CAPSTONE: 2012 Rockets & Robots

PHASE 1:
DETERMINING THE BIG IDEA

1.a Capstone Big Idea:

The **big idea** of the capstone is clearly articulated in one of the following forms: concept, theme, theory, issue, problem, process, paradox, perspective

We all have a mission, whether we know it or not. Your mission is defined by what you know, the morals you have, and the choices you make. You must know what your mission is, and then it's up to you to make that mission a success.

"Careers, like rockets, don't always take off on time. The trick is to always keep the engine running."
- Gary Sinise

1.b Capstone Synopsis:

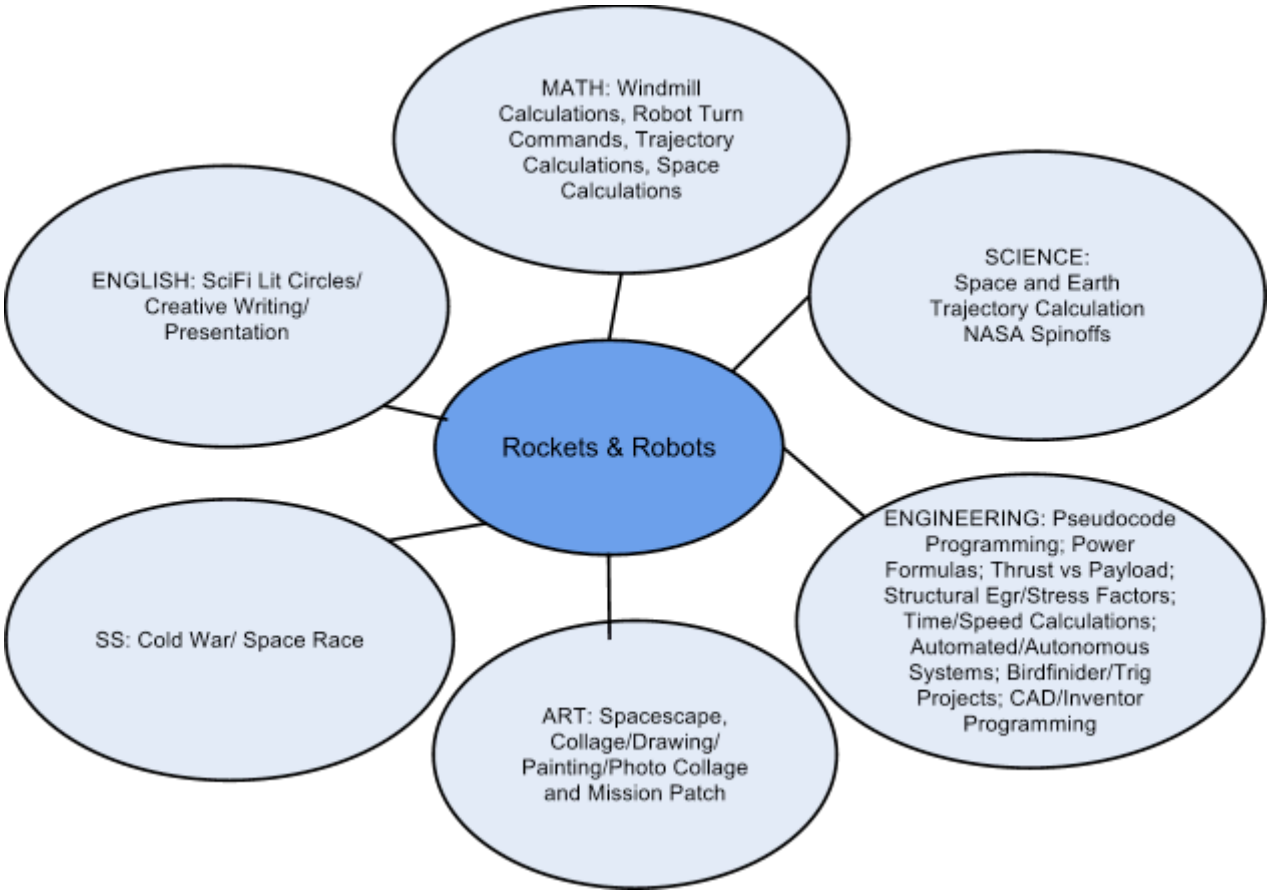
The **big idea** of the capstone is clearly articulated in one of the following forms: concept, theme, theory, issue, problem, process, paradox, perspective

