Jennifer Stock: Good afternoon, everyone. This is Jennifer Stock. I'm your host for Ocean Currents. On this show we dive into ocean topics, discussing research, conservation, exploration, and just about anything having to do with the blue part of this planet. This show is the first Monday of each month and is part of the West Marin Matters series every Monday at 1 o'clock you can hear a program relating to the environmental or economic issues we face locally and globally. Today on Ocean Currents, we will be discussing what I consider to be one of the most important issues facing the long-term health of this planet and the ocean itself. Without consideration of this issue, the future of our planet could be in dire shape.

We are talking about ocean literacy. Here's the big question: If over 70 percent of our planet is an ocean, why is it barely, if at all touched on in K through 12 education? So, today on the show, I'm pleased to welcome Ms. Rita Bell, the education…program manager with the Monterey Bay Aquarium, a leading institution in the US for ocean conservation education and Ms. Meghan Marrero, curriculum director with US Satellite Laboratory based out of Rye, New York who develops teaching resources that bring ocean literacy into the classroom using the standards. So, welcome Rita and Meghan.

Rita Bell: Thank you.

Meghan Marrero: Thanks, Jennifer

Jennifer Stock: I've got a bi-coastal show here. Someone in California and one in New York and there's oceans on both sides. So, welcome again. So, Rita, you have been directly involved in this ocean literacy movement for the last few years. Can you give us a more thorough explanation of what ocean literacy is?

Rita Bell: Well, we think of ocean literacy as kind of the total amount of information and knowledge that the average person should have in order to make good decisions about ocean health. It would…an ocean literate person is aware of how the ocean impacts his or her life and how she or he impacts the health of the oceans.

Jennifer Stock: Excellent. Meghan, do you want to add to that at all?

Meghan Marrero: No, I think that's great and I think that the one thing I would add is that maybe people don't realize how many issues are related to the ocean and that there are so many reasons for citizens to be ocean

literate and to understand this influence on them and their influence on the ocean as well and I think as we move forward in…just in our country alone, we're going to see a lot more of these issues we're talking about: offshore drilling, for example, and people who have this ocean literacy are able to respond to those types of issues because they understand them better.

Jennifer Stock: That's great. We're going to get to a little bit of the public and the influence of media later on, but Rita or Meghan, what concepts should a high school graduate understand about the ocean in order to be considered ocean literate? This is one of the big topics that's been sorted through in the last few years and a lot of movements moving forward. So, what concepts would you say are the most important that a high school graduate should understand?

Rita Bell: Well, Jennifer, a whole bunch of scientists and educators have been working on this project for a long time and they've come up with what they call seven essential principles and then a bunch of fundamental concepts related to each of those principles that kids should know by the time they graduate from high school and one of those principles deals with the fact that the earth is actually…has only one ocean that's completely interconnected and that within that ocean there are a lot of different features along the bottom of the ocean that have an impact on how the water moves.

A second principle is the idea that the ocean and life in the ocean shaped the features of the earth. So, that not only does the movement of the ocean water cause coastal erosion and things like that, but the living things, the organisms in the ocean actually have an impact on the structure of the earth. Another, third, essential principle focuses on the impact of the ocean and weather and also our climate, which is really important now that we're thinking more about global climate change. The fourth essential principle focuses on the fact that the oceans actually make the earth habitable. Most of the oxygen in our atmosphere comes from the ocean, from the plankton that float on the surface of the ocean and so, without the ocean, all of us who are inhabiting the surface of the earth wouldn't be here.

Then, the fifth principle focuses on the fact that there's just a phenomenal diversity of life in the ocean. All sort of animals, many different sizes and shapes and configurations that we never see on the earth and there are just man, many of them in the ocean. Probably the most important, from my perspective, is principle number six, which focuses on the fact that the oceans and humans are inextricably inter-connected, that what we do has, in our daily

lives, has an impact on the ocean and that what happens out in the middle of the ocean directly or indirectly has an impact on us and then the seventh, final, essential principle is that the ocean is largely unexplored.

There are a lot of things that we just don't know about the ocean. We've explored more of the surface of the moon in relationship than we have of our oceans and so, at this point, we're making a lot of decisions based upon just having a small piece of information about what's really going on in our oceans.

Jennifer Stock: Do you think the public, the voting public, understand these concepts right now?

