**DRIVING QUESTIONS**

**SS**
- Who were the Vikings? Where did they live, travel? What was their lifestyle? How did the Vikings change history? What were their greatest accomplishments and contributions? How do we know these things? What happened to their culture? What are the stereotypes? What are the myths? Did they have art? Were the women as fearsome as the men or is that all false?

**Sci**
- What did the Vikings eat? What resources for everyday life did they have at their fingertips? Did the resources pack well with them? How did the Vikings adapt to their various environments? How was this to their advantage against their enemies? How is this similar to animal adaptations?

**M**
- At what scale can we build a ship that’s similar to the Viking ship, Oseberg? 1:6? 1:4? 1:10? What are the dimensions we need to have in order to have the wood shaped realistically? Considering ocean currents and the time of year they traveled, how far could they go using only human power and current technology? Knowing what we know now, but using only the tools of the Vikings, how could that be improved?

**Rdg**
- Research primary resources via Virtual field trips to: museums with Viking artifacts; colony sites in Europe and North America

**Wri**
- Journal a “Day in the Life” of a Viking. You choose the location and timing. Include as many direct ties to authentic vocabulary, writing, and artifacts as you can. Create museum descriptions and guidebooks as visitors view your re-created Viking Ship.

**VIKING SHIP**
Create a scale-model Viking ship as you learn beyond the slash and burn archetype of this complex civilization.
DRIVING QUESTIONS

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Who were the Vikings? Where did they live, travel? What was their lifestyle? How did the Vikings change history? What were their greatest accomplishments and contributions? How do we know these things? What happened to their culture? What are the stereotypes? What are the myths? Did they have art? Were the women as fearsome as the men or is that all false?

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Project Deliverable

VIKING SHIP

Create a scale-model Viking ship as you learn beyond the slash and burn archetype of this complex civilization.

Card Category:
Historian Challenge
Who were the Vikings? Where did they live, travel? What was their lifestyle? How did the Vikings change history? What were their greatest accomplishments and contributions? How do we know these things? What happened to their culture? What are the stereotypes? What are the myths? Did they have art? Were the women as fearsome as the men or is that all false?

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Create a scale-model Viking ship as you learn beyond the slash and burn archetype of this complex civilization.

Core Content ingredients
DRIVING QUESTIONS

What were the Vikings? Where did they live, travel? What was their lifestyle? How did the Vikings change history? What were their greatest accomplishments and as fearsome as the men of 30 that are as modern.

What did the Vikings eat? What resources for everyday life did they have at their fingertips? Did the resources pack well with them? How did the Vikings adapt to their various environment(s)? How was this to their advantage against their enemies? How is this similar to animal adaptations?

Project Deliverable

Recipe title & description

Card Category: Historian Challenge

Core Content ingredients
**DRIVING QUESTIONS**
Who were the Vikings? Where did they live, travel? What was their lifestyle? How did the Vikings change history? What were their greatest accomplishments and contributions? How do we know these things? What happened to their culture? What are the stereotypes? What are the myths? Did they have art? Were the women as fearsome as the men or is that all false?

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**Write a “Day in the Life” of a Viking. You choose the location and timing. Include as many direct ties to authentic vocabulary, writing, and artifacts as you can. Create museum descriptions and guidebooks as visitors view your re-created Viking Ship.**

**Card Category: Historian Challenge**

**Recipe title & description**

**Project Deliverable**

**Core Content ingredients**
**DRIVING QUESTIONS**

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Who were the Vikings? Where did they live, travel? What was their lifestyle? How did the Vikings change history? What were their greatest accomplishments and contributions? How do we know these things? What happened to their culture? What are the stereotypes? What are the myths? Did they have art? Were the women as fearsome as the men or is that all false?

**Sci**
What did the Vikings eat? What resources for everyday life did they have at their fingertips? Did the resources pack well with them? How did the Vikings adapt to their various environment(s)? How was this to their advantage against their enemies? How is this similar to animal adaptations?

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**Rdg**
Research primary resources via Virtual field trips to: museums with Viking artifacts; colony sites in Europe and North America

**Wri**
authentic vocabulary, writing, and explanation of a Viking. You choose the
Create museum descriptions and guidebooks as visitors view your re-created Viking Ship.

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Project Deliverable

Recipe title & description

Category: Historian Challenge

Core Content ingredients
**Core Content ingredients**

**DRIVING QUESTIONS**

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**Wri**
- Research primary resources via Virtual field trips to: 
  - Historical sites
  - Museums

- Journal a “Day in the Life” of a Viking. You choose the location and timing. Include as many direct ties to authentic vocabulary, writing, and artifacts as you can. Create museum descriptions and guidebooks as visitors view your re-created Viking Ship.

**Project Deliverable**

**Recipe title & description**

**VIKING SHIP**
Create a scale-model Viking ship as you learn beyond the slash and burn archetype of this complex civilization.
VIKING SHIP
a step-by-step guide
See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

Before-project prep
Gather 2-3 large refrigerator boxes or 2 bunches of fanfold bluecore flexible insulation, as well as duct tape and other “junk” that could be used as construction materials. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline and end results expected.

Launching the project
Start with a “bang,” telling a brief account of the Kensington Runestone (Minnesota) mystery. Leave out some details, but ask a lot of questions about Vikings and their lifestyle. All involved educators are visibly positive and supporting the mystery of the Kensington Runestone. Introduce potential work teams and ask students to self-select teams, based on topics of interest (Builders, Artifacts, Museum Curators, CSI, etc) OR assign team members. Students document the entire process.

During the project maintenance
Students will first research, collecting properly cited information into collaborative documents. Teachers ask driving questions only; students delve deeper into their own questions. Each team makes a plan, a timeline for completion, a materials needed list, a materials substitution list, and leaders will begin to emerge. Teachers actively encourage, & admire with a hands-off, question-only approach. Teachers’ #1 role is to keep the sense of urgency for completion and mystery surrounding the Kensington Runestone.

Ending the project
Take pictures of students and teams with their work and pictures, showing proud faces. Evaluation: students share their learning, focusing on the learning and skills building and not simply what they did. Share results with local media.

tips & tricks

• As a way to role model time management in an active environment, Soft and Hard Deadlines are useful. Figure a time far enough before the final deadline for students to have a nearly-finished draft completed and allow them to present the unfinished work. Peers will provide wows/hows/bows for the work so far. This allows students to take peer ideas back to the studio for more refinement for a higher-quality final deliverable.

• Nothing is more important than the moment of introduction for a new project. It’s all hands-on deck with every participating teacher showing excitement and helping to create a sense of urgency to the project.

• Let students have a good deal of free-choice in how they choose to contribute to the final deliverable.

• Don’t squash a far-out idea. Get those kids to brainstorm and create a proposal for the leaders to buy into. Help them find a way to explain their thoughts and learn how to be persuasive. You never know if this is the piece that’s the key to the solution. This is easier said than done.
**VIKING SHIP**

*a step-by-step guide*

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**Tips, unique to each card, for building a rich PBL environment**
- Provide opportunities for students to explore different aspects of the project, allowing for multiple pathways to success.
- Encourage collaboration and open dialogue among students and with the teacher.
- Foster a growth mindset by highlighting the learning process, not just the outcomes.
- Use real-world problems and scenarios to make the project more engaging and relevant.

**Step by step implementation guide for this project**
1. Gather materials and ensure all are informed.
2. Launch the project with enthusiasm and questions.
3. Keep teams accountable with timelines and plans.
4. Evaluate progress and sharing opportunities.
5. Celebrate successes and learn from challenges.
VIKING SHIP

a step-by-step guide

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Step by step implementation guide for this project

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- Nothing is more important than the moment of introduction for a new project. It’s all hands-on deck with every participating teacher showing excitement and helping to create a sense of urgency to the project.
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The prep
The launch
The expectations
The grouping
The work
The mid-point re-group
The closing
The assessment
The post-project wrap-up
**DRIVING QUESTIONS**

**SS** Who were the Vikings? Where did they live, travel? What was their lifestyle? How did the Vikings change history? What were their greatest accomplishments and contributions? How do we know these things? What happened to their culture? What are the stereotypes? What are the myths? Did they have art? Were the women as fearsome as the men or is that all false?

**Sci** What did the Vikings eat? What resources for everyday life did they have at their fingertips? Did the resources pack well with them? How did the Vikings adapt to their various environment(s)? How was this to their advantage against their enemies? How is this similar to animal adaptations?

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**Rdg** Research primary resources via Virtual field trips to: museums with Viking artifacts; colony sites in Europe and North America

**Wri** Journal a “Day in the Life” of a Viking. You choose the location and timing. Include as many direct ties to authentic vocabulary, writing, and artifacts as you can. Create museum descriptions and guidebooks as visitors view your re-created Viking Ship.

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**During the project maintenance**
Students will first research, collecting properly cited information into collaborative documents. Teachers ask driving questions only; students delve deeper into their own questions. Each team makes a plan, a timeline for completion, a materials needed list, a materials substitution list, and leaders will begin to emerge. Teachers actively encourage, & admire with a hands-off, question-only approach. Teachers’ #1 role is to keep the sense of urgency for completion and mystery surrounding the Kensington Runestone.

**Ending the project**
Take pictures of students and teams with their work and pictures, showing proud faces. Evaluation: students share their learning, focusing on the learning and skills building and not simply what they did. Share results with local media.

**tips & tricks**
- As a way to role model time management in an active environment, Soft and Hard Deadlines are useful. Figure a time far enough before the final deadline for students to have a nearly-finished draft completed and allow them to present the unfinished work. Peers will provide wows/hows/bows for the work so far. This allows students to take peer ideas back to the studio for more refinement for a higher-quality final deliverable.
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APOLLO 13

Create a scale-model of the Apollo 13 command module

“Failure is not an option.”
Before-project prep
Gather 2-3 large refrigerator boxes, aluminum/plastic take-out dinner boxes, and other “junk” that could be used as construction materials. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline and end results expected.

Launching the project
Start with a “bang,” telling a brief recount of the Apollo 13 space mission. Leave out a LOT of details, but enough to give the picture these astronauts were in mortal peril unless the team was able to problem-solve across a greater distance than ever before. All involved educators are visibly positive and supporting the suspense of the mission. Introduce potential work teams and ask students to self-select teams, based on topics of interest (CSI, Artifact, Build Team, Museum Curators, etc) OR assign team members. Then begin research. Students document the entire process.

During the project maintenance
Students will research first, collecting properly cited information into collaborative documents. Each team will make a plan, a timeline for completion, a materials needed list, a materials substitution list, and leaders will begin to emerge. Teachers are actively encouraging, and admiring with a hands-off, question-only approach. Teachers’ #1 role is to keep the sense of urgency at the forefront of the mission.

Ending the project
Take pictures of students and teams with their work and pictures, showing proud faces. Evaluation: students share their learning, focusing on the learning and skills building and not simply what they did. Share results with local media.

tips & tricks
• Students must use quality triangulation of primary documents and other reliable data in their research. Be sure students cite their quality sources so others don’t question the validity of their work.

