



STEAM Challenge

Digital Storytelling Unit

Super Hero Mathematics

Designed for Middle and High School Students

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<ul style="list-style-type: none">• Introduction• The Challenge• Process• Meridian Support Resources• Evaluation Rubric• Essential Questions• Student Proficiencies• Curricular Correlations	<ul style="list-style-type: none">• Exploring mathematical concepts already formally practiced in class in a creative, open-ended way.• Relating math to the real world. Identifying and explaining its applications.• Navigating the creative process: brainstorming ideas, mediating collaborative conversation, developing concepts, and finalizing production.• Character design.• Creative Brainstorming about compelling ways to communicate the content• Scriptwriting

	<ul style="list-style-type: none"> • Digital Literacy Skills - Video - Pre-production, Production and Post-production • Human Skills: Creativity, Collaboration, Critical Thinking, Presentational Skills
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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

You have been contracted by Marvel Pictures to draft, create, and name a superhero that appeals to your own peer group. You are competing with other creators to have your superhero adopted by Marvel and expanded into a full line of products, so you have to sell your idea in a succinct, 2 - 3-minute video pitch. The twist, however, is

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that your character must draw his powers from mathematical concepts that allow him/her/it to overcome challenges, defeat villains, and generally save the day! That's right: the RFP (Request for Proposal) from Marvel explicitly says that they want a Mathematical Superhero - something about wanting to be *the* STEAM producers in Hollywood.

Your pitch must include the following elements:

- Introduction to the character and their powers: Your goal is to grab the audience's attention by making your superhero as interesting as possible. You must make it abundantly clear that a certain branch of mathematics is the root of their powers, without which he/she/it would be a normal being. Most super heroes have a 'theme': the Hulk has strength and Spider-Man, agility. Your character's theme is the intellectual mastery of math, so use that to develop a background, style, set of accessories/gadgets and persona for your character. Does this hero spend a lot of time hanging out at math conferences? Is his cape emblazoned with Ω ? What's in her utility belt?
- Examples of challenges your hero can/has overcome: Demonstrate those powers in action! Create context (a villain, a disaster, a puzzle, etc.), then work us through a few problems that your hero would solve.
- Appeal to the benefits of a math-oriented hero: This is a business proposal, so you have to promote your own creation. Why should Marvel choose your math hero over another one? What makes your proposition stand out in terms of creativity, entertainment, and educational value? Defend your creation! Are parents more likely to indulge their children if there is an educational aspect? Does this new frontier give Marvel an advantage over their competitors?

Deliverables include:

- "Super Hero Mathematics" pitch video
- Shooting Script (at teacher's discretion)
- Summary Paper (at teacher's discretion)

Process

Below is a suggested breakdown for the students' work.

During Phase I, student teams will:

- Choose the power(s) with which your superhero will be endowed (one for Middle School teams, two for High School teams). This is a critical step that will define your hero's capabilities – don't decide too hastily!
 - High School: Specifically think about where branches of mathematics overlap. For example, think of combining trigonometry and algebra (a particular key equation, perhaps) to find the fastest route to catch a bad guy, or using probability and reasonable estimation to help win a game of wits.
- Create at least two situations that your hero is able to evaluate, confront, and ultimately defeat within the span of your short pitch. Here is one way to think of this: your hero's 'power' is actually just real-world knowledge that anyone could hold. The only difference is that they wield it in "super," society-saving ways. As such, create real-world challenges that are actual issues humans might face.
 - These situations must be clearly posed in your video.
 - You need to be able to clearly explain how the hero's powers enable him/her to triumph over these challenges.
 - Real-world challenges can still have a "super" quality to them! Feel free to exaggerate, embellish, or otherwise spice up the conflict in your pitch as long as the underlying issue at hand could feasibly exist in the real world.