Our final capstone is a series of missions related to rocketry, robotics, and creativity. Students will experience all aspects of these missions from mathematical feasibility of payload and force to scientific understanding of rocketry and robotics, to the hands-on engineering of these items. Additionally, students are on a mission to understand the influence science and engineering have on the political state of nations, and how rockets and robotics missions specifically played a role in the advancement of some nations over others. Students will discover the importance of aesthetic design that is both pleasing to the eye and functional in use, paying special attention to the designs that could potentially become symbols of national pride (mission patches, logos, etc.). Finally, students will go on a mission in creativity, looking at how advancements in technology influence literature, as well as creating literature to looks at current technological advancements.

In this project, students will build robots and construct rockets to complete a variety of space-inspired missions. Students will work in groups of three to program a robot capable of completing one or more of a preselected pool of missions, each mission worth a different point value based on difficulty. Students will also work in groups to design a rocket capable of completing one or many missions, each mission worth a different point value based on difficulty. Students will analyze possible outcomes of these missions through a fictional composition. Finally, students will take what they've built travel to a mission destination and compete in a Mission match, where they attempt to earn points while succeeding in their missions.

2. Trans-disciplinary Curriculum Web:

Identify the team members that will participate on the creation of the Capstone / Big Idea. This should consist of building level disciplines but may extend other grade level courses. (Ex. Government, American History and Government)



