STEAM Challenge

Healthy Rivers: A Call to Action

Designed for Middle and High School Students

Table of Contents	Range of Activities
	- Research – Including Field Work (if feasible) – on Local River System - Exploration of the Metrics that Determine a Healthy River - Interviews with Scientific Experts on Rivers - Creation of An Action Plan for the River's Sustainable Health - Persuasive Script Writing - Digital Literacy Skills - Video Pre-production,

	Production and Post-Production
	• 21st Century Skills - Creativity, Collaboration, Critical Thinking, Presentational Skills

Introduction

This Digital Story Telling Challenge will take two to four weeks to complete. This Challenge targets key Human Life Skills – creativity, collaboration, critical thinking, digital literacy, and presentational skills – in equal measure with the curricular content. Delivering on all those learning goals requires student immersion and time. The results, as based on our research, are a high level of student engagement, deep learning, and 100% teacher endorsement.

The following Challenge:

- Should be completed by collaborative teams of two to four students but can be completed independently, if desired.
- Is aligned to nationally recognized Curricular Standards.
- Contains an Evaluation Rubric that allows the teacher to clearly score and appraise the students' work.
- Is designed to be integrated into the classroom in alignment with existing curricula.
- Can be assigned as an extra credit project to teams of students that you think would benefit from this kind of immersive, deep learning experience. Additionally, will work well in informal educational settings.
- Should follow the rules of Digital Citizenry in their proper usage and/or citation of images, music and text taken from other sources. See the Digital Rules area in the free Media Resources section of the Meridian Stories site for guidance.

The **Media Resources** section also contains many other **free support materials** from short videos featuring professionals in the field – Artists and Innovators– to short written documents that cover everything from storyboarding to creative brainstorming, interviewing techniques to game design.

While it is helpful to have a Technology Integrator involved, they are not usually necessary: the students already know how to produce the media. **The teacher's primary function in these Challenges is to guide the students as they engage with the content. You don't need to know editing, sound design, shooting or storyboarding: you just need to know your content area.**

At the end of the Challenge, it is often fun and useful to have a screening of all the media productions – they are all designed to run under 4 minutes each. Students can vote for their favorite videos that can then be screened in a larger assembly-like setting for the whole grade to see. Or this work can be presented as part of a student showcase for parents and friends. Presentational Skills is another Human Life Skill that this project enables.

Our research indicates this to be a really useful exercise for two additional reasons:
1. Students actually learn from their peers' presentations – it is useful to hear a perspective that is not just the teacher's; and
2. The public setting – painful as it is for some students – provides them with an opportunity to 'own' their work and to be more accountable.

Finally, if you are interested to learn more about the community of schools who annually participate in the **Meridian Stories Competitions** – a community that is characterized by a friendly competitive spirit; feedback from Mentors on each submission; and the rewarding of digital badges in content, storytelling and digital literacy – please return to the Competitions section of the website or inquire at info@meridianstories.com.

Let's get started.

The Challenge

This Challenge is designed to give students a foundational structural understanding of river ecology. It begins with the question: What makes a river healthy or unhealthy? And the journey to answer that question is a journey through the science of river eco-systems, climate change and the anthropogenic threats to rivers, locally and globally. The final deliverable is a Call To Action digital story that is ostensibly being presented to either a) the town council (if the river selected is local); or b) a government environmental agency (in the US it would be the Environmental Protection Agency or

EPA) if the river is non-local. One requirement of this Challenge is to interview an expert on river systems.

This Challenge is designed to give students the tools to assess the basics of stream/river health so that as they continue to learn about climate change and anthropogenic threats to rivers, they have a solid understanding of the metrics that demonstrate disturbance, and a basic understanding of the ripple effects ecologically and socio-ecologically, of that disturbance.

<u>Deliverables</u> include:
- Call to Action Digital Story
- Outline of Research (at teacher's discretion)
- First Draft Script (at teacher's discretion)

[This Meridian Stories Challenge was adapted from Ethan Pierce's Senior Thesis at Vassar College, 2020.]

