

# **Needs Assessment of Alaska Teachers**

By Andrea V. Anderson, Ph.D. and David Plude



## Executive Summary

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By Andrea V. Anderson, Ph.D. and David Plude

COSEE Alaska Evaluator

Event Date: December 2009 – January 2010

COSEE Alaska conducted a survey of teachers to discover their needs for resources and training in order to teach about climate change and marine environments<sup>1</sup> in Alaska. The survey was designed to find out what teachers were doing now and what they considered to be their highest needs for additional resources and training.

Survey responses (N=151) showed a fairly even distribution among the elementary, middle and high school teaching assignments, with a much smaller percentage of respondents indicating a professional role in curriculum or instructional support. The majority of respondents self-identified as ethnically white; 15% of the rural teachers identified as American Indian or Alaska Native,

#### Findings about how topics are addressed by schools and districts

The data suggest that key concepts (of climate change and marine education) are sprinkled throughout the curriculum (K-12), but are not integrated into coherent instructional approaches for either marine education or climate change in Alaska's schools. More than 90% of respondents indicated that both marine education and climate change are addressed in some way in their school districts.

#### Findings about how teacher respondents approach instruction of topics

Across the grades and different settings, teachers engage students in science-related *discussions* about marine environments and/or climate change. High school teachers are somewhat more likely to involve students in doing science activities. More rural teachers (43%) address marine education through multi-day units.

#### Findings about what teachers use:

In general surveyed Alaskan teachers said they use standards-based science lessons, engage students in discussions about both climate change and marine environment, and to a modest degree use hands on activities to support student learning. Teachers use classroom visits by scientists and elders to support instruction, and rely on the Internet for content and access to information. There are interesting, but modest, differences by grade level and by urban-rural settings.

The use of guest speakers differs between elementary schools and either the middle or high schools, with elementary teachers more likely to bring scientists into the classroom. Urban teachers are more likely to bring in scientist as guest speakers than are rural teachers. There is remarkable similarity between rural and urban teachers and across grade levels in terms of other instructional supports used. Teachers reported having considerable access to the Internet and getting web-based content about current research. This was true regardless of urban or rural setting.

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<sup>1</sup> Note for the survey and this report the phrase marine environments was used to encompass marine biology, environmental science and/or oceanography.

**Teachers give reasons why topics are not taught**

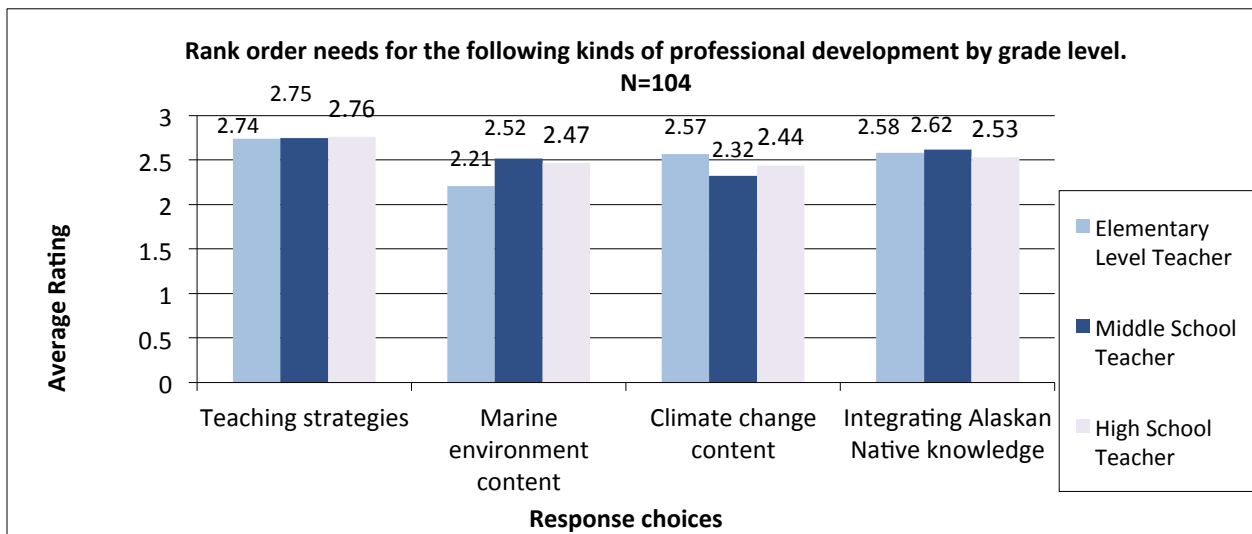
The primary reason for not teaching about either marine education or climate change is that “the topic is not in the curriculum.” Other differences, based on setting, reveal that urban teachers feel there is not enough time to teach about climate change, while rural teachers say it is a lack of resources.

**Teachers prioritize needs for teaching about either marine environments or climate change**

The data show that teachers reported their highest instructional-materials needs as Alaska specific lessons aligned with standards, issues-oriented curricular units, and media. In terms of teaching support, the highest need was for field trips led by scientists (highest ranked by both urban and rural teachers). The highest priority for online resource needs (listed by all grade levels, and across settings), is having virtual field trips with scientists in the field or in the lab.

Rank ordering of needs

Overall, teachers said they needed teaching strategies about climate change and marine education as highest priority, followed by how to integrate Alaska Native knowledge. The graph below shows differences by grade level. Difference by setting showed a slightly greater interest in Alaskan Native knowledge support among those in rural settings.



**Recommendations**

1. COSEE Alaska might consider expanding the ocean science fairs as a strategy for integration of cultural knowledge with the ocean science
2. COSEE Alaska might consider expanding the professional development workshops (e.g., the Bering Sea Workshop) as a way to increase content and connections with scientists
3. COSEE Alaska might consider expanding the virtual field trips being planned for future

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## **Introduction**

COSEE Alaska conducted a survey of teachers to discover their needs for resources and training in order to teach about climate change and marine environments<sup>2</sup> in Alaska. The survey was designed to find out what teachers were doing now and what they considered to be their highest needs for additional resources and training.

The survey was sponsored by the Alaska Center for Ocean Science Education Excellence (COSEE) and the International Arctic Research Center (IARC) at the University of Alaska Fairbanks (UAF) with grant support from the National Science Foundation.

COSEE Alaska, as one of twelve Centers of Ocean Science Education Excellence in the nation, is seeking to create structures, programs, and interactive learning opportunities for scientists to engage with the public about the ocean and climate change. The project, funded by the National Science Foundation, has these specific goals:

- Increase collaboration and interaction among ocean scientists, educators, students, and coastal communities in Alaska and the nation with an emphasis on ocean climate change.
- Provide tools and services to help ocean scientists effectively participate in education and outreach with a focus on ocean climate change and ocean literacy.
- Enhance teacher capabilities for incorporating ocean climate change information and “place-based” knowledge into existing curricula.
- Increase access to and participation in ocean sciences by underrepresented and underserved populations.
- Increase and broaden communication about ocean science and traditional knowledge of ocean climate change to audiences in Alaska and the nation, including the COSEE network.

## **Evaluation Methodology**

The needs assessment online survey invitation was emailed to over 500 teachers and 164 surveys were returned<sup>3</sup>. The survey asked respondents to:

1. Provide professional role and ethnicity data
2. Identify how the teaching of marine environment/education and climate change are addressed in the school or district
3. Identify teaching approaches the individual uses for both topics (e.g., marine environment/education and climate change)
4. Identify types of guest speakers respondents brought into the classroom for either topic
5. Identify the types of instructional materials used for either topic
6. Identify the types of teaching supports used for teaching either topic
7. Identify the online materials and resources accessible by teachers or used for teaching either topic
8. Identify reasons the topics are not being taught

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<sup>2</sup> Note for the survey and this report the phrase marine environments was used to encompass marine biology, environmental science and/or oceanography.

<sup>3</sup> The actual distribution process for this survey was handled outside the domain of the evaluator. The response count of 164 individuals accounts for less than 2% of all Alaska teachers. Confidence level for these findings is at  $\pm 7.5$  points.

9. Identify the top three needs for instructional materials, for teaching supports, and for online materials or resources for either topic
10. Rank-order needs among the following: a) needs for teaching strategies for either topic, b) marine environment content knowledge, c) climate change content knowledge, or d) integrating Alaska Native knowledge within the topics
11. Identify best approaches for gaining additional information and if respondents wanted to join Alaska SEANET

The survey had been piloted at the Alaska’s Math and Science teachers’ conference, and based on the results was revised to better capture the desired information.

This report contextualizes findings by giving all respondents’ data and then parsing the data to understand 1) differences in responses by teachers at grade level; and 2) differences among teachers based on urban or rural assignments, with respect to the current instructional approaches, materials and supports currently in use, and what the perceived needs are.

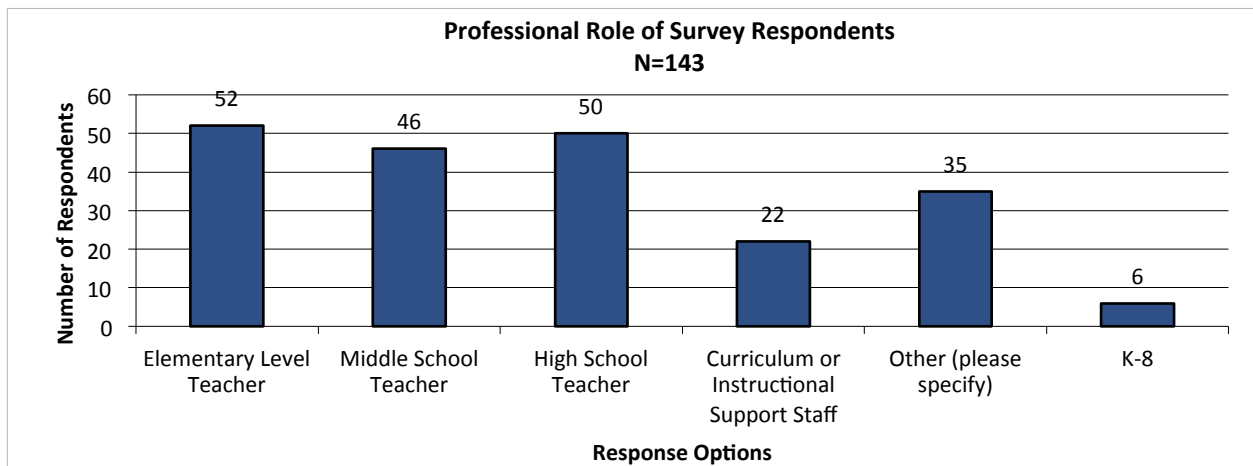
The results are given below, followed by a discussion of findings and recommendations.

