Step UP!

Get READY!

RESPOND!

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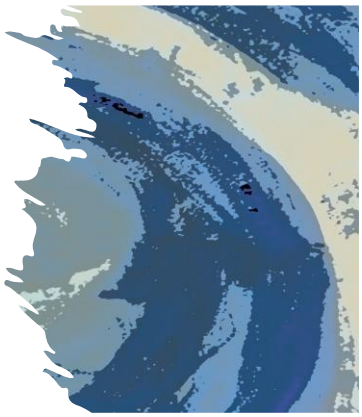
Welcome to the world of Kids Teaching Flood Resilience

where youth ages 11-18 take part in a **RESILIENCE QUEST** with their Teacher Leaders and community mentors to build high impact forms of science literacy. They want to prove that they are not just kids, doing the work necessary to develop **POWER KNOWLEDGE** across five domains: 1) **Weather Smart**, **2) Place Wise**, **3) Storm Surge Smart**, **4) Prep Ready**, and **4) Water Safe**. Whenever possible, they also step up to learn water safety and survival skills, knowing that drowning is the number one cause of death from a hurricane.

Affording opportunities for youth to **TEACH what they know**—to practice making and sharing a **Thing That Could Save Lives (TTCSL)—** is a fundamental part of the KTFR storymaking process. In our middle school program, we've been fortunate to bring in professional artists to work with smaller groups of courageous creatives who want to bring their communication art to a *performance* level. Very often, these same youth have struggled to succeed in traditional test/text driven curricula and have rarely felt part of the story when they're in school.

A compelling story causes you to ask…

The Power of STORY



As a STORY, Kids Teaching Flood Resilience is about REAL KIDS being positioned and empowered as vital resources for family and community flood and hurricane resilience. Instead of being **EDUCATIONALLY VULNERABLE**, KTFR ambassadors know what to **NOTICE, KNOW, and DO** *before* a hurricane strikes.

The KTFR storymaking methods are highly generalizable to other flood prone coastal and inland riverine communities. What is consistently evident in this story—as patterns in the data— is that disproportionate burdens of environmental decline and unsustainable development practices are being borne by low income, historically marginalized populations.

Moving from So What? to Now What?

Now, because of funding support from the NOAA Disaster Preparedness Program, anyone interested in developing their own KTFR stories can do so, knowing that this work meets key criteria for highly *effective* community resilience development programs:

Criteria for effective community resilience development programs

- A high degree of self efficacy.
- Community empowerment.
- Problem-focused coping.
- A sense of community and commitment to action.

Paton and Johnston, 2001

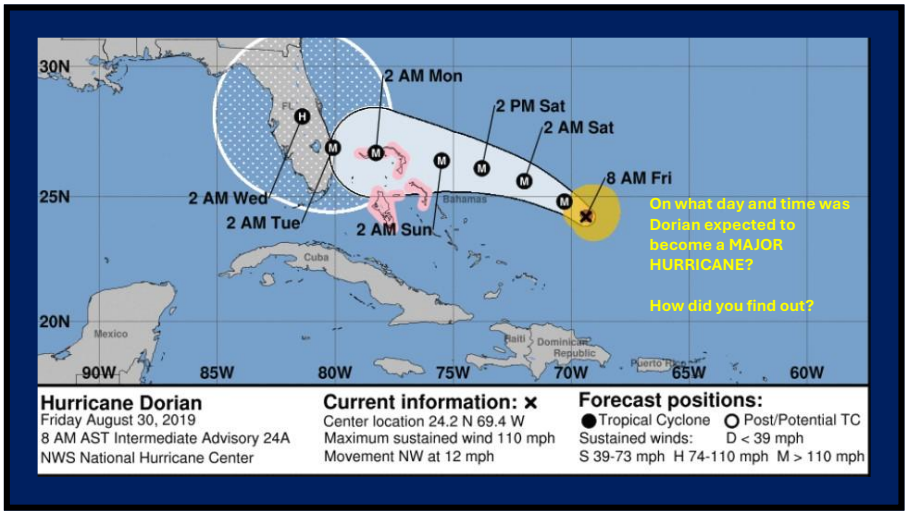
Kids Teaching Flood Resilience is designed for:

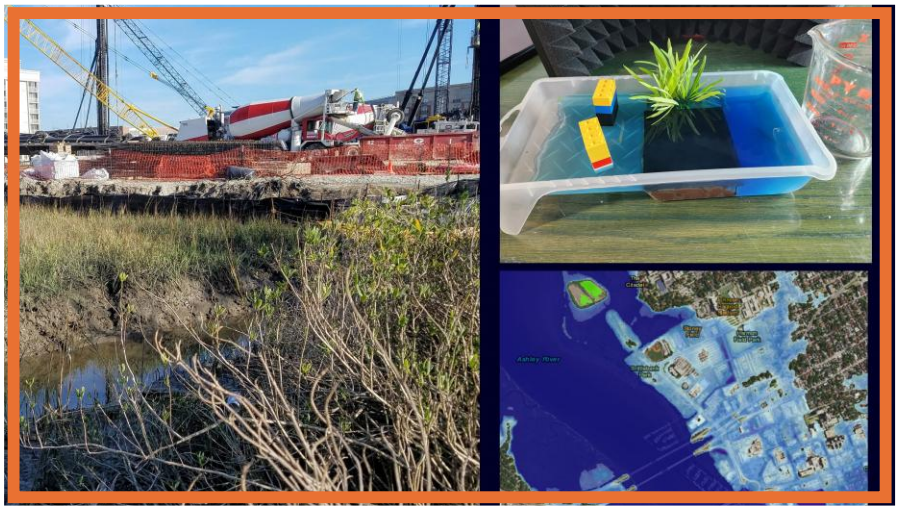
- Middle and high school science teachers—especially those serving youth living in highly flood prone communities. In KTFR, we learn science like our lives depended on it!
- Leaders of out-of-school youth leadership development programs (like 4H clubs) in coastal and inland riverine communities.
- City employees and emergency management specialists who have been tasked with deploying hazard risk reduction public information programs that connect and deliver.
- Higher education teacher education professors---as a research-based exemplar of culturally responsive and engaged pedagogies.
- Family, faith-based and other cultural communities. Home school programs.

A KTFR Participant Can Find Out and Explain…

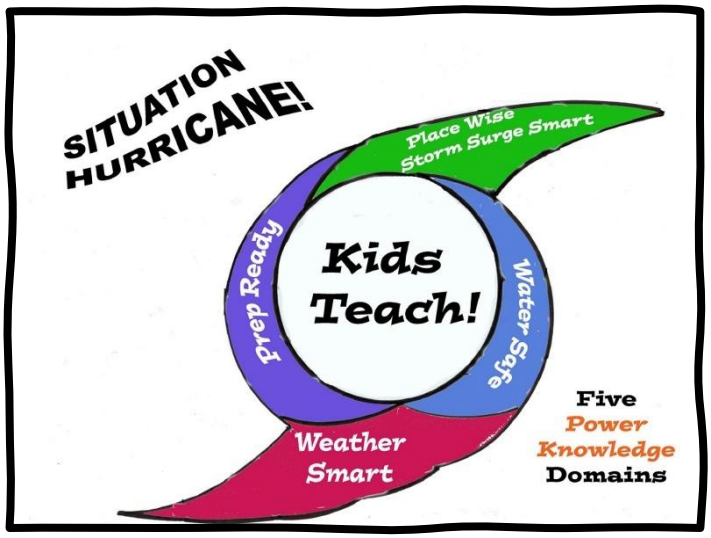
- How much time they have to get ready before a weather event is upon them.
- What to pack in an emergency kit and what their evacuation route should it be necessary for them to leave.
- How to interpret National Hurricane Center (NCH) Forecast Graphics so that they know the storm's forward speed and direction, the wind speeds, the predicted landfall location and time, predicted arrival time of tropical storm force winds, and predicted flooding inundation over the land.
- Their flood hazard risk based on 1) the elevation of their home; 2) whether it's built on top of a re-claimed wetland or in a flood plain; 3) extreme rainfall prior to a tropical storm or hurricane; 4) the moon and tide phase (coastal areas); 5) the storm's wind speed and direction, and 6) whether their community may be located in the right front quadrant of a tropical storm or hurricane.