Rita Bell: I don't think so. I don't think so and we have a documentation that demonstrates that they don't. Back in the 2003 and 2004 there were a couple of national commissions that did a lot of interviews and talked to a lot of people and conducted some surveys and, in fact, in both of those, the Pew Ocean Report and the Joint Oceans Commission, both said that we need to do more educating and better educating about the ocean in our elementary schools and our high schools because the general public just doesn't understand what's going on out there.

Jennifer Stock: How about teachers? Both of you work with teachers and with the teachers you interact with, do you feel that when they come into a workshop or an experience you're working with that they're somewhat ocean literate? Let's hear from both of you on that.

Rita Bell: Well, speaking from the speakers that we work with at the Monterey Bay Aquarium, most everybody that comes to our workshops has a great interest in the oceans and they're very curious and they're very excited to learn more about the oceans. They're probably, of all the teachers that are out there, the ones that have the best background because they've had that personal interest and they've sort of pursued that on their own.

Jennifer Stock: How about you, Meghan?

Meghan Marrero: My experience is, it depends. In some cases, some of the workshops, like Rita, we have workshops that are more marine science focuses and that will draw out educators who have more of an interest in marine science and they're looking for ways to bring marine science into the classroom, but in other programs that we run, we have an earth-system science program, for example, and

part of that, of course, is the ocean and we have infused a number of the ocean literacy principles in there.

A lot of those teachers don't have that same background and studies are showing that a lot of science teachers don't have the background necessary to teach marine science and if there were, sort of, occasions for marine science that less than…there would be, like, less than 1 percent of teachers would actually be able to be certified. Science teachers, I think would actually be able to be certified in those areas. So, I think there's definitely a need for teacher training in the ocean sciences.

Jennifer Stock: How about with our audience in the middle states? We're talking about the ocean literacy concept about the ocean and humans being inextricably inter-connected and how about those inter-states and do we have a good assessment of education in the middle states that may not feel the connection to the ocean that the coastal states do?

Rita Bell: Jennifer, I think that we have sort of anecdotal information from a lot of those teachers and a lot of the….taking a look at the science content that is delivered in those central states and they feel, sort of, far away from the ocean and possibly, if they do watershed studies or they take a look at how their rivers that flow through their communities connect with the oceans, they may be able to see those connections, but for the most part, it's kind of the old out of sight, out of mind kind of perspective.

Jennifer Stock: Meghan, I know you've done some training with some interior state schools. How about yourself?

Meghan Marrero: Yeah, I mean I agree that I think that the teachers that come to us are…they've reported that their students are actually very excited and intrigued to learn about the ocean because it does seem like such a faraway place, but that it is sort of far away and out of sight, out of mind, as Rita just said, but one thing, for example, I had a group of teachers last week in my workshop from Montana and they were thrilled to bring in a program that used, like, our one program uses technology to connect students to the ocean and where they can follow animals that are out in the ocean, for example, and to really give them a reason to start to look at it and then bring them closer to home.

Bring in ideas like, well, the ocean provides our oxygen and the ocean is providing our rain rater and that kind of thing. So, we have to give them reasons like those that Rita just went over that

are outlined in the essential principles to connect to the ocean and to bring it to the classroom and to make it concrete to students.

Rita Bell: I think that Michelle is totally right on that. What we have found is that the ocean and ocean habitats and ocean animals are a really fantastic context by which students and teachers can learn a lot of different sciences that they need to learn anyway, their physical science, and chemistry, and life science, and earth science, and by providing them with the ocean as sort of a hook, because it was very interesting and it's sort of foreign and it's sort of unusual, then the kids and the teachers have something that they are really interested in learning about.

Jennifer Stock: For those just tuning in, you're listening to Ocean Currents, my name is Jennifer Stock and we're talking about ocean literacy. I have Rita Bell from the Monterey Bay Aquarium and Ms. Meghan Marrero from US Satellite Laboratory in New York. Based on that idea that the ocean is exciting and it's this hook and this great way to bring students into science, with the history of the creation of the science standards, why do you think ocean related topics were minimized and basically ignored?

Rita Bell: I think it just had to do with who was invited to sit in on those initial planning sessions and the structure of science education in the United States, especially at the K-12 level has almost always been divided into biology and chemistry and physics and earth science and, you know? So, those were the big four and those were the representatives that were invited to the table originally to have that discussion and there was nobody there that was championing the ocean.