## Results

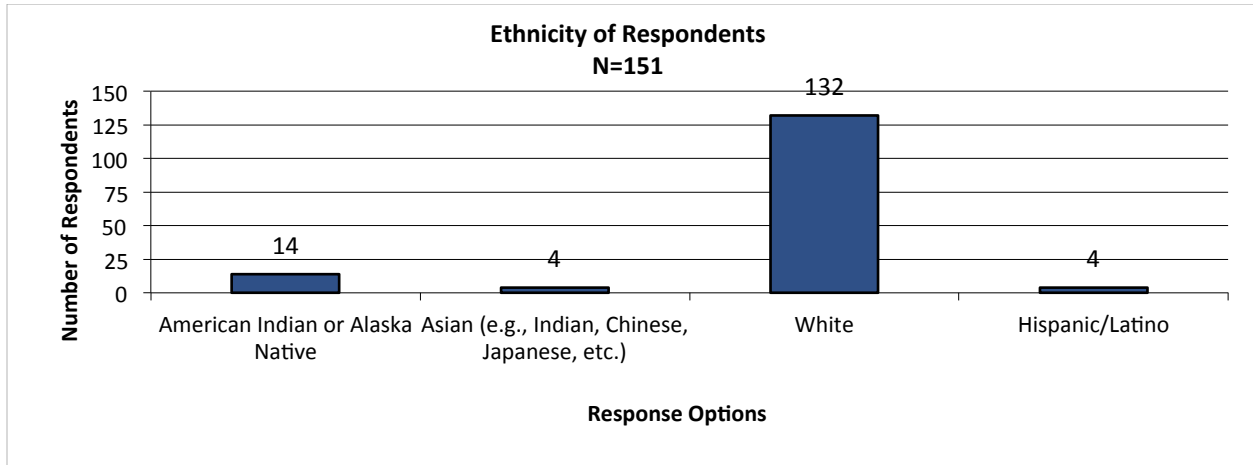
### Demographic information about survey respondents

We asked teachers responding to the Needs Assessment Survey to provide information about their professional role (e.g., the grade level they teach or professional role as curriculum or instructional support staff) and their ethnicity. Respondents were permitted to mark multiple categories.

Survey responses showed a fairly even distribution among the elementary, middle and high school teaching assignments, with a much smaller percentage of respondents indicating a professional role in curriculum or instructional support. In addition, because respondents were able to mark multiple categories, we were able to further refine the analysis to reveal those who identified as K-8 or as middle-high school combined. Three individuals held curriculum positions in addition to a teaching role. Of those who identified “other” as a category, most did not list a teaching position, but rather indicated such diverse roles as informal educator, preschool teacher, university faculty member, librarian, or environmental educator.



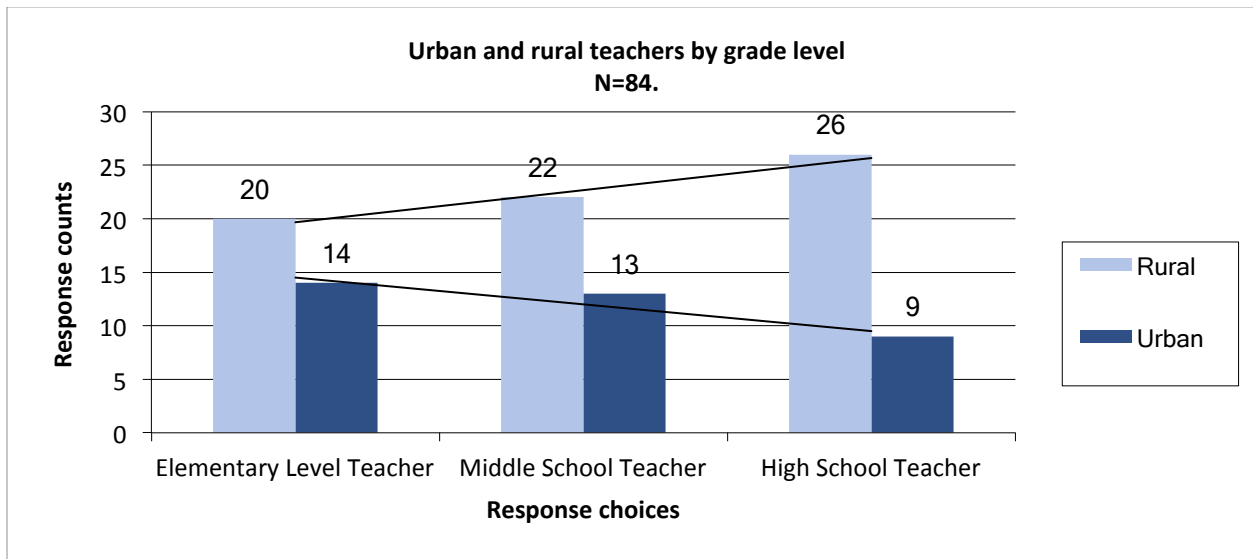
Of the 151 responding participants, the majority self-identified as ethnically white (88%). Four individuals marked more than one ethnicity category. No individuals identified as either Black/African American or Native Hawaiian/other Pacific Islander.



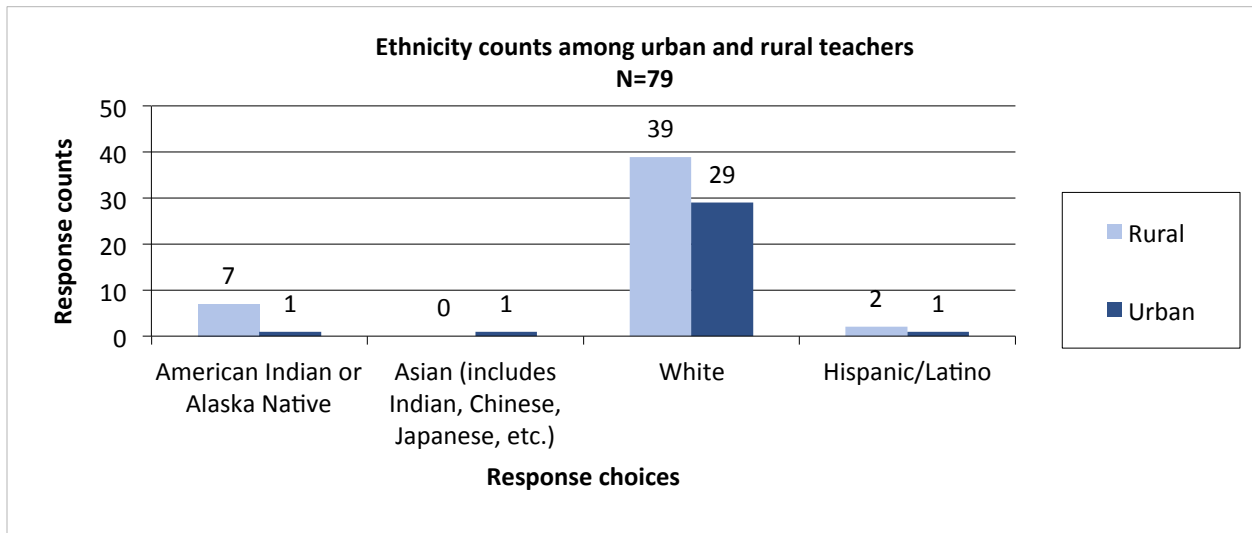
### Exploring the demographic differences between rural and urban teachers

As a post hoc addition to the survey COSEE Alaska identified 109 individuals who worked in urban or rural settings. For each of the following categories of the report, we will present findings of the whole and then break out the differences among the rural and urban teachers.

Of the number we could identify as being from either rural or urban settings, 84 were identified as teachers; 34 were urban and 50 were rural. Response trend lines show an increasing response rate by rural teachers with grade level; the reverse is true for urban teachers.



There is more ethnic diversity among rural teachers than among urban teachers. Proportionally, 15% of the rural teachers identified as American Indian or Alaska Native, while 91% of urban teachers say they are white, compared with 83% of rural teachers.



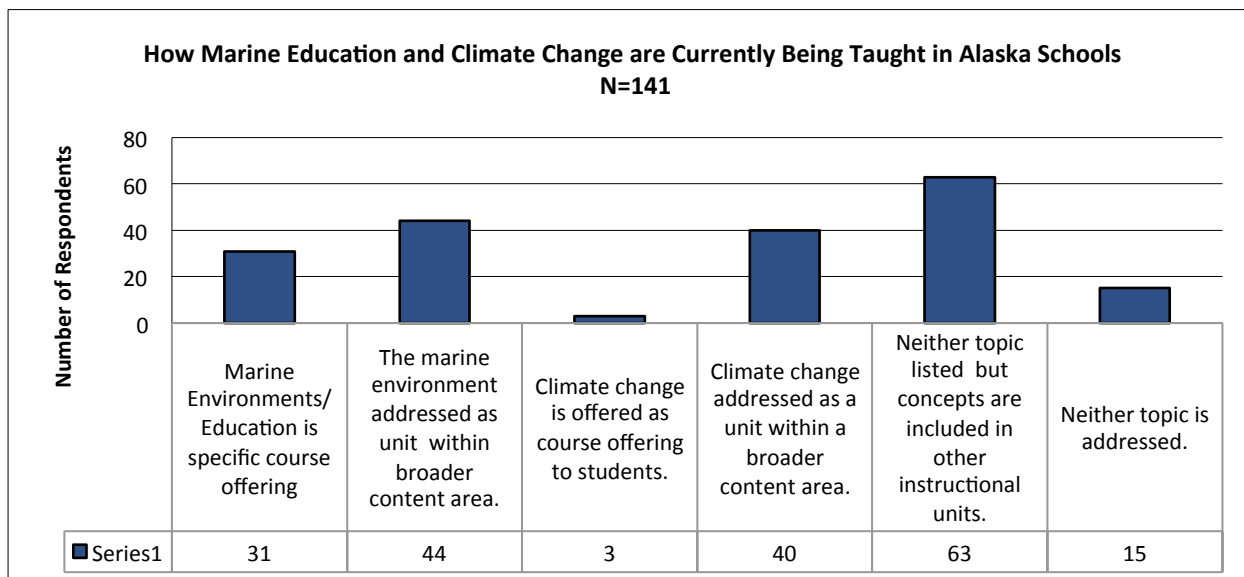
### Findings about how topics are addressed by schools and districts

Respondents were asked to identify how marine environment/education and/or climate change are currently addressed in their school districts’ curriculum. Teachers were allowed to mark all categories as appropriate, since some schools might teach both topics in different ways. These data are reflective of the responding sample, and may only be suggestive of what exists among the broader population.

