Climate Science Education Summative Evaluation Report

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Executive Summary

The purpose of this evaluation report is to describe the outcomes of IslandWood's 2020-2021 Climate Science Education project. This work was implemented as part of ClimeTime, a climate science learning project facilitated by the Office of the Superintendent of Public Instruction (OSPI). IslandWood offered professional development courses and workshops to teachers and informal educators designed to support teaching practices and student outcomes in relation to the Next Generation Science Standards and climate science education. The external evaluation and subsequent results presented here focus on the course outcomes.

Teacher Professional Capacity

Teachers reported important growth in their professional capacity in relation to IslandWood supports. The greatest gains for teachers this year were in their preparation to incorporate climate science into their teaching and to support equitable and just science education through localized science. Teachers also made gains in their perceptions of their ability to connect to student interest and identity, knowledge of the Next Generation Science Standards (NGSS), and comfort taking students outside.

Teachers' thinking about their science teaching changed in a variety of ways over the 2020-2021 school year. Most commonly, teachers reported that before their participation in one of the IslandWood courses they thought science had to be a separate subject. Afterwards, teachers reported that teaching could be inquiry-based or student-led and relevant to their students.

Teachers appreciated how the focus on anti-racist science education in the winter/spring courses centered anti-racism in science as an important focus for their teaching. Teachers left the courses with a sense of urgency and concrete actions, often focused on learning about the communities they work in or connecting science to students' everyday lives and expertise.

Instructional and Student Outcomes

Ninety-four percent of teachers (75) were able to either make changes to their existing lessons or implement new lessons, based on the IslandWood supports. There were no real differences between responses from teachers in schools with more BIPOC (Black, Indigenous and People of Color) students and teachers in schools with few BIPOC students.

Almost one-third of teachers cited distance/hybrid learning as their largest challenge to implementing what they learned from an IslandWood course. Limited class time was also a challenge (29%). Teacher feedback suggesting that IslandWood offer ready-made curricula led to substantial changes for the winter/spring courses.

As last year, teachers reported that the most important outcome for students resulting from the IslandWood supports was access to more relevant or authentic learning. Additionally, students benefited from inquiry-based/ student-led learning, became more engaged or excited, or experienced more disciplinary integration of science generally. Students reported increased enjoyment of science and a sense of how science helped them learn more about their local neighborhood when their teachers implemented classwork related to the IslandWood courses.

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Introduction

The purpose of this evaluation report is to describe the outcomes of IslandWood's 2020-2021 Climate Science Education project. This work was implemented as part of ClimeTime, a climate science learning project facilitated by the Office of the Superintendent of Public Instruction (OSPI). The evaluation focused primarily on teacher perceptions of their experiences with IslandWood's courses, as well as teacher and student reporting on implementation outcomes.

Teacher Supports

During the 2020-2021 school year, IslandWood offered four multi-session professional development courses and six stand-alone workshops to teachers, designed to support teaching practices and student outcomes in relation to the Next Generation Science Standards and climate science education. The evaluation focused on outcomes related to the courses.

Courses: 102 people participated in one or more IslandWood courses in 2020-2021.

- **K-8 Science in your Neighborhood:** This course in fall 2020 focused on creating a science storyline based on the interests and identities of the students in the class. (43 participants in two cohorts)
- **6-12 Community Science** (offered twice)**:** This course for secondary teachers in winter and spring 2021 focused on strategies that could be applied to any lessons teachers were doing and had a more explicit focus on anti-racist science teaching. (30 participants in two cohorts)
- The **K-2 and 3-5 Storyline courses** in spring 2021 focused on a ready-to-go phenomena-based storyline for teachers to implement. (15 and 23 participants, respectively)

Workshops: Ninety-eight people participated in one or more IslandWood workshops in 2020-2021. The first three workshops below were designed to supplement the courses but were also open to others. The last two were presented at the ClimeTime Unconference as shortened versions of work we had done in courses.

- Mapping Community Assets Workshop
- Understanding Urban Water Systems Workshop
- Teacher Philosophy and Positionality Workshop
- Community Centered Science Workshop
- What Makes A Weed A Weed Workshop

2020-2021 Program Improvements

The IslandWood team made several changes between the fall, winter, and spring courses and workshops, in direct response to teacher feedback throughout the year.

These include:

1. More explicitly using the language of "anti-racism" in sharing and modeling strategies for racial equity in science education.
2. Pairing strategies (i.e. for anti-racist education, NGSS-alignment, and climate science connections) with specific lessons and units to implement in the classroom.
3. Increased collaboration with community partners (including one tribal member, one national park scientist, and four teacher facilitators) to represent a diversity of perspectives in course creation and delivery.

Evaluation Questions

This evaluation and this report focused on the outcomes of the courses and subsequent implementation with students. This report is organized according to the guiding evaluation questions for the project:

1. To what extent did teachers report growth in their professional capacity in relation to IslandWood courses?
2. To what extent was classroom instruction impacted by the IslandWood courses?
3. To what extent did students show changes in affective outcomes related to the implementation?
4. What feedback do teachers have for future supports and implementation?

Methods

To address the questions above, the results summarized in this report are based on data gathered through the following data collection methods:

Data source		Reponses
End-of-course teacher survey	Teachers completed this survey after course completion.	**Total:** 80 teacher responses **Fall:** 38 **Winter/Spring:** 42
Teacher Practical Measure	Teachers were encouraged to complete this short survey several times during the course to reflect on *course-related implementation.* Teachers may have completed it 1-3 times. Winter/spring 2021 course data is reported here.	**Winter/Spring:** Before Implementation: 8 After Implementation: 74
Classroom Practical Measure	Secondary students completed this short survey both before and after their teacher implemented classwork related to the IslandWood course. Students may have completed it 1-3 times in winter/spring 2021.	**Winter/Spring:** Before Implementation: 291 After Implementation: 332

Table 1. 2020-2021 Data sources.

Analysis

Descriptive statistics were generated for responses to Likert-scale and other quantitative questions. Open-ended questions were coded using an emergent coding scheme: The codes used to describe the data emerged from the data itself. A small subset of questions in which the response themes were fairly consistent or limited were summarized more generally.

For a select number of questions, school-level demographic data were used to disaggregate the results. Schools were grouped into two categories, based on percentages of white students and students of color, in order to better understand how implementation in schools with more BIPOC students differed from those with fewer BIPOC students. A threshold of 50% students of color in a school served as a proxy to categorize schools and teacher survey responses in two categories: Teachers at schools with more BIPOC students (≥ 50%) and fewer (< 50%) BIPOC students.

EVALUATION QUESTION 1:

To what extent did teachers report growth in their professional capacity in relation to the IslandWood courses?

> *"I SO appreciate everything I have learned and continue to learn in connection with Islandwood! You have inspired me to be a more energized and excited science teacher and* ***shared ways to inspire and support my students in feeling more connected and excited at owning their identities as scientists!"***

General Outcomes

Using a retrospective pre/post format in the end-of-course survey, teachers reported important growth in their professional capacity in relation to IslandWood courses. Teachers rated their agreement with the statements in Figure 1, both before their engagement with Islandwood courses this year (Before) and at the end of the year, after their engagement (After).