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• Shared reflection on quality of work is a valuable metacognitive skill, but students need to learn this skill in a safe environment. “Wows, Hows, and Bows” are a great way for peers to share feedback, learning to give positive feedback before gently questioning about how/why a deliverable was designed and implemented. Then at the end, students are always recognized for their willingness to share the the learning process with others.

See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.
DOOMSDAY 1
Save the Earth from a killer asteroid

http://hnyctt.me/Zmt

DRIVING QUESTIONS

**SS** Create a simulation of how Congress or the UN would react if this scenario was happening? Create an international policy plan to be adopted by the UN in the event this situation would occur. Who would be in charge of introducing the policy? What’s the procedure in order to get it passed?

**Sci** How do the size, shape, and velocity of the asteroid impact any plans for adjustment? What is the significance of the Earth’s atmosphere for shielding or spreading the impact? Is the science in your plan possible right now or do we have to wait for something to be invented first? What role does the rotation and elliptical revolution of the Earth, Moon, Sun, etc, play in helping/hindering a plan?

**M** How does the conservation of angular momentum and Kepler’s 2nd Law come into play? What role does the velocity and the approach of the asteroid play in your plan? How does thrust and inertia affect large objects in space? How does your plan work in the time span until impact? Does it work with the current trajectory of the asteroid? Does the math in your plan make sense for solving this problem?

**Rdg** Research primary resources via Virtual field trips to museums such as the Kansas Cosmosphere and Space Center. Research asteroids and meteorites. Research other near-miss (or actual hits) objects and events in Earth’s history.

**Wri** Create and implement a public relations plan for this event to keep people informed but not panicked as the team moves toward solution. Write a script to explain the technicalities of your final plan to not only other scientists and the President, but also for the lay people of the Earth.
Before-project prep
Make contact with Math/Science/Space advisors, making sure all are ready for fielding student questions in the allotted time and format (email, vid conf, etc). Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline and end results expected.

Launching the project
Start with a “bang,” having the President of the US (or other official), outline the details of the danger and the mission. Make this a quick event, with students brainstorming questions, then introduce work teams. Assign teams, where each team will need experts in: Leadership, Math/Physics, Space/Earth Science, Public Relations, Video Production. Students may choose to add another section to their team, based on their individual plans. All involved educators are visibly positive and supporting the suspense of the mission. Teams then begin research. Public Relations documents the entire process for each team, keeping the President informed of their progress.

During the project maintenance
Students will research first, collecting properly cited information into collaborative documents. Each team will make a plan for research, a list of outside experts needed and a timeline for completion. Teachers are actively encouraging, and admiring with a hands-off, question-only approach. Teachers’ #1 role is to keep the sense of urgency at the forefront of the mission.

Ending the project
Take pictures of students and teams with their work, videos, and presentations, showing proud faces. Evaluation: students share their learning, focusing on the learning and skills building and not simply what they did. Share results with local media.

tips & tricks

- In a fully-collaborative PBL environment, students must have some individual space to claim as their own to keep their materials organized and safe. This may or may not be a traditional locker.

- Allow students to talk with each other in small groups before volunteering ideas. This allows them to hear other ideas and build upon their own for more complex and quality purpose.

- In regard to deliverables, less is more. Allow the students to focus on the effort and learning and less about the grade they will earn.

- Foster student-to-student mentorship and community trust by helping them rely on each other for assistance before running straight to you. When a student asks a question, find out who s/he has asked first. If three people have been consulted, directly answer the question asked and be sure that everyone in the class/group hears the answer.

- Laugh and smile often.
DRIVING QUESTIONS

**SS**
What are ties between colonizing another planet and the New World? What sorts of governments did they start/end up with? What types of people have been successful at starting colonies throughout history? How have the indigenous people survived (or not)?

**Sci**
What resources could be mined from Mars to be used in survival? What supplies need to come with us? How do we and our supplies get there? What are the realities of working and living in space or on Mars? Make a case for choosing Mars over another planet/moon. What would a “first aid” kit for this place include? What are the unique effects that Mars would have on the human body? What is the most efficient way to re-use or dispose of our waste products, including CO2?

**M**
What mode of transportation would get us and our stuff here safely and quickly? How long would it take at what velocity would we need to travel? How big would our colony need to be in order to sustain our population? How does the gravity and atmosphere on Mars change how we build our structures and lives on Mars?

**Rdg**
Read ability-appropriate fiction and/or non-fiction books about what people think/have thought that extraterrestrial beings might be like. Research the bio-domes and “earth-ships” that have been built and share lessons learned from those low-stakes, stand-alone colonies.

**Wri**
Blog what it might be like to take a journey to live on Mars. Create a presentation to share with stakeholders about why we should/not move forward with this plan for your colony. Create a plan to make your colony “modular” for recreating other colonies across the planet.

MARTIAN COLONY

Design a plan for a Martian colony
MARTIAN COLONY
a step-by-step guide
See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

Before-project prep
Gather discarded boxes, dryer hoses, plastic sheeting, and other “junk” that could be used as construction materials. Decide how many people will be launched to this colony. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline and end results expected.

Launching the project
Start with a “bang,” by telling your students that we will be moving to Mars (reasons may be environmental or otherwise). Teams are hired to design and create a potential Mars colony. All involved educators are visibly positive and supportive of the central purpose of the project. Introduce potential work teams (Atmosphere, Agriculture, Sanitation, Government, Transportation, etc) and ask students to self-select their own teams based on topics of interest, OR assign team members.

During the project maintenance
Students will research first, collecting information in cited and collaborative documents. Consider not only what it would take to survive, but also thrive, based on the number of people who will be living there. Students will be building the colony (either with boxes, plastic, or Google SketchUp) based on both imagination and authenticity of human needs on Mars. Teachers’ #1 role is to keep alive the sense of urgency to the design.

Ending the project
Take pictures of students and teams with their colonies and presentations, showing proud faces. Evaluation: students share their learning, focusing on the learning and skills building and not simply what they did. Share results with local media.

tips & tricks

• In a fully-collaborative PBL environment, students must have some individual space to claim as their own to keep their materials organized and safe. This may or may not be a traditional locker.

• Allow students to talk with each other in small groups before volunteering ideas. This allows them to hear other ideas and build upon their own for more complex and quality purpose.

• Foster student-to-student mentorship and community trust by helping them rely on each other for assistance before running straight to you. When a student asks a question, find out who s/he has asked first. If three people have been consulted, you might directly answer the question asked and be sure that everyone in the class/group hears the answer. You might not.

• Try to ask more questions than you give answers. Find a way to rephrase the question the student asked, then support them as they find their own answers.

• Laugh and smile often.
OPEN A STORE

Plan and open an online store with a plan for generating profits.

DRIVING QUESTIONS

**SS**
Big profits came during the Industrial Age. Who were the players? How did they win? How has entrepreneurship changed over the centuries? What types of shops were available in other societies/civilizations? How did humans go from bartering to credit and Ponzi schemes?

**Sci**
What materials are “green” for shipping, packing, and product production? How can you prove that your product is not only green, but not produced by slave/child labor? What are the opportunity costs for choosing one method over the other? Make a case for your choice.

**M**
How do green materials affect your profits in the short term? What size/type of packaging for volume/weight would maximize profits? Run/Implement a cost analysis of your product(s) to reach your profit goals. What is the overhead and startup costs for the business and how long will it take you to generate a profit?

**Rdg**
Research various business plans for both successful and failed businesses. Research successful online businesses and interview the professionals involved. What books and/or classes do they suggest you read?

**Wri**
Create a business proposal for investors to cover your start-up costs. Present it to real people who may invest in your idea. Create a business plan that uses market survey results, cost analysis, marketing plan, advertising plan, tax issues, and scalability plans. Include additional perks that your business would provide for the initial investor(s).
OPEN A STORE
a step-by-step guide

See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

Before-project prep
Research what sites students will be using (Cafe Press, iTunes, etc) and get to know their Terms of Service. Be sure parents are informed of project scope and learning involved. Decide if students are working in teams or individually and what options are available for earned profits. Ensure all educators are clear with timeline and end results expected.

Launching the project
Start with a “bang,” by sharing story of teens who have made real money in virtual stores. Teams or individuals brainstorm potential markets and products. All involved educators are visibly positive and supportive of the central purpose of the project. Introduce the concept of a business plan and ask students to self-select their own teams based on topics of interest, OR assign team members.

During the project maintenance
Students will research potential products, markets, sales outlets, investment capital, etc, creating a complete business plan. Consider not only what it would take to start the business, but also what the start up, manufacturing, and marketing costs will be. A timeline for “opening day” will be set, as well as other important deadlines. Students will need to decide if they will become an LLC, corporation, Partnership, Non-Profit, etc. Teachers’ #1 role is to help the student(s) navigate and complete the business plan.

Ending the project
Take pictures of students/teams in meetings and presentations about their businesses, showing proud faces. Evaluation: students share their learning, focusing on the learning and skills building and not simply what they did. Share results with local media.

tips & tricks

• For students who are new to PBL, help them understand that a to-do list is good, but a to-do list with a timeline is their best friend ever.

• Students often best understand time, task, and materials management skills once they’ve made a mistake of not heeding productivity advice. Allow time for some guided metacognitive reflection and coming up with a workable solution on their own. This, in itself may be the most valuable lesson the student gets from the entire project.

• Warn students about upcoming obstacles, but don’t save a student from stumbling. Allow the mistakes to happen, but help guide them toward productive learning moments right afterward. The emotion they feel, followed by caring support can often unstop a teen’s ears.

• Be sure to group fast learners together when possible. They will push each other forward and it allows you time to spend longer with students who don’t process quite as quickly on their own.
Driving Questions

Going back in time, create a virtual field trip to the location and see what’s been uncovered. What are the last days like? What is the geography/terrain? What’s the census? Are there social strata to consider when evacuating people? Who’s in charge? What’s the government? Can they be relied upon to save everyone?

What's happening? What are the first indicators of something wrong? What are the secondary indicators of panic? What do we need to protect the first/middle/last people from? Gasses? Pyroclastics? Earthquakes? What can we gather and take with us to protect us against the dangers of the journey?

How do you get this many people out? How fast can they travel? What's the speed and distance? Horse power? Ox cart? Is the air quality for the "engine" an issue? How much?

Historical fiction;
Primary source documents from archeologists;
Look at documents from/about the accounts of Pliny the Elder and Pliny the Younger. Are they factual? Or is this a case of "making up history to sell books."

Create an evacuation plan that accounts for 1) all people of Pompeii, 2) the timeline needed, and 3) required survival supplies en route to safety. Be authentic will modes of transportation, realistic speed over time/terrain/distance to safety. Specifically, where will we refuge? Who would be willing and able to take us in? Create an emergency kit to "hand out" to each person to last the time it will take to arrive to safety and new supplies. What do you include for this area, historical time, danger?
POMPEII AND CIRCUMSTANCE
a step-by-step guide

See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

Before-project prep
Decide the time-scope of the project. Will it be conducted in real time? Have access to research documents and websites. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline and end results expected.

Launching the project
Start with a “bang,” by talking about Sendai earthquake, or other large natural disaster (preferably volcano). Ask if it was a volcano, could get everyone out? What if we didn’t have today’s technology? Transport back to Pompeii to create an escape plan to save all the lives of those involved. Introduce potential work teams, including a CSI group to investigate what went wrong and work to correct past errors. Ask students to self-select their own teams OR assign team members. Suggested teams: Transportation Logistics, Equitable Escape, Public Relations, etc. All involved educators are visibly positive and supportive of the central purpose of the project.