Here are some strategies to consider for Phases I and II:

- Work backwards: choose a problem or villain, and think of mathematical concepts that would help your hero overcome that particular challenge. For example, to save a victim from the tenth floor of a building, your hero may put up a slide, requiring knowledge of triangle geometry (trigonometric concepts for high school).
- Think big, but also think small. A power could be something as broad as being a master of circles (and their components: radius, diameter, pi, etc.), or as specific as being a factoring whiz.
- Choose powers that you can manipulate to be useful in many scenarios.
- Specifically think about where branches of mathematics overlap. For example, think of combining trigonometry and algebra (a particular key equation, perhaps) to find the fastest route to catch a bad guy, or using probability and reasonable estimation to help win a game of wits.

During Phase II, student teams will:

Design your hero. This phase is where you can let your creativity run wild.

- The audience expects to learn some (not necessarily all) of the following details about your hero:
 - A personality. Is s/he the quiet hero? The cocky, self-admiring stud? A woman of the people? Show us, don't tell us.
 - A background. Some superheroes only became super when exposed to radiation – where is your hero's power from? Do they have an alternate, civilian alias?
 - How does your hero find missions to undertake or problems to solve? Do they have a boss, or are they part of a team?
 - Where do they live? Where do they do their super deeds?
 - Finally, what does he/she look like? What is their costume, color scheme, texture and size?
- There are no restrictions on your hero being human! If a dog were capable of mastering algebra and being a hero, how would he do so?
- Your hero doesn't have to rely solely on his/her math powers – they can be a trained fighter or athlete using math to gain an edge, or have nifty math-inspired gadgets that help them along their way.

During Phase III, student teams will:

Develop your pitch. Your main goal is to demonstrate mastery of the selected mathematical concepts, however you also need to entertain the audience. Humor, drama, and action are common themes in Marvel films. How can you incorporate these, and other narrative elements, into your pitch in order grab your audience's attention?

- In your pitch, you must:
 - Introduce the character
 - How is your team going to visualize this character? A costumed human? A costumed doll or action figure? Art work?

- Briefly explain his or her powers (“MathWoman fights evil with her ability to instantly calculate the area of a room, and her mastery of conditional probability!”)
- Present challenges, and walk us through the way the hero would overcome them
- Make the audience excited about your creation; make your math-inspired hero interesting!
 - Use props to support your hero’s actions. A sine-wave sword or a division blaster would be great additions to many math-heroes!

Your team should now have a) the key mathematical ideas and real-world applications that need to be communicated; b) a character description; and c) a handful of creative ideas from your pitch development above. Decide on the format or approach to your sales pitch and create the script outline.

- Draft the script
- Discuss and map out the imagery needed to tell your story. Often creating a storyboard is the best way to organize this information.
- Pre-produce the video, preparing for all the shots that you will need to shoot, and researching, as necessary, the still images that you will integrate into your pitch.
- Finalize the script.
 - ***Teacher’s Option: Shooting Script*** – Teachers may require that teams hand in their final Shooting Scripts.
- Shoot the sales pitch video
- Record the voice-over or narration, as necessary.
- Edit the moving and/or still images together and complete the post-production.
 - ***Teacher’s Option: Summary Paper*** - Teachers may require that teams produce a Summary Paper that summarizes the experience, challenges, and process your team went through.

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 a few key tips in the areas of creativity and production.

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

Media Innovators and Artists	Meridian Resources
<p><i>On Mathematics in Everyday Life</i> – Eric Gaze</p> <p><i>On Character Design</i> – Scott Nash</p> <p><i>On the Importance of Characters in Storytelling</i> – Scott Nash</p> <p><i>On Directing Comedy</i> – Davis Robinson</p>	<p>“Creating a Commercial”</p> <p>“Royalty Free Music and Sound Effects”</p> <p>“Creating Storyboards, Framing the Shot”</p> <p>“Building Characters”</p>

Evaluation Rubric – *Super Hero Mathematics*

CONTENT COMMAND			
Criteria	1-3	4-7	8-10
Communication of Content – Math Powers	<p>The hero’s powers are difficult to understand, or seem irrelevant</p> <p>Student understanding is inadequately demonstrated</p>	<p>The hero’s powers are relevant and explained</p> <p>Understanding of the chosen concepts is demonstrated</p>	<p>The hero’s powers are relevant, clearly explained, and presented in an engaging manner</p> <p>Student mastery of the chosen concepts is demonstrated</p>
Communication of Content - Applications	<p>Applications are unimaginative and/or not clearly presented</p> <p>They do not demonstrate anything other than basic understanding of the material</p>	<p>Interesting applications of the powers are presented</p> <p>Applications demonstrate technical proficiency within the chosen topics</p>	<p>Interesting and challenging applications of the powers are creatively presented</p> <p>Applications go beyond basic proficiency, and may combine multiple branches of math</p>
Communication of Content –	The situations facing your hero are too	The situations facing your hero are plausible	The situations facing your hero are not only