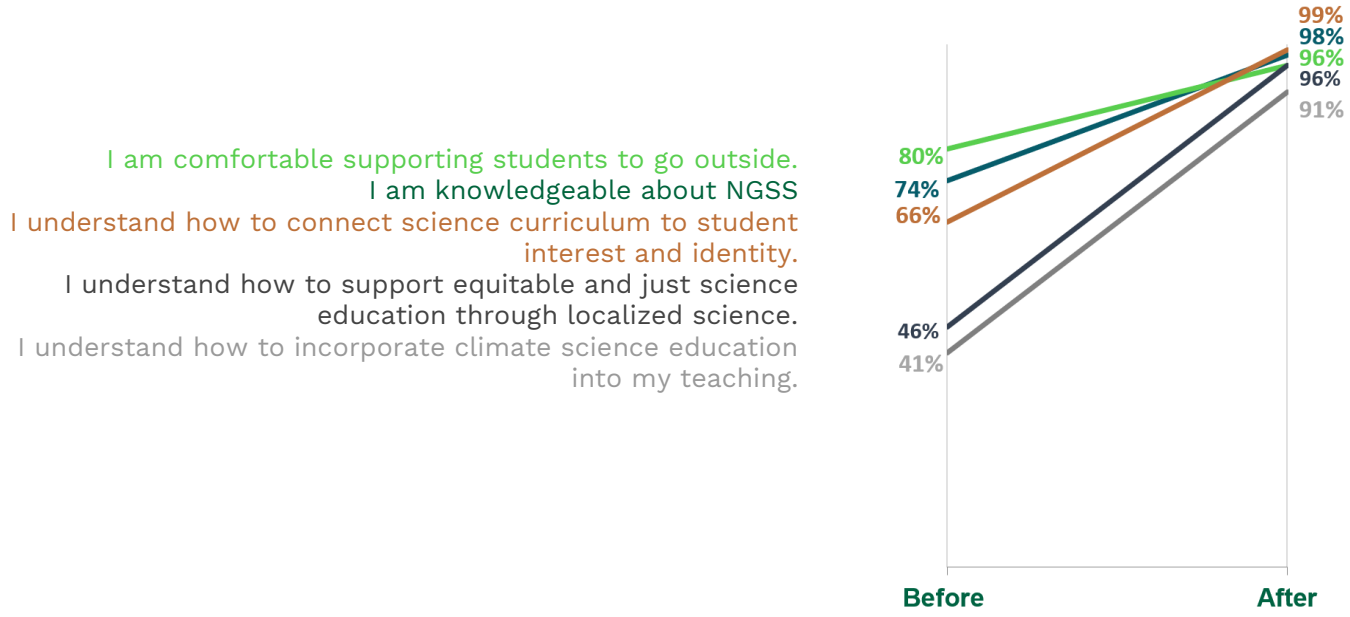

Figure 1. Percent change in teachers' perceptions before and after their engagement with IslandWood supports this year. Percent agreement is based on the sum of agree and strongly agree statements. (n=80)

The greatest gains for teachers this year was in their preparation to incorporate climate science into their teaching (+50% of teachers moved from neutral/disagree/strongly disagree to agree/strongly agree) and to support equitable and just science education through localized science (+50%). There was a 33% increase in teachers who perceived themselves as able to connect to student interest and identity. Teacher knowledge of the Next Generation Science Standards (NGSS) (+24%) and comfort taking students outside (+16%) showed smaller increases because most teachers started with higher ratings in these areas than in climate science. After their participation in one of the IslandWood courses, almost all teachers agreed or strongly agreed with each of the statements.

Teacher Perceptions of their Science Teaching

Teachers' thinking about their science teaching changed in a variety of ways over the 2020-2021 school year (Figure 2 and Figure 3)**.** Using a retrospective format in the end-of-year survey, teachers were asked to report on how their thinking about their science teaching had changed over the academic year, using the prompts: "I used to think...Now I think...". Most commonly, teachers reported that before the course they lacked resources or confidence to teach science (Figure 2). Teachers frequently reported that they thought science had to be a separate subject, lessons had to be teacher-led or content focused, and that they lacked the resources or the confidence. Afterward, teachers reported that they learned teaching could be inquiry-based or

student-led, relevant to their students, and equity-focused.

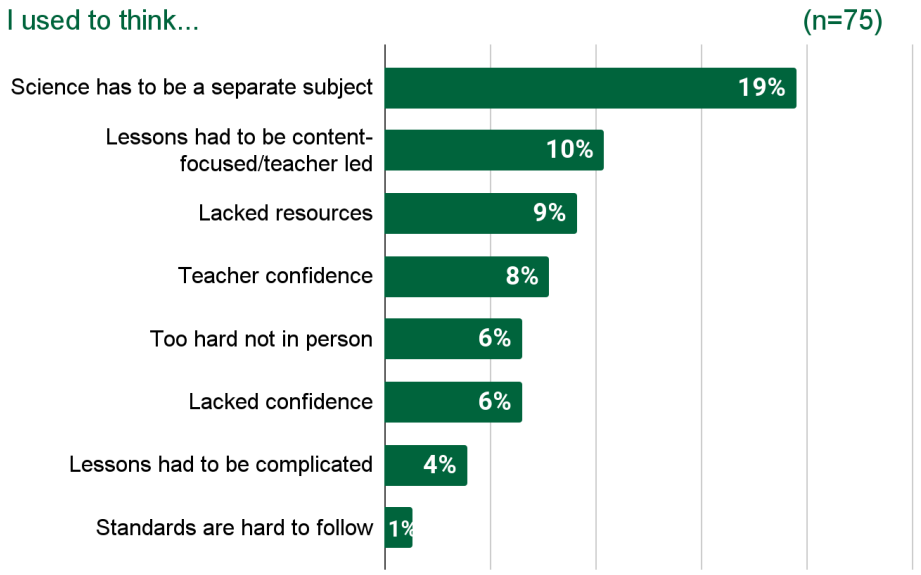

Figure 2. Teachers' perceptions of their science teaching: I used to think...

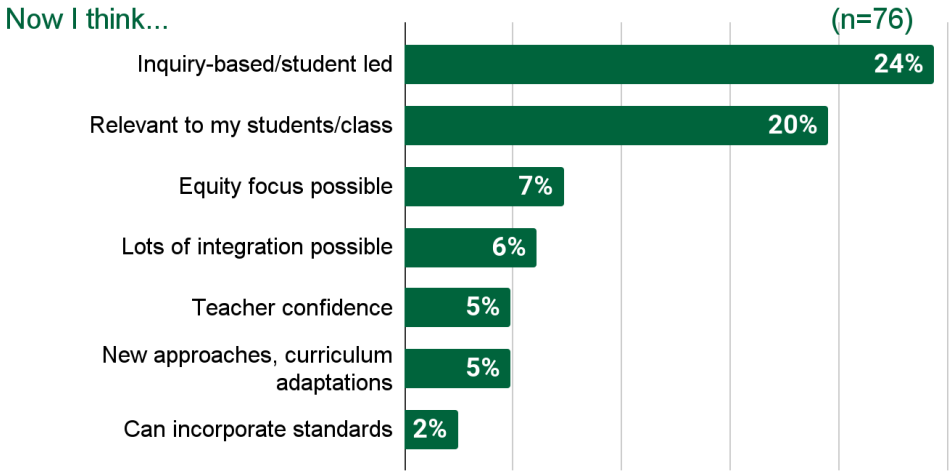

Figure 3. Teachers' perceptions of their science teaching: Now I think...