During the project maintenance
Students will research Pompeii first, collecting information in cited and collaborative documents. Consider not only what went wrong, but also the social structure. Students will be creating the evacuation plan based on time, distance to safety, and social norms of the time. Consider making 3D models of the town and routes of escape. Teachers’ #1 role is to keep alive the sense of urgency for the evacuation plan.

Ending the project
Take pictures of students and teams with models, plans and presentations, showing proud faces. Evaluation: students share their learning, focusing on the learning and skills building and not simply what they did. Share results with local media.

tips & tricks

• Consider hiring students not traditionally seen as leaders to be your leaders and support them with tips on how to organize people and materials. You’ll be surprised at the results.
• Try to ask more questions than you give answers. Find a way to rephrase the question the student asked, then support them as they find their own answers.
• Keep your energy high and always positive, even when you’re worried, but especially when you’re getting tired.
• If something goes wrong, it’s only another problem-solving opportunity. DO NOT solve the problem for the student/class. Slow down and become intense and purposeful: call a re-organizational meeting and present the problem, brainstorm solutions, and together, create the path forward. Above all, stay positive.
• Students must use quality triangulation of primary documents and other reliable data in their research. Be sure students cite their quality sources so others don’t question the validity of their work.
DRIVING QUESTIONS

SS
What essential roles did the French, American Indian, Spanish, & Americans play in the success of this voyage? Were Lewis and Clark explorers or illegal invaders? Support your position with arguments constructed from primary documents.

Sci
Some of the caches held specimens that had been collected by the expedition. What fauna and flora would L&C have found on their route up and down the rivers? What would be the best way to preserve these specimens in the caches? How did L&C know their location in the world without pedometers or odometers? What was a first aid kit for this dangerous, multi-year expedition?

M
How deep/wide does the hole need to be in order to accommodate the cache, as well as create the space needed for the extra structures to support the hole? What was the mass of the boats that L&C used? How fast does the Missouri river flow? What amount of force would be required to pull the loaded boats up river by hand in the shallows? How many men did it take to pull the boats, loaded? What’re the equations for figuring this out?

Rdg
Primary documents in the form of L&C's journal entries; Historical fiction; Ken Burns/PBS/Other documentaries

Wri
Time Travelers! You've found yourself transported back in time, working on the expedition. Create blog posts back to the present to report what you see and experience. Post at least 3 blog post entries for each leg of the trip, including big events and smaller, daily details of your life.

CACHE-ING UP WITH LEWIS & CLARK
Create a replica of a cache that would have been left by the Lewis and Clark Expedition.
CACHING UP WITH LEWIS AND CLARK
a step-by-step guide
See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

Before-project prep
Decide the time-scope of the project. Find and create access to primary documents, websites, and museum virtual field trips. Consider the American Indian and Spanish points of view, looking east. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline and end results expected.

Launching the project
Start with a “bang,” by talking with students about the expedition and the supplies they needed for a trip that long. Convenience stores didn’t exist. Ask them to think about supplies, based on location and predicted need. Introduce potential work teams, including a Build Team, Expedition Guides, Artifact Experts, and Medical team. Ask students to self-select their own teams OR assign team members. All involved educators are visibly positive and supportive of the central purpose of the project.

During the project maintenance
Students will complete initial research about the Corps of Discovery first, collecting cited information in collaborative documents. Ask students to consider all explorers’ and observers’ points of view. Students will be creating a cutaway display of cache with the materials that would have gone into it. Create placards for each artifact inside the cache, explaining what it is, how it was used, and other pertinent information. Teachers’ #1 role is to help students focus on museum-quality of the artifacts and to meet the museum’s deadline.

Ending the project
Take pictures of students and teams with the cache, artifacts, and presentations, showing proud faces. Evaluation: students share their learning, focusing on the learning and skills building and not simply what they did. Share results with local media and younger students.

tips & tricks
• Keep your energy high and always positive, even when you’re worried, but especially when you’re getting tired.
• If something goes wrong, it’s only another problem-solving opportunity. DO NOT solve the problem for the student/class. Slow down and become intense and purposeful: call a re-organizational meeting and present the problem, brainstorm solutions, and together, create the path forward. Above all, stay positive.
• Focus on the learning, not the resulting deliverable. Oftentimes mistakes and metacognitive growth are more important than a pretty product.
• Students must use quality triangulation of primary documents and other reliable data in their research. Be sure students cite their quality sources so others don’t question the validity of their work.
MONKEY SEA MONKEY DO

Hatch Sea Monkeys and document their life cycle

DRIVING QUESTIONS

Create a map displaying where in the world sea monkeys live. What is it about that location that helps them thrive? How did the phenomenon of sea monkeys tie into 20th century American culture? Did they achieve worldwide popularity? Why/not? Who was Charles Darwin and how could his studies teach you about the life cycle of a sea monkey?

Scientifically observe and document the sea monkey life cycle, making sure to use proper terminology for each stage. How do the life cycles of butterflies, frogs, and trees compare with a sea monkey? What is the optimal environment for your sea monkeys to reproduce and thrive?

Demonstrate the concepts of cryptobiosis and anhydrosis and how/if that could be applied to other creatures that might face extinction. Sea monkeys been key for genetic research?

Measure the growth of your sea monkeys and document the growth patterns in a chart. Measure the monkeys at regular intervals to determine the mean/median/mode for their lengths. How could you measure their weight? Given optimal living conditions, after 6 months, how many sea monkeys would cycle through your tank? 6 years? 60 years? Statistically, how many are male? Female?

Fiction about life cycles, shrimp, butterflies, etc; Biography of Charles Darwin; Review research regarding sea monkeys as genetic and biofuel subjects; Research and properly cite sources for learning;

Observe and document the lifecycle of a sea monkey, writing a proper lab report. Visit an aquarium; compare shrimp species. Resolved: Sea monkeys are the link in the human food chain to solve food shortage issues around the world.
MONKEY SEA, MONKEY DO
a step-by-step guide
See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

Before-project prep
Decide the time-scope of the project, which will depend heavily upon the generational growth of the sea monkey batch. Find and create access to scientific documents, websites, and museum virtual field trips. Buy a sea monkey kit (or several). Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline and end results expected.

Launching the project
Start with a “bang,” by showing the advertisements from old comic books, asking students if they’d like to grow a colony/family. Tell them we’re hired to learn and document the lifecycle of these tiny creatures. Introduce potential work teams, including zoologists, reporters, historians. Ask students to self-select their own teams, or assign team members, or, as the sea monkeys develop, each student can play each role him/herself. All involved educators are visibly positive and supportive of the central purpose of the project, which is to document their life cycles.

During the project maintenance
Students will complete initial research about sea monkeys, collecting cited information in collaborative documents. Ask students to consider the advertisement and what the SM might actually look like. Students can go as deeply into Science or Math concepts at their mentors would like to take them. This is a nice “in the background” ongoing project. Teachers’ #1 role is to help students focus on the quality of the math/science concepts, using low-stress and fun creatures as the catalyst for learning.

Ending the project
Take pictures of students with the sea monkeys and their artifacts, showing proud faces. Evaluation: students share their learning, focusing on the learning and skills building and not simply what they did. Share results with local media and younger students.

tips & tricks
• Try to ask more questions than you give answers. Find a way to re-phrase the question the student asked, then support them as they find their own answers.
• Keep your energy high and always positive, even when you’re worried, but especially when you’re getting tired.
• If something goes wrong, it’s only another problem-solving opportunity. DO NOT solve the problem for the group. Slow down to become intense and purposeful: call a re-organizational meeting and present the problem, brainstorm solutions, and together, create the path forward. Stay positive.
• Focus on the learning, not the resulting deliverable. Oftentimes mistakes and metacognitive growth are more important than a pretty product.
• Students must use quality triangulation of primary documents and other reliable data in their research. Be sure students cite their quality sources so others don’t question the validity of their work.
ALL ABOUT TORNADOES

Create a book, audio or video-based story that teaches about tornadoes.

DRIVING QUESTIONS

SS
How have tornadoes (or other natural disaster events) affected public policy in your local area? How does FEMA respond to tornado emergencies? How do other countries protect their citizens from tornadoes/cyclones? Review your school/home/town emergency policy to be sure it's current with recent standards. Research myths/legends across time and history associated with these types of storms. What similarities do you see based on culture and/or geography?

Sci
What is the science behind how funnels form and what drives tornado activity? What are scientists doing to better understand them to keep us safer? How does the jet stream and warm/cold frontal boundaries affect prediction abilities of meteorologists? Why do tornadoes appear where they do and what country has the most tornado activity? Why?
Create a simulation lab to test the behavior of tornadoes.

M
Calculate the force of various objects as they are picked up by tornadoes and smashed into other objects. Play the role of a CSI team and figure these equations as you survey the aftermath of various actual tornadoes. Create a simulation where participants predict with life-saving accuracy the path and projected trajectory of a given tornado.

Rdg
Research the science behind tornadoes; read myths, legends, and tall tales about tornadoes. Why do people and societies create these stories? How will understanding this guide your story about tornadoes?

Wri
Interview for first-witness accounts tornado activity. Create a narrative or expository story (or a combination of the two), based on your learning, including an informative emergency action plan. Add audio and visuals to the written word for a fully-interactive and engaging story. Add music to add to the texture of your story.
ALL ABOUT TORNADOES

a step-by-step guide

See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

Before-project prep

Decide the time-scope of the project. Find and create access to primary documents, websites, experts, and museum virtual field trips. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline, content expectations, and end results expected.

Launching the project

Start with a “bang,” by looking at the Greensburg, Joplin, or other local tornado stories. Ask students to begin thinking about how we can learn about these powerful storms to save lives. Introduce potential work teams, including Emergency Policy, CSI, Virtual Storm Chasers, etc. Ask students to self-select their own teams OR assign team members. All involved educators are visibly positive and supportive of the absolute importance of the book, website, video, or other teaching artifact.

During the project maintenance

Students will complete initial research about tornadoes, collecting cited information in collaborative documents. Students will create an artifact that teaches not only the science and math of tornadoes, but also safety policy. Students will be demonstrating the skill of digital storytelling, incorporating audio, visual, and textual concepts. Teachers’ #1 role is to help students focus on the informative and engaging quality of the story.

Ending the project

Take pictures of students and teams in the learning process. Share the story and accompanying presentation with both local and distant museums, news, etc. Evaluation: students share their story, focusing on the learning and skills-building and not simply what they did. Share results with local media and younger students.

tips & tricks

- Be sure to group fast learners together when possible. They will push each other forward and it allows you time to spend longer with students who don’t process quite as quickly on their own.
- There are times that a slower processor will demonstrate more creativity and quality of thinking. Sometimes quicker processors will go deeper if you give them less time to think, instilling a sense of urgency.
- If you have capable but reluctant learners, consider grouping them all together. One will inevitably rise to the challenge and discover s/he is a very capable leader. Be sure other groups notice and celebrate this growth.
- Allow students to talk with each other in small groups before volunteering ideas. This allows them to hear other ideas and build upon their own for more complex and quality purpose.
- Foster student-to-student mentorships by asking students to point out each other’s strengths while working with the project, during and afterward. This allows each student to be built-up in others’ eyes.
How has the desire to fly sparked innovation, influenced cultures, and created inventions throughout time? What lessons can we learn by studying the ancient Chinese, ancient Greece and the history of flight through the European Renaissance period?

