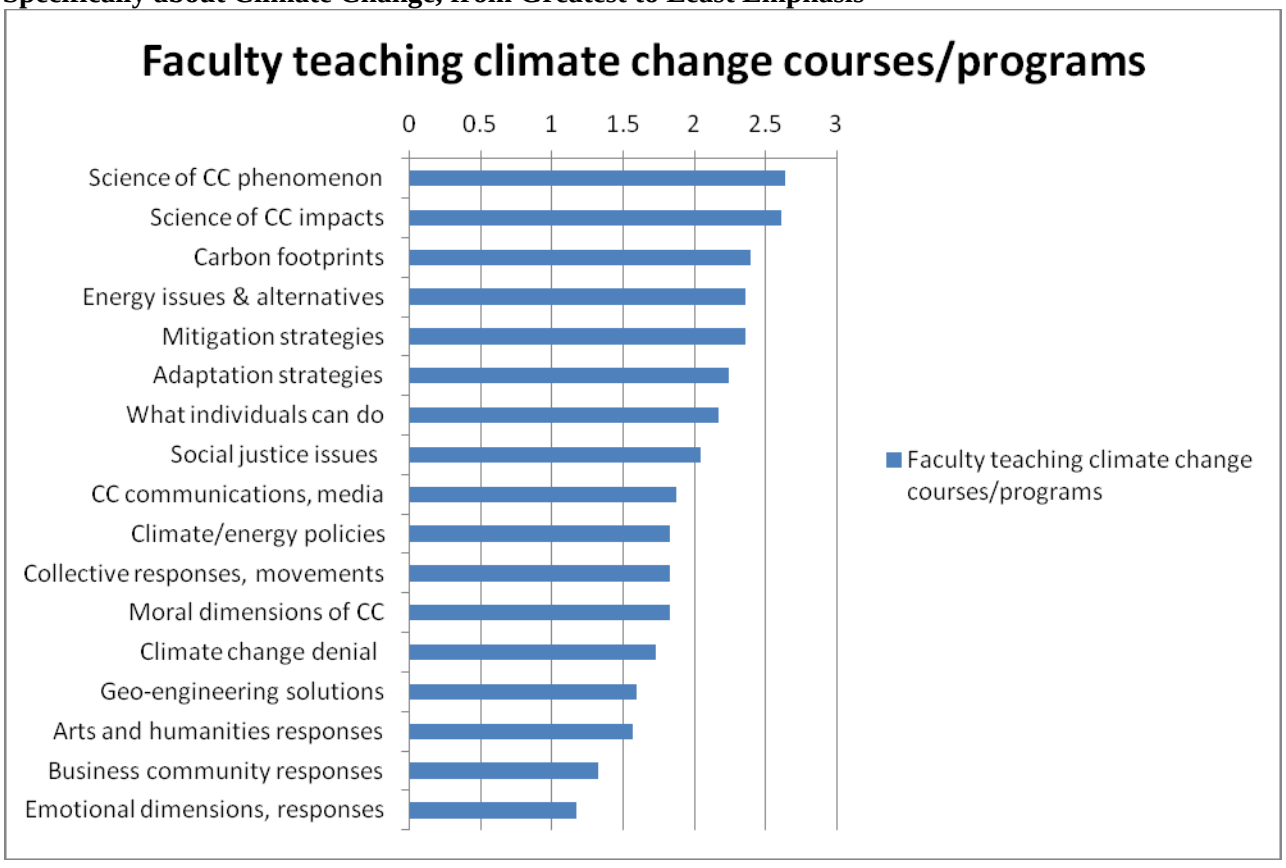


Figure 8. Relative Climate Change Emphases Indicated by Faculty Who Teach Courses Specifically about Climate Change, from Greatest to Least Emphasis



Additional information about teaching emphases: Question 7 provided a text-box for faculty members to tell us more about their climate change teaching. **71** faculty members told us more about what they were teaching; even their short sentences about special topics or emphases revealed a rich array of expertise that could be shared both within and across disciplines. Here are just a few examples:

- What is climate? What is weather? How are the two related? How are measurements related to climate made? How can data related to climate be represented and understood?
- Common misconceptions in climate change reported by the media, scientific models in climate change
- I use climate change and "denialism" as a window into what is and isn't science, the role of peer review, how grants work, the nature and value of scientific consensus in my 201 class.
- Students use official data about earth temperature, carbon emission, etc and describe these data with linear and quadratic models. They then use these models to make predictions and estimations. The topic of climate change provides the background for students to apply their mathematical skills.
- The concept of scientific consensus and public consensus and how they apply to action on climate change.
- The rhetorical arguments used in regards to climate change.
- We use the example of sustainable and organic agriculture in both reducing fossil fuel use, and as potential for mitigation through carbon storage in the soil. A co-instructor is developing political strategies for a local, sustainable farming system that involves the students.
- Environmental justice: most of my classes look at native and First Nations communities that are being affected now more than others - northern villages - erosion and removal due to loss of sea ice and permafrost, pacific nations - sea level rise, southwest - drought. The Idle No More movement in mobilizing native nations. Of course the proposed coal port and all of the connected impacts globally as well as locally. Review mitigation plans - Swinomish Tribe. The nature-culture nexus and connection with nature and place - or lack thereof.

Discussion: While the relative emphases on different climate change topics varies predictably among faculty from different disciplinary areas, it is notable that climate change mitigation (reducing carbon production) and adaptation (planning to cope with climate change's worst effects) did not score very highly. Furthermore, three arenas we think are deeply important—policy initiatives at the local, state, national and international levels; the moral dimensions of climate change; and peoples' emotional responses to this daunting problem—generally scored lower.

Question 8. "Does your climate change teaching have a community-based learning and/or service-learning component? If so, describe it briefly and if you have an ongoing partnership with a community organization or agency, please mention which one(s)."

Findings: Of the **123** faculty from community colleges who are currently teaching about climate change, only **28** (23%) answered the question. **15** faculty members (only12%) said that they require service-learning projects. Of the types of projects mentioned, only **2** individuals mentioned projects directed related to climate change or energy conservation. All the others described service projects involving gardens and food security; watershed or wetlands restoration; or litter clean-up. Four faculty members mentioned that they informally encourage community service. Only **3** respondents described field trips with a climate change component, and only **1** mentioned encouraging community-based research for academic credit.

Of the **145** faculty members from four-year institutions who are currently teaching about climate change, **43** (30%) answered the question. Of these 43, **25** individuals (17%) described internships or service-learning projects that they have sponsored. Very few, just **7** individuals, described projects focused solely on climate or energy alternatives. Most faculty members who require internships or service-projects indicated that students are encouraged to choose their own sites. Just **13** faculty members mentioned field trips or community-based learning projects or speakers; of these, only **5** described specific climate change-related learning.

Discussion: These numbers struck us as low. We are well aware that at community colleges, course schedules and commuting students make field trips and service-learning projects especially challenging, so it is understandable that slightly more community-based learning and service takes place at four-year institutions. Still, the overall amount of community-based learning and service-learning focusing on climate change mitigation or adaptation is strikingly weak. **Is this because faculty members are unaware of local organizations and opportunities? Or because climate change claims too small a segment of their individual courses to warrant a community-based component?**

Question 9: "Are you collaborating on climate change curriculum with others, either at your campus or elsewhere? (team-teaching, linked courses, co-developing curriculum materials). If so, describe briefly."

Findings: 210 (61% of the survey respondents) answered this question, but only **88** (25%) respondents answered affirmatively about any kind of collaboration.

- **59** (66% of the affirmative answers) reported being involved with colleagues in team-taught interdisciplinary courses or learning communities (linked or paired courses, coordinated studies programs).
- **8** (9%) reported that they have participated in *informal* conversations with colleagues within their department or on a sustainability taskforce.
- **7** (8%) reported using a guest speaker in his or her class, either a faculty colleague or someone from the community.
- **4** (4%) respondents mentioned having a formal faculty responsibility for shared curricula
- **3** (3%) respondents mentioned being involved with a national science-reform initiative, including Carleton's InTeGrate project, POGIL (Process Oriented Guided Inquiry Learning, in Chemistry), or a science initiative led by AIHEC (American Indian Higher Education Consortium)
- **3** (3%) respondents mentioned being involved with NSF grants; two of these concern technical energy education and one involves a project with colleagues from other parts of the country doing research on ancient tree rings as a climate change measure.
- **2** (2%) respondents mentioned using material from the Washington Online Resource Center or other professional development resources.
- **2** (2%) respondents from one campus (Whatcom CC) mentioned that sustainability is formally promoted throughout the curriculum.