The table below presents some sample responses from teachers about how their thinking changed. In these examples, teachers highlighted their increased understanding of how science can be integrated with other disciplines, including engineering; opportunities to do science even with little space; and how to increase students and family engagement.

I used to think...	**Now I think...**
"Science was 'science' a self-contained discipline."	*"Science pushes into multiple disciplines."*
"I could only teach from the kit I was given for my grade level."	*"It is way more engaging for students to be outside, notice things around them and wonder about things!"*
"I used to think science and engineering were separate processes."	*"Now I think that engineering skills can be developed within science units when focusing on local phenomena and designing solutions for local problems. Ie. our unit was on fall leaves, and as we worked through the unit. Local phenomena can reveal local problems needing engineering to solve."*
"I needed a dedicated larger science space to do learning outdoors."	*"I can teach phenomenon science with minimal space and more family involvement."*
"Project based learning and following the standards was enough."	*"Localized and equitable project based learning with family connections is essential."*

Table 2. Sample teacher responses to shifts in their thinking about their science teaching.

Supporting Equitable, Just, and Anti-racist Science Education

This year, IslandWood aimed to center equitable, just, and anti-racist science education, especially in the winter/spring courses. Teachers reflected on how the course made a difference in their thinking about and implementing anti-racist science education. Of the 75 responses to this 'select all that apply' demographic question, 15% (11) identified as Asian (4), Asian Indian (1), Hispanic/Latinx (5), and Filipino American (1) and 81% (61) teachers identified as white/Caucasian. Three teachers opted not to answer the demographic question.

In this dataset, the analysis included consideration of teacher race/ethnicity as important to their responses. There were no clear patterns in the differences between responses from teachers who identified as people of

color from those that identified as white/Caucasian. However, this demographic information may be useful in interpreting individuals' responses.

Teachers described a variety of ways in which their participation in one of the courses made a difference in their thinking about anti-racist science education. Though a few teachers in the fall course acknowledged they were not sure how to respond to this set of questions because the course focus on anti-racism was less explicit, teachers were very positive overall.

Teachers especially appreciated how the focus on anti-racist science education the winter/spring courses normalized anti-racism in science as an important focus for their teaching. Most teachers said their participation in the course will help them to actively consider anti-racism in their teaching in ways they had not before. Several white teachers said that this kind of intentional centering of anti-racism made it easier to discuss and gave them confidence to take these conversations back to their colleagues and students. Some pointed out that this course was unique from other professional development opportunities because of the explicit focus on anti-racist science education.

> *"Presenters were very explicit in the way they approached the topic. **This modeling gave me confidence**." (Demographic information: white, winter/spring course)*

> *"I appreciated the openness and frankness about addressing the topic of anti-racist teaching. I teach in a small, rural community and this isn't a conversation we have very often or openly. **Your course made me more confident to bring up the topic and know how to start/carry on the conversation with my colleagues.** This is just the beginning of a long road toward change, but it was a great step for me." (Demographic information: white, winter/spring course)*

> ***"I really appreciated that you made [anti-racism] a speaking point and always came back to it.** Most trainings do not make it a point to state this or to prompt us to think through an equity lens and discuss." (Demographic information: white, winter/spring course)*

Teachers left the courses with a sense of urgency and concrete actions, activities, and ideas for how they can make their work more explicitly anti-racist. They mentioned focusing on locally and culturally-relevant phenomena,

broadening opportunities for student voice, engaging family and community members, and connecting to students' everyday lives.

> *"**The course offered a few different ideas for teachers and students to engage in different reflection processes.** It's something I am used to doing but I liked how it presented activities that the kids could participate in. I feel like this course centered the idea of instilling an anti-racist science education with every session and It helped to keep it constantly in mind." (Demographic information: Hispanic/Latinx, winter/spring course)*

> *"I think it helped educate me in how to look at the implications of science and our environment on our most vulnerable populations. I feel the urgency more than ever that All students need to receive quality science education. **That all students need to connect with the earth and understand how policies in science affect them personally, affect their neighborhoods.** Thinking critically about the decisions that are being made around them and without them, will be one of the most important skills I can teach." (Demographic information: Filipino American, winter/spring course)*
> *"I enjoyed the lessons and concepts around anti-racist teaching and **how to incorporate the identities of our students and actively work towards systemic changes in our approach, our curriculum, and our practices**. *Specifically, discussing anti-AAPI lessons was timely and important. Also, the lessons with visuals of equity were great because they offered a new way of looking at equity for me." (Demographic information: white, winter/spring course)*

> *"**We were able to connect science to students' lived experiences in a way that we hadn't before.** We were also able to involve families in the experiments in a way that improved student engagement and required no materials/little time. This is anti racist because we changed the system and structure of the way we teach science to reach and engage our most marginalized students." (Demographic information: white, fall course)*

Some white teachers said that before their participation in one of the IslandWood courses they thought of science as apolitical and therefore there was no need to focus on social justice or anti-racism, but that their minds were changed.

> *"**It has opened my eyes in many ways about the need for anti-racism in science education.** I had not thought of the two*

together….in other areas of a school day, yes, but not in areas of science. I am not sure why, but this course has given me a lot to think about and consider as I move forward. I am appreciative of being gifted this awareness so I can begin to move forward." (Demographic information: white, winter/spring course)

"I didn't really consider race and environmental education and now I have learned a lot." (Demographic information: white, winter/spring course)

In their reflection on how the course might influence how they provide anti-racist science education for their students, teachers most frequently described their increased awareness of anti-racism going forward and a new intentionality in their planning and decision-making in the classroom. Some said that the course they attended provided a reminder or affirmation for equity work they were already doing, though at least one white teacher recognized that their previous work on equity is different from being actively anti-racist (fourth quote, below).

*"This course certainly kept this topic and issue in the forefront and **pushed me to confront the idea in my practice and my program development process**. Just by making sure the conversation is on-going this course has made a difference in my thinking." (Demographic information: white, fall course)*

***"This course made me aware of the decisions I make in lessons, that I hadn't been conscious of in the past,** that now I make with intention through an equity lens. I think this class provided another space to process this." (Demographic information: Filipino American, fall course)*

*"I have been more apt to think about the subject in light of how my white privilege and experiences have defined my thinking about everything. **I am becoming more aware of places where bias can occur and I want to be an agent of change in supporting anti racist teaching.** Awareness is an important step for me." (Demographic information: white, winter/spring course)*

*"It has brought attention and intention to my education. I'm still looking for the ways to provide anti-racist science education…**working on the equity piece…but that isn't always actively anti-racist.**" (Demographic information: white, winter/spring course)*

Several teachers focused on learning about the communities they work in or connecting science to students' everyday lives and expertise as strategies for justice-centered instruction. Family interviews and other ways of engaging students' communities were mentioned a few times as concrete ways to do this.