How/Why do birds and insects fly? What are the biomechanics that allows them to fly? Why do some birds fly and others don’t? What specifically about the shape and construction of the wing causes an airplane fly? If lift, based on the shape of a wing is a real phenomenon, how can airplanes fly upside down? What other shapes could cause lift with a significant amount of thrust? Some machines have had limited success using rotating wings or a screw-type propeller. What other simple machines could be rethought for flight? Visit a small airport to touch/view wings of various airplanes.

What other wing shapes could cause lift? What are the forces needed at sea level to overcome the force of gravity to lift your flying machine? Show the mathematics behind your theory. How does mass, thrust, and the surface area of your machine play into the success of your machine? Use physics to prove on paper that your machine works before risking the lives of test pilots.

Research primary resources via virtual field trips to museums with flight artifacts, such as the Library of Congress or the Smithsonian Air/Space Museum.

Create a website that describes how your machine works. Apply for a grant to develop a full-sized model of your machine. Apply for a patent of your original idea. Create a narrative story that describes how your machine would be used if it was to be created.

Re-imagine the airplane as if the Wright brothers never built theirs.
NO WRIGHT ANSWER
a step-by-step guide
See your Foundations Card for guiding tips regarding project scope, standards, teeming, assessment and post-project wrap-up.

Before-project prep
Decide the time-scope of the project. Will this be more imaginary or will actual test-flights and proofs-of-concept be created? Find/create access to primary documents, websites, experts, and museum virtual field trips. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline, content expectations, and end results expected.

Launching the project
Start with a “bang!” by walking back through time, imagining what the world would be like without airplanes, jets, etc. Ask them to imagine being the one to design an airplane, not like the Wright Brothers’. Introduce potential work teams and partnerships. Ask students to self-select their own teams rather than assigning team members. All involved educators are visibly positive and supportive of the absolute importance of the new design.

During the project maintenance
Students will complete initial research about airplanes and nature of flight, collecting cited information in collaborative documents. Students will create a website that outlines the history of flight up to their new, successful design that is fully described and illustrated. Teachers’ #1 role is to help students focus on the innovative design, informative description, and engaging quality of the presentation.

Ending the project
Take pictures of students/teams in the learning process. Share the designs and accompanying presentations with both local and distant museums, news, etc. Evaluation: students share their story, focusing on the learning and skills-building and not simply what they did. Share results with local media and younger students.

tips & tricks
• Warn students about upcoming obstacles, but don’t save a student from stumbling. Allow the mistakes to happen, but help guide them toward productive learning moments right afterward. The emotion they feel, followed by caring support can often unstop a teen’s ears.
• Do not attempt to force a student to do learn something they’re not interested in. The lesson that will stick is that they can’t trust you.
• Allow students to talk with each other in small groups before volunteering ideas. This allows them to hear other ideas and build upon their own for more complex and quality purpose.
• Foster student-to-student mentorships by asking students to point out each other’s strengths while working with the project, during and afterward. This allows each student to be built-up in others’ eyes.
• Allow students to see you stumped and let them see you accept a student’s idea over your own.
ALL ABOUT THE MAYAS

Create a book, audio or video based story that teaches about the Mayas

DRIVING QUESTIONS

SS
Compare the story of the Maya civilization to other Meso-Americans’ stories. How were they integrated into Spanish culture to create today’s people? What other civilizations of the world used pyramids in their architecture? What was it about the governmental structure of the Maya that helped them survive the Spanish invasion longer than the Incas or Aztecs? How did religion impact the daily lives of the Maya?

Sci
What type of rocks did the Maya use to build their famous architecture? What tools would have been used? How do their geographical location affect their food supplies? What did they need to know about the human body in order to develop the medical procedures they used? How were the celestial bodies used in their culture? How did they know this information without today’s technologies?

M
The Maya had a complex economic structure; how does that compare with the US today? What was the role of math in the Mayan calendar system? The Maya used a base 20 and a base 5 system. Include how these work into your story. Explain the math behind the measurement of the solar year and compare it with the solar year measurements of the Gregorian Calendar. What does having the number zero mean for the Mayan (or any) culture?

Rdg
Research some of the literature and myths that have been uncovered from the Mayan people such as the annals of the Cakchiquels or the Popol Vuh. One of the oldest books on record is known as the Dresden Codex. Research these pieces of literature and what we know of them. How did these coming to light change the view of these civilizations beyond how the conquering Spanish portrayed them? Look at primary sources when possible.

Wri
Write and illustrate your story, engaging as many of the five senses as possible to tell a compelling story that your audience will want to experience repeatedly. Don’t forget to plan, using an organizational story board.
ALL ABOUT THE MAYANS
a step-by-step guide

See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

Before-project prep
Decide the time-scope of the project. Will students build websites, books, videos, or a combination? Collect sufficient resources? Find/create access to primary documents, websites, experts, and museum virtual field trips. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline, content expectations, and end results expected.

Launching the project
Start with a “bang,” by talking about the end of the Mayan calendar, scheduled for December 2012. Ask them to imagine creating a calendar of such accuracy to predict astronomical events with such accuracy so far in advance. Ask about other aspects of the Mayan culture, making sure you’re asking questions that students will not know the answer to. Introduce potential work teams and partnerships. Have students to self-select teams or you assign team members. All involved educators are visibly positive and supportive of the absolute importance of the new design.

During the project maintenance
Students will complete initial research about Mayan culture, collecting cited information in collaborative documents. Students will create a website/book/video that teaches about a generalized or specific focus of the Mayans. Teachers' #1 role is to help students focus on the informative description, deeper information, and engaging quality of the presentation.

Ending the project
Take pictures of students/teams in the learning process. Share the designs and accompanying presentations with both local and distant museums, news, etc. Evaluation: students share their story, focusing on the learning and skills-building and not simply what they did. Share results with local media and younger students.

tips & tricks

• In a fully-collaborative PBL environment, students must have some individual space to claim as their own to keep their materials organized and safe. This may or may not be a traditional locker.

• Allow students to talk with each other in small groups before volunteering ideas. This allows them to hear other ideas and build upon their own for more complex and quality purpose.

• Allow students the opportunity to share commendations, or “bows” for individual members of their own team. Encourage a safe, trusting environment by doing this publicly at the students’ own choice.

• Foster student-to-student mentorship and community trust by helping them rely on each other for assistance before running straight to you. When a student asks a question, find out who s/he has asked first. If three people have been consulted, directly answer the question asked and be sure that everyone in the class/group hears the answer.
EARS THAT SEE

Find a way for blind people to see with their ears

DRIVING QUESTIONS

Research historical struggles for blind people and the progress created through organizations such as the ADA. How have people who are blind changed the world? What is behavior theory? How do people “learn” things? How can we teach people to “see” objects by hearing? Pinpoint a time in history and research the everyday lives of blind people. Describe the technology that allowed them to see.

How do people become blind? What are the diseases, injuries, etc? What are the structures of the eye and how does the brain “read” incoming light? How does the ear hear? What processes in the brain allow the eyes/ears to communicate? How is augmented reality assisting in this effort? What other devices or methods have been developed to use with or without sound assistance? Is it true that other senses compensate for the lost of sight?

How are light waves and sound waves similar/different? Explain the concepts of cycles, frequency, vibration, Hertz, and period as they pertain to waves. Why do waves behave differently in various mediums? Create an illustration or animation to prove your learning.

Research accounts of and/or interview blind people explaining what they do see. Read an appropriate ability level (auto)biography of a blind person. Learn braille. Practice with an augmented reality sensor to either use sound or another type of light to see.

Write a proposal to support funding for the development of your invention. Research the proper channels for funding. Write a lab report or scientific journal entry to share your work with others interested in this topic.
EARS THAT SEE
a step-by-step guide

See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

**Before-project prep**
Decide the time-scope of the project. Understand how the _____ works. Find/create access to primary documents, websites, experts, and museum virtual field trips. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline, content expectations, and end results expected.

**Launching the project**
Start with a “bang” by asking what if people could see with their ears. What would this mean for blind people? Then demonstrate the ______. Ask students to learn about sound waves & the anatomy of the ear and develop their own inventions. Introduce potential work teams and partnerships. Ask students to self-select their teams rather than assigning team members. All involved educators are visibly positive and supportive of the absolute importance of the new design.

**During the project maintenance**
All students will complete initial research about sound/light, ears/eyes, collecting cited information in collaborative documents. Students will create a presentation that outlines the basic content required, and house pics/vid their new, successful design that is fully described and illustrated. Teachers’ #1 role is to help students focus on the quality information, innovative design, informative description, and engaging quality of the presentation.

**Ending the project**
Take pictures of students/teams in the learning process. Share the designs and accompanying presentations with both local and distant museums, news, etc. Evaluation: students share their story, focusing on the learning and skills-building and not simply what they did. Share results with local media and younger students.

**tips & tricks**

- Sometimes a teacher will have an idea they are sure will work, but while asking questions, it becomes apparent that the students are not going to “guess” what this idea is. Resist the urge to just tell your idea. Sometimes students know what your idea is and are choosing to not use it.

- Consider having students, as a class, create the to-do list for the day, both the big-ideas, as well as the details.

- When at all possible, ask for original “sound-scapes” or musical story-telling, involved in the final product. Music can show suspense and other emotion faster than words can and will hook some students deeply into the work.

- Busy work creates idle learners and “busy work” is not in the eye of the teacher, but the eye of the student.

- Be cautious and sensitive when publicly complimenting some students; the compliment may end up with the opposite desired response.

See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.
SAVE THE TITANIC

Go back in time and save the Titanic from sinking

**DRIVING QUESTIONS**

- Why did a large percentage of 2nd class passengers die, compared to first class? What was European immigration to the US like at that time? Who came? Why? When going back in time, who do you make your appeal to? Why is that the most effective audience?

- Who/What was the #1 thing responsible for the ship’s sinking? What about the design of the ship made it so unsinkable? What were all the steps to it going wrong? Where exactly in time do you go back and what do you change? What is ductility? How does a rudder work? How does the shape of a hull affect the movement, speed and maneuverability of a ship?

- What’s the minimum number of lifeboats they should have had? How long did they have from iceberg to sunk? Figure the time each person had to load in order to save them all? What’s the average weight a vintage life jacket could carry vs modern? How many people could Given the materials on the ship and the common buoyancy of those materials in sea water, what would be the best to grab as the ship goes down? Prove it with math.

- Read survivor accounts about the sinking. Collect evidence for opportunity to turn history around. Learn how wrought iron is made and the controversy surrounding the tensile strength of the hull. Read accounts of the salvage work conducted to solve these mysteries.

