Sea-Level Rise in the Classroom 2019 Educator Workshop Report

Report of activities, methods, and results from the

Sea-Level Rise in the Classroom Educator Workshops
September 19, 2019
MSU Coastal Research and Extension Center
1815 Popp's Ferry Rd, Biloxi, MS 39532

&

September 27, 2019
Dauphin Island Sea Lab
101 Bienville Blvd, Dauphin Island, AL 36528

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Edited by: Renee Collini, Program Coordinator

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<u>Sea-Level Rise in the Classroom Educator Workshop</u>

Project Contacts: Sonia Vedral, Education Coordinator

Northern Gulf of Mexico Sentinel Site Cooperative

www.ngomssc.org

<u>Report Summary</u>

This report documents educator workshops hosted in coastal Mississippi and Alabama for the NAS Gulf Research Program funded project "Building Sea-Level Rise and Flood Resilience Capacity Through Students and Teachers." Two workshops were hosted, one in coastal Mississippi and one in coastal Alabama to engage the educators in the development of a curriculum on sea-level rise (SLR) designed specifically for Alabama and Mississippi high school students. These workshops were targeted for science and social studies formal and non-formal educators to introduce them to the curriculum and to capture their feedback on the early drafts. Educators were provided an opportunity to explore lessons and activities and provide feedback through small and large group discussions and a worksheet. Workshop evaluation results indicate that average participate strongly agreed that participating in this workshop was a good use of their time and that the structure and format were very satisfying. Additionally, pre and post-test comparisons indicated educators' knowledge of the curriculum and of local community resilience practices increased. The feedback collected at these workshops will be used to continue refining the curriculum.

<u>About the Project</u>

Sea-Level Rise in the Classroom is a capacity building project for high school students and teachers in coastal Mississippi and Alabama. The primary objective of the project, "Building Sea-level Rise and Flood Resilience Capacity Through Students and Teachers", is to develop and refine a curriculum that educates students about coastal flooding and sea-level rise resilience. The goal of the project is to build capacity among the next generation of coastal stewards to understand and address complex socio-environmental challenges. The curriculum includes 4 modules (Module 1: Sea-level rise and flooding basics, Module 2: Natural Solutions, Module 3: Ordinances and Policy Solutions, Module 4: Community Planning) each with lessons, activities, and corresponding field trips. The module content was drafted through an iterative process with the Project Team of subject matter experts and the Advisory Panel of local science and social studies educators. The Project Team and Advisory panel met monthly while the curriculum drafting was underway.

The draft curriculum was presented to educators at these workshops to introduce them to the curriculum as a resource, and to collect feedback for further refinement of the curriculum for classroom use. The results from the workshops are detailed in this report. After the curriculum is updated, it will enter a pilot-test phase with a group of coastal science and social studies teachers using different subsets of the 4 modules with their students. The curriculum will then be beta-tested with teachers using all 4 modules and a capstone project. The capstone project presents two simulated towns to students for them to address future sea-level rise scenarios. Student projects will be presented to community members at a Hazard Summit at the conclusion of the project.

Workshop Goal
Generate feedback from classroom and non-classroom educators on the functionality of the lessons while identifying specific areas for improvement.

Workshop Objectives
- To introduce educators to the new sea-level rise curriculum
- To provide educators an opportunity to provide feedback on the curriculum

Project Team
The Project Team includes scientists and educators from coastal Mississippi and Alabama from Alabama School of Math and Science (ASMS), Dauphin Island Sea Lab (DISL), Gulf of Mexico Alliance (GOMA), the Northern Gulf of Mexico Sentinel Site Cooperative (NGOM SSC), Mississippi State University (MSU), and University of South Alabama (USA). The team includes members from across science research and education. Project Team members are:

Renee Collini, NGOM SSC/ MSU / MS AL Sea Grant Consortium
Tina Miller-Way, DISL / MS AL Sea Grant Consortium
Alison Rellinger, Alabama School of Math and Science
Tracie Sempier, GOMA / MS AL Sea Grant Consortium
Stephanie Smallegan, University of South Alabama
Eric Sparks, MSU / MS AL Sea Grant Consortium
Sonia Vedral, NGOM SSC/ MSU / MS AL Sea Grant Consortium

Advisory Panel
The Advisory Panel includes representatives from traditional and non-traditional education settings from coastal Mississippi and Alabama. The team includes science and social studies educators. Advisory Panel members reviewed drafts of the curriculum, helped shape its development, and were present at the workshops to provide additional feedback and assist non-Advisory Panel workshop participants.