Jennifer Stock: So…

Meghan Marrero: I would agree. I think that also the marine science was always lumped together, not always, but often lumped together with environmental science, which is also never brought to the table and is also inherently interdisciplinary and so, I think those two areas have sort of been pushed aside whereas where they could instead be all-encompassing and that's definitely a problem.

Jennifer Stock: I had read in some of the research I've done that the environmental sciences and oceanography weren't considered rigorous enough to be included in these standards. Have you heard that similar fact?

Rita Bell: I think especially environmental science wasn't considered as rigorous. I think a lot of people kind of lumped environmental

science with somebody who was eco-friendly and they think more as a lifestyle rather than a scientific field of study and I think for a long time, people just didn't know or realize how much actual science was going on in terms of oceans and ocean research and so, I don't know if people considered it less rigorous or if they just didn't even know about it.

Jennifer Stock: Well, it seems like it certainly has changed and when did educators realize that this was a big problem for ocean conservation and decided to start working on this issue at the scale that it's being worked on right now?

Rita Bell: Well, the big push came, I would say, probably about 5 or 6 years ago, but all along, for the past 30 years at least and I'm sure before that time, people who taught about marine science and ocean science and ocean issues would get together and they would sort of decry the fact that there just isn't very much education about the ocean that's going on in the school system and it was kind of in combination with a push from those two commission reports that I mentioned earlier and maybe just getting to a critical mass of people who were a little bit upset about things that this big push happened about five years ago where a bunch of teachers and a bunch of informal educators and scientists and researchers said, "You know, what we need to do is we need to get a marine science education and ocean science education into the standards so that it can become part of what it is that kids need to learn K-12"

Jennifer Stock: And so, dealing with the states, I mean, each state has a different board of education. So, what's the thought of how is this going to transfer into each state?

Rita Bell: Well, our approach was knowing that each of the different states has their own standards, that even though they're so different, a vast majority of their science standards were based on the national science standards and so, the first thing that we did was to take a look at the national science education standards and see if there were areas within those standards where we could use the ocean or ocean themes to teach that concept.

So, for example, density. Density is one of those topics that almost everybody teaches in every single state and so, we were saying that you could use the ocean and currents in the ocean to teach density and provide a context for it that would make it more meaningful to kids. So, we kind of went through that exercise, taking a look at what were the main concepts that were supposed to be taught according to the national science education standards and then

what are some of the ocean concepts or ocean themes or ocean ideas that can be used to teach that.

So, that was the first step and then at the same time, we were also talking with a bunch of scientists and other educators and generating among ourselves, this every long list of things that we thought were essential, that…what were the ideas and concepts that people had to know in order to be ocean literate. So, we generated that long list and then we took a look at that and related it to the national science education standards and looked for the overlap.

So, that was our very first step and we figured if we could identify those, then those states that were in the process of taking a look at their science standards might be able to say, "Oh, here is a great ocean theme that we can integrate into our science state standards and then possibly replace that and that way we would get more ocean science incorporated into standards at the state level.

Jennifer Stock: Now, Meghan, as a former science teacher yourself and someone who has a marine science background in your education, did you see a disconnect in your school in regards to the lack of ocean content because basically, what Rita was just describing is what I believe you have taken on as a mission in regards to your education with teachers and teaching science concepts.

Meghan Marrero: Oh, absolutely. Yeah, I mean, the first day that I showed up to be a teacher in New York City, they said, "Congratulations. You're teaching Earth science." I said, "Okay, great. That's not what I'm certified in, but ok." And I was excited because I have a pretty strong background in ocean science and that's a big part of the earth so I was ready to go and then I was told by another earth science teacher that, "Oh, no, no, no.

We cut out the oceanography part of the state science curriculum." And I said, "I'm sorry, what?" And basically, my experience did not change and that had been an optional part of the curriculum and as they had revised the New York State curriculum, that optional oceanography piece sort of, you know, went by the wayside and so, I sort of did exactly what Rita was describing in that I brought in other…the ocean into other concepts.

So, for example, teaching photosynthesis, instead of teaching just plants you can teach phytoplankton in the ocean and you can talk about marine food chain instead of land-based food chains, for example, and then eventually I ended up starting my own marine

science course and program at my school, but I don't think that that's necessarily the way to go. I think the way to go is to try to show teachers that they can meet their regular standards in their regular courses that their kids are tested on using the ocean.