> *"I like considering how to relate science to [students'] lived and direct experiences by **starting with their observations of the world around them rather than doing a teacher-led introduction** to a science concept." (Demographic information: "mixed race: white/asian", fall course)*

> *"I am more aware and will use some of the **new teaching practices in future science lessons; like local phenomena, family interviews.** This would allow for inclusivity and anti-racist education for my students." (Demographic information: white, winter/spring course)*

> *"Improved access and creative thinking around science instruction. **Instead of just STEAM or NGSS, I have added place-based and local to my toolbox.** This provides relevance and acknowledges the place that our students are used to and have background knowledge of for creating science learning connections." (Demographic information: white, fall course)*

> *"By being **intentional and open to learning about our communities** and how different assignments might impact them." (Demographic information: Hispanic or Latinx, white, fall course)*

> *"I have changed the way that I include students' experiences and knowledge into our lessons and their learning. I have also started our science lessons with the Thanksgiving address that Robin Wall Kimmerer talks about in* Braiding Sweetgrass *to help my students **see and feel the positive things that the natural world can do for us, and to understand that the Native communities are our original scientists and keepers of our land.**" (Demographic information: white, fall course)*

A few teachers discussed the ways in which they might think more about "anti-racist science," focusing not just on how their classrooms can be more equitable for students, but also how science content, practices, policies can be more anti-racist or how science can be used for social justice (e.g., acknowledging other ways of knowing; how oppression, marginalization, and power have been a part of science; local phenomena; cross-cutting concepts as part of deconstructing paradigms of science that have marginalized people).

> *"I think introducing the cross-cutting concepts will begin to deconstruct an archaic science paradigm that has long marginalized indigenous populations. The book,* ***"Braiding Sweetgrass" helped me understand the reciprocity that is celebrated in non-dominant cultures that helps sustain ecosystems rather than exploit them****." (Demographic information: white, fall course)*

> *"This course has helped me practice asking specific questions of myself and my colleagues as we develop opportunities for science learning through our institutions:* ***are these examples relevant to all? Where are systems of power in the story we're telling****? How can we highlight these for students? Etc." (Demographic information: white, fall course)*

> ***"I find it important to name the issues with conventional environmentalism. I encourage students to do the same.*** *If someone doesn't see how they're connected to the environment, or doesn't feel like their relationship to the ecosystem is valued or important, we can work with that; the alternative is that students feel this way and don't feel comfortable expressing that disconnect." (Demographic information: white, winter/spring course)*

Overall, the focus on anti-racist science teaching made a meaningful impact on most teachers in the courses, especially when it became more explicit in the winter and spring courses. Teachers planned to focus on incorporating more relevant phenomena; connecting their teaching to students' everyday lives; and recognizing the expertise that they, their families, and their communities bring to science. They appreciated this explicit focus and gained new perspectives that will inform their teaching and their work with colleagues to implement anti-racist science education. Teacher suggestions for further work in this area are reported in Evaluation Question 4.

EVALUATION QUESTION 2:
To what extent was classroom instruction impacted by the IslandWood courses?

Instructional Outcomes

> *"The kids all had some background knowledge on dandelions, but also had their minds blown that the fuzzy plants they see are also dandelions!* ***They made a lot more authentic and relevant connections to the scientific phenomenon*** *as a result."*

In the end-of course survey results, 94% of teachers reported that they were able to implement new lessons (Figure 4) **and 94% said they made changes to their teaching** (Figure 5)**, up from 84% last year.** (Note, both percentages are 94%, but the group of teachers that agreed with each statement is different. Only one teacher said they were able to do neither because their teaching was put on hold in the fall.) Only five teachers said they were unable to implement new lessons, but made changes to their instruction. A different group of five teachers said they implemented what they learned, but did not make changes to their teaching otherwise. There were no real differences between responses from teachers in schools with more BIPOC students and teachers in schools with fewer. Four teachers in 45 schools with fewer BIPOC students were unable to implement and another four were unable to make changes to their teaching. All seventeen teachers in schools with more BIPOC students were able to do both.

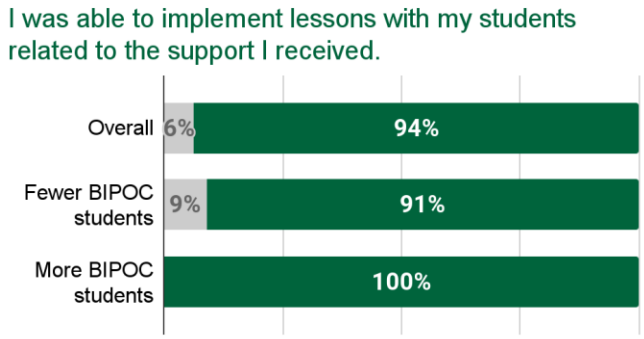

Figure 4. Implementation of lessons related to IslandWood supports.

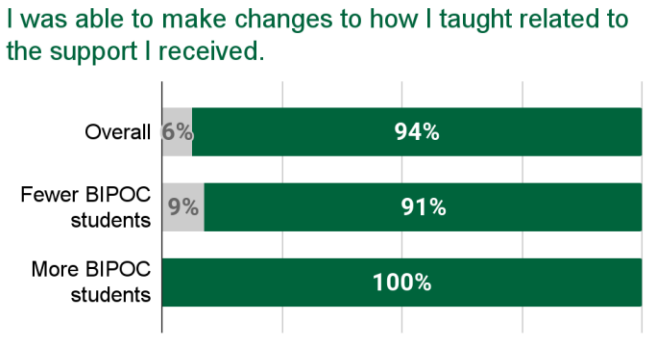

Figure 5. Changes in teaching related to IslandWood supports.

*"Using **the phenomena anchored the learning for all students** and gave us something to come back to throughout the whole unit! Best. Thing. Ever!"*

At the end of each course, teachers reported all the different ways they implemented strategies related to their participation. Of the teachers that were able to either implement lessons or make changes to their teaching, most tried a new lesson or activity or incorporated a local phenomena into a lesson or unit (Figure 6). There were no meaningful differences between responses from teachers at schools with more BIPOC students and those with fewer.

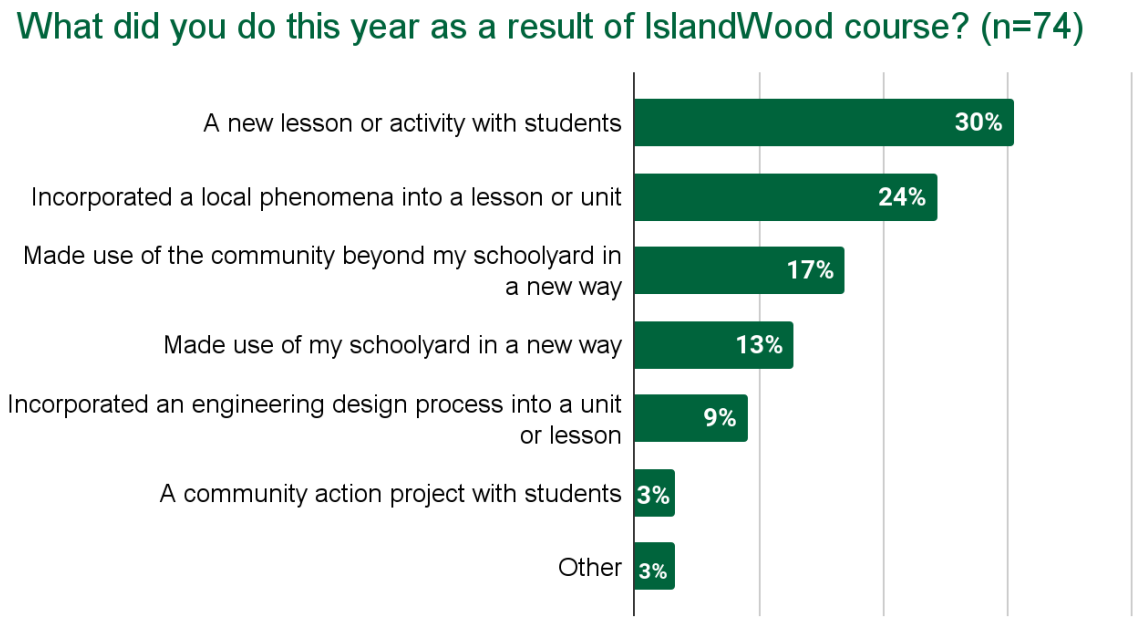

Figure 6. End-of-course survey responses on Implementation with students as a result of IslandWood supports.