Several projects involving faculty collaboration were reported:

- **The Evergreen State College** faculty reported that the institution has created a faculty position in "Climate Justice" and will hire for that position in the next academic year (2013-14);
- **University of Washington Bothell** reported that it has created a new undergraduate degree program in Climate Science and Policy;
- **Whatcom Community College** has, since 2010, required a course in sustainability for its AA degree program and reported that it will continue to promote sustainability content across-the-curriculum next academic year to strengthen course offerings.
- **At Western Washington University, Fairhaven College** plans to devote a themed quarter to climate change in Winter Quarter, 2014.

Question 10: "Does your department, division, or institution support efforts to strengthen the teaching of climate change/climate solutions teaching or curriculum development? This could include support of new course/curriculum development, professional development institutes or conferences for faculty. Briefly describe what's under way or being planned."

Findings: 224 (65%) total survey respondents answered this question; only **149** (43%) answered affirmatively about any kind of institutional efforts.

- **78** (52% of the affirmative answers) respondents mentioned that there is formal ongoing support by their institution for curriculum development in general; several mentioned the collaboration that occurs when learning communities are planned and taught.
- **32** (21%) respondents mentioned there was informal support for curriculum development;
- **29** (19%) respondents mentioned the general support of a sustainability taskforce or committee but no specific initiative.
- **6** (4%) respondents mentioned there was formal and/or informal support for community-based /collaborative learning;
- **3** (2%) respondents mentioned support for curriculum development via NSF or other grants.

No respondents mentioned any formal institution-wide climate change curriculum or teaching initiative on their campus. However, here is some notable news:

1. **Seattle University** has recently created a Center for Environmental Justice and Sustainability and has awarded fellowships for research and curriculum development related to these topics.
2. As noted above, at **Western Washington University, Fairhaven College** plans to devote a themed-quarter to climate change in Winter Quarter, 2014.

Discussion: Since 19 of the institutions participating in this survey are signatories/participating campuses in the American College and University Presidents Climate Commitment, we hoped to see more formal ongoing faculty and curriculum development work related to climate change. Perhaps it is happening and just was not reported.

Question 11: "Are you engaging in research/scholarly work on climate change or climate solutions? If so, describe briefly."

Findings: 20 (12%) of the community college faculty completing the survey and **64** (36%) of the faculty in the four year system answered this question affirmatively and described their research, which was either directly or indirectly related to climate change.

- **14** are engaged with measurement and/or analysis of energy use/climate-change impacts, such as ocean acidification's effect on hypoxia (inadequate oxygen in living organisms), the loss of glaciers, climate change modeling, climate change impacts on water supplies.
- **11** described research related to climate/energy policy, climate solutions, and social movements, such as forest and land cover conservation, carbon policy modeling, and the pros and cons of biofuels.
- **6** described their work on the ethical dimensions of climate change.
- **5** are involved in climate change education, involving curriculum development projects. One person is helping to organize a national "physics of sustainable energy" conference to be held at UC Berkeley in 2014. Only one person reported doing research on student attitudes and behaviors related to sustainability.
- **4** individuals described scholarship on communications related to climate change or sustainability.
- **3** individuals described their research on the carbon cycle and carbon emissions.
- **3** individuals described applied work (greenhouse gas emissions measurement; land use consulting; stormwater planning)
- **2** individuals reported researching climate change in earlier geological periods.
- **2** individuals described international research on human ecology and sustainable communities.
- **2** are working on planetary or extra-planetary projects (cloud chemistry and asteroids)

- **2** individuals mentioned informal research simply to stay current.

Question 12: "Would you be interested in participating in an inter-institutional faculty project on how to strengthen curriculum and improve teaching on climate change and climate solutions, with a focus on this region?"

Findings: A cross-tabulation of Q12 by school type (2- or 4-year), shown in **Table 7**, shows that more respondents from 4-year than 2-year schools were ready to make an immediate commitment to participate in an inter-institutional climate change education project. But the combined "Yes" and "Maybe" scores were close to the same for both sectors, **68%** for 2-year, and **72%** for 4-year respondents, indicating a strong majority of the respondents had an interesting in participating. Slightly more respondents from the 2-year schools responded that they were not interested in the project at the moment.