- Why slow-moving storms can create significant rainfall flooding that can compound storm surge and inland riverine flooding hazards.
- ***What NOT to do when a hurricane is coming!***





The KTFR POWER KNOWLEDGE Domains



KTFR is a quest to acquire **POWER KNOWLEDGE** over five domains, each with its own set of **SITUATIONS to analyze and interpret and skill sets to master**. The colors of each domain are story elements in themselves, acting as repeating cues throughout the experience to catalyze associative thinking. For the middle school program, a playlist of KTFR & YOU videos on YouTube unpack the POWER KNOWLEDGE.

GET WEATHER SMART (Videos 1-6) / An analysis and interpretation of information communicated in the state and national science standards and "NOAA Smart Tools"—the National Hurricane Center (NHC) forecast graphics, National Weather Service forecasts, and the NOAA Sea Rise Viewer. Patterns in the data from past hurricanes provide extra insight.

GET PLACE-WISE (Video 7) / A place-based analysis of their neighborhood's proximity to the ocean, river, or stream, as well as its development history. For example, is their home place built on re-claimed saltmarsh? What evidence from maps can we find? What are their home/school's land elevation and where are their community's flood hazard spots? What challenges do engineers face in managing stormwater run-off in low lying areas? What can we learn from local cultural and indigenous people about sustainable land use practices and ways of being community?

GET STORM SURGE SMART (Video 8) / Technically part of the GET PLACE WISE learning, this inquiry includes an assessment of situational storm surge risk, especially the conditions that can lead to a Compound Coastal Water Event (CCWE). We have employed the NOAA NWS Potential Storm Surge Flooding Models, NOAA Sea Rise Viewer, land elevation and survey data from the USGS, place-based knowledge about storm drains and flooding hot spots, as well as how to use apps to find tide and moon phases, wind direction, and a model "worst case situation" hurricane scenarios.

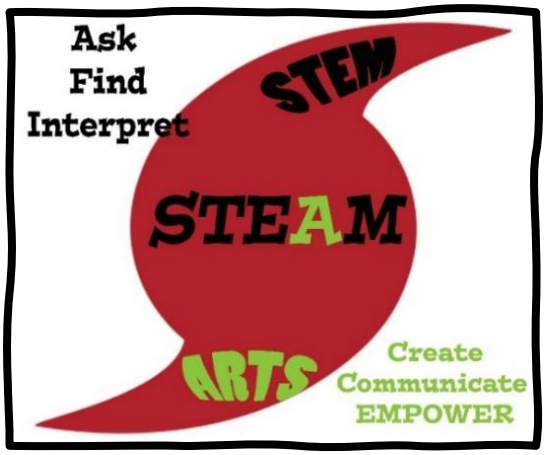
GET PREP READY (Video 9) / Hurricane season preparation, including making family emergency plans, writing down family and other contact information, identifying evacuation routes, what to pack in an emergency kit, and what to do if you get separated from our family.

GET WATER SAFE (Video 10) / An analysis of youth and family member water survival capacities. NOTE: A key goal of the KTFR outreach is to address the disproportionately high drowning deaths among Black children and youth with culturally responsive methods developed by Thought Leader, Nicole Ashby, founder and director of Gullah Swim Academy in Charleston, SC.

GAME ON. SITUATION HURRICANE (Video 11) / Hurricanes are NO GAME. In this collaborative board game, it's impossible to win unless your team shows they have the POWER KNOWLEDGE they need to get themselves out of SITUATIONS.