*"Students engaged in spaces they are used to in new ways. They learned vocabulary and processes that they knew a little about and together we expanded our knowledge and our abilities to ask meaningful questions about what we were observing. **We were also able to be of service in our local preserve areas."***

*"Students had connections and familiarity with the topic which **allowed them to be more confident in participating** and sharing in the learning. The topic was more relevant to them because it is all around them, which kept them more engaged than other lessons in the past. It was helpful for them to be engaged in the lesson because they could go out and see what we were talking about."*

Barriers to Implementation

Almost one-third of teachers cited distance/hybrid learning as their largest challenge to implementing what they learned from their participation in one of the IslandWood courses. Limited time with their students was also a challenge (29%) (Figure 7)**.** One teacher said their biggest challenges were "lack of materials and ability to distribute materials to students [and] lack of reliable experiments/activities that can be demonstrated to students through a virtual model." Teacher suggestions for addressing these challenges are reported in Evaluation Question 4.

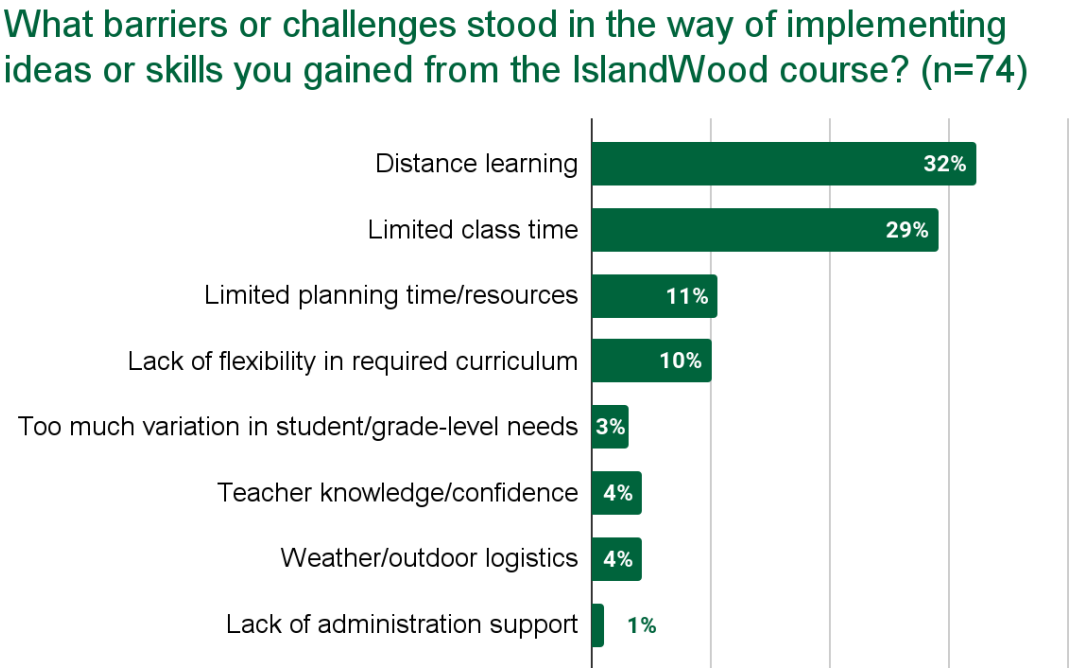

Figure 7. Barriers to implementation.

"Lack of time- this is "extra", can supplement Plant and Animal relationships but we are on Landforms Unit. ***Really hard to find time when just no re-entering in person*** *and seeing kids two days a week. But it was a great way to get students excited about learning after a year of no in person school and that was how I justified it."*

EVALUATION QUESTION 3:
To what extent did students show changes in affective outcomes related to the implementation?

Teacher Perceptions of Student Outcomes

During implementation, teachers' perceived outcomes for students were very positive (Figure 8)**.** Almost all teachers agreed or strongly agreed that their students were interested in and enjoyed the science they did that week, and that students learned personally relevant science.

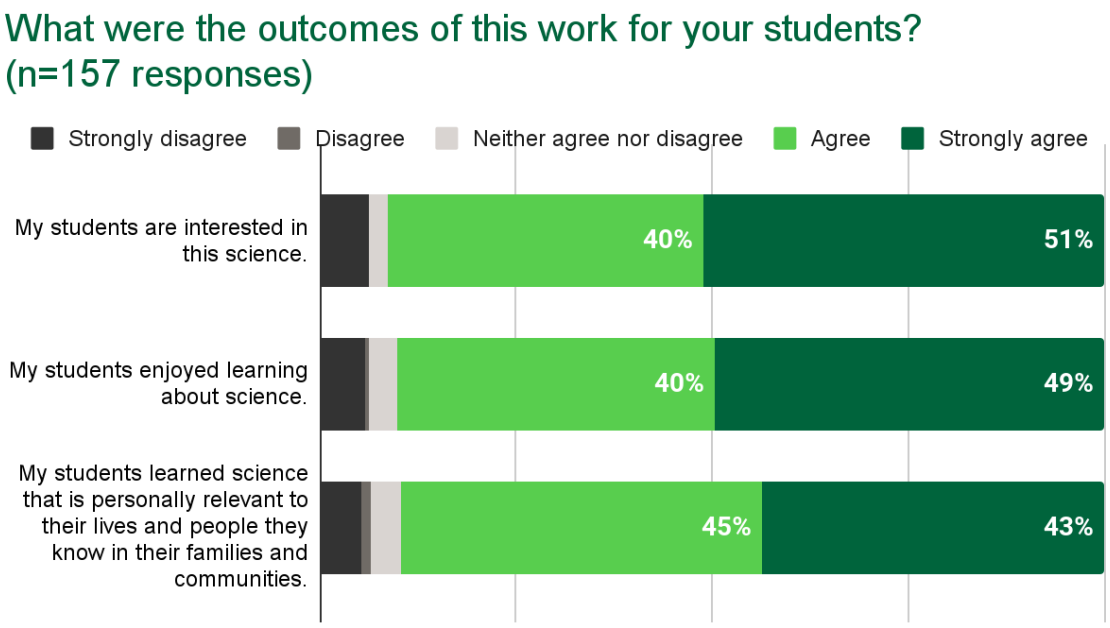

Figure 8. Teachers practical measure responses on student outcomes

As last year, teachers reported that the most important outcome for students resulting from the IslandWood supports was access to more relevant or authentic learning (Figure 9)**.** Additionally, teachers believed students benefited from inquiry-based/student-led learning or improved teacher confidence, became more engaged or excited, or experienced more integration of science or science instruction generally.