The data suggest that key concepts are sprinkled throughout the curriculum (K-12), but are not integrated into coherent instructional approaches for either marine education or climate change in Alaska’s schools. Overall, nearly half the respondents (47%) indicated that key concepts are addressed in other instructional units, but only a few schools offer coherent marine education or climate change units of instruction (31% and 28%, respectively).

One in ten of the respondents indicated a specific course in marine education is available for students. Only one school offers a course about climate change. Just 10% of the schools teach neither marine education nor climate change,





A cross-tabulation of how grade level teachers and curriculum/instruction specialists is charted below and illustrates how the different grade levels address the topics.

- Marine education is addressed as a unit by one third of the elementary and middle schools; fewer high schools (e.g., 27%) include it as a unit of instruction
- Climate change is addressed as a unit by nearly half the high schools (44%); fewer elementary or middle schools include it as a unit
- The schools that offer specific courses in either climate change or marine education are modest in number.

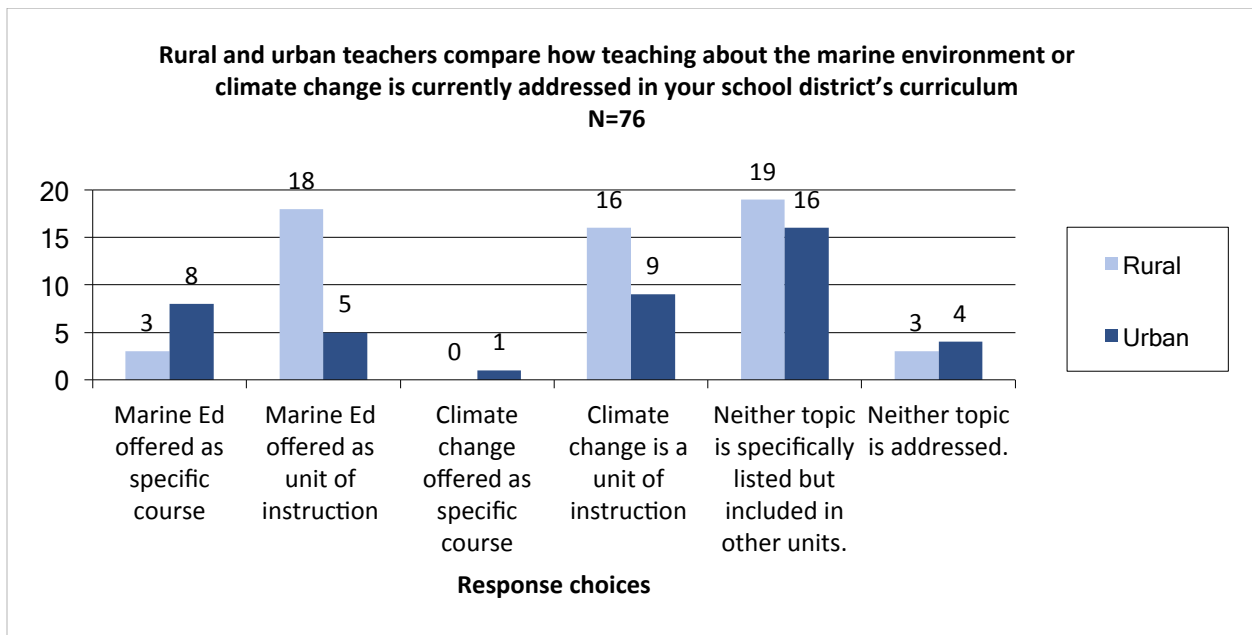
**Cross Tabulation of How Teaching of Marine Education and Climate Change Takes Place by Professional Role**  
N=127

	Elementary N=42	Middle School N=45	High School N=48	Support Staff N=19	Total Response Counts N=127
Marine Environments/Education is offered as a specific course offering to students.	2.4% (1)	15.6% (7)	29.2% (14)	26.3% (5)	19.7% (25)
The marine environment is specifically addressed as a unit of instruction within a broader content.	<b>38.1%</b> <b>(16)</b>	33.3% (15)	27.1% (13)	26.3% (5)	30.7% (39)
Climate change is offered as a specific course offering to students.	0.0% (0)	2.2% (1)	2.1% (1)	5.3% (1)	1.6% (2)
Climate change is specifically addressed as a unit of instruction within a broader content area.	19.0% (8)	37.8% (17)	<b>45.8%</b> <b>(22)</b>	15.8% (3)	28.3% (36)
Neither topic is specifically listed as an instructional unit or course for students, but key concepts related to the ocean, coast, marine environment, or climate change are included in other instructional units.	<b>38.1%</b> <b>(16)</b>	<b>51.1%</b> <b>(23)</b>	41.7% (20)	<b>47.4%</b> <b>(9)</b>	<b>44.1%</b> <b>(56)</b>
Neither topic is addressed.	21.4% (9)	6.7% (3)	6.3% (3)	15.8% (3)	11.8% (15)

How marine environment and climate change are addressed in the district(s)

For the following questions, we analyzed the rural-urban differences among teachers only—curriculum specialists and “other” were eliminated from this analysis. We found some modest differences between urban and rural. A total of 30 urban teachers and 46 rural teachers responded to this question.

- More than 90% of respondents indicated that both marine education and climate change are addressed in some way in their school districts.
- Rural teachers often said topics were addressed as a unit of instruction within a broader content area (39% claimed marine education units, with 35% claiming climate change units)
- Urban teachers said marine education was offered as a course (27%) but only 1 teacher said there was a course about climate change.
- Less than 10% of respondents said neither topic was addressed in the district



There was an opportunity for teachers to respond to an “other” category when asked how their school district’s curriculum. The educators gave the following illuminating responses, which I have collapsed into common themes, beginning with the most extensive grouping:

Marine education or climate change are embedded as units within other instructional topics.

*units on IPY and climate change;*

*I teach a unit on Weather, Climate, and Climate Change*

*basics of greenhouse mechanism (e.g. vibrational spectroscopy)*

*Teach a two-week unit within social studies*

*I teach about environ. issues, but specifically climate change*

*I teach a topographic map reading unit that incorporates possible sea-level change.*

*I teach the long term and short term effects of climate change on separate and spend a total of 4 days teaching the concept. Then throughout the rest of the school year will integrate and reference climate change as local topics and news article apply. Basically, I teach the concept, then show application throughout the remained of the school year.*

*Taught 3 week unit addressing climate change two years ago as part of my two year curriculum cycle. Plan on expanding it to 3-4 weeks this year.*

*This is a new unit. However, I am collecting activities and researching lessons. The 3 basic areas of The sun's solar heat and how earth converts it, rotation of earth for seasonal climate change, and lastly how the water cycle promotes changes in the weather.*

*teach an environmental science class unit on global warming.*

*I cover climate change in my climates unit in my meteorology course.*

*Oceanography- ocean acidification mini-unit and project, El Nino Marine bio- coral bleaching*

Online instruction or resources are used for marine education or climate change

*participate in efield trips and other web-based activities about climate change*

*I have engaged in online exchanges with other classes in other parts of the world (Nairobi, Mumbai, US Southwest, to discuss local observations and implications*

*Normally as an online moodle discussion with lots of reading.*

As part of another identified curriculum

*Alaska Seabirds & Climate Change*

*AK Seas & Rivers unit as well as unit written for another class.*

*Facing our Future Climate Change Curriculum*

*GLOBE activities*

Taught within teacher professional development programs

*I train student teachers to teach the concept*

*Sponsored teacher workshop on Cryosphere w/ links to life systems and climate change*

Included as part of informal science programming

*I support teachers who are doing these activities. For example a kindergarten class is taking a survey of how many light bulbs are in their homes as a springboard for discussion about energy conservation*

*This is done through informal education at KBRR*

Other comments of interest

*We live on the sea we are a fishing/hunting village this is real for us.*

*we have a permafrost monitoring site, but it's hard for kindergartners*

*Depends on the science class, and I teach a different one each year. My checks are from the last 3 years.*

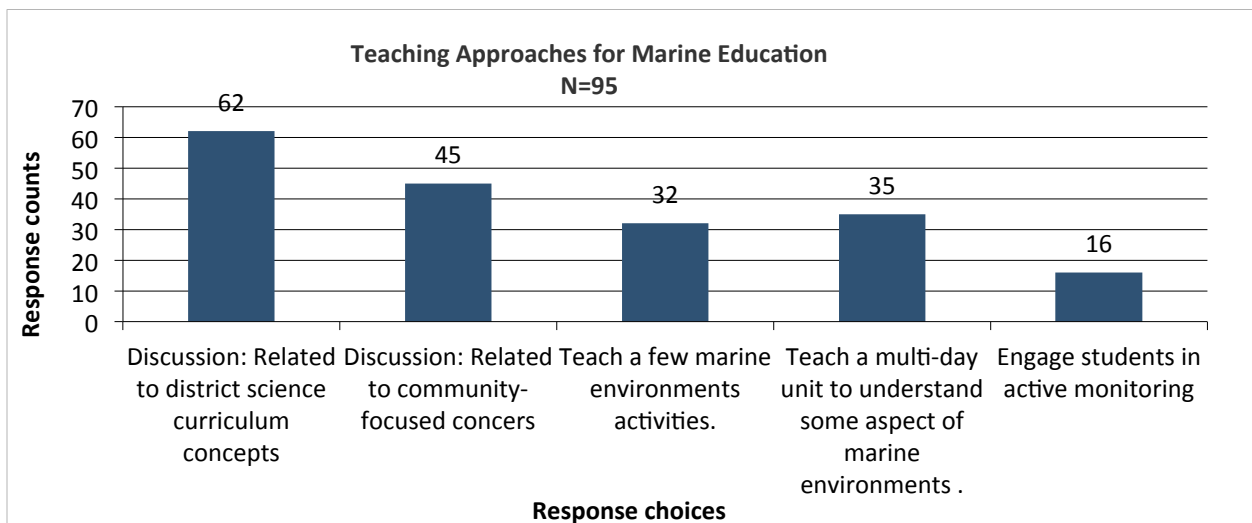
*I want to be careful when teaching about climate change so that this topic doesn't make 4th graders unduly upset. Yes, they can make a difference in small ways, but when we talk about global warming, a lot of students get unnecessarily frightened.*

## Findings about how teacher respondents approach instruction of topics

### Marine Environment/Education

Respondents were asked to mark all the ways they taught about the marine environment in their classrooms; 125 individuals answered this question. A first level of analysis shows that respondents reported discussion of marine education topics—either in context of the district science curriculum or as it relates to community-focused observations, impacts or concerns—most frequently. Other, more active approaches are used less frequently.