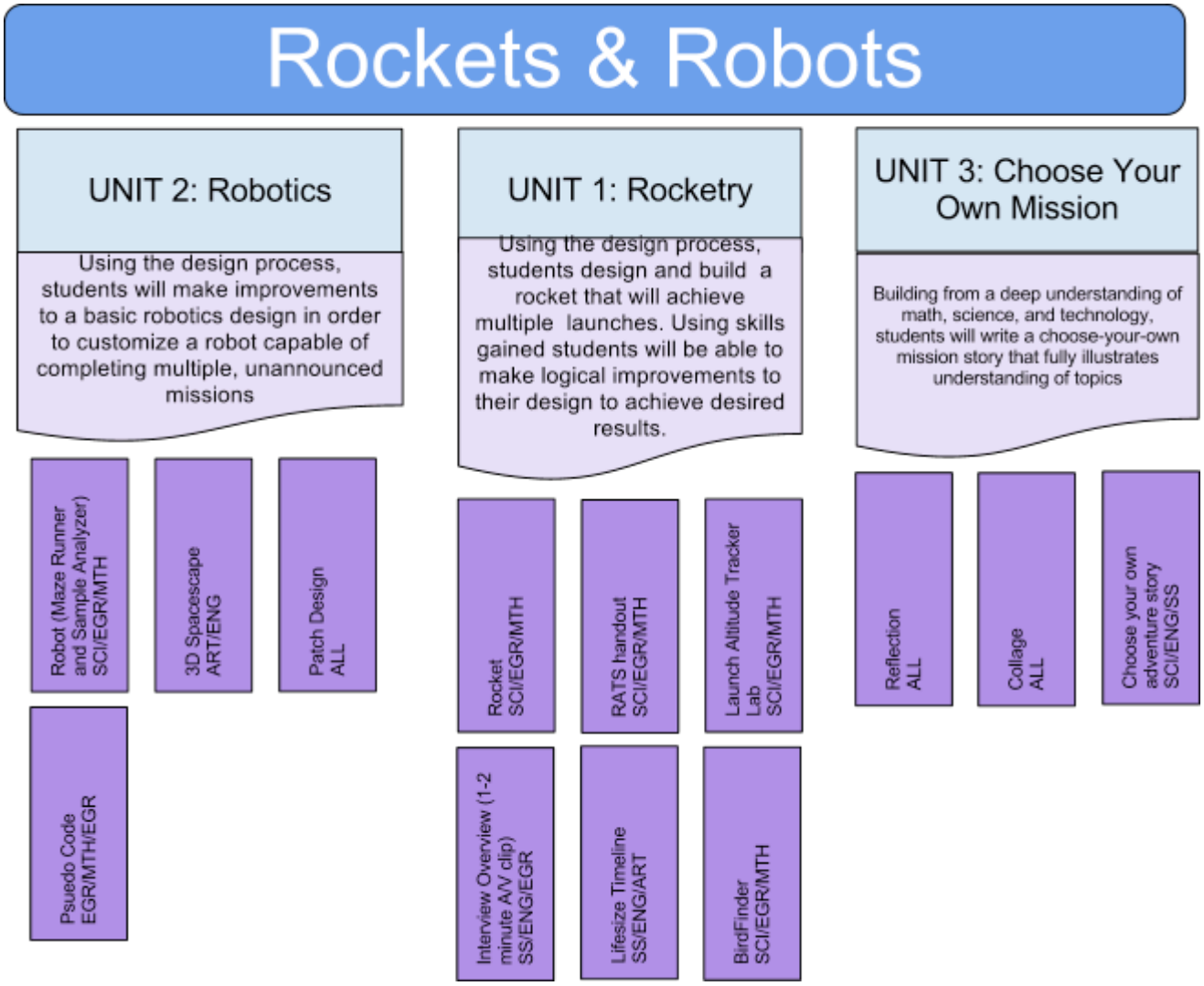
3. Essential Questions

What Essential Questions/ Critical Problem encourages students to uncover/probe deeper into knowledge in all six disciplines? How do we engage our students around the concept of_____? Should be evident in all the Units.

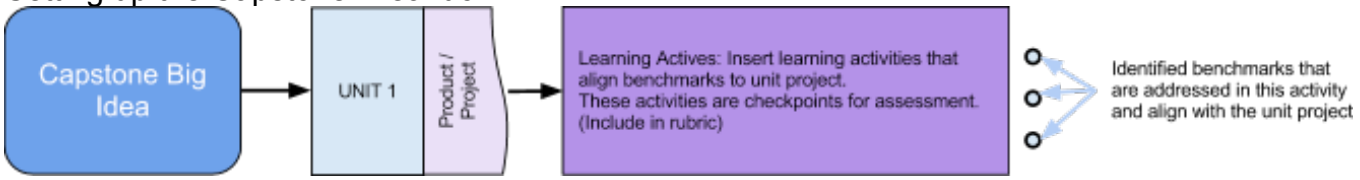
Selected Questions	Questions to consider (Brainstorm)
● What is your mission in life? ● Where are you going and how do you plan on getting there? ● How can you make the impossible possible?	● What is your mission in life? ● Where are you going and how do you plan on getting there? ● How can you make the impossible possible?

4. Capstone Breakdown

Pencil in titles that would break down the Big Ideas into smaller Project Based Units. The units would have individual end products/projects that each has essential questions, specified subject area benchmarks, mastery learning goals, project rubrics, and learning activities.



Setting up the Capstone Breakdown:



5. Subject Matter Goals:

Develop subject matter goals for the capstone. How does your content connect to the big idea?

Example: English Language Arts:
Reading: Reading comprehension on metaphorical light through short fiction
Writing: Display Description Panel, Lesson Plan
Speaking: Lesson Teaching, Timing, Public Speaking
Listening:GE Presentations on light

English Language Arts:

- Students will be able to formulate writing ideas and identify a topic appropriate to the purpose and audience with the use of organizers and prewriting for a Choose-Your-Own-Mission story.
- Students will be able to prepare writing for publication that is legible, follows an appropriate format and uses techniques such as electronic resources and graphics for a Choose-Your-Own-Mission story.
- Students will be able to compose narratives that establish a specific setting, plot and a consistent point of view, and develop characters by using sensory details and concrete language for a Choose-Your-Own- Mission story.
- Students will be able to compose reflective writings that balance reflections by using specific personal experiences to draw conclusions about life through a reflective memoir in which students explore the essential questions.