Pam Baker, Bryant HS
Sandra Huynh, Grand Bay NERR
Tracy Jay, Environmental Education Center / MS AL Sea Grant Consortium
Andrew Lawrence, Daphne High School BCBE
Stephanie LeGrone, Mobile County Public Schools
Tammy McKenna, Gulfport High School
Caitlin McLeod, MSU Jackson County Extension
Leslie Salter, Pascagoula-Gautier School District
Nate Smith, Mobile County Public Schools
Chris Snyder, GCRL MEC
Lily Swanbrow Becker, FFWCC
Avery Sward, Grand Bay NERR
Angela Underwood, Weeks Bay NERR

Educator Workshops

Two educator workshops were held in coastal communities, one for Mississippi educators in Biloxi, Mississippi and another for Alabama educators in Dauphin Island, Alabama. The workshops were held on weekdays and attending educators were provided breakfast and lunch, and a $100 stipend to cover travel or substitute teacher expenses. Workshop advertising with information fliers was sent to high school principals, science coordinators, education centers, and to Project Team educator contacts. Advertisement for the workshop began three months before the date of the workshop, through fliers, emails, and phone calls. Workshop participants represented science and social studies educators at all levels of education, from direct instruction, department coordinators, and organization directors.

Dates and Locations
- September 19, 2019 at MSU Coastal Research and Extension Center in Biloxi, MS – Building A
- September 27, 2019 at Dauphin Island Sea Lab on Dauphin Island, AL – Endeavor

Workshop Format

The workshops were hosted on a weekday for a full day with catered lunch. Direct instruction was 6 hours, allowing educators to receive 0.6 Continuing Education Units (CEUs). The workshop space was set up with five groups of tables and chairs for educators to work in groups. Around the perimeter of the room five additional tables were set up, to allow small group breakout with more distance to reduce noise.

Each workshop followed the same agenda, shown in Appendix B. Sonia Vedral, the Education Coordinator, started each workshop by welcoming participants, leading an ice breaker introduction, and describing the project. The ice breaker used Poll Everywhere software and participants responded by using their phone. A one-page pre-assessment was given to the participants to see their existing knowledge.

Following the introduction, the participants worked through each of the four modules of the curriculum with their table group. The pattern for each module was to first have an introduction by the subject matter expert from the Project Team on the topic and then have each table group work through one lesson from each module. This provided feedback to the Project Team on all the activities and allowed the activities to be completed by educators in one condensed day. All workshop participants had a full copy of all the modules and a worksheet (Appendix A) for them to write their comments. A workshop facilitator was present with each of the small groups to capture feedback on a flip chart (Table 1). Participants could write notes on post-it notes and stick to the flip chart for strengths and areas for improvement on the module and could use the worksheet (Appendix A) for additional comments. After working through the activity for 15 minutes, each group considered the ideas they had generated and discussed which of the potential suggestions should be prioritized. After discussion, the participants placed sticky dots next to the area for improvement they thought was most important. This generated a priority list of needed improvements.

Table 1: Layout of the flipchart tables used to collect feedback from the teachers at each activity.

Specific Activity		
+ (strengths)	△ (areas for improvement)	Overall module thoughts

Module 1: Sea-Level Rise and Flooding Basics was introduced by Renee Collini, the sea-level rise subject matter expert from the Project Team. Lesson activities educators explored were:
- Climate Change Ice Core
- Thermal Expansion of Water
- Melting Land and Sea Ice
- Coastal Flooding
- Economics/Modeling

Module 2: Natural Solutions was introduced by Dr. Eric Sparks, the Coastal Ecology Specialist from the Project Team. For modules with less than 5 unique activities the activities were duplicated by two separate groups. Lesson activities educators explored were:
- Tides and Wetlands
- Water Pan Demonstration (duplicate set up on two tables)
- Rain Garden worksheet (duplicate set up on two tables).