The chart below illustrates the frequency of response for each option (except for the response option of “I do not teach marine education,” which was marked by 30 survey respondents)



Further analysis of this data provides additional insight. The cross-tabulated chart breaks out the number and percentage of educators responding to each response option. (Does not include the “I do not teach marine education” option making the total number of responses 95.) For clarity, in the chart below, read down for each column. Each cell within the column indicates the number who answered the question and what percentage it represents of the total who answered title question.

<b>How do you teach about marine environments in the classroom? Check all that apply.</b>						
<b>N=95</b>						
<b>Answer options</b>	Discuss marine environments related to science	Discuss marine environments related to community	Teach a few marine environments activities.	Teach a multi-day unit to for understanding	Engage students in actively monitoring scientific indicators	Response Totals
<b>The number of individuals who answered the question</b>	<b>73</b>	<b>58</b>	<b>38</b>	<b>42</b>	<b>21</b>	<b>95</b>
Discuss marine environments as it relates to science concepts in the district curriculum.	<b>100.0%</b> (73)	81.0% (47)	65.8% (25)	76.2% (32)	85.7% (18)	76.8% (73)
Discuss marine environments as it relates to current community-focused observations, impacts and concerns.	64.4% (47)	<b>100.0%</b> (58)	68.4% (26)	71.4% (30)	85.7% (18)	61.1% (58)
Teach a few marine environments activities.	34.2% (25)	44.8% (26)	<b>100.0%</b> (38)	47.6% (20)	28.6% (6)	40.0% (38)
Teach a multi-day unit to understand some aspect of marine environments	43.8% (32)	51.7% (30)	52.6% (20)	<b>100.0%</b> (42)	76.2% (16)	44.2% (42)
Engage students in actively monitoring scientific indicators related to marine environments	24.7% (18)	31.0% (18)	15.8% (6)	38.1% (16)	<b>100.0%</b> (21)	22.1% (21)

Because teachers were able to mark multiple categories we did some further filtering analysis to better understand what approaches teachers employ with marine environment education. It should be noted these numbers do not precisely correspond to the previous results about how topics are taught in the district—likely because we asked individuals to comment on their own instruction, rather than what is taught throughout the district.

Some of the specific, interesting findings are distilled from the data and illuminate the place of discussion within multi-day teaching units and the relative conflation of science and community-focused discussions. These findings also reveal that talking about the topic is more pervasive than engaging students in the doing of related science.

1. More than half the respondents (83 people out of 125 total number of respondents to this question) marked either or both of the discussion-focused items. Within that group we found some (but not perfect) overlap between the science-focused and the community-focused marine education discussions. Specifically, we found that
  - Of those who hold science-related discussions, two-thirds also discuss community-focused observations or concerns
  - Of those who address the community-focused marine education concerns, more than 80% also discuss the science concepts.
2. About one third of the respondents (42 individuals out of 125) taught multi-day units. Among these 42 teachers we found

- nearly three-quarters engaged students in discussions about the science concepts and/or the community-concerns (76% and 71% respectively)
  - about half (48%) taught activities in marine education, with about one-third (38%) engaging students in monitoring scientific indicators.
3. Among the 38 individuals who taught a “few marine environments activities”
- 26 held discussions about community-focused concerns.
  - 25 held discussions related to science concepts in the district curriculum
  - only 19 discussed both science concepts and community-focused concerns

Twenty-five individuals contributed comments, which either elaborated on their markings, or explained their reason for no markings. Both types of comments further illuminate how marine environment education is taking place within the Alaska education system.

#### Elaboration about how marine environment education is or is not taking place in the classrooms

*participate in tide-pooling and other field trips to study specific aspects of the local marine environment. participate in efieldtrips and other web-based activities to learn about marine environments.*

*Intensive multi-day Field Trips to inter tidal areas in Kachemak Bay through Center for Alaskan Coastal Studies and a two week trip to work with scientists from U of Miami to study coastal environments in the Bahamas/coral reefs.*

*I teach 7-12 grade science, Earth Science, Geology, Physical Science, Biology, Chemistry, and Health climate change is covered in each science however the depth and scope of the unit varies. Marine Environments is covered in the same way there is a two week Marine Biology unit in the Biology class.*

*I teach a marine biology and oceanography class.*

*A specific unit I created for all sixth year students participating in the Kenai Fjords Marine Science cruise field trip*

*Discuss and teach marine environments, including hands on field trips to the beach.*

*Teach all 6th grade students to build and use SeaPerch ROV's.*

*4th grade is salmoniods (sic) in the classroom with ADF&G, an ongoing unit throughout 4th grade*

*I have a group of students who are studying water chemistry in a sea-water aquarium.*

*I have done a variety of units and activities related to this-clam collecting and PSP monitoring, intertidal communities, diversity of life looking primarily at marine systems etc., wild edibles of the intertidal, cold water safety and survival, plankton cycles, etc.*

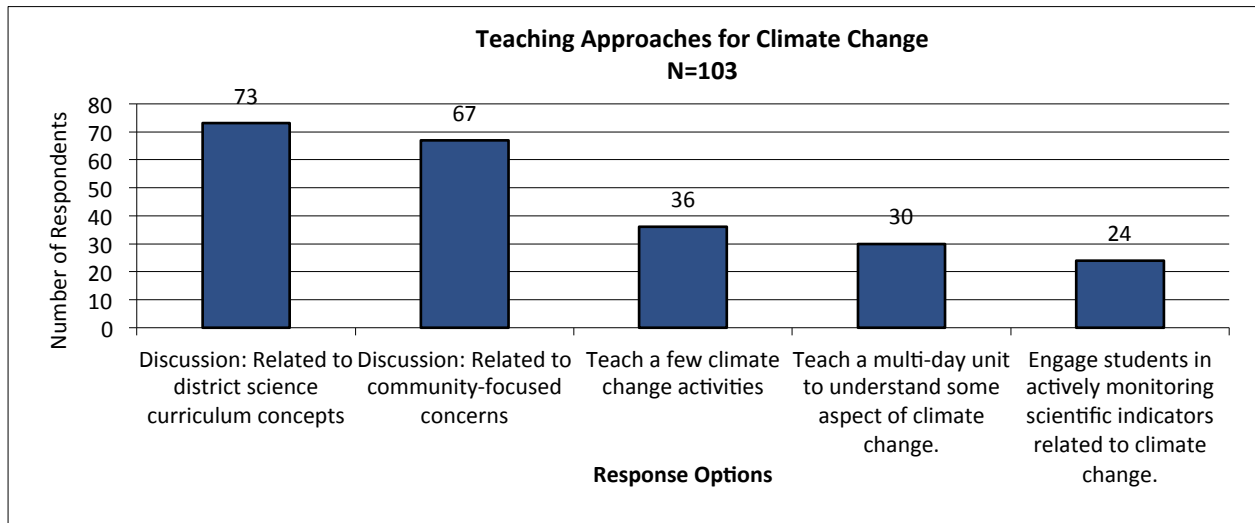
*I lack the time and equipment to do in depth instruction. Like most "rural" science teachers I have 6 preps limited equipment and supplies and must vary my level of instruction to fit the individual student. I try to cover the matter in as much depth as possible because it is extremely relevant to my students.*

*I believe there are other grade levels that study this area at length. I will try to supplement with activities that my grade level has promoted.*

Climate Change Instruction

The table and charts below are similar to the table and chart depicting how Alaska teachers are approaching their instruction about marine education. The notable differences are that more teachers engage in discussion as it relates to community-focused observations, issues or concerns and fewer teachers have multi-day units addressing the topic.

As with the question about marine education, the respondents were able to mark multiple answers. There were 23 respondents who marked “I do not teach about climate change.” That data has been eliminated from the graph below as well as the following cross tabulations chart, which helps show the ways teachers are approaching climate change instruction in the classroom. Further analysis of how teachers are combing instructional approaches follows the two graphics.



<b>How do you teach about climate change in the classroom? Check all that apply.</b>						
	Discuss climate change related to science curriculum	Discuss climate change related to community-focused concerns	Teach a few climate change activities	Teach a multi-day unit for understanding	Engage students in actively monitoring scientific indicators	Response Totals
<b>The number of individuals who answered the question</b>	<b>73</b>	<b>67</b>	<b>36</b>	<b>30</b>	<b>24</b>	<b>103</b>
Discuss climate change as it relates to science concepts in the district curriculum.	<b>100.0% (73)</b>	76.1% (51)	66.7% (24)	70.0% (21)	79.2% (19)	<b>70.9% (73)</b>
Discuss climate change as it relates to current community-focused observations, impacts and concerns	69.9% (51)	<b>100.0% (67)</b>	69.4% (25)	70.0% (21)	79.2% (19)	65.0% (67)
Teach a few climate change activities	32.9% (24)	37.3% (25)	<b>100.0% (36)</b>	30.0% (9)	37.5% (9)	35.0% (36)
Teach a multi-day unit to understand some aspect of climate change. {Explain below}	28.8% (21)	31.3% (21)	25.0% (9)	<b>100.0% (30)</b>	50.0% (12)	29.1% (30)
Engage students in actively monitoring scientific indicators related to climate change.	26.0% (19)	28.4% (19)	25.0% (9)	40.0% (12)	<b>100.0% (24)</b>	23.3% (24)

As discussion about the topic appears to be the primary mode of instruction about climate change, further analysis shows that

1. Nearly three-fourths (70%) of the teachers who discuss the topic in relation to science curriculum also discuss the topic with regard to community-focused concerns.
2. Fewer than one-third of the teachers embed the discussions in multi-day units or have students monitor scientific indicators related to climate change,
3. Just a third of the teachers engage students with activities (about climate change)

#### Grade Level Differences In Teaching Approaches For Both Topics

By direct count among the survey respondents, more teachers are engaged teaching climate change than were teaching about marine environments. The numbers here constitute a relatively small sample when considered against the bigger educator population of Alaska, and should be viewed with caution.