Resilience as a Creative Act and Communication as Art

KTFR treats resilience as a creative act, fully recognizing that **effective communication about STEM matters is an ART**. The **STE*A*M** learning progression aims to develop a *storm of educative resilience*. Affording time, space, and resources for developing and practicing communication skills is considered a vital part of the KTFR resilience building story.



The KTFR Storymaking Tools – An Overview

The following Storymaking Tools have been extensively field tested with youth ages 11-14.

Kids Teaching Flood Resilience Digital Media Field Guide for Teacher Leaders (under construction)

This curriculum guide primarily features how to facilitate KTFR teaching/ learning experiences for grade 5-8 youth, a time when Earth and environmental science (especially weather and human impact on the environment) begin to be centered in their school science curricula. The high school KTFR curriculum—*Once Upon Our Flood Prone Community*— is aligned with science standards for both Earth and Environmental Science and features the ways in which community Thought Leaders create opportunities for youth to imagine themselves entering the workforce in "Resilience Careers."

KTFR FLOOD RESILIENCE LITERACY SURVEY

As a metric for documenting one's pre/post "RESILIENCE CAPACITY LEVEL" from 1-10, this survey (if honestly answered), this survey provides a lot of insight about your knowledge and action gaps. Instructions for administering it are part of the KTFR & YOU video called **Building Resilience Capacity**.

Printable GET HURRICANE SMART RAP

Tapping into the power or rhyme and rhythm to communicate and remember important messaging, the KTFR POWER KNOWLEDGE has been concentrated into rap poetry, with hyperlinks for even deeper learning on how to avoid getting into flood hazard SITUATIONS in the first place. Each POWER KNOWLEDGE domain has its own set of verses. Knowing their significance is necessary if your team is to WIN the board game SITUATION HURRICANE and to declare oneself an "official" KTFR Ambassador!

RESILIENCE CAPACITY CONCEPTS

Color coded by POWER KNOWLEDGE domain, this is a single page of terms that, when considered in relationship to one another, reveal the cause-and-effect relationships that can amplify flood hazard risk. At the top of the page are orange colored "Big Picture" concepts that frame the story. These RC Concepts are described in the first two KTFR & YOU videos.

THE GET HURRICANE SMART KAHOOT QUIZ

Developed with a team of youth from Morningside Middle, this Kahoot Quiz has become a regular favorite with all of our KTFR participants, from students, teachers, and families to large groups of professional engineers.

A dedicated YouTube video playlist called KTFR & YOU

These videos provide a plug-and-play way to shape your own KTFR stories, even if you have minimal content knowledge to begin with! For in class sessions, these videos are flexibly purposeful and can be used anywhere in a 5E Inquiry KTFR session—to Engage early learning as well as a powerful tool for reinforcing learning (Explain, Elaborate) and for youth to share with their families, too.

Practice SITUATION and POWER KNOWLEDGE Cards, Keyed to the Rap. The entire middle school KTFR experience is meant to feel like a game whose goal is to avoid getting into flood hazard situations in the first place. At the beginning of most sessions, a SITUATION that could happen if you remain EDUATIONALLY VULNERABLE sets the scene for that day's story. Fortunately, there's a RAP for that AND the POWER KNOWLEDGE acquisition that the lesson will provide.

To reinforce learning and to help youth shape their own teaching performances, youth are invited to watch the KTFR & YOU videos after a lesson and work with partners in a a quest to find both the SITUATION and POWER KNOWLEDGE game cards which THAT video teaches. They can then share these videos and their own confident teaching with their families. **ALL KTFR material can be accessed on mobile phones.**

KTFR "KNOW"tations and Sketchbook Guide (under construction)

Throughout the KTFR storymaking process, youth are invited to create KNOW"tations, narrative drawings that communicate a science story (Koester, 2017). The **KTFR Sketchbook** becomes a homebase for this **drawing-to-know form of learning**—from why storm drains can fail to depictions of a storm surge event.