- Prove, in writing and with a presentation, that your plan for saving the Titanic would work. Persuade your audience. Contact experts to gather primary source evidence.
SAVE THE TITANIC
a step-by-step guide
See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

Before-project prep
Decide the time-scope of the project. Establish connections with experts in case students need them. Find/create access to primary documents, websites, experts, and museum virtual field trips. Limit viewing of the movie, unless that will be a focus. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline, content expectations, and end results expected.

Launching the project
Start with a “bang,” by sharing the general story of the Titanic and it’s unsinkability. Perhaps include death tolls. Ask them to imagine being on the deck. Or on shore, waiting for loved ones. Or on the rescue boat, not being able to save all you’d like. Introduce potential work teams and partnerships. Ask students to self-select their own teams OR assign team members. All involved educators are visibly positive and supportive of the absolute importance of the new design.

During the project maintenance
Students will complete initial research about the Titanic, collecting cited information in collaborative documents. Students will create a plan that outlines the plan for stopping the disaster. Boat redesign? Change captains? More lifeboats? Teachers’ #1 role is to help students focus on the thoroughly researched plan, informative description, and engaging quality of the presentation.

Ending the project
Take pictures of students/teams in the learning process. Share the plans and accompanying presentations with both local and distant museums, news, etc. Evaluation: students share their story, focusing on the learning and skills-building and not simply what they did. Share results with local media.

tips & tricks
• If a student isn’t turning work in, ask yourself which is more important to you: that they turn the assignment in or that they’re interested and engaged in the learning? Which will produce more personal change? If they’re not interested or engaged, what will YOU do differently to help them get there?
• PBL is messy. “If ya’ ain’t got it on ya, then ya ain’t got it in ya!”
• There is rarely anything more important in setting the stage for a successful project than having an environment of trust. How a teacher best establishes trust is to run a project which allows students the opportunity to develop trust. It’s not “the chicken OR the egg.” It’s the chicken AND the egg.
• Sometimes a teacher will have an idea they are sure will work, but while asking questions, it becomes apparent that the students are not going to “guess” what this idea is. Resist the urge to just tell your idea. Sometimes students know what your idea is and are choosing to not use it.
How did the scientific developments of the Renaissance lead to an understanding of cells and DNA today? Predict where will this lead us in the future. Who were some of the leading minds of the discovery of cells, the structures to our knowledge base today? How were those scientists regarded in their time?

What are the functions of a cell and its parts? How do they work together for efficient functionality? How are animal and plant cells similar/different? What is the latest research and advances going on in cellular biology today? How does this affect our lives today? Scientifically explain abiogenesis at the cellular level and the controversy surrounding the concept.

How are cells being used in medical research today? What is the current progress with nanotechnology in human health?

How big is a plant cell? An animal cell? How would you explain that to a 5 year-old? How fast do various cells complete life cycles? How were measurement tools this small developed? What do cells weigh? How does math help scientists “see” things that aren’t able to been with the human eye and technology? Use math algorithms to explain how quickly cancer cells spread.

Read/Research using informational text from ability-appropriate publications; Triangulate resources and facts from reputable, scientific journals; read/discuss science fiction that has turned to science reality.

Write a script for yourself as tour guide for your cell, explaining to a younger child and an adult, using appropriate scientific language and explanations for each. Accompany the tour with a soundscape that tells the story of your cell’s functions.

Design an animal cell, big enough to walk through.
**WALK-THRU CELL**
*a step-by-step guide*

See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

**Before-project prep**

Decide the time-scope of the project. Establish connections with experts in case students need them. Find/create access to primary documents, books, websites, experts, and museum virtual field trips. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline, content expectations, and end results expected.

**Launching the project**

Start with a “bang,” by asking students to either view a clip from The Fantastic Voyage or imagine shrinking down to travel around the human body. Tell them they’ll do the next best thing: inflate a cell to be nearly room-sized! Introduce potential work teams: Build Team, Organelle Design, Travel Agents and Facts Team. Ask students to self-select their own teams OR assign team members. All involved educators are visibly positive and supportive of the learning, quality of construction, and exciting, informative tours.

**During the project maintenance**

Students will complete initial research about cells and cell structures, collecting cited information in collaborative documents. Students will create a plan for each of their team’s work. Teachers’ #1 role is to help students learn and explain the functionality of the cell, as well as any related content work.

**Ending the project**

Take pictures of students/teams in the learning process. Share the plans and accompanying presentations with both local and distant museums, news, etc. Evaluation: students share their presentation with local students of lower and higher ages, focusing on the learning and skills-building and not simply what they built. Share results with local media.

**tips & tricks**

- Consider collaborating with teachers who have different leadership styles than you, but who are still very student-centered. Various students will gravitate toward their natural center and you’ll find strong mentorships forming. However, consider switching it up occasionally but be mindful of students perhaps being off balance. That gentleness and understanding of their individual learning styles will strengthen the entire group.

- Never; ever forget that learning is fun.

- When students are working on projects, they should see themselves practicing particular roles in life. This is purposeful and meaningful learning that’s intentionally crafted by the purposeful educator during the planning phase, as well as during other moments throughout the process.

- Utilize content experts inside your school building/district/community to assist in creating rigor for a project. Sometimes your best resources are in your own backyard.
WHICH WITCH IS WHICH?

Create a book, audio, or video story that tells about the events of the Salem Witch Trials.

**DRIVING QUESTIONS**

- **SS** What are the reasons why Europeans came to the New World? How were Puritans & Pilgrim dis/similar? Did anyone stand up against the accusers? Was this an inevitable fallout of the Reformation years before? The Salem Witch trials occurred in the US for <1 year, but similar incidences occurred across the globe for two Centuries. What were some of the environmental stressors that may have created panic? How did the trials change the US legal system regarding treatment of testimony and witnesses?

- **Sci** What is ergot? Could it have been a cause for the evidence or fervor of the witch trials? Could it have been mercury poisoning? Other? How? Why do or don’t you think so? *not for all students: What are some of the forms of torture employed? What about the human anatomy/psyche made that device effective?

- **M** What were the demographic profiles of the accused? Convicted? Chart & Plot the results over time. Using mathematical principles, including then-population, event duration, and deaths, which killed more people: the Salem Witch Trials or Hitler’s Final Solution?

- **Rdg** Read age-appropriate primary source accounts. Historical fiction is appropriate for young readers. Compare/Contrast Cotton Mather’s “Memorable Providences, Relating to Witchcrafts and Possessions” with Thomas Brattle’s “A Full and Candid Account of the Delusion Called Witchcraft.” Perform “The Crucible,” or other books. Students must properly cite their research sources.

- **Wri** Analyze artifacts and primary doc pictures to understand relationships between people, events, & environment. Taking the role of an outsider, write an appeal that would convince accusers to stop. Create a dramatic soundtrack to narrate.
WHICH WITCH IS WHICH?

*a step-by-step guide*

See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

**Before-project prep**

Decide the time-scope of the project. Establish connections with experts/museums in case students need them. Find/create access to primary documents, websites, and museum virtual field trips. Be sure parents are informed of project scope and academic learning involved. Ensure all educators are clear with timeline, content expectations, and end results expected.

**Launching the project**

Start with a “bang” by sharing a general story of the witch trials. Perhaps include some descriptions of accusations, trials, results. Ask students to imagine being there as accused, accuser, and observer. Introduce potential work teams and partnerships: CSI, Storytellers, Technology Support, SoundScape, Statisticians. Ask students to self-select their own teams OR assign team members. All involved educators are visibly positive and supportive of the absolute importance of the new design.

**During the project maintenance**

Students will complete initial research about the trials, collecting cited information in collaborative documents. Students will create an outline for aspects of the story product and final delivery model. Website? Video? Historical fiction inspired by true events? Teachers’ #1 role is to help students focus on the thoroughly researched plan, informative description, and engaging quality of the presentation.

**Ending the project**

Take pictures of students/teams in the learning process. Share the plans and accompanying presentations with both local and distant museums, news, etc. Evaluation: students share their stories, focusing on the learning and skills-building and not simply what they did. Share results with local media.

tips & tricks

- Assessment of learning should be focused first on the standards and skills students need to develop. Try to make the assessment of that information as authentic to real life as possible.

- Students need help learning how to prioritize tasks. When it's time for them to wrap up for the day, always end with the expectation that they'll create a prioritized list of tasks to work on before the next meeting. Not all will be able to work, but some will and it sets a tone of 24/7 learning.

- After a presentation or during the work, students should practice asking “How is it you...” when learning how to be critical of another’s work or behavior. Constructive criticism is a learned skill, both offering and receiving it.

- Create hard and soft deadlines for students to learn to manage their time and quality of work, while receiving feedback before submitting their final work. Set the soft deadlines enough in advance of the hard deadline to allow students to adjust their work for their best efforts.
Create a book, audio or video based story that teaches about this beautiful state.
Assessment of learning should be focused first on the standards and skills students need to develop. Try to make the assessment of that information as authentic to real life as possible.

When assessing growth and mastery and growth in students, checklists, rubrics, and self-evaluations are ideal. Rarely can an accurate measurement of authentic and sustained growth be taken by a test that a person has to study for.

When students are responsible for their own deadlines and are held accountable by teammates in a trusting environment, they learn to understand the importance of to-do lists.

Teams should create their own contracts for work and behavior guided by both positive and negative past group work experiences. Contracts also need to have a distinct positive approach flavor as well as having team-negotiated consequences.

Let students have a good deal of free-choice in how they choose to contribute to the final deliverable.

Before-project prep
Decide the time-scope of the project. Establish connections with experts in case students need them. Find/create access to primary documents, websites, experts, and museum virtual field trips. Secure permission for field trips and scale maps in the parking lot. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline, content expectations, and end results expected.

Launching the project
Start with a “bang,” by sharing the story of Bleeding Kansas and other exciting, but little-known tidbits of Kansas History. Outline several radical ideas that Kansas has produced first. Introduce potential work teams such as Tech, Cartographers, Lobbyists, CSI, Soundscape, Virtual TourGuides. Ask students to self-select their own teams OR assign team members. All involved educators are visibly positive and supportive of the absolute importance of the new design.

During the project maintenance
Students will complete initial research about facts/history of Kansas, collecting cited information in collaborative documents (GoogleDocs). Students will create an outline for their project, then create smaller outlines as to-do lists for each chapter/topic. Teachers' #1 role is to help students focus on the thoroughly researched information, thorough and broad (or focused) topics, and engaging quality of the final product.

Ending the project
Take pictures of students/teams in the learning process. Share the plans and accompanying presentations with both local and distant museums, news, etc. Evaluation: students share their story, focusing on the learning and skills-building and not simply what they did. Share results with local media.

See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.
SPORTS DRINKS: MYTH OR MAGIC?

Prove whether sports drinks really enhance performance or not.

**DRIVING QUESTIONS**

**SS**
What are other performance enhancements that soldiers or travelers used in other times to keep them strong? Greeks? Romans on the march? Vikings conquering? Civil War soldiers? Sailors on ships? Slaves at work? Explorers crossing land? Egyptians building pyramids? Middle Ages for the plagues? What were the various types of "snake oil" sold as health-enhancers? How well did these work? Why/Not?

**Sci**
What are the ingredients? How do they act upon the human body? Are there ingredients that are more productive/destructive to performance than water? How will you know if it enhanced a performance? What are some of the variables to consider? Who/What will be your constant? What are related questions you'd like to follow up on? Look for patterns in the chemical compounds of the active ingredients. What other compounds could be combined for potential benefit? What would the dangers be?