How different grade level teachers approach instruction is of interest. We filtered the data for each grade level and for each topic to produce these graphics—one for marine education and one for climate change. We did not break out K-8 or middle-high schoolteachers, as there were so few identified in this survey.

Across the grades, teachers engage students in science-related discussions about marine environments. High school teachers are much more likely to involve students in doing science activities, and slightly



more likely to teach a multiday unit. Interestingly, elementary and middle school teachers were more likely than high school teachers to engage students in monitoring.

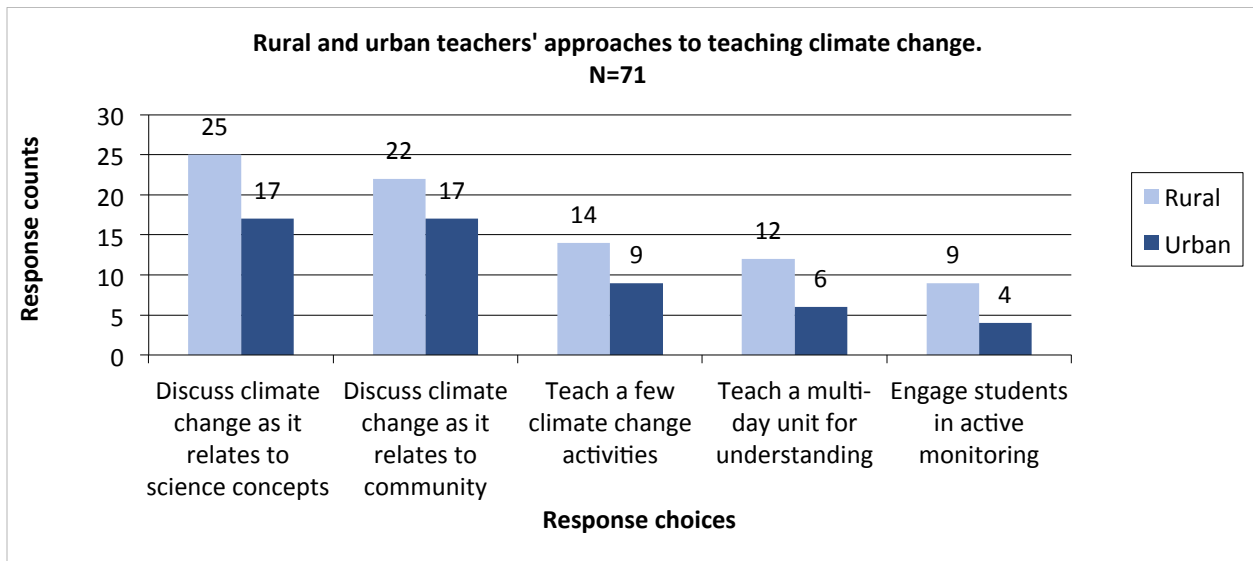
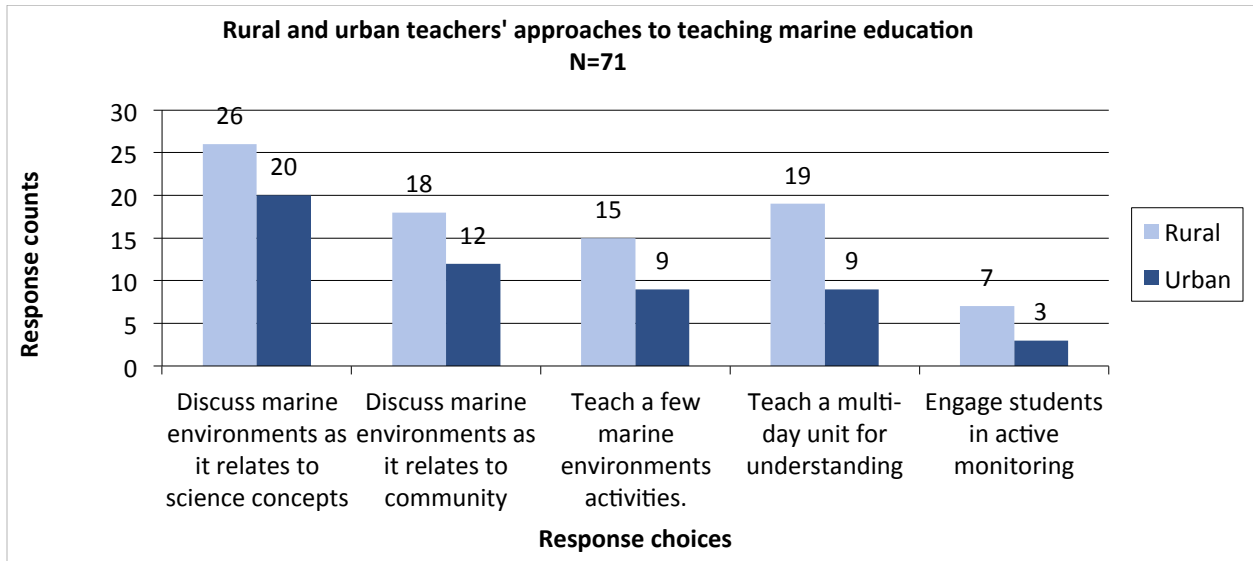
For climate change, the breakout of approaches by grade level reveals that discussion is still important, but proportionally not as prevalent as with marine education. There appears to be a stronger overlap between science related and community-focused discussions for this topic. Yet as with marine education, there is a paucity of teachers engaging students in hands-on activities related to the science.

<b>How do you teach about marine environments in the classroom? Check all that apply.</b>			
<b>Answer Options</b>	<b>Elementary Teachers N=32</b>	<b>Middle School Teachers N=32</b>	<b>High School Teachers N=33</b>
Discussion: related to science concepts in curriculum.	78.1%	81.3%	81.8%
Discussion; Related to community-focused concerns.	59.4%	50.0%	63.6%
Teach a few marine environments activities.	34.4%	28.1%	54.5%
Teach a multi-day unit to understand some aspect of marine environments	40.6%	43.8%	45.5%
Engage students in actively monitoring scientific indicators related to marine environments	21.9%	21.9%	15.2%

<b>How do you teach about climate change in the classroom? Check all that apply.</b>			
<b>Answer Options</b>	<b>Elementary Teachers N=38</b>	<b>Middle School Teachers N=38</b>	<b>High School Teachers N=40</b>
Discussion: related to science concepts in curriculum.	68.4%	68.4%	75.0%
Discussion; Related to community-focused concerns.	60.5%	60.5%	70.0%
Teach a few climate change activities.	36.8%	36.8%	37.5%
Teach a multi-day unit to understand some aspect of climate change	34.2%	34.2%	42.5%
Engage students in actively monitoring scientific indicators related to climate change	26.3%	26.3%	22.5%

#### Approaches teachers use to teach about marine environment and climate change

The patterns of how teachers approach teaching either marine education or climate change is remarkably similar for both rural and urban teachers. The majority of teachers, both urban and rural, engage their students in discussions about the topics. On the other hand very few teachers engage their students in active monitoring. One notable difference is that more rural teachers (43%) address marine education through multi-day units – the 2<sup>nd</sup> highest approach. It is likely tied to the high number of rural teachers saying they offer marine education as a unit of instruction in the rural schools (see chart above).



### Findings about what teachers use: 1) instructional materials, 2) teaching supports and 3) online resources

In general surveyed Alaskan teachers said they use standards-based science lessons, engage students in discussions about both climate change and marine environment, and to a modest degree use hands on activities to support student learning. Teachers use classroom visits by scientists and elders to support instruction, and rely on the Internet for content and access to information. This section provides specific information about the differences between grade levels and between rural and urban settings.

#### Instructional materials used

The charts below show the types of instructional materials used for teaching about marine environment and/or climate change, with the total response rate and broken out by grade level. The number counts refer to the number of individuals who responded to the questions. Overall, the majority of survey respondents said they depend on Alaska specific lessons aligned with standards.

The grade level breakout of the data shows that nearly two-thirds of elementary and middle school teachers, (78% and 66% respectively) depend on Alaska specific, standards-based lessons, while only slightly more than half the high school teachers do (53%). The responding middle school and high school teachers were more likely to use issues-oriented lessons (59% and 58% respectively) than are elementary teachers (36%). Also middle and high school teachers said they were more likely to use Alaska climate change information and data (55% and 52% respectively) than elementary teachers (32%).

Of particular note to COSEE Alaska, the use of “how to” support for organizing ocean science fairs is dramatically low among the respondents, and in particular with either the middle or high schools that are the target for COSEE’s science fair efforts.

<b>Have you used these types of instructional materials for teaching about marine environments or climate change?</b>				
<b>Answer Options</b>	Elementary N=31	Middle School N=29	High School N=36	<b>TOTAL Response Count N=99</b>
Alaska specific lessons aligned with standards	<b>67.7%</b>	<b>65.5%</b>	52.8%	60
Issues-oriented units (e.g., climate change and salmon or climate change and coastal erosion	35.5%	58.6%	<b>58.3%</b>	53
“How to” help with organizing an ocean science fair	6.5%	0.0%	2.8%	4
Descriptions and stories about climate change and its impacts from Alaska Native perspectives	35.5%	31.0%	27.8%	31
Instructions for the collection and use of data by students	22.6%	44.8%	33.3%	39
Resources to engage the community in student research	16.1%	17.2%	11.1%	18
Alaska climate change information and data	32.3%	55.2%	52.8%	46
Local climate change information and data	32.3%	44.8%	38.9%	41

In comparing the differences between urban or rural teachers, the only notable observation is that urban teachers claim to use the Alaska climate change information equally with their use of Alaska specific lessons.

Guest speakers invited to classrooms

The use of guest speakers, as revealed in the table below, is different between elementary schools and either the middle or high schools. More than half the elementary teachers report bringing scientists into the classroom, while more than half the teachers in middle school or high school report they are unable to bring guest speakers in the classroom. Within the array of guest speakers that do come to classrooms, few policy makers are involved at any grade level. In comparing urban and rural teachers, the urban teachers are more likely to bring in scientist as guest speakers than are rural teachers (52% to 36% respectively). However, a subsequent question about teaching supports asked if scientists made classroom visits. There are some apparent anomalies in the data that are difficult to explain—specifically in reconciling scientists as “guests in the classroom” and “classroom visits by scientists.” This discussion is noted in the next section.