Process
Below is a suggested breakdown for the students' work.

During <u>Phase I</u> student teams will:
- Research and identify the key components that scientists use to measure the health of a river. This can be done by creating a list of metrics via which the students can measure a river's health. OR, share the list below and have students define what exactly is meant by each metric. Metrics include, but are not limited to, the following:
    - Steady seasonal flows
    - No pollution/pollution sources
    - Diverse biotic community
    - Nutrient cycling
    - No invasive species/presence of native species
    - Stable riparian zones
    - Uninterrupted sediment transport
    - Non-saline waters
- Choose a river about which to create your digital story. We recommend using a local river, if there is one, that will facilitate field work on that river. However,

if there is not a river nearby, we recommend focusing on a regional river in order to ensure the relevance of this work for your students.

> This Challenge uses the term River throughout this project. The term is meant to include streams, tributaries – any form or size of flowing water: they are all important to understand, preserve and protect.

- Choose three metrics that will help establish the state of the river's health and determine how you will research the river inside of those three metrics. Below are three approaches, the first of which is required.
    a. Interviews with experts whose job it may be to monitor the river's health or are involved in some way with environmental health and sustainability (this is required).
    b. Internet and library-based research;
        i. Keep in mind that we live in the age of big data; an age where data is being generated as never before, revealing new secrets about the nature of ecosystems and humanity's impact on the environment. Is there new data out there – data that may be about new standards or measuring techniques - that can assist you in determining the health of your river?
    c. Field work that may involve collecting river samples and/or behavioral observations during different weather conditions;
- Using primary and secondary sources, research the health of your river inside of the three metrics you have selected, and combining digital research with field work, if possible.
    - Given that you are creating a **visual** Call to Action video, you may want to shoot your work during various parts of this research phase so that you have this footage available for your digital story. This is especially true for your interviews: be sure to get permission to shoot, record and post your discussion with them.
- Create organizing charts and systems, as necessary, to keep track of your data, research, and conclusions.
- The Interview: Prep – A Call to Action needs to have both data **and** people supporting it: people who live and breathe river/environmental ecosystems. This is why the interview is so important. They validate your research and call to action. And they help humanize your message; help provide an emotional connection to the topic for your audience.

- Identify potential subject matter experts to be included. Keep in mind that this expertise often resides right there in your school in the science department.
- Prioritize your list of potential subject matter experts to be interviewed and contact your interviewee. Once agreed, be sure to prep her/him/them fully for the interview, to insure their comfort and ease. This includes a clear time and place that you have set up ahead of time – you will want to scout locations – as well preparation of the topic.
- Additionally, in order to record and edit, your interviewee may need to sign a Release Form giving you permission to record, edit and post this discussion online. Research generic and simple Release Forms online to find the right language for you.
- Prepare your questions. See **Conducting an Interview** from the Digital Storytelling Resource Center for guidance.
- Create an outline of the facts you have discovered inside of these three metrics that will form the spine of our Call to Action digital story, including a list of questions for your upcoming interview, which will be partially designed to fill out content areas where you don't have all the answers.
  - ***Teacher's Option:*** **Outline of Research –** The teacher may require teams to hand in an outline of the information that they have discovered in these three areas, as well as their interview questions.
- Conduct your interview and record it. Use a transcription app to move the words from the video recording to paper.
- Now, take your research that one last step and devise a plan of action. With the data and information you have, what can be done to improve the health of the river? Or, perhaps the issue is: what threats exist that could derail the current health of your river? So, this Call to Action could be more about, say, protecting the watershed that surrounds the river. Try to identify two or three clear action steps.
- Keep in mind that once you determine your action step, you may need to go back to your subject matter expert – the person you interviewed (perhaps there is more than one) – for one more round of interviews to learn more information about what is actionable and what isn't.