Foldable Emergency Contacts and Plan

As a key component of the GET PREP READY session(s), this document can be completed as part of a family planning meeting and folded down to easily fit in a wallet or purse. Completing this form not only gets family members to write down cell phone numbers of family and emergency contacts (irretrievable if a cell phone dies or gets lost), doing so also starts conversations about where to meet up in case you get separated.

Moon Tide Factors

This is a model-based learning activity for teaching why we have tides and why tides are highest at new and full moon phases.

Included by popular demand from our Teacher Leaders, this activity creates kinesthetic awareness of the fact that the Earth is rotating under the ocean, which itself is being pulled on by the gravitational forces of the sun and moon. Tracking the moon's phase

and the tides (using mobile apps), while one also tracks a progressing storm on the National Hurricane Center (NHC) website, are essential parts of being flood and hurricane literate.

SITUATION HURRICANE / The Board Game Kit

This game kit includes all the materials you'll need to print out the game board and cards as well as the links to purchase other basic supplies. We've also made our own game pieces and devised several different ways of playing the game, even as a large family-based event!

Trifold Board Displays

This resource provides a highly interactive way of pulling an entire POWER KNOWLEDGE story together for youth-led family-based teaching.

KTFR LIVE! REAL KIDS / REAL TEACHING

All KTFR youth get to practice performing/TEACHING their POWER KNOWLEDGE throughout the KTFR storymaking process, signifying that they've "arrived" at the turning point in the quest. We call this part of the quest ***KTFR LIVE!*** As you'll see here, some incredibly powerful work emerged when we got to work just a few hours with a professional artist. Capstone KTFR experiences have included youth led GAME ON! SITUATION HURRICANE family-based events, as described earlier. There is large format set of POWER KNOWLEDGE cards for this kind of event. Youth have devised different versions of "game rules" as well.

Kids Teaching Flood Resilience

KTFR FLOOD RESILIENCE LITERACY SURVEY

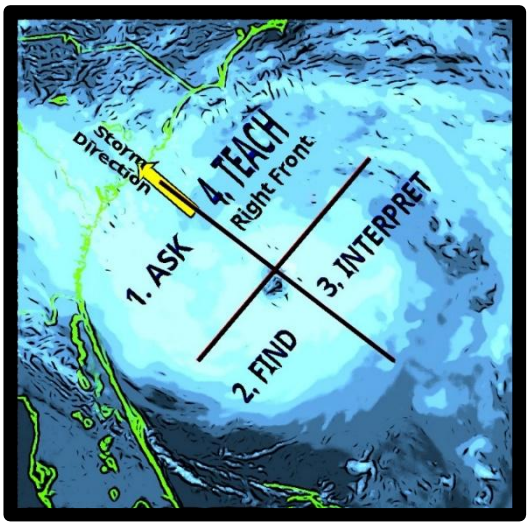
Please answer YES or NO to the following questions. It's REALLY important that you answer honestly. If there is any doubt, then please answer NO. By the completion of your KTFR program, you should be able to answer a Big YES to all of these AND back that up with your own teaching!

QUESTION	Pre-KTFR Answer	Post-KTRF Answer
1. Do you know the difference between a Hurricane WATCH and WARNING? *Post Experience: Do you now know why this knowledge matters so much?*		
2.Can you find and interpret forecast graphics by the National Hurricane Center (NHC?) *Post Experience: Are you now more confident you can do this?*		
3.Do you regularly check the weather (and the NHC) THREE times a day, especially during hurricane season? *Post Experience: Are you now more likely to do this?*		
4. Do you know the WORST possible landfall location of a hurricane for YOU? *Post Experience: Are you now more confident you can answer this question?*		
5. Can you name FIVE factors that can INCREASE storm surge hazard risk? *Post Experience: Are you now more confident you can do this?*		
6. Do you ALWAYS avoid walking or driving through a flooded area? *Post Experience: Are you now more likely to avoid flooded areas in the future?*		
7. Have you and your family downloaded (and know how to use) a tide chart app, the FEMA app, and the state emergency management department app? *Post Experience: Are you now more likely to download and use these apps?*		
8. Have you and your family 1)made a WRITTEN family emergency plan, including the phone numbers of emergency contacts; 2) identified your evacuation route; and 3) prepared an EMERGENCY KIT? *Post Experience: Are you now more likely to take these PREP-READY steps?*		
9. Do you and your family always obey hurricane evacuation orders and leave? *Post Experience: Are you now more likely to obey evacuation orders in the future?*		
10. Do you think it's important to learn how to swim? *Post Experience: Can you now explain three things to do to keep yourself and others safe in and around the water?*		