Math Goals:

- Students will be able to calculate altitude of their constructed rocket using a constructed altimeter and successfully use ratios and proportions to do accomplish this on their Launch Altitude Tracker lab.
- Students will be able to find statistical data on various rocketry variables such as the shapes of fins, nose cones, etc and utilize a spreadsheet of the data to create a statistical graph of optimization and write a logical interpretation of the graph on their Rocket Analysis and Technical Statistics (RATS) handout.

Science Goals

- Student can construct a robot that describes one physical property of a substance in the center of the maze
- Student can explain how the mission they have chosen for their rocket is parallleled in actual rocket missions used for scientific research citing specific examples via a taped interview (30-45 seconds)
- Student can produce a worksheet that neatly and completely analyzes the motion of their group's rocket based on Newton's Laws and the equations of motion (RATS)

Engineering Goals

- Students will be able to show complete understanding of development of robotics by building a robot capable of completing predesigned missions.
- Students will be able to discuss robotics and automated systems including understanding of AC/DC current, motors and fundamentals of simple machines.

Social Studies Goals

- Students will design a timeline that will analyze connections between World War II, the Cold War and contemporary conflicts by identifying the causes of political, economic and social oppression and analyzing ways individuals, organizations and countries respond to resulting conflicts. The timeline will also identify the differences among various forms of government to determine how power is acquired and used.

Art Goals

- Students will be able to formulate and solve design issues using teacher/peers lead strategies but also using relate subjects
- Students will be able to design a patch (with a narrative to identify their group), rocket technical drawings and painting lunar surfaces.
- Students will be able to formulate and demonstrate purpose of their works of art with clear understanding using prior knowledge or techniques and materials from other courses.
- Students will be able to critique their work and their peers works of art by written and oral assessment.
- Students will be able to understand but also assimilate real life situations about photography, light, aperture and shutter speed.

PHASE 2:
Operationalizing

6. Benchmark Alignment/ Trans-disciplinary Project Based Units

Content Standards and Benchmarks that were identified for the CAPSTONE that have natural disciplinary connections and are overlapping in theme, ideas, topics, etc.

The benchmarks codes will be concatenated together and placed in the first column of the unit rubric.
Example:

Benchmark(s) (Code)	Mastery Learning Goals	Exceeding 4	Mastery 3	Reaching 2	Basic 1
SCI INQR 9-10 A SCI KNWG 9-10 D SCI KNWG 11-12 C		Phase 3	Phase 3	Phase 3	Phase 3

ELA - English Language Arts

	C.C. ENG 9 W 3.b	Text Types and Purposes: Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters.
	C.C. ENG 9 W 3.c	Text Types and Purposes: Use a variety of techniques to sequence events so that they build on one another to create a coherent whole.
	C.C. ENG 9 W 3.d	Text Types and Purposes: Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters.
	C.C. ENG 9 W 3.e	Text Types and Purposes: Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.
	CC.9-10.R.L.1	Key Ideas and Details: Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
	CC.9-10.R.L.2	Key Ideas and Details: Determine a theme or central idea of a text and analyze in detail its development over the course of the text, including how
	CC.9-10.R.L.3	Key Ideas and Details: Analyze how complex characters (e.g., those with multiple or conflicting motivations) develop over the course of a text, interact with other characters, and advance the plot or develop the theme.
	CC.9-10.R.L.4	Craft and Structure: Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).
	CC.9-10.R.L.7	Integration of Knowledge and Ideas: Analyze the representation of a subject or a key scene in two different artistic mediums, including what is emphasized or absent in each treatment (e.g., Auden's "Musée des Beaux Arts" and Breughel's Landscape with the Fall of Icarus).
	CC.9-10.R.L.10	Range of Reading and Level of Text Complexity: By the end of grade 9, read and comprehend literature, including stories, dramas, and poems, in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 10, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 9–10 text complexity band independently and proficiently.

SCIENCE

Unit Title	Benchmark Code	Benchmark
	ERTH 9-10 B	Explain that many processes occur in patterns

	ERTH 9-10 E	Explain the processes that move and shape Earth's surface.
	ERTH 11-12 A	Explain how technology can be used to gather evidence and increase our understanding of the universe.
	PHYS 11-12 D	Apply principles of forces and motion to mathematically analyze, describe and predict the net effects on objects or systems.
	ERTH 9-10 A	Explain how evidence from stars and other celestial objects provide information about the processes that cause changes in the composition and scale of the physical universe.
	ERTH 9-10 C	Explain the 4.5 billion-year-history of Earth and the 4 billion-year-history of life on Earth based on observable scientific evidence in the geologic record.