Jennifer Stock: So, if this…and you're coming with someone with someone who cares about the ocean and is passionate about it, but probably, a lot of folks may not have that same drive. So, is there a plan for when we get these essential concepts and units approved in the states to help bring up the knowledge level amongst teachers across the United States?

Rita Bell: I think, definitely. One of the things that we've talked about with those who have been in this kind of ocean literacy movement for the last few years is realizing that it has to be a, kind of a, multi-phase approach.

Our first step is to get people aware of the fact that there's some really good science out there that you can teach through the context of the ocean and we're trying to get the ocean concepts integrated into the standards so that they become a natural part of the science program and we know, though, that there's got to be a lot of professional development made available for teachers so that they can become comfortable with the topics and that they can have some good resources to use with their students and so, everybody realizes that that is an important next step and luckily for us, there really is a great network of professional development providers for ocean science and ocean concepts already established and we have…the National Science Foundation has funded a bunch of what we're calling COSEE programs which is Centers for Ocean Science and Education Excellence and those are collaborative projects that include universities and informal institutions and school systems that are designing some of those professional development programs for teachers.

Jennifer Stock: Yeah. It's exciting to be a part of that. The network is growing and expanding. It's wonderful. Can you both, just briefly, talk about some of the programs that you do to try to increase ocean literacy and bring oceans into classrooms at your respective workplaces? Meghan, let's start with you.

Meghan Marrero: Sure. We have a few different programs in which we've infused ocean literacy. One of them is called "Signals of Spring Aces" and that one is funded by NOAA and it was funded under an environment literacy grant to improve ocean literacy by students who are tracking…this is the one where they're tracking marine

animals live and online. So, they might follow a polar bear, for example, or follow a harbor seal or a sea turtle and they're using earth imagery to explain the animals' movements.

So, they'll look at phytoplankton or biosymmetry or sea surface and try to find out why these animals are going or where they're going and try to use some of that earth data to explain it and what we find is that students become very attached to the animal and that's, you know, kind of the hook that we're using to get them learning about it, but in order to really understand and analyze this data, they really have to know a lot of standards-based information.

So, they have to know things like density and currents and phytoplankton and how that fits into the marine food web and a little bit about seafloor and the seafloor features and how they're formed, for example, and climate and so, that's one program that's really ocean literacy focused. We have a couple of other programs that we do. One is called "Project 3D View," and that one is funded by NASA and that's for students in grade 5 and 6 and it's a earth systems science program and students are…they wear 3D glasses and they use 3D visualizations like animations and 3D maps and other…and pictures and other images to learn about each of earth's sea areas, one of which, of course, is the hydrosphere, which is mostly ocean and there's also this earth systems part where they really see how the different features are interacting.

So, they'll see, for example, coastal erosion and how humans are speeding up that process and they'll see climate change and how the ocean and the atmosphere and the land and everything is contributing to climate change and then our third major program right now is "Sprint," "Project Sprint," and that is funded by the National Science Foundation and that one is all about climate change and so, of course, there's inherently a lot of ocean work in that as well and we have students looking at buoy data and sea idea data and ocean animals and seeing how these things might be affected by changes in the climate. So, those are all of our curriculum programs.

We also do professional development for teachers on all of our programs, but we also do stand-alone courses and one of the courses that we offer is called "Lessons from the Ocean," and that course is basically all about what we were just talking about in terms of using the ocean as a context for teaching science standards and middle and high school educators.

Although, we've had teachers who teach as low as pre-school and for students of all ability levels and it's all about how to use the ocean in your classroom and we've had really great feedback from that. Teachers are very interest in trying to pull the ocean in and seeing ways that they can make things more relevant to their students. So, it's been very promising.

Jennifer Stock: It sounds great, wonderful programs. How about you, Rita, with the Monterey Bay Aquarium? I know a lot of your programs rotate year to year of what's needed and desired by teachers in your community.

Rita Bell: Right, right. We do have a really nice set of teacher professional development programs. In addition to smaller workshops, we do these week-long teacher institutes that actually, we continue through the school year with the classroom teachers and they're grade-level specific. One of them is called our "Splash Zone Teacher Institute," and it's designed for preschool through second grade teachers and it introduces them to the rocky shores that are not too terribly far from us here at the aquarium and then it also helps the teachers learn how to use their own school yard as a field site to take the little kids out and do exploration and data gathering and they look at the animals that they find, the insects, and the sow bugs, and the snails that they find in their schoolyard and they collect data and use that data to do long-term observations of their schoolyard.