Module 3: Ordinances and Policy Solutions was introduced by Dr. Tracie Sempier, the Coastal Storms Program Outreach Coordinator at Mississippi-Alabama Sea Grant from our Project Team. Lesson activities educators explored were:
- Levels of Government worksheet
- Municipal Decision Makers worksheet (duplicate set up on two tables)
- Floodplain Management worksheet (duplicate set up on two tables)

Module 4: Community Planning was introduced by Renee Collini and Dr. Tracie Sempier. Lesson activities explored were:
- Community Planning worksheet
- Stakeholder Participation scenario (duplicate set up on two tables)
- SLR integration scenario (duplicate set up on two tables)

A culminating capstone project consists of two simulated towns vulnerable to sea-level rise depicted on interactive ArcGIS StoryMaps. Designed by a coastal engineer from the Project Team, Dr. Stephanie Smallegan, these towns provide an opportunity to explore real data and vulnerabilities. Dr. Smallegan provided a demonstration on the maps for the workshop participants, working through different examples for 15 minutes. Participants recorded their feedback on the Discussion Questions & Feedback Sample Sheet (Appendix A).
The final section of the workshop was comprised of small and large group discussions to comment on the curriculum as a whole. Participants spent 15 minutes working in their same small groups to prioritize

at least three solutions to areas they marked as needing improvement throughout day. Then each small group shared one solution with the whole room. These were captured on a flip chart and the full group determined priority revision areas and other areas for improvement of the curriculum. This section concluded with 10 minutes of open discussion to hear other concerns, easy solutions, free discussion around improvements. This focused on the big picture: what are overall comments, concerns, questions.

The workshop wrapped up with Sonia Vedral summarizing what had been reviewed in the curriculum and areas that will be updated with feedback from workshop. Workshop participants completed a post-assessment that was compared to their pre-assessment to gauge knowledge gained through workshop participation. Participants also completed a workshop evaluation. All flip charts were recorded through a google doc and with pictures taken. Educators interested in pilot-testing or beta-testing the curriculum with their students were invited to sign up on a flip chart by the exit.

Participation and Demographics
Fifty-five educators from 41 educational institutes participated in the two educator workshops. Educators represented formal education in private schools, public schools, and non-formal educators from research reserves or aquariums (Table 2). A majority of educators (64%) were from public schools.

Table 2. Total Workshop Attendance

Workshop Location	Participants	Formal Education (Private School)	Formal Education (Public School)	Non-Formal Education
Mississippi	25	3	17	5
Alabama	30	2	18	1
TOTAL	**55**	**5**	**35**	**6**

Workshop Results
Pre- and Post- test knowledge change results show in tables below.

Pre-Post Test SLR Educator Workshop		
Change/Improvement		
	Points*	**Percentage**
Average Alabama	+2.7	13%
Average Mississippi	+1.6	8%
Average combined workshops	+2.2	11%

*Pre- and post-tests were scored out of 20 possible points. The points displayed here show the net change in average final score.

Pre and Post Test Score Percentage		
	Pre Test	**Post Test**
Average Alabama	55%	68%
Average Mississippi	56%	64%
Average combined workshops	55%	66%

Module 1
It was recommended that activities that can be run in tandem (e.g., a thermal expansion experiment and a melting land vs sea ice experiment) be provided better guidance on timing so both lessons can be accomplished in the same class period. Specific feedback was provided for the format of worksheets to focus on graphing skills and separate "teacher" pages from "student" pages. The strengths of this module were that the lessons could be recreated with easy to find items, and that the graphing lessons were cross curricular with relevant real-world data.

Module 2
Provided feedback centered on increasing the detail in the instructions with diagrams and more specific step-by-step breakdowns for students. Teachers loved the hands-on and outdoor related activities of this Module.

Module 3
Feedback collected for this Module related to the timing of the lessons. It was suggested that the four lessons presented in the workshop be reworked and combined to result in only three lessons. The content was marked as important, though more visuals would increase engagement. Educators shared that the strength of this module is how lessons breaks down what ordinances are in understandable language.

