**Unit title: Sea Ice Tracking 60 min.**

**Module 1 – What is Sea Ice?**

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| **Desired Results or Learning Targets** |
| **State or Common Core Standard:*** CCSS.MATH.CONTENT.HSN.Q.A.1 – Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
* CCSS.MATH.CONTENT.HSN.Q.A.3 – Choose a level of accuracy appropriate to limitations on measurement when reporting quantities
* SMP 1: Make sense of problems and persevere in solving them
* SMP 5: Use appropriate tools strategically
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| **Learning Objectives Posted and Shared:*** SWBAT describe how motion of sea ice is tracked, using words such as satellite or buoys.
* SWBAT explain why sea ice motion matters in terms of the Arctic communities it impacts.
 | **Evidence of Learning the Lesson Objectives:*** Student talk during lesson with partners and whole group about Arctic communities and why we track sea ice motion
* Student completion of exit ticket with two sentences describing how motion of sea ice is tracked
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|  | **Learning Plan** |
| **Opening/Hook:** **10 min.** | * T: *“What does the Arctic Ocean look like?”*
	+ Students talk amongst themselves
	+ T show pictures of ocean OR Ss research and find some themselves (reference slides 2-9)
* T: *Okay, so I’m going to show you a video of the Arctic Ocean taken by some satellites. We’re going to watch the video twice. The first time we watch the video, I want you to just watch. No writing, no talking. The second time we watch the video, I’m going to ask you to write down what you notice in the video and what wonderings, or questions, you have.*
	+ Play video two times in a row. Re-prompt students before second viewing about noticing and wondering task. (reference slide 10)
	+ Ask Ss to share out what they wrote after second play is done. Capture all thoughts on the board, as students are sharing.
	+ Focus on mathematical questions that students have shared.
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| **Lesson procedures:****45 min.** | **Sea Ice Information*** T: *“These are some really interesting questions you’ve raised. Other mathematicians and scientists have raised some similar questions about the video you’ve just watched.”*
	+ Launch introductory slides on sea ice (reference slides 11-19)
	+ End with definition of what sea ice is and connect it to the visuals in the slides

**Sea Ice Exploration*** T: *“Why do we think that the sea ice moves? What factors might influence the movement that we just saw in the video?”* (reference slides for visuals and prompts 20-27)
	+ Anticipated S responses: wind, ocean, jostling
* Build/get out demonstration set up
* T: “*This is a model of what sea ice might look like in the Arctic. Let’s see what we can figure out using this.*” Invite students to come up around the model and engage in hands-on inquiry. Have them test out answers to the below questions. Track student thinking on the board.
	+ How can we make the ice move?
		- If the Ss do not say all three, refer to slides and provide them with other prompts to help them get the ones they missed
	+ What slows ice down?
	+ Draw diagrams on the board with force arrows (reference slides 24-27)

**Ice Drift Tracking/Measurement*** Introduce general studies of ice drift tracking (reference slides 28-34)
* T: *Why might we care about tracking the ice? Why do scientists do this?*
	+ Anticipated S responses: ships, climate change, etc.
	+ T can support/add on: people live up in the Arctic too and rely on sea ice for many things
		- Can extend to conversation about climate change and impact on human interaction patterns (reference slide 35-38)
* **Introduce Goal of Sea Ice Unit – Developing a Drift Forecast** (reference slides 39-41)
* T: *How might we track or measure the ice? What would you do to measure how it is moving?* (reference slides 42-55)
	+ Anticipated S responses: satellite video
	+ T can support/add on: scientists actually take trips out there and can launch them themselves, want to see?
		- Show video from slides
* Show students the IABP website (<http://iabp.apl.washington.edu/maps_daily_table.html>) , help them pull it up. Explain briefly how data is regularly collected and tracked.
	+ - Show quick video of buoy motion over time – help student connect from data tables to visual (reference slides 54-55)
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| **Closure:** **5 min.** | **Exit Ticket*** T: *Take 5 minutes and explore this webpage. Click on a buoy and see what information you can find. There is a class buoy that I will use, if you’d like to explore that. Otherwise, pick your own buoy.*
* T: *Your exit ticket for today will be to fill out a half-sheet. On the top, put your name, then write the buoy ID/name. Underneath, write at least two sentences describing what is happening to the sea ice and what you notice about how it’s being tracked.*
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| **Resources:** | * Reference slides 1-55 for lesson
	+ Additional slides covering:
		- Historical polar exploration
		- A modern drift experiment (MOSAiC)
		- More about ice breakers
		- Services for human Arctic activities
* Demonstration materials (optional) – wooden block, water, fan
* Half sheets of paper or index cards for exit tickets
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