> *"**Students were more involved with my weather unit because they were observing from their window,** and my students live in at least five distinct neighborhoods and three cities. It interested them to see different weather at the same time depending on point of view."*

*"I noticed that **my students continued to do science on their own** because of the connection they made to the dandelion unit. My students gathered more local flowers on their own and did the same research on those flowers as we did on the dandelion, just because they were curious."*

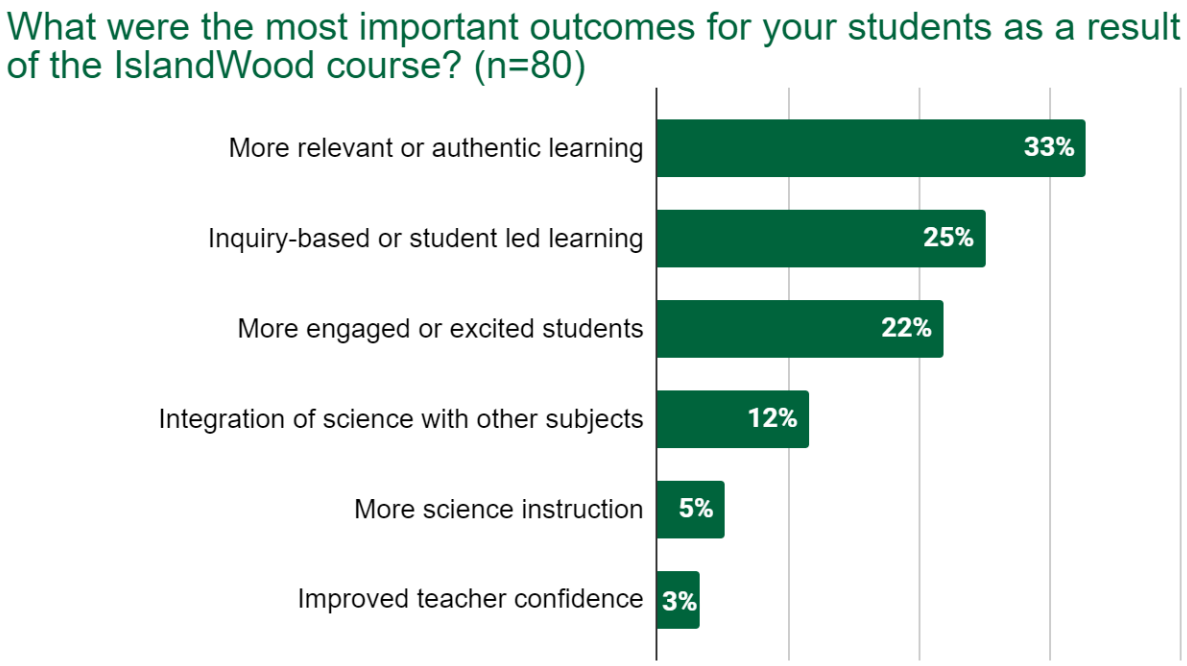

Figure 9. Teacher perceptions of most important outcomes for students.

Eighty percent of teachers said that incorporating local phenomena and/or activities made a difference in how students engaged with or connected to the lesson, up from 73% last year. Teachers reported that students were more engaged in their learning, more engaged in the community, and more confident because the subject matter was familiar.

*"Students were more invested in activities because they were focused on a local phenomenon. We can look out of our classroom window and see the Fidalgo Bay. I think students take the beauty of our location for granted and do not realize that even if the Bay looks clean, it is contaminated and that contamination is problematic. **I feel like students started making more meaningful connections to their local environment as a result of the learning we did together in the classroom.**"*

Student-Reported Outcomes

In winter and spring 2021, secondary teachers collected 291 student practical measure responses before classroom instruction related to the course and

332 responses afterwards. Students were somewhat positive (combined percentages of 'agree' + 'strongly agree') about their science class experiences before implementation related to IslandWood (Figure 10). After implementation, students were more positive, especially in their ratings of their enjoyment of science (+15% agreement) and how science helped them learn more about their local neighborhood (+16%). There was a small increase in their reported curiosity (+6%), and no meaningful change in their sense of how much they saw science as connected to something in their life (+1%). Figures 11 and 12 show the full breakdown of student responses to the practical measures before and after.

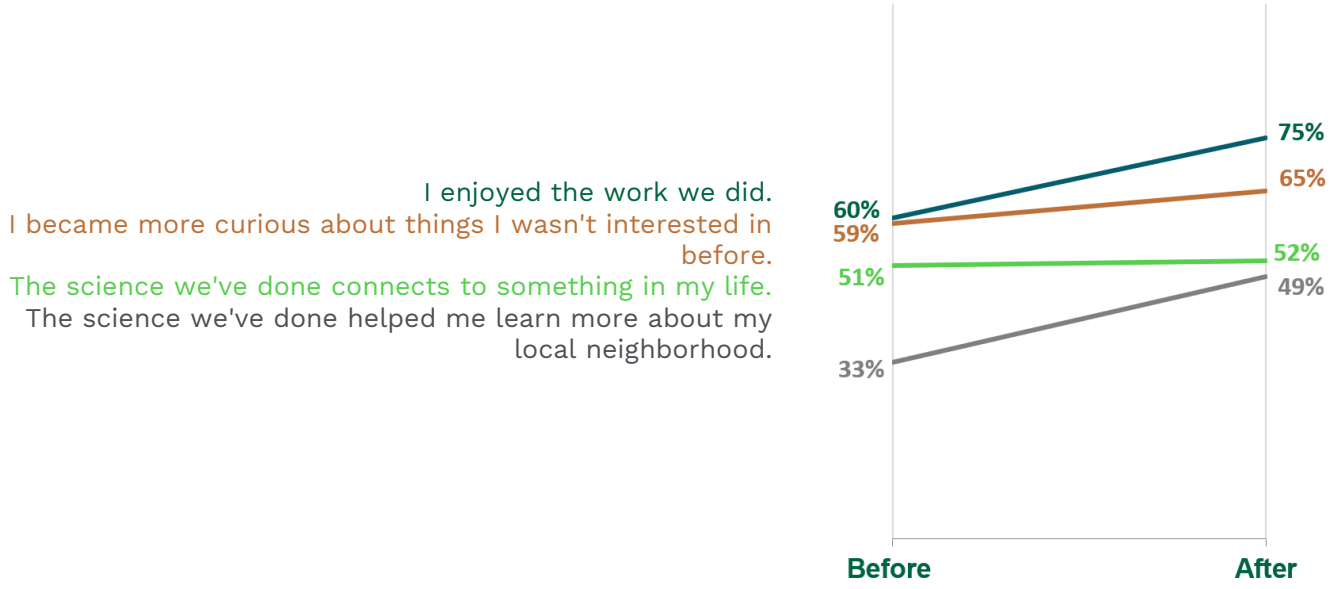

Figure 10. Percent change in students' perceptions before and after their engagement with IslandWood supports this year. Percent agreement is based on the sum of agree and strongly agree statements. (n=80)