<b>When you teach about either climate change or the marine environment, do you bring any of these types of guest speakers into your classroom?</b>				
	Elementary N=36	Middle School N=39	High School N=35	<b>TOTAL Response Count N=48</b>
Scientists as guest speakers	<b>52.8%</b>	29.7%	31.4%	48
Village elders or other local experts	30.6%	29.7%	20.0%	32
Natural resource managers	25.0%	27.0%	28.6%	30
Policy makers	2.8%	5.4%	8.6%	7
Have been unable to bring guest speakers into the classroom.	30.6%	<b>45.9%</b>	<b>57.1%</b>	48

Other types of teaching support used

Teachers rely on other instructional supports to teach about marine environments and/or climate change. The table below shows how these supports are used at each of the grade levels. There is remarkable similarity between rural and urban teachers, except for two problems noted in the following paragraphs.

For the first problem, in comparing the two tables, the counts for *Scientists as Guest* is different than counts listed as *Classroom visits by Scientists*, especially for the middle and high school teachers. By direct count the difference for the scientists is only 2 in the elementary schools, but differs by 8 for middle school and 3 for high school. Moreover, when comparing the rural and urban responses, nearly two-thirds of the rural teachers (62%) say they have had classroom visits by a scientist.

While the counts are not hugely different, and may simply reflect “noise” in the system, it may also be a reflection of differences in the “who” and “how many” responded to each question. Or other possible explanations may be:

- the scientists coming into the elementary classrooms are parents of the students and by the time students enter into middle school or high school fewer parents are “invited” to share their skills or perspectives.
- the scientists are coming as a support for teaching and not specifically as a “guest speaker,” especially in the rural settings

- there may be greater access to scientists in an urban setting and therefore more urban schools benefit from having scientists as “guest speakers”

The difficulty is in extrapolating from sample to full population. These counts and data difficulties mean that generalization becomes more difficult.

Which of these types of teaching support have you used to teach about marine environments or climate change?				
Answer Options	Elementary N=36	Middle School N=33	High School N=31	Response Count N=101
Classroom visit by a scientist	61.1%	57.6%	48.4%	60
Interaction with a scientist during a professional development course	52.8%	45.5%	48.4%	51
Field trip led by a scientist	52.8%	36.4%	41.9%	53
Opportunity to participate in a research project with a scientist	16.7%	18.2%	29.0%	28
Opportunity for students to participate in a research project with a scientist	22.2%	21.2%	32.3%	30
Classroom visit by an elder or local expert	41.7%	48.5%	51.6%	47
Interaction with an elder or local expert during a professional development course	13.9%	36.4%	32.3%	26

There is a similar result when considering *Elders as Guest* versus *Classroom visit by Elders*. By direct count there is a difference of 3 for the elementary responses, 5 for middle school, and 9 for high school. In analysis, it seems that some scientists are being involved in the schools, as are some elders. For purposes of this report, what will be more useful is discerning what teachers say they need and want. Do they want more elders or scientists to visit?

Online technologies and other resources

From the survey we also found that teachers reported having considerable access to the Internet and web-based content about current research. This was true regardless of urban or rural setting. The online access to read scientist blogs or hear podcasts was greatest among urban teachers (80%) compared with rural teachers (48%). Surveyed teachers also noted they access web content about Alaska Native knowledge.

<b>Do you have access to these technologies or have you used these types of resources?</b>				
<b>Answer Options</b>	<b>Elementary N=37</b>	<b>Middle School N= 37</b>	<b>High School N=43</b>	<b>Total Response Count N=123</b>
Access to web content about current research	86.5%	86.5%	90.7%	110
Access to online scientist blogs and/or podcasts	54.1%	45.9%	60.5%	74
Communication with a specific scientist	37.8%	13.5%	32.6%	50
Weekly or monthly web-based Ask-a-Scientist opportunity	10.8%	8.1%	11.6%	19
Access to web content about Alaska Native knowledge	43.2%	40.5%	39.5%	51
Communication with a specific elder or local expert	32.4%	27.0%	32.6%	41
Audio conferences	27.0%	32.4%	25.6%	43
Video conferences	21.6%	29.7%	25.6%	37
Interactive webcast/webinar distance learning	37.8%	29.7%	18.6%	40
Virtual field trip with scientists in the field or lab	16.2%	16.2%	11.6%	26

### Teachers give reasons why topics are not taught

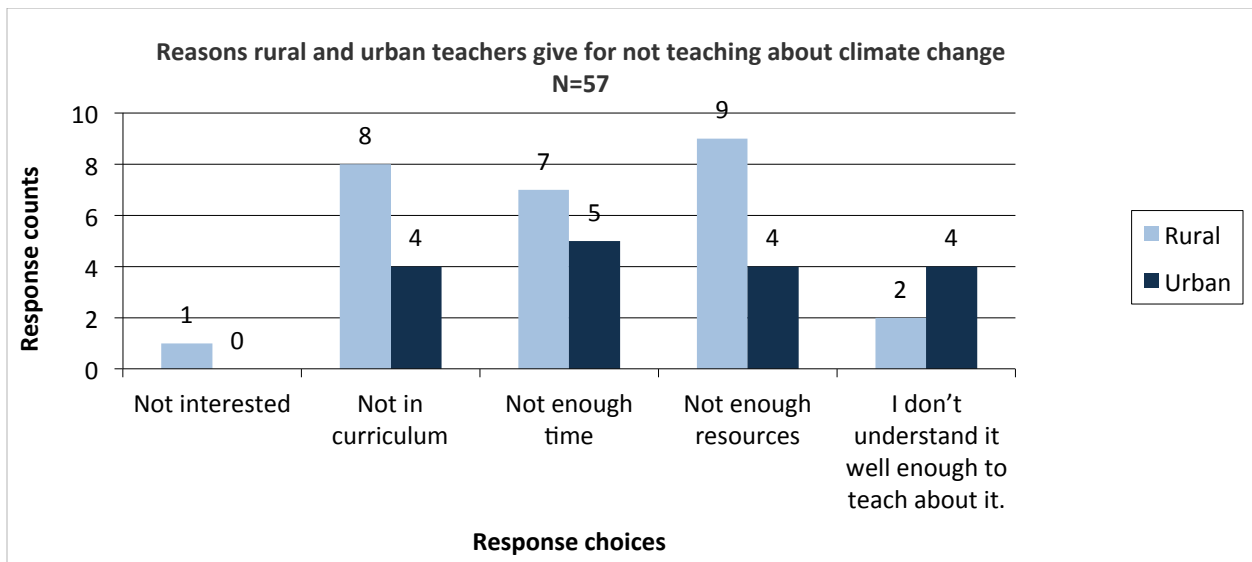
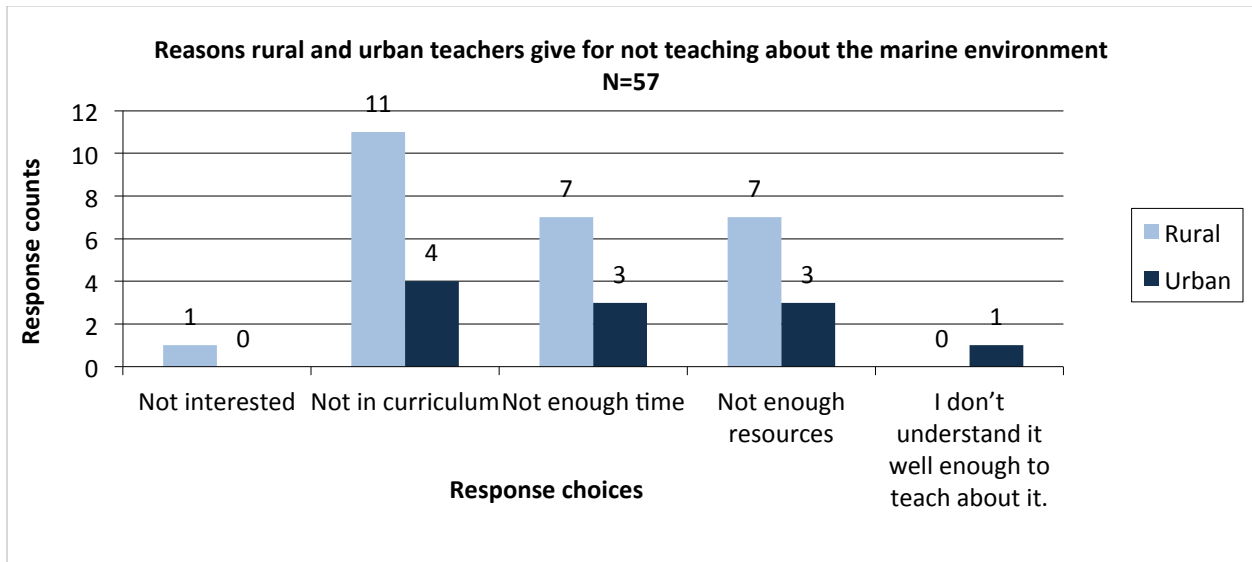
Those teachers who responded to the survey, but do not teach about marine environment or climate change, gave as their primary reason, “the topic is not in the curriculum.” The high school teachers were the most adamant in their response, while elementary teachers were also strongly concerned about time and resources.

<b>If you do not currently teach about the marine environment, please indicate why. Check all that apply. {If you teach marine environment, skip this and go to the next question.}</b>				
<b>Answer Options</b>	<b>Elementary N=17</b>	<b>Middle School N=18</b>	<b>High School N=18</b>	<b>Total Response Count N=48</b>
Not interested	5.9%	0.0%	5.6%	2
Not in curriculum	47.1%	66.7%	83.3%	29
Not enough time	41.2%	27.8%	11.1%	13
Not enough resources	41.2%	22.2%	16.7%	12
I don't understand it well enough to teach about it.	0.0%	5.6%	5.6%	2

<b>If you do not currently teach about climate change, please indicate why. Check all that apply. {If you teach about climate change, skip this and go to the next question.}</b>				
<b>Answer Options</b>	<b>Elementary N=25</b>	<b>Middle School N=11</b>	<b>High School N=14</b>	<b>Total Response Count N=47</b>
Not interested	4.0%	0.0%	7.1%	2
Not in curriculum	48.0%	54.5%	71.4%	26
Not enough time	36.0%	45.5%	14.3%	15
Not enough resources	44.0%	27.3%	28.6%	16
I don't understand it well enough to teach about it.	28.0%	18.2%	7.1%	8

When we compare the responses of teachers who are in urban settings with teachers who are in rural settings we see some slight differences. The charts below illuminate some of the differences.