During Phase II, student teams will:

- What **is** a Call to Action Digital Story? It is a short video that is designed to lead viewers on a quick journey from possible indifference to caring. Or from caring to actual action. That's a lot to ask of a short media piece. But this all suggests that this Call to Action digital story stays laser focused and builds its arguments well.
- Here is one way to consider structuring your story. As you look at each narrative section, brainstorm what we are **seeing** during that part of your digital story.
    - Clearly identify the vast importance of the river to the local (or global) health of the region. This could span from economic health to recreational health; food resource health to environmental health. Establish the critical importance of the river to the lives of your audience.
    - Introduce your issue. One way to do this is to present the question first: "Is our river healthy?" Or perhaps, the question can be more specific: "Something is wrong with our river and we moved quickly to find out what." Here, you want to set up your story; invite the audience into wondering, 'what did they discover?' This moment is your story hook.
    - Present your data. This may focus on what is healthy about your river…and what is not; what is threatening it or what might happen…if you don't act quickly. In terms of storytelling, this is your conflict.
    - Present your solution. This is the climax to the story: the moment that communicates to your audience that this conflict can be solved; this threat can be averted; the fish can come back!
        - That last line – "the fish can come back" – suggests the importance of bringing in the element of a live character. Whether it's a human character, an animal, or even sea flora, your call to action will most likely have more impact if your audience can directly relate to an outcome that has a certain emotional appeal.
    - Present the Call to Action. This is the invitation to your audience to become a part of this success story. Or to become a part of the new behavior change needed to make this a success story. Or to become part of the defenses to avert the danger.
- Draft a script
    - **Teacher's Option: First Draft Script –** The teacher may require teams to hand in their first draft scripts for review and feedback.
- Storyboard the script. Creating a storyboard may be the most organized way to approach the logistics of shooting. This will help you organize the use of the

footage that you have already taken, which will, in turn, identify what remaining shots you need. The primary purpose of creating a storyboard is to allow you to 'see' your story – moment by moment – before shooting. When you 'see' it in advance like that, you can make changes then, rather than after you have shot the whole thing (and discover it doesn't make sense!), Check out the Create a Storyboard, Framing a Shot document for assistance.

- Pre-produce the remainder of your story. This means gathering all the remaining materials you need to visualize your story. This might include scouting locations along the river or elsewhere; gathering props; researching and collecting photos and footage; and checking on your video and sound recording devices.
- Rehearse your script. Finalize your script.
- Produce your story.

During <u>Phase III</u>, student teams will:
- Record the voice-over or narration, as necessary.
- Edit the video, adding stills and graphics as desired.
- Post-produce the video, adding music and sound effects as desired.

Meridian Support: The Digital Storytelling Resource Center

Meridian Stories provides two forms of support for the student teams:

1. Meridian Innovators and Artists – This is a series of three to four minute-videos featuring artists and innovative professionals who offer important advice, specifically for Meridian Stories, in the areas of creativity and production.
2. Media Resource Collection – These are short documents that offer student teams key tips in the areas of creativity, production, game design and digital citizenry.

Recommended review, as a team, for this Competition include:

Meridian Innovators and Artists	Media Resource Collection
Margaret Heffernan on Non-Fiction **Sarah Childress on Documentary Films**	**Producing: Time Management** **Creating Storyboards/Framing a Shot**

[Tom Pierce on Interviewing Techniques](#) [Tom Pierce on Editing](#)	[Creating a Commercial/PSA](#) [Conducting an Interview](#)