So, they're actually doing some inquiry-based science, as well. We have another institute that we've been doing for the last few years for high school teachers called "Dynamic Cycles," and it focuses on the bio-geo-chemical cycles that are happening in the watershed, I mean, the wetlands area that's not terribly far from here. In fact, our sister institution, the Monterey Bay Aquarium Research Institute, has a number of data gathering buoys that are anchored in the Alcorn Slew where we take the teachers and they can then use that data that's posted on the MBARE website when they go back to school with their students.

So, they can monitor things like oxygen level and water temperature and chlorophyll levels and also tide levels and all of those other things and try and show what happens when there's a rain event or agricultural water runs off of the agricultural field and what kind of impact that has on the entire wetlands ecosystem. So, those are a couple of really neat teacher programs and probably one of the neatest activities that we do is for middle school girls.

It's called our "Young Women in Science Program," and we focus on girls who are going into 6th, 7th, or 8th grade.

We run the program bilingually, in English and in Spanish, and really do a lot to try and recruit a high level of Spanish speaking girls and the kids learn about sea otters and what are some of the issues that are effecting the sea otter population here in central California and how it is that they…what they can do back in their homes and in their communities to help the sea otters and one of the things that we have them do is do storm drain stenciling so that people realize that whatever goes down those storm drains winds up going out into the Bay and having an impact on the health of the animals that are living out there. So, that's a really cool activity that we're really proud of.

Jennifer Stock: In addition to, of course, working in an institution that the whole theme is ocean literacy and it's so wonderful.

Rita Bell: That's true too.

Jennifer Stock: Well, we're coming up on the half hour here. We're going to take a short break. So, folks just tuning in, we've been talking about ocean literacy. This is Ocean Currents and my name is Jennifer Stock. We're talking with Rita Bell from the Monterey Bay Aquarium and Meghan Marrero from US Satellite Lab. Please stay with us. Meghan and Rita, please stay on the line. We'll be back in just a few minutes.

(Music)

Jennifer Stock: So, I wanted to go back to a little bit of some of the research you've done. Meghan, you are working on your doctor of education right now and your topic is focusing on ocean literacy, which is well-needed in this field. Can you tell us a little bit about your biggest take-home message about the research you've done and what you're writing about?

Meghan Marrero: Sure. One of the most exciting things that I've found is that students get really excited about the ocean and once they get that connection, they're really eager to share it and they will actually go home and talk to their parents about it and they can actually influence their family and, like, for example, we've had students come in and tell us, "Well, now we're eating organic because then the fertilizers don't go down the watershed and effect the ocean." I mean, for them to put all of those steps together is pretty impressive and we're pretty happy with what they're doing.

So, that's one thing and I think, for me, that was the most exciting finding is that they are impressionable and that they're taking the message and they're spreading it, they're paying it forward, I guess is the best way to explain it.

Jennifer Stock: And, Rita, have you been seeing any results from some of the programs you've been doing. I know you do a lot of evaluations. What types of results have you seen from some of the programs you've been doing at the aquarium?

Rita Bell: Well, we have and I think in addition to just, sort of, to reinforce what Meghan said is that we do find that the experience the kids have here at the aquarium when they're visiting or any of our programs, they do go home and they make sure that they share that information with their families and their parents and there are a lot of behavior changes that they implement simply because they've gotten excited about something that they learned here at the aquarium. So, that's exciting. We've found that one of the things that the Monterey Bay Aquarium really is trying to do is to inspire conservation of the ocean.

So, we're trying to get people excited about the oceans and knowledgeable and to get them to move to do something positive for the ocean. So, through our education programs, we see that the kids are, as we said, going home and they're changing behaviors at home. We find that teachers are establishing programs at school so that their kids can recycle and they can learn how to do things so that they can reduce their overall eco-footprint and they've made quite an impact. So, we've been quite pleased with that.

Jennifer Stock: That's great. Is there a difference in the sense of urgency in regards to who needs to be educated about the ocean in regards to the general public versus the K through 12 generation? Do you have any thoughts on that? Either of you?