MATH

UNIT Title	Benchmark Code	Benchmark
	CC.F.IF.1	Understand the concept of a function and use function notation. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).
	CC.F.IF.2	Understand the concept of a function and use function notation. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
	CC.F.IF.3	Understand the concept of a function and use function notation. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1 (n is greater than or equal to 1).
	CC.F.IF.4	Interpret functions that arise in applications in terms of the context. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*
	CC.F.IF.5	Interpret functions that arise in applications in terms of the context. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*
	CC.F.IF.6	Interpret functions that arise in applications in terms of the context. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*
	CC.F.IF.9	Analyze functions using different representations. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.
	CC.F. TG.1	Extend the domain of trig. functions using the unit circle. Understand radian measure as the length of the arc on the unit circle subtended by the angle.
	CC.F. TG.2	Extend the domain of trigonometric functions using the unit circle. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

ENGINEERING

UNIT Title	Benchmark Code	Benchmark
	EGR 29.2	Ability to summarize test data to explain and plot trajectory motion.
	EGR 18.1	Demonstrated ability to translate an orthographical drawing or model into corresponding three-dimensional product.

	EGR 18.2	Demonstrated mastery applying appropriate dimensioning rules and practices.
	EGR 14.1	Ability to construct various geometric parts and shapes in the form of a birdfinder.
	EGR 15.3	Ability to select the appropriate modeling material to complete a three-dimensional prototype or mockup in the form of a birdfinder.
	EGR 15.5	Demonstrated ability to evaluate a sketch and generate a model utilizing Computer Aided Design (CAD) software.
	Egr 42.1	Full understanding of ability fo explain the sequence of events and needs that precipitated the development of robotics. Also implications of developments.
	Egr 42.2	Knowledge of robotic componts including understanding of AC/DC current, motors and fundamentals of simple machines. Creative application of robotic components
	Egr 42.6	Successful creation of a working Lego robot with attachments. Mastery skill at programming. Robot programmed to do multiple tasks. Vex robot started.
	Egr 86.6	Accurate CAD generation of 3D image of rocket. Parts represented vividly and proportionally accurate. All dimensions present.
	Egr 14.1.2	Successful design and construction of aerodymically efficient working rocket. Engineering principles evident and geometric constrains recognized. Understanding of thrust/Payload.
	Egr 29.1.2	Successfully construct a device that will illustrate linear and trajectory motion and measurements using mathematical formulas. Mastery knowledge of interpreting data using trigonometry, triangulation and other processes.

SOCIAL STUDIES

UNIT	Benchmark Code	Benchmark
	SS HIST 9-10 E	Analyze the connections between World War II, the Cold War and contemporary conflicts.
	SS PEPL 11-12 B	Identify the causes of political, economic and social oppression and analyze ways individuals, organizations and countries respond to resulting conflicts.
	SS GVNT 9-10 B	Analyze the differences among various forms of government to determine how power is acquired and used.

Art

UNIT	Benchmark Code	Benchmark

7. Creation of Mastery Learning Goals - Unit

The identified capstone benchmarks should be operationalized as capstone Mastery Learning Goals that describe clearly the expected student performance aligned to the benchmarks. These Mastery Learning Goals will be plugged into the units' project rubrics.

Mastery Learning Goals = What does it look like when students demonstrate mastery of the benchmarks in the project?
Example:

Benchmark(s) (Code)	Mastery Learning Goals	Exceeding 4	Mastery 3	Reaching 2	Basic 1
SCI INQR 9-10 A SCI KNWG 9-10 D SCI KNWG 11-12 C	Students will apply the processes of scientific investigation/inquiry, citizenship, and social action by creating teaching models, lesson plans, and learning activities to teach a class about light, cells, and the energy pyramid.	Phase 3	Phase 3	Phase 3	Phase 3

8. Unit - Performance Criteria (Rubrics):

You can use a holistic rubric or a criterion rubric to measure your performance assessment. Insert your rubric below the samples provided. The scale is an example, but you can design the scale and criteria that best fits your intended outcomes.The capstone's mastery learning goals are deconstructed and represented in a rubric that describes clear, scaffolded performance criteria for the demo of mastery learning, as well as, learning that goes beyond mastery, approaches mastery, or is basic to mastery.