Appearances in Real World	far-fetched or not adequately explained	The audience recognizes the authenticity of the scenario	plausible, but also interesting
	The audience may feel lost		The audience can relate, and as a result is better engaged

STORYTELLING COMMAND			
Criteria	1-3	4-7	8-10
Script/Narrative Clarity	The narrative is hard to follow and/or the scripting is lackluster and ineffective	The narrative is presented clearly, but the scripting is inconsistently engaging	The narrative is presented clearly and the scripting is engaging and effective
Persuasion	The sales pitch does not successfully persuade	The sales pitch is inconsistently persuasive and engaging	The sales pitch is consistently persuasive and engaging
Character Design	The design of your character is not compelling	The design of your character is compelling	The design of your character is novel and well- matched to his/her powers

MEDIA COMMAND			
Criteria	1-3	4-7	8-10
Mixed Visual Media	The use of imagery – still or moving – does not service the narrative well	The use of imagery – still or moving – services the narrative clearly	The use of imagery – still or moving – demonstrates an effective and creative use of visuals, and propels the narrative forward
Sound Design	The mix of music and sound does not enhance most elements of the narrative	The mix of music and sound services the intent of the narrative	The mix of music and sound greatly enhances the intent of the narrative
Editing and Pacing	There is minimal or no editing	The editing of the film inconsistently adds to the visual and	The editing of the film adds to the visual and aural enjoyment of the scene

	The film is paced inappropriately, detracting from the content	aural enjoyment of the scene The pace of the film is appropriate	The pace of the film keeps the audience engaged while still allowing for thorough explanation
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HUMAN SKILLS COMMAND			
Criteria	1-3	4-7	8-10
Collaborative Thinking	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
Creativity and Innovation	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
Initiative and Self-Direction	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

Essential Questions

1. What are the most critical component parts to a select area of mathematics and how do those parts work together?
2. What types of real-world problems can be addressed with mathematics? How does looking at situations through a mathematical lens enhance understanding?
3. How has incorporating mathematical content into the production of a video that is intended to educate and persuade, changed your understanding of the mathematics?

4. What techniques did you use to persuade the Marvel Executives to choose your Super Hero?
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. The student will be able to exhibit mastery over a select area of mathematics.
2. The student will be able to identify real-world applications of the curricular math area they have selected. The student will be able to use mathematics as a tool for understanding the real-world.
3. The student will understand more about the math content by approaching it through a media production designed to educate the audience.
4. The student will understand more about the different methods and approaches used to sell products and the particulars about why some are effective, and in which situations.
5. The student will utilize key 21st century skills, with a focus on creativity, critical thinking and digital literacy, in their process of translating mathematical 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 21st century skills to develop in students as they prepare for life after secondary school.

Curricular Correlations

The *Super Hero Mathematics* 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

The open-ended nature of this challenge allows for a variety of potential areas of focus that will likely differ on a group-to-group basis. This can be directed at the

instructor’s discretion, however any successful completion of the above challenge will incorporate some or all of the following, overarching elements of the Common Core:

- Construct viable arguments and critique the reasoning of others.
- Reason abstractly and quantitatively.
- Model with mathematics.
- Use appropriate tools strategically.
- Make sense of problems and persevere in solving them.

All groups will use mathematics to model potential real-world situations:

“Real-world situations are not organized and labeled for analysis; formulating tractable models, representing such models, and analyzing them appropriately is a creative process. Like every such process, this depends on acquired expertise as well as creativity.

One of the insights provided by mathematical modeling is that essentially the same mathematical or statistical structure can sometimes model seemingly different situations.”

<http://www.corestandards.org/Math/Content/HSM/>