Evaluation Rubric – *Healthy Rivers: A Call to Action*

CONTENT COMMAND	
Criteria	**1-10**
The Metrics	The Metrics upon which the digital story is focused are strong indicators of the river's health
Research	The research and data presented reflect a thorough and substantive scientific investigation
Call to Action	The proposed solution and Call to Action perfectly matches the problem and the reality of what can be achieved
STORYTELLING COMMAND	
Criteria	**1-10**
Story Hook	The probing question that your video sought to answer – the hook – is set up in a convincing and inviting way
The Interviews	The interviews are thoughtful, relevant and compelling
Story Structure	The narrative build-up to the climactic Call to Action is tight and engaging
MEDIA COMMAND	
Criteria	**1-10**
Editing	The Call to Action digital story is edited cleanly and effectively, resulting in an engaging viewing experience
Sound and Music	Sound effects and music enhance the audience's engagement with the work

Visualization	The choice of how to present the story and the quality of the visual mode reflect a thoughtful professionalism
HUMAN SKILLS COMMAND (for teachers only)	
Criteria	**1-10**
Collaborative Thinking	The group demonstrated flexibility in making compromises and valued the contributions of each group member
Creativity and Innovation	The group brainstormed many inventive ideas and was able to evaluate, refine and implement them effectively
Initiative and Self-Direction	The group set attainable goals, worked independently and managed their time effectively, demonstrating a disciplined commitment to the project

Essential Questions

1. What factors affect water quality, aquatic health (animals and plants) and overall river sustainability?
2. How does climate change affect the health of a river?
    i. What does the term anthropogenic mean and why is it important to know?
3. How does one conduct effective scientific research that can lead to positive change?
    i. What are metrics and why are they important in scientific research?
4. How does one craft a realistic and inspiring Call to Action?
5. How has immersion in the creation of original content and the production of digital media – exercising one's creativity, critical thinking and digital literacy skills - deepened the overall educational experience?
6. How has working on a team – practicing one's collaborative skills - changed the learning experience?

Student Proficiencies

1. Students will be able to identify important factors in river health.
2. Students will be familiar with factors that might change river health. Students will be able to identify anthropogenic vs. natural effects on rivers.

3. Students will under the importance of pursuing multiple research pathways in order to understand a complex, scientific issue. Students will be familiar with metrics to assess stream/river health.
4. Students will gain an understanding of what the community can realistically do to create a healthy river system and craft that understanding into a persuasive message.
5. The student will utilize key Human Skills, with a focus on creativity, critical thinking and digital literacy, in their process of translating STEAM content into a new narrative format.
6. The student will have an increased awareness of the challenges and rewards of team collaboration. Collaboration – the ability to work with others - is considered one of the most important Human Skills to develop in students as they prepare for life after secondary school.

Curricular Correlations

The *Healthy Rivers: A Call to Action* Challenge addresses a range of curricular objectives that have been articulated by the **Next Generation Science Standards** and the **Common Core: Language Arts and Science and Technical Literacy Standards.** Below please find the standards that are addressed, either wholly or in part.

Next Generation Science Standards

STANDARD	DESCRIPTION
MS - ESS3-3 **Earth and Human Activity**	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
MS-ESS3-4 **Earth and Human Activity**	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
MS-LS2-1 **Ecosystems: Interactions, Energy and Dynamics**	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
HS - ESS3-4 **Earth and Human Activity**	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

HS-LS2-1 **Ecosystems: Interactions, Energy and Dynamics**	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-6 **Interdependent Relationships in Ecosystems**	Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-7 **Interdependent Relationships in Ecosystems**	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Common Core Curricular Standards – Language Arts, and Science and Technical Literacy

Standards	*8*	*9/10*	*11/12*
W2 **WRITING** **Text Types and Purposes**	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
W3 **WRITING** **Text Types and Purposes**	Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.	Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.	Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.
W4 **WRITING**	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Production and Distribution of Writing			
W5 **WRITING** **Production and Distribution of Writing**	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
W7 **WRITING** **Research to Build and Present Knowledge**	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
RI 1 **READING INFORMATIONAL TEXT** **Key Ideas and Details**	Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
RST7 **SCIENCE AND TECHNICAL LITERACY**	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Integration of Knowledge and Ideas			
RST8 **SCIENCE AND TECHNICAL LITERACY** **Integration of Knowledge and Ideas**	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.