Module 4
Recommendations from educators on this module highlighted the strengths of local connections and the prompts to generate discussion after critical thinking. It was strongly recommended to retool the directions for better understanding and flow. The critical thinking and cooperative learning components for students was highlighted as a strength.

Top Priority Updates Recognized at Both Workshops
- Mod 2, Lesson 2- Measure the vertical height of the sand in the water pan activity. Include human structure (house) on the shoreline
- Include tables, graphs and boxes for students to fill out on the worksheets
- Mod 3, Lesson 3 - would be good engagement for next lesson or to make more standalone lesson add a topographical map or grid for percent change
- Mod 2, Lesson 3 - More detailed instructions, include measurements of materials in instructions, tie-into other lessons by talking about the dream house.
- Mode 3 + 4 - Have an option to focus on ecosystems rather than communities to fit environmental science better
- Make compatible with technology. Many schools are 1:1 chromebooks or other technology and teachers utilize online classroom management tools like Google Classroom. Need to be able to put this material in these types of tools since many teachers will not print out everything.
- Strong desire for powerpoints to accompany lessons so that they can do the intro lectures
- Strong desire for small activities for bell ringers and exit tickets since this is common in most classrooms
- Glossary of vocabulary words
- Black and white images for printing

Workshop Evaluations

Evaluation Question	Average Response
1. Participating in this workshop was a good use of my time	Strongly Agree
2. This workshop increased by understanding of the Sea-Level Rise in the Classroom curriculum	Strongly Agree
3. I was provided with opportunities to provide input on the lessons, activities, and overall curriculum.	Strongly Agree
4. I learned something that I will apply in my work, either now or in the next academic year.	Strongly Agree
5. Do you intend to apply the complete modules in your teaching?	60% responded "Yes"
6. Did your awareness of local community resilience practices increase as a result of this workshop?	94% responded "Yes"
Workshop Content	Very Satisfied
Workshop Format	Very Satisfied
Workshop Pace	Very Satisfied
Workshop Time Length	Very Satisfied
Level of Detail Provided	Satisfied
Workshop Location	Very Satisfied
Opportunities provided for networking	Very Satisfied
Knowledge and Communication Skills of Presenters	Very Satisfied
Overall Workshop Experience	Very Satisfied

Workshop participants self-ranked themselves at the start and end of the workshop with a 5-point Likert scale for the question "I can explain the difference between climate and weather." There was a slight positive increase in the understanding of the difference between climate and weather

8. What did you like most about the workshop?
Workshop participants commented that their favorite aspect of the workshop was the hands-on exploration of the activities. The flow of the workshop also allowed teachers to strengthen their knowledge of the curriculum while being integral to providing feedback and networking with other educators. One educator wrote that "I love how the workshop was organized and involved us in the decision making process." The content in the modules was also appreciated, with another educator saying "The "real life" modules that are diverse enough and relatable enough for everyone"

9. What aspect of this workshop was least useful to you?
Only a portion of the workshop participants responded to this evaluation question. Some of those responses were that all aspects were useful. Other responses indicated that educators would have liked to have hands-on activities for all of the module lessons, and not just one lesson from each module. "Only focusing on a limited number of available modules - sharing at end did not prove valuable because did not know the lessons." Other educators mentioned that Module 3 and 4 and the capstone project needed more development to guide teachers through and increase student engagement.

10. What improvements would you recommend in this workshop?
The most suggested improvement was to allow the educator groups to mix and rotate to more of the lessons. "Rotate tables to work with new people and new perspectives." Improvements mentioned for the module content were to add student worksheets, introduce vocabulary, create bell activities/do nows, and to strengthen the alignment to state standards.

11. What questions, if any, do you have as a result of participating in this workshop?
Questions that educators asked at the conclusion of the workshop centered on how to stay involved with the curriculum and community resilience and where to access it once it is finished.

Next Steps
The feedback captured during the workshop was used to update the curriculum for the pilot-test and continued to be used to update the curriculum for continued use. These updates included layout adjustments, inclusion of additional directions, student worksheets, and updates to specific lessons.

Acknowledgements
The Education Coordinator and Project Team would like to thank the Advisory Panel for their assistance developing the curriculum, Mississippi State University Coastal Research & Extension Center and Dauphin Island Sea Lab Discovery Hall Programs for hosting the workshops, and all the participants who helped shape the curriculum to best fit the needs of teachers and students.