**M**
Collect data using estimation, graphing, correlation analysis. What percent of the drink is performance enhancing and which is simply sugar and water? Compare these percentages to soda, milk, juice. Which is healthier or has potential to enhance performance more? How would you use an SIS model to gather additional data about health?

**Rdg**
Use primary documents for background research and historical data. Research other product comparisons that have been published. Evaluate the comparisons for scientific accuracy vs product persuasion.

**Wri**
Write up a lab report that includes the traditional steps for a science project. Now make it more as a real scientist might submit to a journal. Be a journalist and write the findings for a magazine targeting moms. Targeting kids. Targeting athletes. Make it informational. Make it persuasive.
SPORTS DRINK: MYTH / MAGIC
a step-by-step guide

See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

Before-project prep
Decide the time-scope of the project. Establish connections with nutritionists, sports experts, and scientists in case students need them. Find/create access to primary documents, websites, and experts. Consider visiting a food lab. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline, content expectations, and end results expected.

Launching the project
Start with a “bang,” by sharing that we’ve been hired by a famous sports team to collect data to see which drinks improve performance. Include commercials and advertisements in the launch. Cite the big budgets that are at risk. Ask students to create a proposal that addresses all sides of the issue. This proposal will be used to persuade the Board of Directors to make the right choice. Introduce potential work teams and partnerships: LabRats, MadisonAvenue, IntelDiggers. Ask students to self-select their own teams OR assign team members. All involved educators are visibly positive and supportive of the absolute importance of the new design.

During the project maintenance
Students will complete initial research about sports drinks and performance enhancers, collecting cited information in collaborative documents. Students will run an ability-appropriate-level experiment on the various drinks. Teachers’ #1 role is to help students focus on the thoroughly researched project, quality math and data collection and display, informative description, and engaging quality of the presentation.

Ending the project
Take pictures of students/teams in the learning process. Share the plans and accompanying presentations with both local and distant museums, news, etc. Evaluation: students share their story, focusing on the learning and skills-building and not simply what they did. Share results with local media.

tips & tricks

• During project prep, you will see that students will need a specific direct teaching moment. Resist the urge to front-load this information. Create the opportunity for students to discover they need this skill or information, then provide a brief workshop. Having the need to know will open their ears for the information more clearly than any activity artificially-designed to provide information before they know they need it.

• Consider having students, as a class, create the to-do list for the day, both the big-ideas, as well as the details.

• Allow students to talk with each other in small groups before volunteering ideas. This allows them to hear other ideas and build upon their own for more complex and quality purpose.

• All students enjoy learning when they can be successful. Provide whatever environment it takes to foster enjoyable learning opportunities for every single student.
DRIVING QUESTIONS

**SS**
What was Lincoln’s background in younger years? With whom was he allied? Who specifically were his enemies? Why did they, in particular, want him dead? Who might have wanted him dead badly enough to try even if Booth never existed or failed? What were the surrounding details of Lincoln’s death? Of his Booth’s life and death?

**Sci**
Recreate the crime scene of in Ford’s Theatre and demonstrate the angle and circumstances the bullet struck the President and what damage was done to his body. What was the science behind the assassination? How did Lincoln live so long afterward? What are the scientific processes that would allow Lincoln to be saved? What technology would have to be invented, if any, for your plan to work?

**M**
How are bullets and guns similar and different today? Explain mathematically how riflings work, as compared to ball and musket firings. Explain the crime scene and the escape scene of JWB, detailing time, distance, and the damage done to JWB during his escape.

**Rdg**
Read academically-appropriate primary source documents about Lincoln’s early life and rise in politics and JWB’s (and others’) lives and anger with Lincoln. Determine an appropriate time to save Lincoln from this information.

**Wri**
Write your proposal, including why you selected that moment in time. Include visual and audio narration with your proposal.

SAVE LINCOLN
Go back in time and save Lincoln from assassination
There’s rarely anything more important in setting the stage for a successful project than having an environment of trust. How a teacher best establishes trust is to run a project which allows students the opportunity to develop trust. It’s not the chicken OR the egg. It’s the chicken AND the egg.

Consider collaborating with teachers who are have different leadership styles than you, but who are still very student-centered. Various students will gravitate toward their natural center and you’ll find strong mentorships forming. However, switch it up occasionally, staying mindful of students being “off balance” with the change. That gentleness & understanding of individual learning styles will strengthen the entire group.

Busy work creates idle learners. Busy work is not in the eye of the teacher, but the eye of the student.

Don’t be afraid to find global experts & resources. Using today’s technology of video conferencing can demonstrate to learners of all ages that connectivity can be the first step to deeper experiences.
DRIVING QUESTIONS

**SS** What were the first attempts into space by other civilizations? Who are our current space pioneers? How did the space race and Cold War between the US and USSR fuel the world’s economy? What is the history behind the current combined efforts of international space travel?

**Sci** How does a rocket and rocket fuel work? How does it break the atmosphere? How does weight and thrust work with/against gravity of planets and space objects as we travel through space? What do scientists say the next generation of space travel will be? What are the “truths” of space travel and living that have been disproven by extended experiments aboard the ISS and other missions? What is the main function of your spaceship? Travel? Living? Experiment lab? Other? How will travelers communicate with those on Earth?

**M** What is the math behind escaping Earth’s gravity and atmosphere? What is the math and/or physics to prove your new system could work? Have you reduced “drag” friction in this spaceship? Will it be used in space or to leave earth? How much space aboard will be for cargo and equipment and how much will be for living?

**Rdg** When has Science Fiction become Science Reality? What are instances of this happening? Read age-appropriate space-travel books, science fiction, biographies, etc.

**Wri** Write a proposal, targeting NASA, explaining the materials, design, function of your spaceship. Perhaps include how much your ship would cost. Use your best scientific learning and mathematical proofs to convince NASA that it could work. Utilize real-life experts in math/space science to check your work and ideas.

SPACE SHIPS TO OUR FUTURE

Design a next generation spaceship
When students are working on projects, they should see themselves practicing particular roles in life. This is purposeful and meaningful learning that’s intentionally crafted by the purposeful educator during the planning phase, as well as during other moments throughout the process.

In regard to deliverables, less stuff is more. Higher quality is better. Allow the students to focus on the effort and learning and less about the grade they will earn.

When at all possible, ask for original “sound-scapes” or musical storytelling involved in the final product. Music can show suspense and other emotion faster than words can and will hook some students deeply into the work.
ALL ABOUT THE GREEKS

Create an “Arts and Architecture” book, audio- or video-based story that teaches about the Greeks.

DRIVING QUESTIONS

SS - How do the Arts and Architecture of the Ancient Greeks leave a timeline of history? Of culture and environment? Of government? Of who the people were? Of innovations? Warfare? Education? How does the geography of Greece affect their growth and trade of the city-state throughout the Classical and Hellenistic periods? How did trade outside of Greek lands affect the Arts and Architecture of Greece?

Sci - What were the scientific and technological innovations that the people in Classical and Hellenistic Greece discovered and utilized for their Arts and Architecture? What do we know about their discoveries of space/celestial bodies? Explain the Antikythera mechanism? Was this piece more science or art? What were some of the medical advances? How did the application of geography, mathematics, and astronomy help the Greeks to discover and explain the known world?

M - Explain the geometry and math used for building the Parthenon. Why was the Acropolis chosen for this building? What mathematical principles can be attributed to the discoveries of the Greeks? How were these principles discovered and applied to everyday life? How are the same principles used today?

Rdg - Primary source information from museums, photos, artifacts, and virtual field trips to architectural ruins and recreations are helpful. Read translations from Ancient Greek historians. Read age-appropriate historical fiction. Read plays and other theatrical pieces for insight.

Wri - Write the story, based on the Arts and Architecture of all periods or isolate a selected period of time. Expository or Persuasive methodology can be utilized, depending on purpose of the work. Consider creating a soundscape to help narrate your story.
ALL ABOUT THE GREEKS
a step-by-step guide

See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

Before-project prep
Decide the time-scope of the project. Establish connections with experts in case students need them. Find/create access to primary documents, websites, experts, and museum virtual field trips. Decide what technology will be utilized. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline, content expectations, and end results expected.

Launching the project
Start with a “bang,” by asking students to share what they know about the Greeks. Then add other little known, high-interest facts, eg, The Greeks colonized from modern-day Russia to Libya? There was no such thing as “Greece” as a country? That the Parthenon was a mathematically perfect structure? Introduce the assignment. Introduce potential work teams and partnerships. Ask students to self-select their own interest-based teams OR assign team members. All involved educators are visibly positive and supportive of the absolute importance of the new design.

During the project maintenance
Students will complete initial research about the Classical and Hellenistic Greek period arts and architecture. Help keep the focus and strong ties to arts/architecture as students learn other basic foundations of the civilization. Teachers’ #1 role is to help students focus on the thoroughly researched plan, informative description, and engaging quality of the presentation.

Ending the project
Take pictures of students/teams in the learning process. Share the plans and accompanying presentations with both local and distant museums, news, etc. Evaluation: students share their story, focusing on the learning and skills-building and not simply what they did. Share results with local media.

tips & tricks

- If you have capable but reluctant learners, consider grouping them all together. One will inevitably rise to the challenge and discover s/he is a leader. Be sure other groups notice and celebrate this growth.
- Warn students about upcoming obstacles, but don’t save them from stumbling. Allow the mistakes to happen, but help guide them toward productive learning moments directly after. The emotion they feel, followed by caring support, can unstop a teen’s ears.
- Do not attempt to force a student to do learn something they’re not interested in. The lesson that will stick is that they can’t trust you.
- For students who are new to PBL, help them understand that a to-do list is good, but a to-do list with a timeline is their best friend ever.
- A teacher’s role is mostly one of encouragement and helping shepherd lost sheep back into the fold. PBL is difficult for students and teachers. Lend an understanding ear on a regular basis, and don’t ever let the rigorous standards of learning drop.
PUBLISH & PROMOTE YOUR BOOK

Produce a book and publish it with a plan for generating sales.

DRIVING QUESTIONS

SS
What books have been published on this topic already? When? By whom? What are some resources (online and analog) for learning how to ensure book sales? What expert(s) can give you advice? Have you considered micropublishing, blogging, or other forms of publication before going to print?

Sci
What materials would you like your book to be made of? Does it make a difference to go with a “green” publishing house? What about sales, marketing, delivery of the product? What’s the greenest method available? Could this be an aspect to marketing your book?

M
How long will your book be? How long do you have before you need to publish? What are other books of this type and length selling for? What can you figure your price point will need to be, based on the time you spend writing vs the profit you’d like to make? How many people will need to buy the book in order for it to be monetarily successful for you?

Rdg
What style is your book going to use? Who has been involved in writing/editing it? Is there a market for it? Once the book is written, it needs to be edited, designed, marketed, and sold. Research and create a plan for each of those steps.