Table 7. Responses to Q12 Regarding Interest in Participating in an Inter-institutional Faculty Project on Strengthening Climate Change Teaching, Cross-tabulated by Sector, and Percent of Respondents

	Yes	Maybe	Yes & Maybe	Probably not now	NA	Total respondents
2-year	26% (42)	42% (68)	68%	19% (30)	13% (21)	161
4-year	33% (57)	39% (68)	72%	17% (29)	11% (19)	173
Overall	30%	41%	71%	18%	12%	334

In addition, we generated a contingency table that allowed the statistical analysis of whether differing responses to Q4 (currently teaching about climate change, or not) impacted future interest in the project. We found no statistical difference between the two groups; there was about the same level of interest for getting involved, whether faculty members were teaching about climate change or not.

Discussion: We think that among these respondents, there is fairly strong interest in an inter-institutional initiative with 71% answering "Yes" or "Maybe" regarding their interest in participating. Our challenge now is to design a project that will be attractive and worthwhile.

Question 13: "What resources would help you to strengthen your climate change teaching? Check any that would be useful."

Findings: Responses to this question were cross-tabulated with Q3 (self-reported academic discipline). Overall, proven teaching modules, climate change impact maps, films and web-based resources, and accessible readings were the most commonly requested resources with more than 50% of the respondents expressing interest in them. Most of the responses to this question came from self-identified science and math faculty. However, 31% or more of the respondents mentioned every category of resources as possibly helpful. Table 8 summarizes these levels of interest.

Table 8. Resources that Faculty Indicate Would Strengthen their Climate Change Teaching, Sorted by Discipline: Numbers of Faculty Checking Each Category

	Science & math	Social Science	Arts & Human	Professional & Technical	Interdis-ciplinary	TOTALS
Number of faculty in each disciplinary grouping	**153**	**94**	**66**	**16**	**17**	**346**
Accessible readings	75	48	36	4	12	175
Films or web based resources	72	56	36	5	9	178
Teaching strategies for handling controversial issues	60	33	26	2	9	130
Proven modules, labs, or classroom activities	109	43	23	4	11	190
Contacts with key experts at local agencies and orgs	63	42	28	5	9	147
CC impact maps for this region	91	46	34	4	10	185
Resources on climate change denial	51	28	22	1	5	107

Responses to Q13 were also cross-tabulated with Q4, whether the respondents were teaching about climate change or not. Table 9 summarizes this data. Higher percentages of faculty currently teaching about climate change indicated they would like to get additional resources, but it is a salient finding that those not teaching now about climate change still expressed some interest in these resources.

Table 9. Resources that Faculty Indicate Would Strengthen their Climate Change Teaching, Sorted by Whether They are Teaching Now about Climate Change

[Highest percentages of interest are highlighted.]

Helpful resources	Faculty currently teaching about climate change	Faculty <u>not</u> currently teaching about climate change	TOTALS
Number of faculty completing the survey	**271**	**75**	**346**
Accessible readings	146 (53%)	33 (44%)	175
Films or web based resources	150 (55%)	28 (37%)	178
Teaching strategies for handling controversial issues	107 (39%)	23 (31%)	130
Proven modules, labs, or classroom activities	160 (59%)	30 (40%)	190
Contacts with key experts at local agencies and orgs	124 (46%)	23 (31%)	147
CC impact maps for this region	159 (59%)	26 (35%)	185
Resources on climate change denial	84 (30%)	23 (31%)	107

Question 13 provided an optional text-box for faculty members to write additional comments about their needs and interests in resources. **74** (21% of the total survey respondents) respondents offered additional information:

- **21** (28% of those who offered comments) indicated that they would benefit from "real applications," such as ecological studies summarizing predicted climate-change impacts in this region, and teaching modules that are discipline-specific.

- **13** (18%) respondents commented that in general, they would benefit from more administrative and teaching support, such as funding to attend conferences or time to engage in collaborative curriculum planning.
- **11** (15%) respondents commented that they would benefit from networking within a faculty learning community.
- **8** (11%) respondents wanted advice about how to incorporate climate change into current curriculum.
- **5** (7%) respondents reinforced how beneficial it would be to have climate change impact maps and access to data in different regions of the world, including this locale.
- **4** (4%) respondents would benefit from opportunities to discuss the human complexities of climate change, including cultural responses in different parts of the world and issues of behavior change.
- **2** (3%) respondents would benefit from learning about ways to incorporate contemplative practices into their climate change teaching.
- **2** (3%) respondents commented specifically on the debates over whether climate change is caused by humans and would like to work on helping students understand both sides of this argument.