Meghan Marrero: I think that's a tough one. I mean, I think both are very important. I mean, working with students is great because they're very impressionable and they grab on to things really quickly, I think, but I think that right now they're not the decision-makers. So, I think they're both, they are for our future, but I think it's equally important to get to focus on our voters and decision makers now.

Rita Bell: That's true. There are a lot of policy makers out there who really need an extra boost of education in order to make good decisions and draft good policies and vote the right way on certain initiatives

that are coming up for legislation. So, that's a group that really, we're trying to reach. Just like the kids go home and have an impact on their families, you know, families get excited about things as well and can go home and have an impact on their kids and we know for a fact that a lot of times, ideas need to be reinforced multiple times before they finally become part of somebody's way of life.

So, if a family member or a young person hears a fairly consistent message from the aquarium when they visit and from their family when they come home and from their teachers at school, there's a better likelihood that that behavior will become internalized and that they'll act in ways that will be more environmentally sensitive. So, it's sort of like, you know, you can't, you really can't turn your back on anybody at all. You need to address them all.

Jennifer Stock: Right. That's a big area. I was just looking at this booklet, the National Marine Sanctuary Foundation with many, many collaborators put on a conference on ocean literacy in Washington, DC in 2007 and it sounds like there was a lot of working groups that were with members of Congress and to have this issue brought to that level was very encouraging to me, to see all these different organizations working at that level to make it more of an issue in the national eye. So, that was very exciting to see.

Meghan Marrero: I think it has been a bigger issue too because now agencies like NOAA and NSF are providing a lot of funding towards this issue. So, I think that's very encouraging as well.

Jennifer Stock: How do you see the media playing a role in this issue overall? It seems like the media is one of the biggest ways that people learn about what's going on in the world.

Rita Bell: That's true and if they get good stories and exciting things that are happening and they can share that with a broader audience, it's going to really make our, the educator's job, a whole lot easier.

Jennifer Stock: Yeah.

Meghan Marrero: That's true. I found that through some of my research that students report that one of the major ways that they learn about the ocean is through television and that's really interesting because they cited examples like Animal Planet and PBS and great examples that they could watch wonderful documentaries and things, but they also cited the news and in the literature, there's definitely some concern that sometimes they're not always getting truthful information.

So, I think we have to be careful. It is a great way to spread the word and to share really exciting changes and information, but we also have to be a little bit wary and I think, encourage teachers to elicit from students what kinds of things they've learned and to try to make sure that they're coming away with misconceptions or things that might be a little bit slanted in one direction or another.

Jennifer Stock: Well, as an employee of NOAA myself, it's easy to say our agency is heavily involved in working on providing resources to educators, but it seems that there is a major disconnect at each state and school district level with the standards movement and the accountability testing. What do you as both educators in the field, recommend for agencies like NOAA or the National Parks Service or the EPA or National Science Foundation to do and respect the state boards of education on this issue? It seems like we're really good at making all these resources, but what I'm seeing is this larger level of the accountability at the state level and I'm just curious what you would recommend on that

Rita Bell: Well, I know the ocean literacy movement is looking to identify when different state science standards are coming up for revision and the idea is to actually lobby those state departments of education to integrate more ocean content into the standards and so, certainly, the ocean literacy group, I mean, there's a lot of good representation from NOAA and from other agencies on the ocean literacy initiative, but that help and that level of expertise that you folks in the, sort of, government world have would be much appreciated and beneficial, I'm sure.

Jennifer Stock: Meghan, how are you feeling about that?

Meghan Marrero: I agree. I think it's really important to continue to communicate with state boards of Ed who are making the standards and who are revising them and, more importantly, the assessments that go with them because if things are not on the test then they're not getting taught and that's unfortunately the culture as a result of No Child Left Behind and other federal initiatives. So, that's something that I think the ocean literacy group and others should continue to work on is lobbying state representatives and those who are making the standards.

Jennifer Stock: What do you both see as some of the major challenges ahead for strengthening ocean literacy and bringing it into schools?

Rita Bell: I think one of the problems that we face here in California, especially in schools where there's a large English language learner population, is that the kids aren't getting any science education, let alone ocean science education and so, the pendulum has sort of swung so that we're really working hard to make sure that the kids learn how to speak English and that their language arts skills and their math skills improve, but because there are only so many hours in the day, something has to give as a result and one of the things that has given has been time during the school day for science instruction and social studies instruction and art and music and PE and all of those other sorts of subjects.