RESILIENCE CAPACITY CONCEPTS *How Are They Related?*

Power Knowledge Domain Key: Orange = Big Picture Knowledge / Red = Weather Smart/ Green = Place-Wise and Storm Surge Smart / Purple = Prep-Ready / Blue = Water Safe

SITUATION	DISASTER RISK	SITUATIONAL VULNERABILITY
HAZARD	RESILIENCE CAPACITY	POWER KNOWLEDGE
EDUCATIONAL VULNERABILITY	WHATEVER ATTITUDE	3 HAZARD SMART QUESTIONS
SANKOFA	RESILIENCE QUEST	DROWNING
WATER SAFETY SKILLS	NATIONAL HURRICANE CENTER (NHC) FORECAST GRAPHICS	WATCH vs. WARNING
TRACK FORECAST CONE ("Cone of Uncertainty")	LAND ELEVATION	STORMWATER FLOODING
RAINFALL INTENSITY	STORM SURGE FLOODING	TIDAL FLOODING
FILL-AND-BUILD ON WETLANDS	GLOBAL WARMING & SEA LEVEL RISE	STORM DRAIN FAILURE
TIDE & MOON PHASE	HURRICANE LANDFALL LOCATION	WIND SPEED AND DIRECTION
HURRICANE QUADRANT AND TORNADO RISK	HURRICANE CATEGORIES	EMERGENCY KIT
EVACUATION ROUTE	SMART CELL PHONE USE (FEMA App, State EMD App, Tide Chart App, Text, don't call!)	FAMILY EMERGENCY PLAN



Build High Impact STEM Literacy!

Integrate evidence-based thinking, place-based analysis, model-based inquiry, and the creative arts to document and communicate flood and hurricane hazard risk.

KTFR and the NGSS Science Standards

Dimension 1/ Science and Engineering Standards:

- Asking questions (for science) and defining problems.
- Engaging in argument from evidence
- Analyzing and interpreting data
- Constructing explanations

Dimension 2 – Cross Cutting Concepts

- **Cause and effect relationships**
- Patterns
- Scale, proportion, and quantity
- Stability and change

Dimension 3: Disciplinary Core Ideas (DCI)

- **Earth's Systems – ESS2**
  - ESS2.D: Weather and Climate

ESS3: Earth and human activity

  - ESS3.B: Natural Hazards

KTFR StoryMaking Stages

1. NOTICING

There's a weather SITUTATION?

2. KNOWING

There's something I could learn that can help prevent getting into this SITUATION in the first place!

3. DOING

I can practice TEACHING this POWER KNOWLEDGE in ways I think can get people to listen and ACT!

The Who, What, Where, When, Why, and HOW

Kids Teaching Flood Resilience is (KTFR) is a community resilience building initiative founded and directed by Dr. Merrie Koester of the University of SC Center for Science Education. This teaching material has been developed in with funding from the NOAA National Disaster Preparedness Program, in collaboration with SC Sea Grant Consortium, the Citadel's James Near Center for Climate Studies and STEM Center, together with a a robust team of Teacher Leaders, community STEM mentors, artists and, of course, KIDS!

The KTFR Story creates opportunities for middle and high school youth to communicate (with authority!) the cause-and-effect relationships, patterns in the data, and change over time that have and can continue to create flood hazard risk for their home place. They are anything but helpless children. They are science literate weather ready ambassadors!