



# STEAM Challenge

## Digital Storytelling Unit

### *A Graphic Story*

Designed for Middle and High School Students

Table of Contents	Range of Activities
<ul style="list-style-type: none"><li>• Introduction</li><li>• The Challenge</li><li>• Process</li><li>• Meridian Support Resources</li><li>• Evaluation Rubric</li><li>• Essential Questions</li><li>• Student Proficiencies</li><li>• Curricular Correlations</li></ul>	<ul style="list-style-type: none"><li>• Graphical Analysis and Interpretation</li><li>• Creative Narrative Development</li><li>• Scriptwriting</li><li>• Digital Literacy Skills - Video - Pre-production, Production and Post-production</li><li>• Human Skills: Creativity, Collaboration, Critical Thinking, Presentational Skills</li></ul>

## 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.

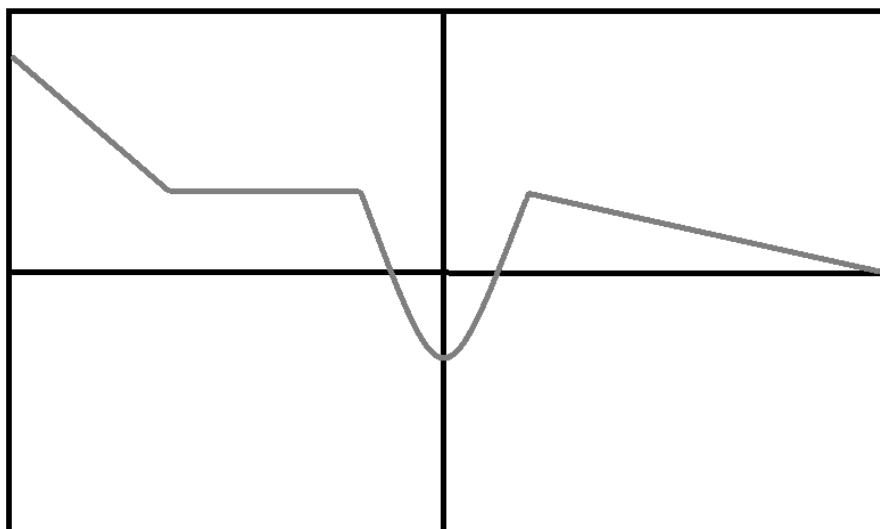
Finally, if you are interested to learn more about the community of schools who annually participate in the [Meridian Stories Competitions](#) – a community that is characterized by a friendly competitive spirit; feedback from Mentors on each submission; and the rewarding of digital badges in content,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

**Let's get started.**

## The Challenge

In this Meridian Challenge your team is asked to create a short-format film, in which you analyze the included graph and tell its story. You will demonstrate mastery of the algebra that describes the graph, while exercising creative interpretation through your explanation of what information the graph offers. Be warned: this graph has no axes, no units, and no scale attached to it, so it's up to you to define the unknowns and defend your analysis.

Your final video will be no longer than 90 seconds, and will include no more than three edits, so brevity and clarity of communication are critical. You likely will not have time to go into great detail, so part of this challenge is to pick-and-choose the most significant, interesting, and/or striking features of the graph for inclusion in your interpretation.



**Deliverables include:**

- A Graphic Story – The Video
- Shooting Script (at teacher’s discretion)

## The Process

Below is a suggested breakdown for the students’ work.

**During Phase I, student teams will:**

- Study the graph, noting its significant features, points of interest, and overall form. You should break down the graph into as many components as you can:
  - What are the peaks and valleys? Identify local minima and maxima.
  - Note where there are changes in slope. *High school: identify points of inflection.*
  - Is the graph continuous? Continuous in certain places?
  - Find all asymptotes and holes.
  - Is the graph best described by a piecewise function? If so, identify how many pieces there are, and think of what type of equation describes each.
- Simultaneously, take a step back from the graph and explore it for what story it tells? What is the graph communicating to you? For example, if you were to

extemporaneously tell a story to a group of children about what is happening in this graph, what would that story be?