Appendices

Appendix A Discussion Questions & Feedback Sample Sheet

Name:

Please provide detailed feedback about the lessons and curriculum.

Module 1: Sea-Level Rise and Flooding Basics

Please share an idea for a "fun" title for the lesson you worked on:

What was your favorite part of the activity?

What part of the activity needs improvement?

What comments do you have on the written curriculum for Module 1? (In your binder)

Module 2: Natural Solutions

Please share an idea for a "fun" title for the lesson you worked on:

What was your favorite part of the activity?

What part of the activity needs improvement?

What comments do you have on the written curriculum for Module 2? (In your binder)

Module 3: Ordinance and Policy Solutions

Please share an idea for a "fun" title for the lesson you worked on:

What was your favorite part of the activity?

What part of the activity needs improvement?

What comments do you have on the written curriculum for Module 3? (In your binder)

Module 4: Community Planning

Please share an idea for a "fun" title for the lesson you worked on:

What was your favorite part of the activity?

What part of the activity needs improvement?

What comments do you have on the written curriculum for Module 4? (In your binder)

Capstone Project

Do the comparison layers show meaningful data or are they too confusing/ambiguous?

What other key infrastructure should be included?

Are there other cultural aspects or social vulnerabilities that should be pointed out?

Overall

Do the lessons flow well as a whole curriculum?

What are your general impressions for ease of use for high school teachers and students?

Please share all other comments.

Sea-Level Rise in the Classroom Workshop
September 27, 2019
Dauphin Island Sea Lab
101 Bienville Boulevard, Dauphin Island, AL 36528

Agenda

Meeting Objectives
- To introduce educators to the new sea-level rise curriculum
- To provide educators an opportunity to provide feedback on curriculum

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8:30 a.m.	**Breakfast and Check-In**

9:00 a.m.　　**Welcome, Objectives, and Introductions**

　　　　　　　　Project Overview
　　　　　　　　Speaker
　　　　　　　　Sonia Vedral, NGOM Sentinel Site Cooperative

　　　　　　　　Activities: Ice breaker activity

10:00 a.m.　**Module 1: Sea-Level Rise and Flooding Basics**
　　　　　　　　Speaker
　　　　　　　　Renee Collini, NGOM Sentinel Site Cooperative

　　　　　　　　Activities: Module 1 activity groups

11:00 a.m.	**10-min Break**

11:15 a.m.　**Module 2: Natural Solutions**
　　　　　　　　Speaker
　　　　　　　　Eric Sparks, Ph.D., Mississippi State University Coastal Research & Extension
　　　　　　　　Center

　　　　　　　　Activities: Module 2 activity groups

12:00 p.m.	**Lunch** Lunch will be provided on site.

12:45 p.m.　**Module 3: Ordinances and Policy Solutions**

Speaker
Tracie Sempier, Ph.D., Mississippi-Alabama Sea Grant Consortium

Activities: Module 3 activity groups

1:30 p.m.   **Module 4: Community Planning**
Speakers
Renee Collini, NGOM Sentinel Site Cooperative
Tracie Sempeir Ph.D., Mississippi-Alabama Sea Grant Consortium

Activities: Module 4 activity groups

2:15 p.m.   **10-min Break**

2:30 p.m.   **Capstone Project**
Speaker
Stephanie Smallegan, Ph.D. University of South Alabama

Activities: Capstone exploration

3:00 p.m.   **Small and Large Group Discussion**

3:45 p.m.   **Wrap-Up & Next Steps**

Activity: Workshop evaluation survey

4:00 p.m.   **Adjourn**

Sea-Level Rise Education in the Classroom

Workshop Evaluation Form

September 19, 2019

Biloxi, MS

Content area (please check best fit)

_____ Science

_____ Social Studies

_____ Other: _____

Teaching location (please check best fit)

___ Classroom teacher/homeschool

___ Administration

___ Non-formal education

1) **Participating in this workshop was a good use of my time. (circle one)**
   Strongly Disagree 1   2   3   4   5   Strongly Agree