So, one thing that we have to try and do is figure out how can we get…expose kids to these other sorts of areas of the curriculum and I think one of the things that I've seen happen and that a number of informal institutions are doing is trying to work with after school programs to provide curriculum activities that would be, could be, used in an after school setting that would be maybe not quite as academic, but it would still have a lot of the good, solid content and the basic ideas and the basic concepts that kids should learn about ocean science or science in general.

Meghan Marrero: Yeah. I think that in the formal incidents one of the major challenges is that teachers aren't really prepared to teach, not only marine science, but science. So, just as Rita was saying, if science doesn't get taught, particularly at the elementary school level, because there is so much to teach and if science is being taught, well, the teachers don't have the background, probably, in marine science in order to do so. So, I think more teacher training is needed through and by informal institutions, by professional development groups like myself. So, I think that that's a way to start as well is to make teachers feel comfortable using the ocean as a context to teach science.

Jennifer Stock: That's great. If someone asked you what the most important concept to understand about the ocean was, what would you say? Let's start with you, Rita.

Rita Bell: I think I would say that I think the most important thing for people to realize is that what they do, personally, no matter whether they live on the coastline or in the middle of the continent, has an impact on the health of the oceans just like the ocean itself has an impact on their own health.

Meghan Marrero: Yeah. I have to go with your earlier comment, or you know, that principle number six, which is that the oceans and humans are

inextricably interconnected. I think that's just so important. I think people don't realize this and whenever I have to talk to someone about my dissertation topic, I'm talking about all of that and they're like, "Oh, really? Oxygen and rain…" and all of that good stuff, but there's just so much that people don't necessarily know, probably because we weren't taught it in school and keep going back from there and I think that's, to me, the most important concept is the interconnection.

Jennifer Stock: That's great. I would agree with you as well. Are there any events coming up that are related to ocean literacy that the public can participate in?

Rita Bell: Well, nice that you mention that...

Jennifer Stock: It just happens to be this week.

Rita Bell: …it happens to be the…one of the…after the ocean literacy group generated this list of essential principles and fundamental concepts, the group of us got together and said, "Okay. Well, this is what is great for the person who is graduating from 12th grade to know, but how do you introduce those concepts and at what grade level do you introduce them and what makes sense in terms of the sequence?"

And so, we've been working for the last couple of years to develop what are called conceptual flow maps, which outline the…how you might introduce a topic and what would be the first thing that you would teach and then what would be, kind of the following ideas and how could you build over a series of experiences from kindergarten or first grade through 12th grade so that by the time the kids do graduate from high school, they have a good, solid understanding of each of these principles and we are at a point right now where those conceptual flow maps are being put out for public comment and, in fact, beginning on Wednesday for two weeks, beginning on Wednesday, there is going to be an online forum and we would love to have members of the public, members of the education field, ocean scientists, non-ocean scientists, log in and actually give some feedback on the concepts, on the organizational strategy, let us know whether or not they think that those concepts are developmentally appropriate for that grade level and whether the whole sequence flows in a logical pattern.

So, I have a website if people would like to log on and it's www.oceanliteracy.net and ocean literacy is all one word.

Jennifer Stock: That's great. So, www.oceanliteracy.net and you just basically get a login and you can start commenting as you read them. That sounds fantastic.

Rita Bell: It's fantastic and we have seven different principles and each principle has four different grade levels. So, there are 28 different conceptual flow maps that people can provide feedback on and we're really looking to get as much information from the public as possible. We want this to be a really open opportunity for people. We want to make sure that we're representing the best thought and the best science and the best ideas in terms of what is developmentally appropriate in terms of education.

Jennifer Stock: Thank you so much. That's fantastic. Meghan, how about the website you were talking about, the tracking animals? Can you give us that website because that's a public website. People can log in and see what's going on.

Meghan Marrero: The website is www.signalsofspring.net/aces and there's a lot of great information about some of the different animals that we track. The maps are open to the public. So, you can see where some of the animals. We have walruses and polar bears and sea turtles and all sorts of marine mammals. So, there's a lot of fun stuff to see on there and for teachers, there is also information about how to register for teacher training, which, at this point, are federally funded, which means they're free for teachers. So, if you know anyone that might want to take part in this kind of workshops, they can definitely pass it on and take a look.