Wri
What is the message or story you want to get out there? Why do you think others will want to read it? How can you hone your message so that more people will want to read it? What’s your voice? How will the message be presented? Have you field-tested it and then edited it? Who can you get to review the book, thereby helping to promote it?
Measure frustration levels carefully. Get to know your students’ thresholds and support them through the really tough parts. Giving up and walking away is not an option. Persistence through the frustration will be some of the best learning your students will ever experience with you.

Teams should create their own contracts for work and behavior guided by both positive and negative past group work experiences. Contracts also need to have a distinct positive approach flavor as well as having team-negotiated consequences.

When at all possible, involve art into the production planning and final product. 2D and 3D creativity work engage learning in kinesthetic learners unlike any other participation.

Don’t be afraid to find global experts and resources. Using today’s technology of video conferencing can demonstrate to learners of all ages that connectivity can be the first step to deeper experiences.
DESIGN AN APP

Conceive and design an app for smart phones

DRIVING QUESTIONS

Why did a large percentage of 2nd class passengers die, compared to first class? What was European immigration to the US like at that time? Who came? Why? When going back in time, who do you make your appeal to? Why is that the most effective audience?
Primary documents are tough for students to decipher and understand. Help them figure that out and research is automatically of higher quality, students become true researchers/historians, and the learning is authentic. Finding and using primary documents is a great skill for life.

During project prep, you will see that students will need a specific direct teaching moment. Resist the urge to frontload this information. Create the opportunity for students to discover they need this skill or information, then provide a brief workshop. Having the need to know will open their ears for the information more clearly than any activity artificially-designed to provide information before they know they need it.

All students enjoy learning when they can be successful. Provide whatever environment it takes to foster enjoyable learning opportunities for every single student.

Never, ever forget that learning should be fun!

### Before-project prep

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### During the project maintenance

Students will complete initial research about the Titanic, collecting cited information in collaborative documents. Students will create a plan that outlines the plan for stopping the disaster. Boat redesign? Change captains? More lifeboats? Teachers’ #1 role is to help students focus on the thoroughly researched plan, informative description, and engaging quality of the presentation.

### Ending the project

Take pictures of students/teams in the learning process. Share the plans and accompanying presentations with both local and distant museums, news, etc. Evaluation: students share their story, focusing on the learning and skills-building and not simply what they did. Share results with local media.
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Go back in time and save Kennedy from assassination.
SAVE KENNEDY
a step-by-step guide

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**tips & tricks**

- PBL is messy. “If ya’ ain’t got it on ya, then ya ain’t got it in ya!”

- Emotion is a powerful memory generator. Be sure you’re setting the stage for the right emotions to start, work through, and end on. Students will remember the events and teachers that provoked the most powerful emotions. Be sure you’re remembered positively.

- All students enjoy learning when they can be successful. Provide whatever environment it takes to foster enjoyable learning opportunities for every single student.

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- Foster student-to-student mentorships by asking students to point out each other’s strengths while working with the project, during and afterward. This allows each student to be built-up in others’ eyes.

- Allow students to see you stumped and let them see you accept a student’s idea over your own.

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CREATE A 3-D DESIGN BUSINESS
Plan and open a business based on 3-D designs.

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3D DESIGN BUSINESS
a step-by-step guide

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**2-D TO 3-D**

Design a sculpture in 2-D and export it to 3-D

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2D TO 3D
a step-by-step guide
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tips & tricks

• Want to keep kids motivated? Give them less work, but ask them to work their brains harder with the work they have. Lower quantity = higher quality.

• Always help learners find meaning in whatever work they’re doing. If there’s no meaning for them, don’t do it. If they must do it, don’t lie about the lack of purpose. Be honest that it’s the must-do, crap-curriculum. Teens know and they’ll respect your honesty more. Then help them develop strategies for coping with this type of work too.

• Busy work creates idle learners and “busy work” is not in the eye of the teacher, but the eye of the student.

• Sometimes a teacher will have an idea they are sure will work, but while asking questions, it becomes apparent that the students are not going to “guess” what this idea is. Resist the urge to just tell your idea. Sometimes students know what your idea is and are choosing to not use it.

• Keep your energy high and always positive, even when you’re worried, but especially when you’re getting tired.
ALL ABOUT THE SKELETON

Create a book, audio or video based story that teaches about the human skeleton.

Driving Questions

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tips & tricks

- When assessing growth and mastery and growth in students, checklists, rubrics, and self-evaluations are ideal. Rarely can an accurate measurement of authentic and sustained growth be taken by a test that a person has to study for.

- When students are responsible for their own deadlines and are held accountable by teammates in a trusting environment, they learn to understand the importance of to-do lists.

- Teams should create their own contracts for work and behavior guided by both positive and negative past group work experiences. And contracts need to have a distinct positive approach flavor as well as having team-negotiated consequences.

- Team-negotiated contracts are some of the most powerful tools for self-management and creating trust in a PBL environment. They allow students to role-play teach vital life skills inside a safe environment.
DRIVING QUESTIONS

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STEALTH FIGHTER
Create a scale-model F117 Stealth Fighter
STEALTH FIGHTER
a step-by-step guide

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• Find a way to help students safely evaluate the performance and growth of other students. Fishbowl conversations where students share “wows” about the work of a group of students is the first step. Another step is where students have the opportunity to share commendations, or “bows” for individual members of their own team. Encourage a safe, trusting environment by doing this publicly at the students’ own choice.

• Start planning your projects with keeping the standards and soft skills/ experiences in focus. This will help to ensure rigor amongst the engaging fun.

• Consider having students, as a class, create the to-do list for the day, both the big-ideas, as well as the details.

• Utilize content experts inside your school building/district/community to assist in creating rigor for a project. Sometimes your best resources are in your own backyard.
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**DINOSAUR FOSSILS**  
*a step-by-step guide*

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- After a presentation or during the work, students should practice asking “How is it you...” when learning how to be critical of another’s work or behavior. Constructive criticism is a learned skill, both offering and receiving it.

- Students need help learning how to prioritize tasks. When it’s time for them to wrap up for the day, always end with the expectation that they’ll create a prioritized list of tasks to work on before the next meeting. Not all will be able to work, but some will and it sets a tone of 24/7 learning.
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INSIDE JULES VERNE’S BRAIN

Create your own steampunk’d future technology
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• In a fully-collaborative PBL environment, students must have some individual space to claim as their own to keep their materials organized and safe. This may or may not be a traditional locker.

• Allow students to talk with each other in small groups before volunteering ideas. This allows them to hear other ideas and build upon their own for more complex and quality purpose.

• In regard to deliverables, less is more. Allow the students to focus on the effort and learning and less about the grade they will earn.

• Foster student-to-student mentorship and community trust by helping them rely on each other for assistance before running straight to you. When a student asks a question, find out who s/he has asked first. If three people have been consulted, directly answer the question asked and be sure that everyone in the class/group hears the answer.

• Laugh and smile often.
Tips/Tricks

- Try to ask more questions than you give answers. Find a way to rephrase the question the student asked, then support them as they find their own answers.
- Keep your energy high and always positive, even when you’re worried, but especially when you’re getting tired.
- If something goes wrong, it’s only another problem-solving opportunity. DO NOT solve the problem for the student/class. Slow down and become intense and purposeful: call a re-organizational meeting and present the problem, brainstorm solutions, and together, create the path forward. Above all, stay positive.
- Nothing is more important than the moment of introduction for a new project. It’s all hands-on deck with every participating teacher showing excitement and helping to create a sense of urgency to the project.
- Let students have a good deal of free-choice in how they choose to contribute to the final deliverable.
- Don’t squash a far-out idea. Get those kids to brainstorm and create a proposal for the leaders to buy into. Help them find a way to explain their thoughts and learn how to be persuasive. You never know if this is the piece that’s the key to the solution. This is easier said than done.
- Help every student find his/her niche. Cheer on every single kid, especially when their energy is starting to scatter.
- Consider hiring students not traditionally seen as leaders to be your leaders and support them with tips on how to organize people and materials. You’ll be surprised at the results.
- PBL is messy. “If ya ain’t got it on ya, then ya ain’t got it in ya!”
- A teacher’s role is mostly one of encouragement and helping shepherd lost sheep back into the fold. PBL is difficult for students and teachers. Lend an understanding ear on a regular basis, and don’t ever let the rigorous standards of learning drop.
- Focus on the learning, not the resulting deliverable. Oftentimes mistakes and metacognitive growth are more important than a pretty product.
- Students must use quality triangulation of primary documents and other reliable data in their research. Be sure students cite their quality sources so others don’t question the validity of their work.
- As a way to role model time management in an active environment, Soft and Hard Deadlines are useful. Figure a time far enough before the final deadline for students to have a nearly-finished draft completed and allow them to present the unfinished work. Peers will provide wows/hows/bows for the work so far. This allows students to take peer ideas back to the studio for more refinement for a higher-quality final deliverable.
- Shared reflection on quality of work is a valuable metacognitive skill, but students need to learn this skill in a safe environment. “Wows, Hows, and Bows” are a great way for peers to share feedback, learning to give positive feedback before gently questioning about how/why a deliverable was designed and implemented. Then at the end, students are always recognized for their willingness to share the learning process with others.
Tips/Tricks

<table>
<thead>
<tr>
<th>Time</th>
<th>TASK</th>
<th>Materials</th>
<th>People</th>
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• For students who are new to PBL, help them understand that a to-do list is good, but a to-do list with a timeline is their best friend ever.
• Students often best understand time, task, and materials management skills once they’ve made a mistake of not heeding productivity advice. Allow time for some guided metacognitive reflection and coming up with a workable solution on their own. This, in itself may be the most valuable lesson the student gets from the entire project.
• Warn students about upcoming obstacles, but don’t save a student from stumbling. Allow the mistakes to happen, but help guide them toward productive learning moments right afterward. The emotion they feel, followed by caring support can often unstop a teen’s ears.
• Do not attempt to force a student to do learn something they’re not interested in. The lesson that will stick is that they can’t trust you.
• Always choose “deeper learning” over “more learning.” The path to mastery in a topic is stronger and developed more quickly when mastery of another topic has been nurtured and connections have been encouraged.
• Be sure to group fast learners together when possible. They will push each other forward and it allows you time to spend longer with students who don’t process quite as quickly on their own.
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• There are times that a slower processor will demonstrate more creativity and quality of thinking. Sometimes quicker processors will go deeper if you give them a shorter amount of time to think by instilling a true sense of urgency.
• If you have capable but reluctant learners, consider grouping them all together. One will inevitably rise to the challenge and discover s/he is a very capable leader. Be sure other groups notice and celebrate this growth.
• In a fully-collaborative PBL environment, students must have some individual space to claim as their own to keep their materials organized and safe. This may or may not be a traditional locker.
• Consider having students, as a class, create the to-do list for the day, both the big-ideas, as well as the details.
• Allow students to talk with each other in small groups before volunteering ideas. This allows them to hear other ideas and build upon their own for more complex and quality purpose.
• In regard to deliverables, less stuff is more. Higher quality is better. Allow the students to focus on the effort and learning and less about the grade they will earn.
• Foster student-to-student mentorship and community trust by helping them rely on each other for assistance before running straight to you. When a student asks a question, find out who s/he has asked first. If three people have been consulted, directly answer the question asked and be sure that everyone in the class/group hears the answer.
• Foster student-to-student mentorships by asking students to point out each other’s strengths while working with the project, during and afterward. This allows each student to be built-up in others’ eyes.
• Laugh and smile often.
• Be cautious and sensitive when publicly complimenting some students; the compliment may end up with the opposite desired response.
• Allow students to see you stumped and let them see you accept a student’s idea over your own.
• If a student isn’t turning work in, ask yourself which is more important to you: that they turn the assignment in or that they’re interested and engaged in the learning? Which will produce more personal change? If they’re not interested or engaged, what will YOU do differently to help them get there?
• Want to keep kids motivated? Give them less work, but ask them to work their brains harder with the work they have. Lower quantity = higher quality.
• Always help learners find meaning in whatever work they’re doing. If there’s no meaning for them, don’t do it. If they must do it, don’t lie about the lack of purpose. Be honest that it’s the must-do, crap-curriculum. Teens know and they’ll respect your honesty more. Then help them develop strategies for coping with this type of work too.
• Busy work creates idle learners and “busy work” is not in the eye of the teacher; but the eye of the student.