2) **This workshop increased my understanding of the Sea-Level Rise in the Classroom Curriculum. (circle one)**
   Strongly Disagree 1   2   3   4   5   Strongly Agree

3) **I was provided with opportunities to provide input on the lessons, activities, and overall curriculum. (circle one)**
   Strongly Disagree 1   2   3   4   5   Strongly Agree

4) **I learned something that I will apply in my work, either now or in the next academic year. (circle one)**
   Strongly Disagree 1   2   3   4   5   Strongly Agree

5) **Do you intend to apply the complete modules in your teaching?**

   Yes ☐   No ☐   Cannot Rate ☐

6) **Did your awareness of local community resilience practices increase as a result of this workshop?**
   Yes ☐   No ☐   Cannot Rate ☐

7) **Please note your feelings about the following aspects of today's workshop:**

	Dissatisfied				Very Satisfied
Workshop Content	1	2	3	4	5
Workshop Format	1	2	3	4	5
Workshop Pace	1	2	3	4	5
Workshop Time Length	1	2	3	4	5
Level of Detail Provided	1	2	3	4	5
Workshop Location	1	2	3	4	5
Opportunities provided for networking	1	2	3	4	5
Knowledge and Communication skills of presenters	1	2	3	4	5
Overall workshop experience	1	2	3	4	5

8) **What did you like most about the workshop? Please explain.**

9) **What aspect of this workshop was least useful to you? Please explain.**

10) **What improvements would you recommend in this workshop?**

11) **What questions, if any, do you have as a result of participating in this workshop?**

Appendix D List of Feedback per Module

<u>Module Feedback</u>
Module 1
- Climate Change Ice Core - AL
    - Strength - focus on graphing skills
    - Improvement - flexibility in rounding. More explicit directions in student paper.
    - How to better integrate what's happening now with historical trends?
    - Link to historical human geography events
- Climate Change Ice Core - MS
    - Consider ways to get the graphs on one page and/or can easily be overlayed depending on student skill level
- Thermal Expansion of Water - AL
    - Have iterative worksheet chart, allowing students to input temperature and height at 0, 5, and 10 minutes. Additionally, more specifications in the directions will help the activity go smoother, esp. specify the distance from lamp.
    - A big strength is the cheap and reusable nature of the activity
- Thermal Expansion of Water - MS
    - Include a "teacher page" separate from the student hand-out. This teacher page can include additional background and details and extensions for the teacher to use without adding more detail to the student page (which they wouldn't want to read beyond what's necessary for the activity).
    - Strengths: so cheap and so easy! And most importantly, you can actually see it happen.
- Melting Land and Sea Ice - AL
    - Start activity before thermal expansion, so you can do that while ice melts
    - Have options to trade out clay for other materials (like sand) to be able to discuss different regions, permeability, etc.
- Melting Land and Sea Ice - MS
    - Do graphs to show results
    - Worksheet needs to better match the lesson in binder
    - Add food coloring to the water
- Coastal Flooding Worksheet - AL
    - Strength - cross curricular and includes relevant, real world data
    - Improvement - add more questions!
- Coastal Flooding Worksheet - MS
    - Strengths - real data but still accessible, leads to discussion, relatable
    - Improvement- Include more scaffolding, include grey scale versions of color figures, add
    - more visuals (photos, graphs that are on SLR two-page handouts by community in actual lesson)

- Economics/Modeling worksheet - AL
    - Good for ACT prep
    - Good for visual learners
    - Need to provide more examples for graphs
    - Need to include graphing in xls, gsheets tutorial
- Economics/Modeling worksheet - MS

- o Strengths - like graphing practice - making, interpreting, use of technology (google sheets)
- o Improvements - provide tutorial for graphing using google sheets or excel; consider providing examples of what graphs should look like in instructor materials; relate graphing activity back to economic information provided by including some questions for discussion at end of graphing/ modeling activity; some typos in data sheet (2global temps, no aerosols); aim for consistency in data column headings and variable (lines) in tables in handout