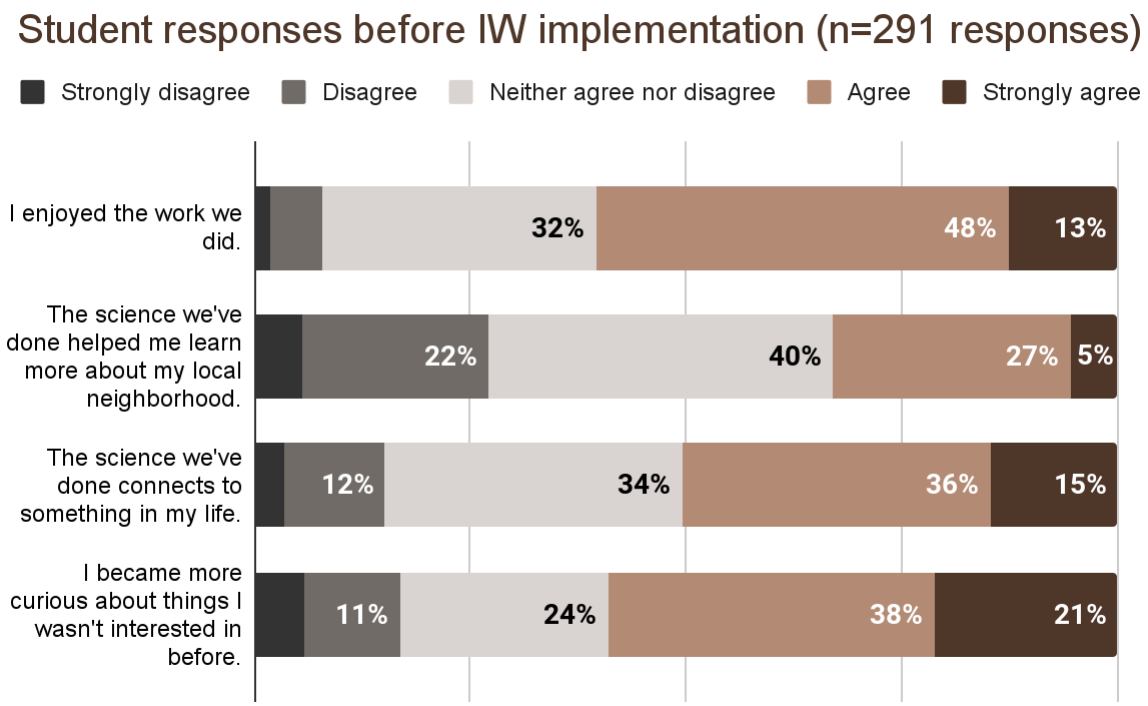

Figure 11. Breakdown of student practical measure responses on classroom instruction before IslandWood supports.

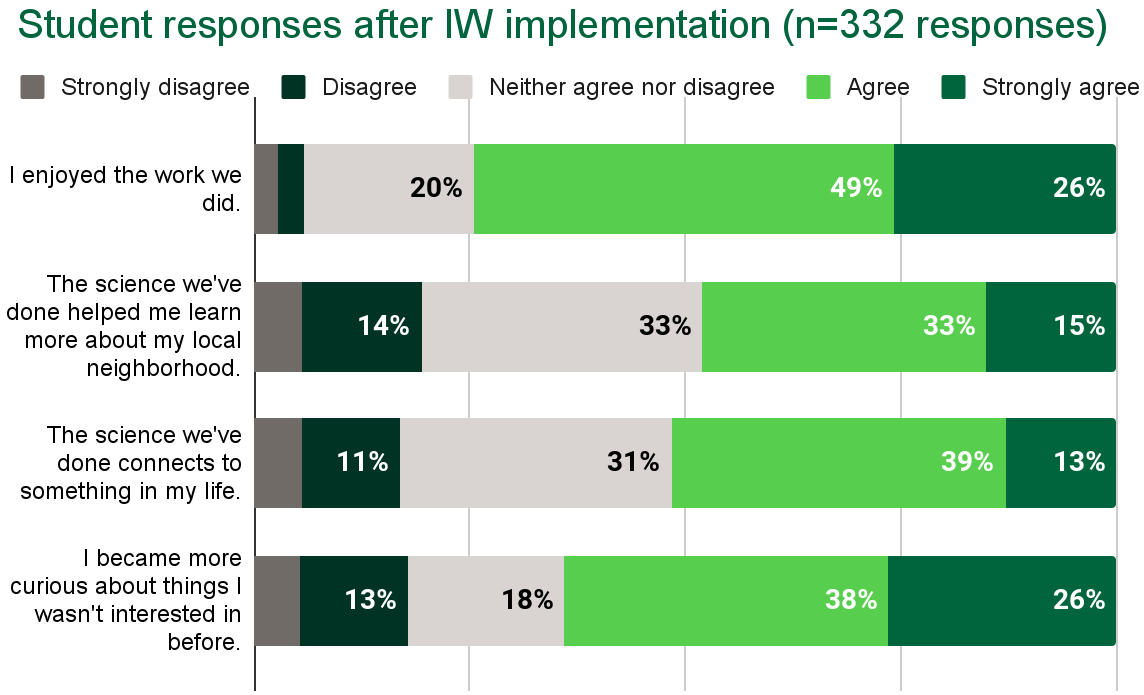

Figure 12. Breakdown of student practical measure responses on classroom instruction related to IslandWood supports.

EVALUATION QUESTION 4:

What feedback do teachers have for future supports and implementation?

Future Work

Ninety-seven percent of teachers said they were likely or very likely to incorporate their schoolyard or local community into their teaching next year (Figure 13), similar to last year's results. A few teachers from schools with fewer BIPOC students said they were unsure about next year. One teacher said, "I hope I can include something I like to teach in the limited time I have for my classes, but more likely the school district will tell me what I should teach and which program that I need to use, etc." and another said, "It depends on our next unit."

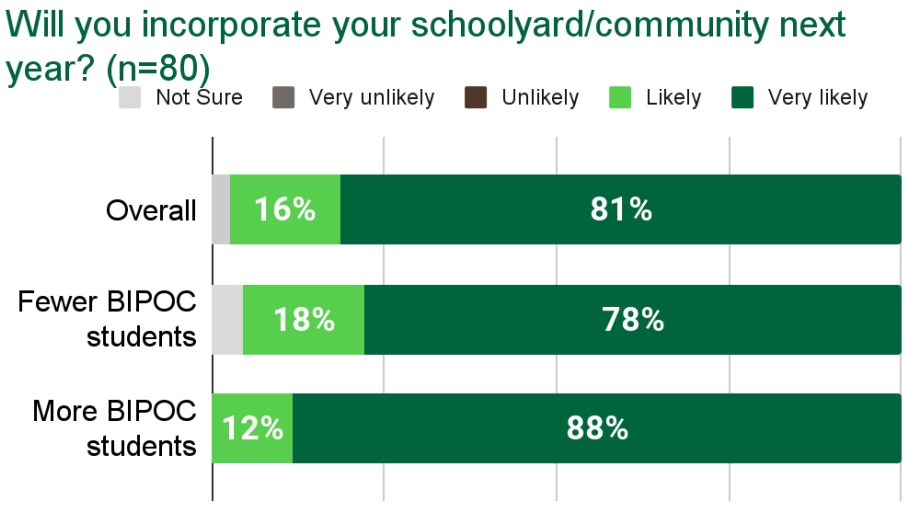

Figure 13. Incorporating schoolyard/local community next year.