The reasons both rural and urban teachers give for not teaching about the marine environment is that it is not in the curriculum (61% and 44% respectively). Among the urban teachers more (42%) say there is not enough time to teach about climate change, while the majority of rural teachers (60%) say it is a lack of resources.



## Teachers prioritize needs for teaching about either marine environments or climate change

In seeking to understand what Alaska teachers need for instruction about both climate change and marine environment, we asked teachers to list their top three needs for instructional material, for teaching support, and for online resources. The following tables include data from all teachers, whether they currently teach either topic or not, and is disaggregated to better illustrate the needs at different grade levels.

### Needs for instructional materials

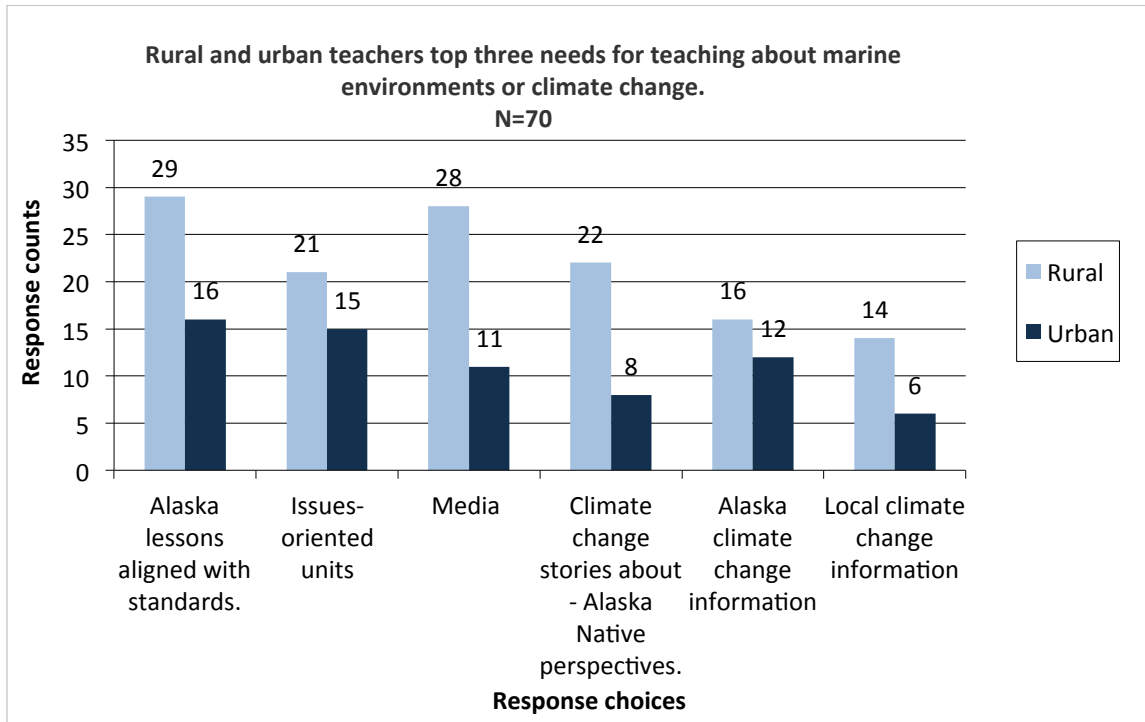
The data show that teachers reported their highest instructional-materials needs as Alaska specific lessons aligned with standards, issues-oriented curricular units, and media. These needs align with the reasons teachers gave for not teaching these topics.

In the following list of materials, please check your top three needs for teaching about marine environments or climate change.				
Answer Options	Elementary N=42	Middle School N=38	High School N=40	Total Response Count
Alaska specific lessons aligned with standards.	<b>64.3%</b>	47.4%	<b>60.0%</b>	67
Issues-oriented units (e.g., climate change and salmon or climate change and coastal erosion).	57.1%	44.7%	60.0%	63
Media (videos, DVDs, Charts.)	57.1%	<b>55.3%</b>	55.0%	64
"How to" help with organizing an ocean science fair.	19.0%	15.8%	12.5%	17
Descriptions and stories about climate change and its impacts from Alaska Native perspectives.	47.6%	39.5%	37.5%	44
Instructions for the collection and use of data by students.	21.4%	31.6%	25.0%	34
Resources to engage the community in student research.	21.4%	26.3%	25.0%	34
Alaska climate change information and data.	28.6%	42.1%	50.0%	49
Local climate change information and data.	21.4%	28.9%	37.5%	38

The chart below illustrates the differences between rural and urban teachers with regard to their highest identified needs. The notable differences between urban and rural teachers, with regards for their instructional materials needs, are:

- rural teachers (67%) rated media, such as videos, DVDs and charts, as one of their top three needs
- urban teachers (54%) wanted issues-oriented lessons.





Needs for teaching supports

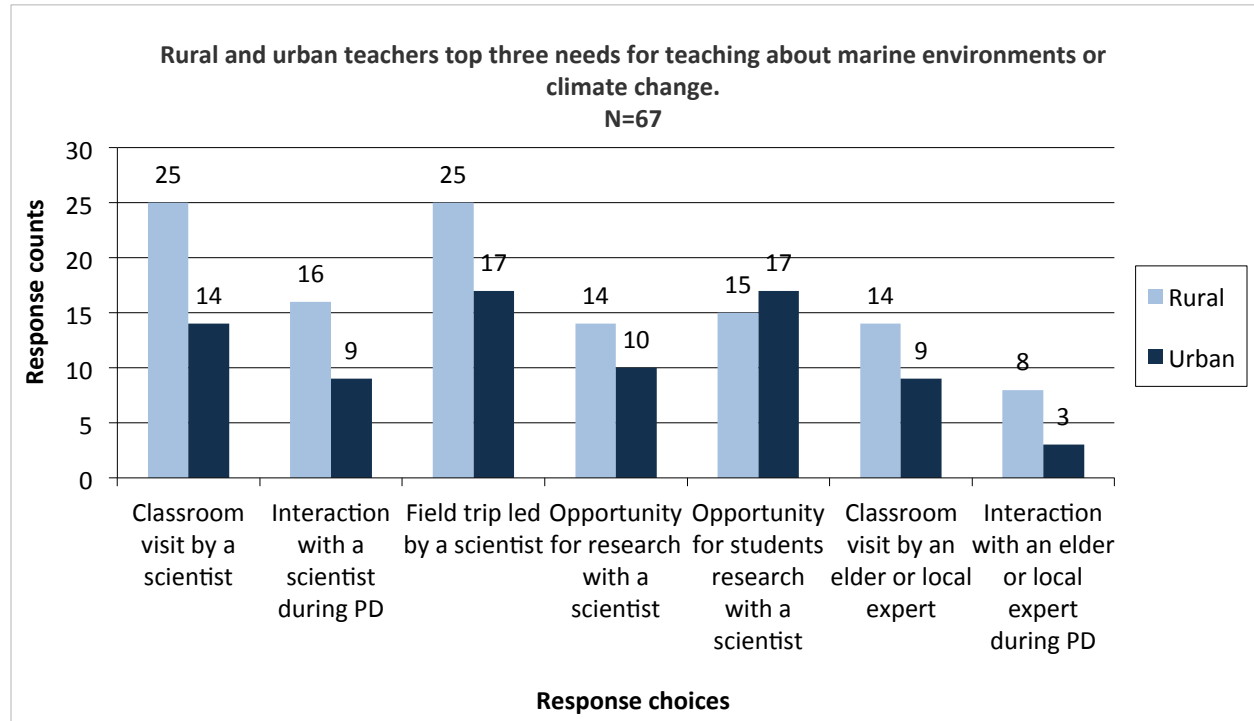
In terms of teaching support, there was reasonable coherence among grade levels about the highest priority needs. The highest needs were identified as 1) classroom visits by scientists, 2) field trips led by scientists, and 3) opportunities for students to participate in a research project with scientists. Teachers also expressed a need for elders visiting their classrooms.

**In the following list of types of teaching support, please identify your top three needs for teaching about marine environments or climate change.**

Answer Options	Elementary N=41	Middle School N=37	High School N=38	Total Response Count
Classroom visit by a scientist	46.3%	59.5%	52.6%	64
Interaction with a scientist during a professional development course	26.8%	35.1%	39.5%	45
Field trip led by a scientist	68.3%	54.1%	52.6%	67
Opportunity to participate in a research project with a scientist	34.1%	37.8%	36.8%	42
Opportunity for students to participate in a research project with a scientist	58.5%	43.2%	50.0%	62
Classroom visit by an elder or local expert	43.9%	35.1%	36.8%	42
Interaction with an elder or local expert during a professional development course	7.3%	21.6%	26.3%	23

Both urban and rural teachers indicated their highest need was for field trips led by scientists. However, nearly two-thirds of the rural teachers also ranked having classroom visits by scientists as an equally important need. By contrast, 61% of urban teachers wanted opportunities for their students to

participate in a research project with scientist; for urban teachers this tied with the field trips by scientists.



Needs for online resources

The highest priority for online resource needs listed for all grade levels, is having virtual field trips with scientists in the field or in the lab. The next ranked priorities were less uniform across the grades. For example, 41% of responding high school teachers said they wanted access to web content as their second highest priority, whereas elementary teachers (30%) wanted web-based Ask-A Scientist opportunity, and middle school teachers want to communicate with specific scientists (42%).

Both rural and urban teachers indicated their highest need was for virtual field trips with scientists.