• Sometimes a teacher will have an idea they are sure will work, but while asking questions, it becomes apparent that the students are not going to “guess” what this idea is. Resist the urge to just tell your idea. Sometimes students know what your idea is and are choosing to not use it.

• Consider having students, as a class, create the to-do list for the day, both the big-ideas, as well as the details.
• When at all possible, ask for original “sound-scapes” or musical story-telling involved in the final product. Music can show suspense and other emotion faster than words can and will hook some students deeply into the work.
• When at all possible, involve art into the production planning and final product. 2D and 3D creativity work engage learning in kinesthetic learners unlike any other participation.
• There is rarely anything more important in setting the stage for a successful project than having an environment of trust. How a teacher best establishes trust is to run a project which allows students the opportunity to develop trust. It’s not “the chicken OR the egg.” It’s the chicken AND the egg.

• Consider collaborating with teachers who are have different leadership styles than you, but who are still very student-centered. Various students will gravitate toward their natural center and you’ll find strong mentorships forming. However, consider switching it up occasionally but be mindful of students perhaps being off balance. That gentleness and understanding of their individual learning styles will strengthen the entire group.

• Utilize content experts inside your school building/district/community to assist in creating rigor for a project. Sometimes your best resources are in your own backyard.
• Don’t be afraid to find global experts and resources. Using today’s technology of video conferencing can demonstrate to learners of all ages that connectivity can be the first step to deeper experiences.

• Start planning your projects with keeping the standards and soft skills/experiences in focus. This will help to ensure rigor amongst the engaging fun.
• Never, ever forget that learning is fun.
• When students are working on projects, they should see themselves practicing particular roles in life. This is purposeful and meaningful learning that’s intentionally crafted by the purposeful educator during the planning phase, as well as during other moments throughout the process.
• Primary documents are tough for students to decipher and understand. Help them figure that out and research is automatically of higher quality, students become true researchers/historians, and the learning is authentic. Finding and using primary documents is a great skill for life.

• During project prep, you will see that students will need a specific direct teaching moment. Resist the urge to frontload this information. Create the opportunity for students to discover they need this skill or information, then provide a brief workshop. Having the need to know will open their ears for the information more clearly than any activity artificially-designed to provide information before they know they need it.

• All students enjoy learning when they can be successful. Provide whatever environment it takes to foster enjoyable learning opportunities for every single student.

• Measure frustration levels carefully. Get to know your students’ thresholds and support them through the really tough parts. Giving up and walking away is not an option. Persistence through the frustration will be some of the best learning your students will ever experience with you.

• Emotion is a powerful memory generator. Be sure you’re setting the stage for the right emotions to start, work through, and end on. Students will remember the events and teachers that provoked the most powerful emotions. Be sure you’re remembered positively.

• Assessment of learning should be focused first on the standards and skills students need to develop. Try to make the assessment of that information as authentic to real life as possible.

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• When assessing growth and mastery and growth in students, checklists, rubrics, and self-evaluations are ideal. Rarely can an accurate measurement of authentic and sustained growth be taken by a test that a person has to study for.

• When students are responsible for their own deadlines and are held accountable by teammates in a trusting environment, they learn to understand the importance of to-do lists.

• Teams should create their own contracts for work and behavior guided by both positive and negative past group work experiences. Contracts also need to have a distinct positive approach flavor as well as having team-negotiated consequences.

• Team-negotiated contracts are some of the most powerful tools for self-management and creating trust in a PBL environment.

• Find a way to help students safely evaluate the performance and growth of other students. Fishbowl conversations where students share “wows” about the work of a group of students is the first step.

• Allow students the opportunity to share commendations, or “bows” for individual members of their own team. Encourage a safe, trusting environment by doing this publicly at the students’ own choice.

• Students need help learning how to prioritize tasks. When it’s time for them to wrap up for the day, always end with the expectation that they’ll create a prioritized list of tasks to work on before the next meeting. Not all will be able to work, but some will and it sets a tone of 24/7 learning.

• After a presentation or during the work, students should practice asking “How is it you...” when learning how to be critical of another’s work or behavior. Constructive criticism is a learned skill, both offering and receiving it.
• Learners need the opportunity to share what they’ve learned on a daily basis. This emphasizes the purpose of the project, solidifies that each person is working as part of the team to move the learning forward, and finally, allows students to hear the important content in various ways.

• Students should see themselves working in many and varied groupings. Sometimes it’s absolutely appropriate for homogeneous groupings based on readiness and ability, heterogenous groupings based on shared interests are crucial to a project’s success.

• When creating work group topics, do not lead with content names, such as Math, Science, etc. This limits students, based on their previously-held personal beliefs regarding ability and interest in those areas. Instead, use the action the team will perform to dictate the name. “Build Team” or “CSI” are great choices for groups.

• It’s ok for students to self-select their teams and work with their friends as long as the work is getting done. You’ll soon know who is working. Contracts make it awkward for students to work with their friends who need fired. You may soon see that students would prefer you to group them so they don’t have to hurt their friends’ feelings.

• Student-created contracts are a great way for the work to keep progressing while students support the positive behaviors of others. If a student isn’t working according to the negotiated contract, their team can choose to fire them. All of a sudden, no one wants to be the one fired and they’ll be more likely to stay focused.

• If you’re worried students aren’t working, get out of your chair and talk with them. Sit beside them. At the end of the day, you should be very tired from shifting around the room.

• Create hard and soft deadlines for students to learn to manage their time and quality of work, while receiving feedback before submitting their final work. Set the soft deadlines enough in advance of the hard deadline to allow students to adjust their work for their best efforts.
Why did a large percentage of 2nd class passengers die, compared to first class? What was European immigration to the US like at that time? Who came? Why? When going back in time, who do you make your appeal to? Why is that the most effective audience?
SAVE THE TITANIC
a step-by-step guide

See your Foundations Card for guiding tips regarding project scope, standards, teaming, assessment and post-project wrap-up.

Before-project prep
Decide the time-scope of the project. Establish connections with experts in case students need them. Find/create access to primary documents, websites, experts, and museum virtual field trips. Limit viewing of the movie, unless that will be a focus. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline, content expectations, and end results expected.

Launching the project
Start with a “bang,” by sharing the general story of the Titanic and it’s unsinkability. Perhaps include death tolls. Ask them to imagine being on the deck. Or on shore, waiting for loved ones. Or on the rescue boat, not being able to save all you’d like. Introduce potential work teams and partnerships. Ask students to self-select their own teams OR assign team members. All involved educators are visibly positive and supportive of the absolute importance of the new design.

During the project maintenance
Students will complete initial research about the Titanic, collecting cited information in collaborative documents. Students will create a plan that outlines the plan for stopping the disaster. Boat redesign? Change captains? More lifeboats? Teachers’ #1 role is to help students focus on the thoroughly researched plan, informative description, and engaging quality of the presentation.

Ending the project
Take pictures of students/teams in the learning process. Share the plans and accompanying presentations with both local and distant museums, news, etc. Evaluation: students share their story, focusing on the learning and skills-building and not simply what they did. Share results with local media.
DRIVING QUESTIONS

Who was Shakespeare's influence?

Why did a large percentage of 2nd class passengers die, compared to first class? What was European immigration to the US like at that time? Who came? Why? When going back in time, who do you make your appeal to? Why is that the most effective audience?

Who was Shakespeare’s influence?
BUILD YOUR OWN GUITAR/Violin, etc

DRIVING QUESTIONS

SS

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Sci

M

Rdg

Wri

Create your own dinosaur fossils
THE ROARING 20’S!

Create your own dinosaur fossils

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POE:
MADMAN OR GENIUS
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**Sci**

**M**

**Rdg**
Thoreau, Emmerson, Muir,

**Wri**

BACK TO NATURE

Create your own dinosaur fossils
SCHOOLS OF ART (BLACK MOUNTAIN PEOPLE)

Create your own dinosaur fossils

DRIVING QUESTIONS

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BLOOD SUCKERS!

Create your own dinosaur fossils

DRIVING QUESTIONS

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Dinosaur Fossils

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You don’t want a shark swimming with your guppies.

But if he’s only *a guppy in a shark suit*, what will you do so he feels safe enough to take it off?
PROJECT FOUNDATIONS

Select the scope and standards for the project
How long will the project run? Identify the standards and skills you want emphasized. Are there other driving questions you’d like to add/substitute? Are you utilizing outside experts? Will you be the only teacher or are you teaming with other educators? How many students will be involved? Will you run this with your class only? Or will you team with other classes in the building? Outside of the building? Will you team across age/ability groups? Who are obvious leaders? Who are hidden leaders?

Project prep and work safety
Identify the area students will be using and secure the tools students will need to use. Identify any tool-safety workshops that will need to be taught. Be sure parents are informed of project scope and learning involved. Ensure all educators are clear with timeline and end results expected.

Launching the project
Start with a “bang,” whether that is a question, conundrum, or quest presented by a guest speaker, depending upon the emphasized standards and driving questions selected.

Grouping
You may choose to have multiple teams assigned the same role, creating multiple solutions to the same project, or you may choose to have different teams working on various roles to complete one version of the project. This is selected according to the class and according to the project and outcomes chosen by the Lead Teacher.

Ending the project
Take pictures of students and teams with their work and pictures, showing proud faces. Evaluation: students share their learning, focusing on the learning and skills building and not simply what they did.

Assessment of learning
Teachers may use rubrics to assess evidence of growth, based on standards and skills identified at onset of the project. Students should also self-assess and peer-assess their own learning and skills development.

Post project wrap up
Debrief with educator and student teams to create “wows/hows/bows” lists, purposefully identifying +/O and learning. This is a good time for final content assessment. Formal testing, however, is discouraged. Rather, consider demonstrations of ability.

Role of the Teacher-As-Guide
Teachers should expect to ask more questions than give directions. This is more difficult than it seems. The majority of the teachers’ work is to be done before the project begins; once the project starts, this role shifts more to one of “advisor” for learning and less of “teacher” for content-delivery.

Role of the Learner-as-Leader
Allow students to experience leadership within peer groups. Encourage students with budding leadership skills to push themselves. Help the students highlight each others’ emerging strengths as part of the post project wrap-up.
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