Question 14: "If you have additional comments or suggestions as we develop this project, please tell us."

Findings: 51 individuals (14% of total survey respondents) offered additional suggestions.
19 (37% of those who made additional suggestions) respondents offered suggestions for the types of things the project should do such as providing contacts for local experts, working with local tribes, advising on ways to make the scientific material more digestible for students, and planning workshops where teachers could share resources.
- **7** (14%) respondents provided suggestions for resources or themselves as resources to help other teachers.
- **6** (12%) respondents described projects and interests in which they are already engaging on their own campuses

Here are some representative quotes:

- "I'd teach about CC more often if I had community contacts for speakers, in-program internships, etc."
- "A workshop in which those of us teaching climate-change related material could share teaching resources would be great."
- "Bring in those who can work on EcoPsychology and Deep Democracy, the Arts, and other areas of personal growth and transformation along with the environmental challenges we face…There are many people out there doing this work. We need to find ways to connect, engage, energize, and support our individual and collective work."
- "I'd be interested in finding articles, essays, and other materials suitable for inclusion in a first-year English course…I'd like to make climate change one of them [a theme] for my own composition course. I know others in my department feel the same."

Question 15: Respondents who indicated they would like to be informed about the project as it develops.

Findings: A total of 229 respondents to the survey left a contact email address; this was about two-thirds of the "cleaned up" total of respondents. The major groups of respondents by academic field did not differ much across categories; only the professional/technical group showed less interest in continuing to be involved in the project. Table 10 summarizes this data.

Table 10. Survey Respondents Who Asked to Be Kept Informed about the Project, Sorted by Discipline

	Number of total respondents	Q15 responses "keep me informed"	Percent
Science/math	153	106	69%
Social Science	94	60	64%
Arts & Humanities	66	44	67%
Professional/Technical	16	7	44%
Interdisciplinary	17	12	71%
Totals	**346**	**229**	**66%**

Less Supportive Survey Participants

Findings: While the survey respondents were generally quite interested in and supportive of the proposed project, there were five respondents whose responses indicated a lack of support for climate change education in general and this project in particular. They are directly quoted here:

From a STEM faculty member: "Climate is always changing but not as a result of man! Look at the real data. We are in a normal cycle! Waste of state funds."

From a computer science faculty member: "Saint Martin's University is not a proper place to embark on climate curricula. This would be better done by more research institutions like Univ. of Washington and Washington State U. Saint Martin's should stretch already outstretched budget on this. [Probably the word "not" was omitted from the last sentence.]

From an engineering faculty member: "I take offense at term 'climate change denial.' Differing views on a complex issue is not denial. Balanced resources which acknowledge the issue's complexity and acknowledge that alternative solutions, including doing nothing, exist. A more balanced approach than implied by this survey is essential.'

From a welding instructor: We take care of the gasses generated by our welding. This should be in the science curriculum! Sorry to be negative but you make things cost way more, use up a lot of unproductive time and burn tax dolars (sic) that could be better spent helping people who really need it.

From a physics faculty member: "I would suggest others read The Sceptical (sic) Environmentalist by Bjorn Lomborg and his other book Cool It! Dr. Lomborg believes in climate change but has real-world solutions rather than doomsday scenarios."

One individual, a faculty member at a community college, bemoaned the fact that, "Unfortunately, our sole tenured Earth Sciences instructor is a climate change denier."

But on the other hand, there were many, many expressions of gratitude and strong interest and commitment to the imperative of climate change teaching and learning. One respondent to the survey commented, "[Doing this survey] …was a useful exercise. I framed it as considering my one last year of teaching. I also appreciate the fact that asking about faculty engagement with climate change is also a *de facto* call for faculty to bring climate change into their sphere of consciousness, if it isn't already. I heartily approve of this strategy."