**In the following list of materials, please check your top three needs for online resources.**

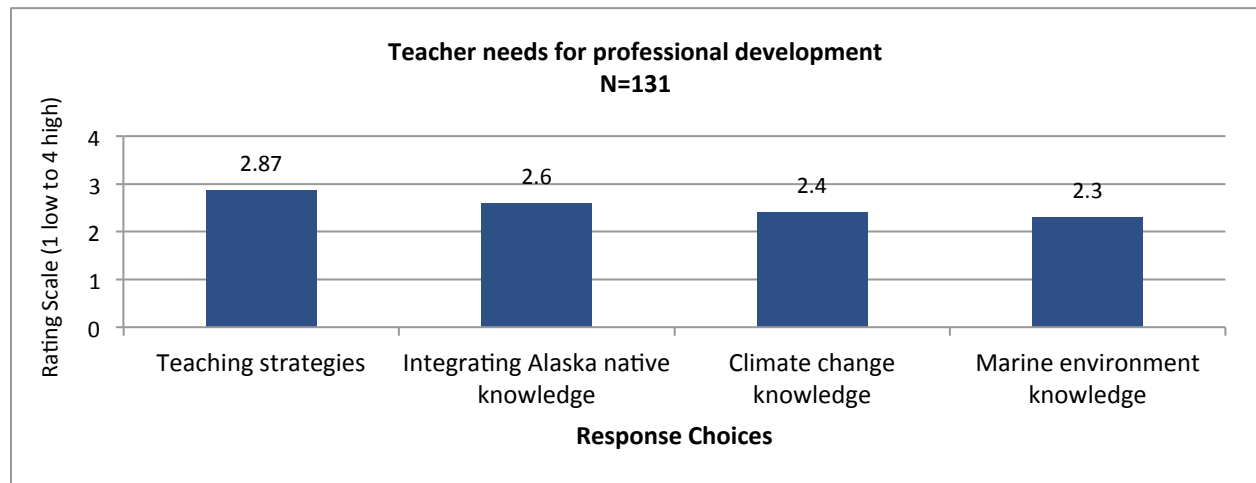
Answer Options	Elementary N=43	Middle School N=36	High school N=39	Total Response Counts
Access to web content about current research.	25.6%	30.6%	41.0%	41
Access to online scientist blogs and/or podcasts.	23.3%	25.0%	25.6%	29
Communication with a specific scientist.	30.2%	41.7%	33.3%	39
Weekly or monthly web-based Ask-a-Scientist opportunity.	34.9%	25.0%	17.9%	37
Access to web content about Alaska Native knowledge.	20.9%	16.7%	25.6%	27
Communication with a specific elder or local expert.	25.6%	16.7%	17.9%	25
Audio conferences.	2.3%	8.3%	5.1%	6
Video conferences.	9.3%	13.9%	23.1%	21
Interactive webcast/webinar distance learning.	23.3%	27.8%	20.5%	29
Virtual field trip with scientists in the field or lab.	<b>72.1%</b>	<b>63.9%</b>	<b>74.4%</b>	83

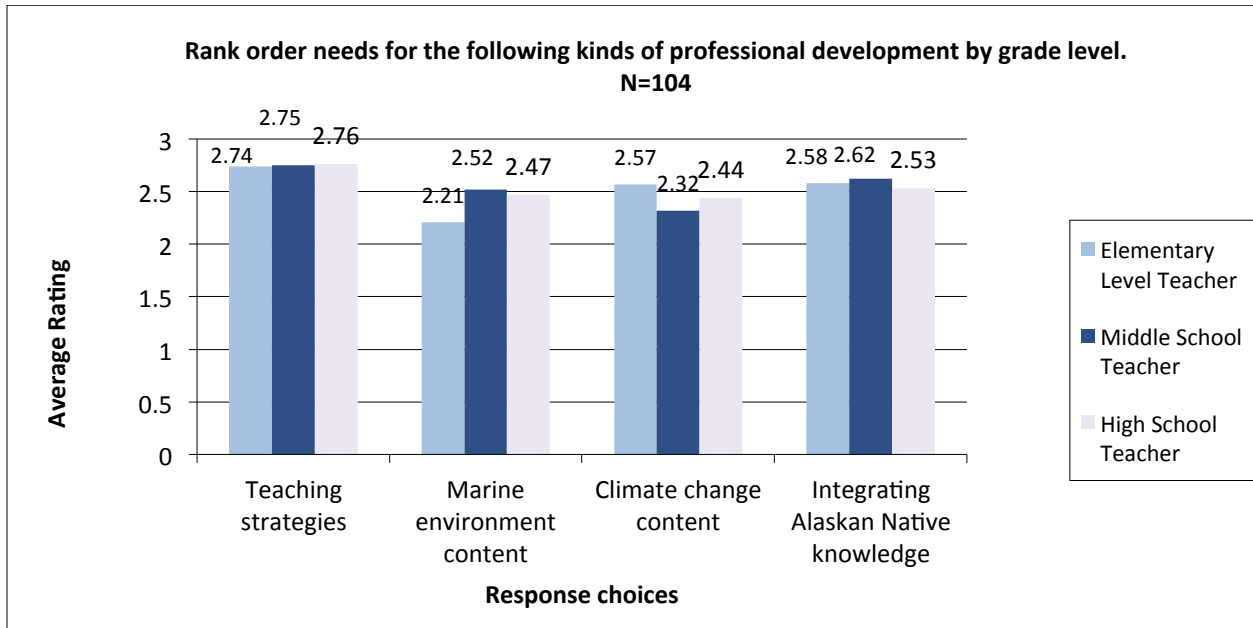
Rank ordering of needs

We then asked teachers to rank order their needs for teaching strategies, marine environment content, climate change content, and the integration of Alaska Native knowledge within these topics. The graphics below provide two different ways of viewing the needs data. The table provides additional perspectives that help inform needs analysis. Two-thirds (66%) of the respondents ranked “teaching strategies” as their higher-highest need area, and slightly over half (57%) ranked integrating Alaskan Native knowledge about climate change or marine environments as their higher-highest needs area. In comparing the urban and rural teachers, there was only a slight more interest among rural teachers for learning to integrate Alaskan Native knowledge and skills in the topics.

**Rank your needs for the following kinds of professional development that would support your teaching about marine environments or climate change. You can only choose one per column.] N=131**

	Lowest need	Lower Need	Higher Need	Highest Need	Rating Average	Response Count
Teaching strategies related to climate change or marine environments.	17.2% (20)	16.4% (19)	28.4% (33)	<b>37.9%</b> <b>(44)</b>	2.87	116
Marine environment content knowledge.	<b>33.6%</b> <b>(38)</b>	22.1% (25)	25.7% (29)	18.6% (21)	2.29	113
Climate change content knowledge.	21.9% (25)	<b>36.8%</b> <b>(42)</b>	19.3% (22)	21.9% (25)	2.41	114
Integrating Alaskan Native knowledge within the topics.	19.5% (24)	23.6% (29)	<b>35.0%</b> <b>(43)</b>	22.0% (27)	2.59	123





**Urban and rural teachers forced-choice ranking of needs for of professional development to support teaching about marine environments or climate change. N=73**

Teaching strategies related to climate change or marine environments.	Urban	Rural
• Lowest Need	4	7
• Lower Need	7	8
• Higher Need	3	9
• Highest Need	13	15
<b>Average</b>	<b>2.93</b>	2.82
Marine environment content knowledge.		
• Lowest Need	7	13
• Lower Need	5	7
• Higher Need	10	10
• Highest Need	3	8
<b>Average</b>	2.36	2.34
Climate change content knowledge.		
• Lowest Need	6	11
• Lower Need	10	10
• Higher Need	2	10
• Highest Need	8	7
<b>Average</b>	2.46	2.34
Integrating Alaskan Native knowledge within the topics.		
• Lowest Need	7	6
• Lower Need	3	15
• Higher Need	14	11
• Highest Need	3	9
<b>Average</b>	2.48	2.56

## Findings about topics from non-teachers' perspectives

### Comments about how topics are addressed by schools or districts

*I offer teachers resources and instructional strategies. I create thematic units and post them for teacher use throughout the district. I have one at this time specific to cetaceans, and plan to produce more on marine life*

*I can justify working with teachers and students if topics are related to mine permitting. Therefore, as a POTENTIAL visiting instructor or instructional support person, I could utilize materials that related to community-focused observations, impacts and concerns...specifically related to mining (offshore suction dredging-tailings disposal and other mine support infrastructure: roads, docks, fuel storage, etc.)*

*We sponsor summer science camps that include or focus on marine science: Sun to Sea, a two week camp for middle school students, in partnership with NOAA NMFS & NWS; Discover Design Research @ UAS, a 2 wk, 1 college credit camp for 10-12 grade students, two courses/modules of which focused on marine science in 2009, two anticipated in 2010; in 2009 sponsored a UAF ASRA module, Marine Mammals & Seabirds at Round Island.*

*There is a river near our school that we monitor for water quality using biological and chemical factors. I teach in Illinois, so we don't monitor an ocean. We also discuss non-native species and how they affect the waterways around us. (Lake Michigan, rivers, etc.)*

*I support teachers who engage in these activities. I am sometimes directly involved in the planning and delivery*

## Conclusions

All teachers indicated common needs that should be considered when preparing instructional materials, teaching supports or professional development for the future.

1. Teachers need lessons and materials in marine environment and climate change that align with the Alaska State Standards.
2. Teachers need and want scientists to help with content and to support learning experiences for students.
3. Teachers would like help integrating traditional ecological knowledge with Western science in regards to climate change and the marine environment.

There were a few differences among teachers based on their grades taught and whether they taught in rural or urban settings. These differences are modest and, given the size of the sample, may reflect "noise in the data" rather than real differences. In general we found that elementary teachers brought in more scientists to the classroom, they were more interested in getting climate change content in professional development, and less interested in marine education content than were either middle school or high school teachers. Rural teachers seem more sensitive to the need for Alaska Native stories and knowledge to be integrated into curriculum and instruction.

## **Recommendations**

- 1. COSEE Alaska might consider expanding the ocean science fairs as a strategy for integration of cultural knowledge with the ocean science**

COSEE Alaska already has in place an ocean science fairs model that integrates western science and traditional ecological knowledge. COSEE Alaska might consider how to expand this model to other districts. This existing strategy of linking traditional knowledge and ocean science within the science fair model will help teachers achieve several of their needs.

- 2. COSEE Alaska might consider expanding the professional development workshops (e.g., the Bering Sea Workshop) as a way to increase content and connections with scientists**

COSEE Alaska has already piloted a new professional development approach (the Bering Sea workshop) that links the scientists with teachers. The workshop achieved significant success in helping teachers with content knowledge. Further expanding this model with strategies for integrating cultural relevance will achieve the needs of educators across grade levels and in both rural and urban settings. This model is highly effective as teacher professional development that increases the content knowledge of teachers and builds the relationships with ocean scientists that might enable some of the classroom connections teachers hope for.

- 3. COSEE Alaska might consider expanding the virtual field trips being planned for future**

COSEE Alaska has already developed the Voices of Climate Change CD to be distributed both through the website and to teachers in professional development. This is a good beginning, although it would benefit from greater distribution. Additional topics might be considered to specifically address the interest of teachers in having virtual field trips for their students.