Module 2
- Tides and Wetlands - AL
  - o Have specific instructions on how to calculate range and the difference in height
  - o On the student work page have a place to record data & place to graph
  - o Include in the activity connection to how the plants can grow taller and not just in and how this helps
- Tides and Wetlands - MS
  - o Different tidal overlays to then show where the plants move for AFTER they first pin the plants on the marsh
- Water Pan Demonstration -AL
  - o Add directions on how to measure the shoreline change
  - o Diagram with shoreline profile and description of how to measure each part
  - o Make a data table
  - o Measure where the water is after waves and not just before
  - o Strength - visual and hands on
  - o Improve - provide more measurements on how to make measurements. In addition to marking where the shoreline is before and after, also mark shoreline at inch increments before and after (see pictures) using dry erase markers.
- Water Pan Demonstration - MS
  - o Use two different colored dry erase markers to trace whole shoreline
  - o More detailed instructions for each box
  - o Give discussion questions ahead of time to get kids thinking
  - o Strengths: Quick/easy and a fun visual
  - o Improvements: control variables a bit more. Provide detailed instructions for formulating a hypothesis before the activity and evaluating if your predictions were supported by the data at the end.
  - o Overall: can also be used as a demo so there's lots of ways to use this in the classroom
- Rain Garden worksheet - AL
  - o Having a few hypothetical (local, realistic) scenarios would be helpful. Additionally, the directions were not clear enough, it would help to have each part separated out and labeled (e.g., pt 1, look at area and collect data; pt 2, design in class; or do in 3 pts and have potential pt 1 as students researching what a rain garden is and how it can be helpful).
  - o A big strength was that this activity was very much applied science and that it wasn't just STEM, but STEAM.
  - o Like best - practical application of learning
  - o Most common suggestion improvement - more visuals throughout
- Rain Garden worksheet - MS

- o Strengths: love the idea of bringing the students outside and active.
- o The worksheet (and module, but especially worksheet) needs pictures of rain gardens. Especially good if you can get items 1-6 labeled on one image. Additionally it would be nice to consider safety measures (e.g., snakes, sharp rocks, etc.)
- o Strengths, cross curricular, Can involve career tech students, allows students ownership (they can act to solve problems), can inspire students for the future, has direct application to real life
- o Improvements
  - Fix exponents (ft2) for clarity (not multiple by 2)
  - Clarify depth confusion, depth in size factor vs depth in slope calculations
  - Make note to student - think about units (ft / inch)
- o Ideas
  - Approach by doing example (calculations) in classroom first, then head outside
  - Graph paper comes in large poster size, actually use to have them lay out garden design / plant locations
  - Use of plant list allows for differentiation (lower / higher performing students)

Module 3

- Levels of Government Worksheet - AL
  - Information is important for students to know
  - Goal is to let students know how to make change
  - Doesn't fit with other lessons, integrate into one of them (suggest 3) to give the information relevance to the student
  - Expand 2nd part of activity (local info) so that they know more about local government, people, offices, structure
  - Direct student research with relevant question / ordinance / regulation or follow history of one that has been passed recently in their community
  - Are other resources that could communicate info without dedicating class time - schoolhouse rocks :-), ~5-10 min clip of city council meeting, graphic of relationships among branches of gov
- Levels of Government Worksheet - MS
  - o Consensus was not stand alone activity, recommend integrate into one of other activities, would not be able to dedicate entire classroom period to, if possible, could work with SS teacher to make happen, but that's very school dependent; too much text to read, students would not do, perhaps find video that would achieve purpose, make homework
  - o Engagement activity - awesome, great way to introduce gov't to students
  - o If do as discussion, set behavior norms / expectations, before starting
  - o Ideas - pick law having to do with flooding, discuss as lead-in activity, set government info in context, leads students thru process
- Municipal Decision Makers worksheet - AL
  - o Instead of the first table, rework the activity so it begins with a large classroom discussion to identify community assets and then to categorize them as infrastructure, natural resources, or people
  - o Set up the "why" for the activity better - why do you need to think critically about all the stresses on valuable infrastructure before you can tackle it
  - o Develop a "sim city" type game
  - o Argument board