> *"We work with families through our programming and I love the idea of supporting this audience in getting outside and exploring their nearby outdoors, as well as **finding ways to feature some of the natural spaces near our institution**."*

> *"Schoolyard and community work has always been important to me. I started my career at the elementary level and would spend hours in the wetland attached to our school property. Once I moved to teaching middle school, I lost the flexibility I had in the elementary classroom. **I took this course to regain confidence in using outdoor spaces within limited amounts of class time.** I am going to keep pushing myself in this area!"*

Teacher Feedback

Teachers were very positive about how IslandWood has supported them, but made suggestions related to specific resources and strategies to engage other teachers in this work. Teachers made suggestions for improving the anti-racism focus, for the course set-up and content, and how to address barriers to implementation.

To improve the anti-racism focus in future courses, several teachers suggested that focus on anti-racist education be more fully integrated into the rest of the courses (not as a stand alone piece) so that that teachers can actively consider teaching strategies and engagement throughout the course content.

> *"Incorporate this INTO the lessons. **Stop and think, stop and share about how specific instructional moves or community engagement can be actively anti-racist.** I found the separate components helpful, but it cannot be separate in how we teach so it shouldn't be separate in our learning sessions." (Demographic information: white, winter/spring course)*

> *"I would have liked it if the ABAR (anti-bias, antiracist) work was not a separate component. Instead, I think it should be embedded in each part of the lesson. For example, modeling the lesson and then stopping to share ABAR practices as you go. **This could also be supported by having teachers intentionally stop and consider their students. What do they need? Who do you hear from? Who do you not?** Contextualizing the lessons with specific cohorts is important too for teachers to reflect on their practices." (Demographic information: white, winter/spring course)*

Teachers suggested that IslandWood should focus on hiring BIPOC educators and involving BIPOC activists and families who have been doing this for a long time to share their work.

> *"**Maybe it would help to incorporate examples or activities from BIPOC in the fields now.** For example, talking about water conservation and bringing in information about what BIPOC have done for years. This series did a little of that by bringing in information about the First People in this area. This would help the kids see themselves in the science field." (Demographic information: Hispanic or Latinx, fall course)*
> *"I think making sure that various cultures and opinions are represented in the examples and **continuing to include the family voices as experts too**." (Demographic information: white, winter/spring course)*

> *"**I would have appreciated hearing from representatives of different racial groups in their fight for environmental justice** - CitySoil Farm, the Yakama Tribe and their work to preserve fish populations in the Columbia River." (Demographic information: white, winter/spring course)*

Other suggestions related to anti-racist science education:

- Provide a syllabus, along with an anti-racism book or video list (for teachers and students).
- Provide examples of what anti-racist science teaching looks like in practice.
- Provide workshops/courses that focus explicitly on anti-racism.

For the course set-up and content, teachers requested:

- Opportunities to rotate into other groups to hear from new people.
- More direct instruction on using phenomena.
- Pre-planned units ready to teach.
- Follow-up courses later in the school year.
- More focus on student technology use.
- Examples of how teachers have done the classwork.
- More collaborative planning time.
- More resources specific to remote learning.

> *"I wonder if there could be **multiple sessions throughout the year**? Maybe Session 1, you provide us with the phenomenon and lesson ideas. We all do the same thing, and discuss. And THEN, when we feel more confident/comfortable, we could be more flexible with what the lessons/focus are. I think for myself, and many in my group, we maybe were overloaded with all the new learning from remote teaching, and just wanted to be told what to do! :)"*

To address barriers of limited time or lack of flexibility, teachers suggested that it would be helpful to have more support for curriculum planning and/or alignment with specific district curricula—and even pre-planned units ready to teach.

> *"One thing that might be helpful in a mentorship would be to have **an Islandwood mentor actually look at curriculum together with teachers to plan integration**. The practice of going 'off book' is hard for teachers with all the pressures that come their way in the classroom. But I believe with practice and team planning integration can be a huge tool in our equity action plan. As a classroom teacher, I would have welcomed another outside perspective on those reading/writing/math/science curricular connections to push science education. Practice going into depth in a few different units to train teachers on where to find the integration pieces can be a really powerful exercise."*

Some teachers suggested that more flexibility in the time to complete the courses would help address barriers to implementation.

> *"I wanted to engage more and attend the final Zoom, but my school has been pushing for us to end our cohort model and have all students 4 days per week. This has been a massive stressor that required me to work early and late every day, not allowing for extra time or energy for this class anymore. I kept trying to catch up on Google Classroom, but ultimately did not complete the Implementation Summary because I have not had enough time to dig into the final session materials. **It would help teachers like me to have a longer window to complete the course or start it before summer and then give them [time] to reflect and process during early summer."***

Finally, teachers suggested that this year it would have been especially helpful to have more ideas for lessons specific to remote learning.

*"I believe this year is very different from regular years because of Covid-19. If you can provide the **digital resources** that are helpful to create science activities will be helpful. It took a long time for me to research resources."*

Conclusions

During the 2020-2021 school year, IslandWood's climate education supports, as well as teachers and students, experienced major adjustments to distance and hybrid learning environments due to COVID-19. However, the outcomes of the 2020-2021 IslandWood Climate Science Education project were still overwhelmingly positive. During a challenging time, the program aimed to support teachers and informal educators with resources, strategies, and experiences that would enable them to provide hands-on climate science learning experiences for their students. Though teachers cited distance learning as the largest barrier to implementing what they learned from Islandwood's courses, they still cited important outcomes for their instruction and for students. Through the climate education courses, IslandWood's program effectively worked with educators to reach climate science education goals in Washington state.

Teachers were very positive about their learning experiences with the IslandWood courses. After their participation in an IslandWood course, teachers felt more knowledgeable and comfortable with the Next Generation Science Standards and climate science, taking their students outside, and connecting to students' identity and everyday lives. Teachers appreciated the practical strategies that were immediately applicable to their classrooms and made important shifts in their thinking about science learning and how to connect students to their communities, especially as students were learning from home.

Teachers were positively impacted by the focus on anti-racist science education. White teachers and teachers of color were generally positive about the experience and are enthusiastic about continuing this work, both back in the classroom, with their colleagues, and in future IslandWood courses. Several teachers pointed out that this focus is not as explicit in other professional development opportunities. Centering anti-racism in science education gave them confidence to learn more, focus on anti-racism and social justice with their students, and have these discussions in other spaces.

Almost every teacher who responded to the end-of-course survey was able to implement what they learned back in the classroom. Only a few could not because of shifting teaching roles. Teachers in schools with more BIPOC students were just as likely to have implemented lessons or to have made changes to their teaching – in fact, all teachers in these schools said they were able to do these things. Similarly, the challenges and barriers were similar across all schools, with time being the biggest factor this year. There were also no meaningful differences in terms of what they did with students.

Teachers most frequently tried a new activity, made use of their school grounds, or incorporated local phenomena into their teaching. Ninety-seven percent of teachers said they were likely or very likely to incorporate their schoolyard or local community into their teaching *next year*.

Finally, the results presented here indicate that teachers perceived that the IslandWood Climate Science Education program enabled them to implement instruction that successfully engaged students. As last year, teachers reported students benefited from access to more relevant or authentic learning and that incorporating local phenomena and/or activities made a difference in how students engaged with or connected to the lesson. Students reported increased engagement in the related classroom instruction.