Example:

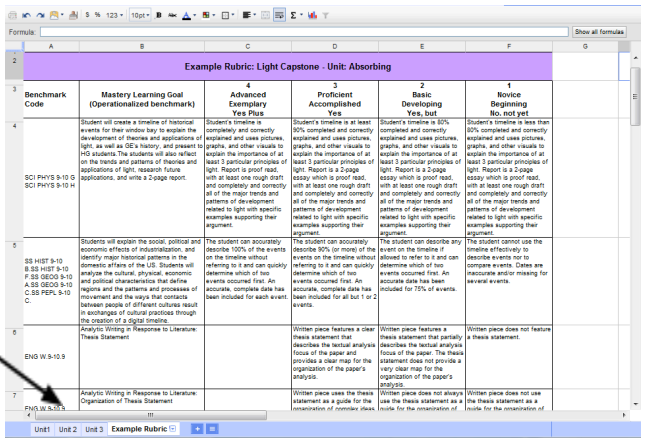
Benchmark(s) (Code)	Mastery Learning Goals	Exceeding 4	Mastery 3	Reaching 2	Basic 1
SCI INQR 9-10 A SCI KNWG 9-10 D SCI KNWG 11-12 C	Students will apply the processes of scientific investigation/inquiry, citizenship, and social action by creating teaching models, lesson plans, and learning activities to teach a class about light, cells, and the energy pyramid.	Student's reflection assessment explains their role as a student and a citizen of Cleveland within this project. Student's design process document is 100% complete.	Student's reflection assessment explains their role as a student and a citizen of Cleveland within this project. Student's design process document is 90% complete.	Student's reflection assessment explains their role as a student and a citizen of Cleveland within this project. Student's design process document is 70% complete.	Student's reflection assessment explains their role as a student and a citizen of Cleveland within this project. Student's design process document is < 50% complete.

9. Unit Rubrics:

Unit rubrics are on a seperate google document that is very similar to to Microsoft Excel. Complete the rubric by pasting appropriate information from this document into the google excel document.

LINK: Patterns and People RUBRIC

Tabs for each unit / project are located at the bottom of page.



PHASE 3:
Assessment Development

8. Unit – Assessments & Reflection

Formative assessments of student performance on learning activities are designed into the capstone and units to provide data that determines learning activities and their pacing, as well as, the provision of remediation/extension opportunities - to insure successful performance of the mastery learning goals

Units	Group Products	Individual Products
Unit 1 **Robots**	Programming Loops (EGR, SCI) Robot (EGR, SCI) Flow Charts (EGR, SCI, MTH) Sensor Labs (MTH, SCI)	Mission Patch (ART)
Unit 2 **Rockets**	Rocket (EGR, SCI) Timeline (SS, SCI, ART) Birdfinder (EGR, SCI, MTH)	RATS (EGR, SCI, MTH) Launch Altitude Tracker Lab (SCI) Interview (SCI)
Unit 3 **Choose- your-own-mission**	Choose-Your-Own Mission Story (ENG)	Choose-Your-Own Mission Story (ENG) Reflection (ALL) Collage (ART, SS)

PHASE 4:
Choreography of Learning

9. Unit – Learning Activities

The learning activities within the capstone (as well as their sequence and pacing) provide adequate scaffolding / differentiation to facilitate successful performance of the mastery learning goals in both project time and class time.