- o Include background information for lesser understood community assets
- o Provide opportunity for individual assets to be considered as a whole (e.g., wetlands protect roads which are needed to get to hospital)
- Municipal Decision Makers worksheet - MS
  - o Provide examples of climate and non-climate stressors
  - o Include an activity to help students learn background information and vocabulary
  - o Integrate SLR viewer with activity
- Floodplain Management worksheet - AL
  - o A major opportunity for improvement would be to adjust the process for the activity:
    - ▪ Take quiz
    - ▪ Read about ordinances
    - ▪ Re-take quiz
    - ▪ Grade quiz
  - o Note that this process requires separating out the quiz, the ordinance descriptions, and the grading score card into different pages. The grading score card should be clearer as well, with each answer choice listed with its pts next to it.
  - o Big strengths include that this breaks down what ordinances actually mean and that it's very realistic and cross-cutting.
- Floodplain Management worksheet – MS
  - o Include visuals so that this isn't just words on paper - maybe even make this into more of a visual-based quiz. There are a lot of options to make it more creative and story-based (e.g., you just won the lottery! "So now you're a millionaire…"
  - o Strengths: Love that it introduces the concept of ordinances and esp. That it has the summary alongside real official language and explains the why of the ordinance.
  - o Strengths: this is cool! They can use addresses they know and it's very interactive.
  - o Improvement: more in depth questioning to explore the "why" we see the differences. We can use Claim/Evidence/Reasoning exercises and just ask more specific questions.
  - o Overall: Real world application that is very engaging and a great use of technology.

Module 4
- Community Planning Worksheet - AL
  - o Strengths- highlights how government works and has lots of possible extensions. Will generate great discussion.
  - o Include more direction for use in class after the decisions have been made (i.e. discussion, mock town hall meeting). Could ask students to compare their personal decision to that of their stakeholder.
- Community Planning Worksheet – MS
  - o Layout is confusing
  - o Activity has too many options. Needs to be streamlined.
- Sea-Level Rise Integration Scenario - AL
  - o Develop a game play board
  - o Photos and definitions for the adaptation strategies
  - o Discuss integration with Science in Motion
  - o Change roll sums to reflect the likelihood of a scenario to happen (SLR 2 pager)
  - o Include what the cost of damages will be
  - o Where does the candy go when you lose it?

- - - Make a student in each group the insurance agency.
- Sea-Level Rise Integration Scenario - MS
    - Integrate the agencies more. Have the agencies select a strategy as a group that is related to their authority. Then reword language to reflect impacts at a community level. Suggestions from RC: work with teachers on what the impacts should be captured to resonate with the students.
    - Strengths: encourages critical thinking
    - Improvements: need more detailed instructions
    - Overall: this component has strong real world connections
- Stakeholder Participation Scenario - AL
    - Needs more specific written directions for teachers and students before and during 'council meeting'
    - Suggest have list of appropriate guest speakers
    - Like most - engagement with local community (gives them a voice, ownership)
    - Put students in position to discuss against their personal perspective
    - Like that incorporates debates (how to discuss something with someone of an opposing perspective in a civil manner)
    - Suggest include expected norms for discussions
    - Give students outline of how they must present components
    - Suggest they must even want to dress the part
    - Each lesson should include extensions / ideas for greater depth
    - Need list of materials for each lesson
    - Key area for improvement to increase participation and provide opportunity to grade students would be an exit slip: "In your opinion, which stakeholder presented the best argument and why?"
    - Strengths include the easiness of the project, the engagement opportunity, and the fact that it encourages thinking about other stakeholders' perspectives
- Stakeholder Participation Scenario - MS
    - Would prefer to use the whole class into the exercise instead of separating them into individual groups. Multiple students would then be in each stakeholder group and would be further encouraged to speak up. Additionally, allow the students to try to come up with ideas for solutions on their own and be provided ideas only as necessary. And again ensure that there is a teacher-separate page and students are only handed the top portion of the worksheet and their group's thoughts/directives.
    - Strengths include the ownership and responsibility and this being a real-world application about something we're already seeing and dealing with on a regular basis!
    - Liked the role playing approach very much
    - Would like to have setting flushed out to greater extent (more details, including irrelevant ones)
    - Clarify whether active scenario (happening now) or planning for future
    - Need more details on nuisance flooding - how often, where, etc.
    - Would help some learners to view as drama, make more play-like (reduce discomfort in playing role)
    - Consider asking students to research / speak to individuals in community in that role (parent, first responder, etc.) as part of lesson