- Take your various narrative directions and choose one that you want to develop. That is to say, what is the real-world context that you are choosing for your graph? Some ideas to get you going:
  - Weather: could the graph plausibly describe rainfall over the year or month? Wind speed? Perhaps in a part of the world with different climate conditions? You could put on a weather-reporter tone.
  - Entertainment: popularity of a celebrity (real or invented) over time. Scandals, hit movies, and TV show cancellations all affect this.
  - Travel story: Could it describe the trajectory of an adventure? Stay away from the graph representing altitude, but think about other geographical challenges it could depict (i.e. speed over terrain).
  - Ecology: Population of one species vs. population of a different species (think: predator and prey – are there restoration efforts?)
  - Personal narrative: could the graph describe something in your life? Amount of time spent doing homework by time of year, perhaps? Does it summarize a trip you’ve been on (or would like to go on)?
  - Literature: A character’s wellbeing throughout the course of a movie or novel. The graph could correlate with their ups-and-downs.
- By the end of this phase, you should have a relatively clear sense of your narrative interpretation of this graph.

**During Phase II, student teams will:**

- Apply a scale to the graph. This can be arbitrarily chosen, but it will affect what type of interpretation you can make later: for example, if you label your axes from 0-5, the graph probably doesn’t describe number of iPads sold each month in the United States!
- Choose a handful of your mathematical findings to discuss in your film. With only 90 seconds, you need to be selective and stick to only the features that are most crucial in understanding what the graph can tell us. Though you need not explain every nuance of the graph, you should at least acknowledge all major features to demonstrate that you have examined the graph thoroughly.
  - You are effectively “translating” a mathematical picture – a graph – into an easily understood narrative.
  - The key: be accurate. (At this stage, point to each feature in your graph and ask a question of it: i.e. “The precipitous fall at the end of the graph is steady and fast. What in your story correlates to such a steady and predictable fall?”) Tell a story that exactly maps onto the graph.

- Draft the script.
  - Keep in mind that this Challenge is partially about working inside of a very disciplined art form. You have only three edits. That means only four shots. How best are you going to use your four shots? Some questions to consider:
    - Who is telling the story?
    - Is there an intended audience?
    - Where, exactly, is the graph in all of this? Is it in all four shots? (You don't *have* to use four shots – you can choose just one or two shots)
    - What is the setting for this?
    - How will you engage the audience in your narrative, visually? What in the narrative lends itself to visualization?
- Finalize the script.
  - ***Teacher's Option:*** Shooting Script – Teachers may require that teams hand in their Shooting Script
- Pre-produce the scene:
  - Scout locations for shooting (if this is being shot on location);
  - Create costumes, props and other set pieces, as needed;
  - Prepare the logistics for the actual shooting of the scene; and
  - Rehearse the scene.

**During Phase III, student teams will:**

- Shoot the video.
- Edit the video, adding stills and graphics as desired.
- Post-produce the video, adding music and sound effects as desired.

## Meridian Support Resources

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

1. Media 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. Meridian Resources – These are short documents that offer student teams key tips in the areas of creativity and production.

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

<b>Media Innovators and Artists</b>	<b>Meridian Resources</b>
<p><i>On Non-Fiction</i> – Margaret Heffernan</p> <p><i>On The Importance of Characters in Storytelling</i> – Scott Nash</p> <p><i>On Making Documentaries</i> – Margaret Heffernan</p> <p><i>On Interviewing</i> – Tom Pierce</p>	<p>“Conducting an Interview”</p> <p>“Creating a Short Documentary”</p> <p>“Royalty Free Music and Sound Effects”</p> <p>“Producing: Tips for the Shoot”</p>

## Evaluation Rubric – *A Graphic Story*

<b>CONTENT COMMAND</b>			
<b>Criteria</b>	<b>1-3</b>	<b>4-7</b>	<b>8-10</b>
<b>Analysis of Graph’s Features</b>	<p>Many of the graph’s features, or one of the most prominent ones, were not noted</p> <p>Minimal attention to detail is evident</p>	<p>Most of the graph’s features have been acknowledged</p> <p>Some of the more subtle features may have gone unmentioned</p>	<p>The graph’s features are succinctly and accurately summarized, demonstrating a close examination of the chart</p>
<b>Modeling of Equations that Describe Graph</b>	<p>Students’ estimations are insufficient, or fail to account for many of the graph’s features</p> <p>Little to no justification is offered</p>	<p>Students offer reasonable estimations of the equations that could describe the graph, but may neglect to justify them adequately</p>	<p>Students offer reasonable estimations of the equations that could describe the graph</p> <p>These model equations are justified with algebraic knowledge, and are consistent with the chosen scale</p>
<b>STORYTELLING COMMAND</b>			
<b>Criteria</b>	<b>1-3</b>	<b>4-7</b>	<b>8-10</b>
<b>Scriptwriting</b>	<p>The script is consistently lacking in clarity</p> <p>The flow of the narrative is halting or difficult to follow</p>	<p>The script adequately creates a narrative for the graph</p> <p>Thoughts are well-articulated and the narrative flows cohesively</p>	<p>The script serves as a clear narrative of the graph</p> <p>Ideas are not only clearly expressed, but distilled into pointed statements that indicate thorough consideration of the topics at hand</p>