Summary of Findings

1. Climate change and associated issues are being taught at a wide array of classes at the 30 campuses represented by faculty members who completed our survey. Predictably this topic is taught the most extensively in science or applied science classes at both the introductory and advanced level. Climate change is a highly complex scientific phenomenon that has yet to be

taught in depth at the secondary school level; therefore, in many classes, faculty members have to start from scratch, introducing the science of the phenomenon of climate change to students. That the science of the phenomenon and its possible ramifications/impacts is taught most heavily in science classes makes sense. However, it is heartening that climate change is also being taken up by faculty members in social sciences and, to a small extent, in the arts and humanities as well.

2. Faculty members in different academic fields (especially science and non-science faculty) emphasize different topics in their climate-change teaching. The respondents from the 2-year schools emphasized what individuals can do along with energy issues more than the 4-year respondents, while the 4-year respondents gave more attention to social justice, collective responses, climate policy processes, and responses from the arts and humanities. Some dimensions of climate change appear not to be taught very much at all or are only taught in depth by a few faculty members; these topics are climate/energy policy; the moral and inter-generational dimensions of climate change; climate change communications and discourse about climate change in the media; as well as collective responses and social movements related to climate change.

3. Tellingly, human's emotional responses to climate change appear to get very little coverage by any faculty except those in arts and humanities. This bears further investigation, in that throughout our work with Curriculum for the Bioregion, large numbers of faculty have told us anecdotally that one of the most challenging aspects of teaching about climate change is students' emotional responses to a very frightening future and how challenging it is to handle these emotions in class.

4. It is understandable that unless faculty members are teaching an entire course devoted to climate change, they cannot cover every dimension of the subject when they take it up as a topic for a week or two within a larger course. Climate change is a complex topic to teach and perhaps the only emphasis many faculty members can give it is simply "climate change, the phenomenon and its role in the discipline or course I am teaching." The real risk here though is that students may be left with the perception—*or rather, the misperception*—that little is being done about climate change, or little *can* be done to mitigate its worst effects.

5. Only a very small number of those who teach about climate change carry out community-based learning or service-learning. Those who do involve their students in such activities do not, for the most part, focus them on climate change related sites or projects—perhaps reflecting the fact that they are unaware of field sites or service-learning opportunities in their respective communities. This presents a problem—and a huge opportunity.

6. Only a small number of faculty development or curriculum development initiatives related to climate change are occurring on these campuses, even though 19 out of the 30 campuses are signatories to the American College and University Presidents Climate Commitment, which requires campuses to carry out broad-scale climate change education and sustainability-across-the-curriculum initiatives.[2] These campuses include:

   - **Seattle University**, which has recently created a Center for Environmental Justice and Sustainability and has awarded fellowships for faculty and student research and action-projects related to environmental justice and sustainability;

   - **The Evergreen State College** whose faculty reported that the institution has created a new faculty position in "Climate Justice" and will hire for that position in the next academic year (2013-14); [Evergreen has also held two TedX events on climate change, although, oddly, none of the 58 respondents from Evergreen thought to report this as an institutional endeavor related to climate change];

[2] Signatories to the ACUPCC promise to undertake "actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for **all students**." *[emphasis added]*

- **University of Washington Bothell,** where faculty members reported that UWB has created a new undergraduate B.S. degree program in Climate Science and Policy;
- **Western Washington University's Fairhaven College,** where plans are under way to devote a themed-quarter to climate change in Winter Quarter 2014.
- **Whatcom Community College** which has, since 2010, required a course in sustainability as part of its AA degree requirements. It is the only college in the state of Washington to have implemented a curriculum requirement for all students in the liberal arts degree track to take a course that features sustainability content and concepts. Whatcom also reported that next year, as an institution, it will continue to strengthen course offerings by promoting sustainability content across-the-curriculum.

7. One quarter of the faculty respondents are doing some kind of research or scholarly work on climate change and they are pursuing a wide variety of topics. Furthermore, 20% of the faculty respondents are bringing special interests and expertise to their climate change teaching. Any climate change education project that we mount should create effective vehicles for these faculty members to serve as resource experts to others.
8. Among this group of interested faculty who completed the survey, there is substantial interest in participating in an inter-institutional effort to strengthen climate-change education: over 70% of the respondents said "Yes," or "Maybe" in answer to the question gauging interest in participating in a faculty and curriculum development project. The data reveals widespread interest both across campuses and disciplines. We are now poised to move ahead.