Jennifer Stock: Wonderful. Well, I want to just thank you very much, both Rita and Meghan, for sitting with us today and talking about this topic and you're both at the forefront of making some change here. So, congratulations on that and thanks again for your time today.

Rita Bell: Well, thanks for the opportunity, Jennifer. It was great.

Meghan Marrero: Yeah. Thanks for having us.

Jennifer Stock: Alright. Thanks so much.

Rita Bell: Okay. Bye, bye.

Meghan Marrero: Bye.

Jennifer Stock: And please do stay with us. In just a few moments, I will be coming back. We have a couple announcements to wrap up Ocean

Currents with today. We were just talking with Rita Bell from the Monterey Bay Aquarium and Meghan Marrero from US Satellite Lab, a curriculum company and we were discussing ocean literacy and getting the public and our K through 12 audiences more aware about how the ocean is an influence on us and we are an influence on the ocean. So, please stay with us. We'll be right back in just a few minutes.

(Music)

Jennifer Stock: We've been talking about ocean literacy and I have a couple of resources for you if you would like to become more ocean literate or learn a little bit more of what's happening locally. The Cordell Bank National Marine Sanctuary has put up a special part on their website about the recent research cruise. You can go to cordellbank.noaa.gov and learn about the recent cruise where we were testing methods to remove derelict fishing gear on Cordell Bank and there's some neat videos and pictures of how we use a remotely operated vehicle underwater to cut the gear and all the cool invertebrates and some sharks swimming around. So, please do check that out if you'd like to find out what's happening locally.

Also, in November, November 20th, we have a lecture coming up with the Point Reyes National Seashore and the Point Reyes National Seashore Association as well as the Cordell Bank Sanctuary. They've put on an ocean lecture series to bring different speakers to talk about different topics relating to our ocean environment here and this one will be pretty exciting. On November 20th at 7 to 9pm at the Red Barn Classroom, an urchin diver out at the Farallon Islands, Ron Elliot, who has taken up also video…taking video footage out at the Farallones while diving will be talking as well as Scot Anderson, a local shark researcher are going to be talking about their white shark experiences at the Farallon Islands and maybe even nearshore of Point Reyes as well.

Ron has helped produce a couple of videos about his time diving out at the islands and this will be a really unique opportunity to hear from these local folks and see these videos. This event is free. It's November 20th, coming up in a few weeks at the Red Bard Classroom at Point Reyes National Seashore at 7 o'clock. So, come on down for that and last, but not least I wanted to just give you some of the highlights from the Cordell Bank National Marine Sanctuary field trips we had. We had a field seminar that we run with the Point Reyes National Seashore Association and October 12th and October 19th we braved the big swell and wind and made it all the way up to Cordell Bank and back with two boatloads of

excited participants and it's amazing what you can see if you can make it out there, you never know.

It could be absolutely nothing, it could be a whole bunch, but we certainly did. On October 12th, we had humpback whales and sea lions diving with those humpback whales. We saw lots of albatrosses and pink-footed shearwaters and Fuller's shearwaters flying around and then we had what we call a mega pod of dolphins with us and they were with us for a long time and I have some sounds to share with you from that. One of our naturalists, Carol Kiper, was with us and she has a hydrophone that she sticks in the water to hear all of the sounds and we recorded some of that to share with you.

So, I'll end with that today and then on October 19th, we had another trip and almost was one of those days where things are just not around, but lo and behold when we were way out west, just north of the Cordell Sanctuary, around the Bodega Canyon area, we had two blue whales spending some time near us including seeing their beautiful flukes coming out of the water, which was just outstanding and then while we're sitting there, four orcas were sighted as well. Four orca whales were moving just further north of us.

We didn't get a very close look, but they were certainly orca whales and it was just amazing seeing all of this all at once within 20 minutes. So, it was really exciting days out on the water at Cordell Bank. So, locally here, we have an incredible amount of amazing marine resources. We have a role to share that with our students and with our families and our public to become more aware of the ocean and the impact we have on it.

So, hopefully you'll share some of the things you're hearing on Ocean Currents and what you're learning about with your friends and family to bring the ocean to the forefront in our conversations about the environment. I'm going to leave you today with some wonderful dolphin sounds that were collected by Carol Kiper on her hydrophone. Thanks for joining us today and enjoy the dolphins.

(Dolphin sounds)