<b>Tone and Acting</b>	The tone and narrative presentation are inconsistent with the format, and repeatedly detract from the content	The tone and narrative presentation are consistent with the pacing of the video	The tone aids the pacing of the short video  The narrative presentation helps to direct the audience's attention where appropriate
<b>MEDIA COMMAND</b>			
<b>Criteria</b>	<b>1-3</b>	<b>4-7</b>	<b>8-10</b>
<b>Visual Engagement</b>	A limited variety of visuals limits the audience's understanding of the graph	Visuals aid the understanding of the group's graphical interpretation	The video makes use of a variety of visuals that enhance the audience's understanding of the group's graphical interpretation
<b>Sound and Music</b>	The overall use of music and sound effects detracts from the scene	The selective use of music and sound effects service the scene	The selective use of music and sound effects enhances the quality of the production without distracting from the narrative
<b>HUMAN SKILLS COMMAND</b>			
<b>Criteria</b>	<b>1-3</b>	<b>4-7</b>	<b>8-10</b>
<b>Collaborative Thinking</b>	The group did not work together effectively and/or did not share the work equally	The group worked together effectively and had no major issues	The group demonstrated flexibility in making compromises and valued the contributions of each group member
<b>Creativity and Innovation</b>	The group did not make a solid effort to create anything new or innovative	The group was able to brainstorm new and inventive ideas, but was inconsistent in their evaluation and implementation of those ideas.	The group brainstormed many inventive ideas and was able to evaluate, refine and implement them effectively
<b>Initiative and Self-Direction</b>	The group was unable to set attainable goals, work independently and manage their time effectively	The group required some additional help, but was able to complete the project on time with few problems	The group set attainable goals, worked independently and managed their time effectively, demonstrating a



			disciplined commitment to the project
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## Essential Questions

- 1) What information about algebraic equations or data can one glean from an unlabeled graph?
- 2) What meaning could an unlabeled, unscaled graph potentially hold? What could it describe?
- 3) What criteria make for an engaging and informative short-format video?
- 4) 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?
- 5) How has working on a team – practicing one’s collaborative skills - changed the learning experience?

## Student Proficiencies

- 1) The student will be able to think about a graph as a visual representation of equations in their general form and will not rely on specific values for understanding.
- 2) The student will think creatively about the types of data or relationships that an unlabeled graph could represent. In this process they will consider the shape certain data trends or relationships would produce if depicted graphically.
- 3) The student will exercise thoughtful prioritization as part of a decision-making process focused on elaborating only upon key concepts.
- 4) The student will utilize key 21<sup>st</sup> century skills, with a focus on creativity, critical thinking and digital literacy, in their process of translating STEAM content into a new narrative format.
- 5) 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 21<sup>st</sup> century skills to develop in students as they prepare for life after secondary school.

## Curricular Correlations

The *A Graphic Story* Challenge addresses a range of curricular objectives that have been articulated by the **Common Core State Standards Initiative: Mathematics.**

Below please find the standards that are addressed, either wholly or in part.

## **Common Core State Standards: Mathematics**

- Reason abstractly and quantitatively.
- Attend to the meaning of quantities.
- Construct viable arguments and critique the reasoning of others

### **Middle School: Expressions & Equations**

#### **Grade 6:**

- Represent and analyze quantitative relationships between dependent and independent variables. (6.EE.C.9)
  - Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.
- Reason about and solve one-variable equations and inequalities.
  - Use substitution to determine whether a given number in a specified set makes an equation or inequality true. (6.EE.B.5)

#### **Grade 7:**

- Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (7.EE.B.4)

#### **Grade 8:**

- Understand the connections between proportional relationships, lines, and linear equations. (6.EE.B.5)
- Analyze and solve linear equations and pairs of simultaneous linear equations.
  - Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. (8.EE.C.8.A)
  - Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. (8.EE.C.8.B)

### **High School: Functions**

- Write a function that models a relationship between two quantities. (HSF.BF.A.1)
- Build new functions from existing functions. (HSF.BF.B.3)

### **High School: Algebra**

- Create equations that describe numbers or relationships. (HSA.CED.A.1)
  - Create equations and inequalities in one variable
- Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (HSA.CED.A.2)