9a. Entry Event: Launch inquiry, kick-off event, "the hook"

Video Introduction
Group Selection System

9b. Community Resources and Partnerships: Mentors, speakers, authentic assessment

NASA
Great Lakes Science Center
Kelley's Island

9c. Capstone Vocabulary:

English	Science	Math	Social Studies	Engineering	Art
Science Fiction Literature Literature Circles Reflective Writing Choose-Your -Own- Mission	Trajectory Projectile Propulsion Acceleration Energy Action-Reaction Momentum Inertia	Sine Wave Sinusoid Amplitude Periodic Function Frequency Sinusoidal Wave Horizontal Shift Wave Shift	Cold War Space Race Imperialism Containment Truman Doctrine Marshall Plan Berlin Airlift N.A.T.O Warsaw Pact Satellite Nations Iron Curtain Arms Race	Thrust Payload Structural Egr/Stress Factors Automated/ Autonomous Systems; Birdfinider CAD	Canvas 2-dimensional Art 3-Dimensional Art Collage

10. Resources Needed:

Unit 1:

Facilities / Venues	Equipment	Materials	Purchased Supplies
GLSC Kelley's Island NASA Glenn	Robotics Kits Rocket Launcher Laser Cutter	Paint (variety of colors for painting) Paint Brushes Scissors (set) Pens/Pencils Modeling clay (100) 8.5 x 11Card stock (30) CVR temperature probes AAA batteries AA batteries 9V batteries (10) LEGO kits masking tape (4) 4 x 8 x ⅛" luan wood (10) wire strippers (10) needle nose pliers	

11. Project Time Calendar - Sequencing of Instruction

Project Time Week: 1

	Monday	Tuesday	Wednesday	Thursday	Friday
Science Room	Build Robots	Build Robots	Build Robots	Build Robots	Build Robots
Engineering Room	Build Robots	Build Robots	Build Robots	Build Robots	Build Robots
Math Room	Build Robots	Build Robots	Build Robots	Build Robots	Build Robots
English Room					
Social Studies Room	Timeline	Timeline	Timeline	Timeline	Timeline

Project Time Week: 2

	Monday	Tuesday	Wednesday	Thursday	Friday
Science Room	Program Robots	Program Robots	Program Robots	Program Robots	Program Robots
Engineering Room	Program Robots	Program Robots	Program Robots	Program Robots	Program Robots
Math Room	Excel	Excel	Excel	Excel	Excel
English Room					
Social Studies Room	Timeline	Timeline	Timeline	Timeline	Timeline

Project Time Week: 3

	Monday	Tuesday	Wednesday	Thursday	Friday
Science Room	Program Robots	Program Robots	Program Robots	Program Robots	Program Robots
Engineering Room	Program Robots	Program Robots	Program Robots	Program Robots	Program Robots
Math room	Data/ Flow charts	Data/ Flow charts	Data/ Flow charts	Data/ Flow charts	Data/ Flow charts
English Room					
Social Studies Room	Timeline	Timeline	Timeline	Timeline	Timeline

Project Time Week: 4

	Monday	Tuesday	Wednesday	Thursday	Friday
Science Room	Robot Challenges	Robot Challenges	Robot Challenges	Robot Challenges	Robot Challenges
Engineering Room	Robot Challenges	Robot Challenges	Robot Challenges	Robot Challenges	Robot Challenges
Math Room	Robot Challenges	Robot Challenges	Robot Challenges	Robot Challenges	Robot Challenges
English Room	CYOA (Choose-your-own adventure story)	CYOA	CYOA	CYOA	CYOA
Social Studies Room					

Project Time Week: 5

	Monday	Tuesday	Wednesday	Thursday	Friday
Science Room	Rocket Build	Rocket Build	Rocket Build	Rocket Build	Rocket Build
Engineering Room	Rocket Build	Rocket Build	Rocket Build	Rocket Build	Rocket Build
Math Room	Sensors	Sensors	Sensors	Sensors	Sensors
English Room	CYOA	CYOA	CYOA	CYOA	CYOA
Social Studies Room					

Project Time Week: 6

	Monday	Tuesday	Wednesday	Thursday	Friday
Science Room	Bird Finder	Bird Finder	Bird Finder	Bird Finder	Bird Finder
Engineering Room	Bird Finder	Bird Finder	Bird Finder	Bird Finder	Bird Finder
Math Room	Bird Finder	Bird Finder	Bird Finder	Bird Finder	Bird Finder
English Room	CYOA	CYOA	CYOA	CYOA	CYOA
Social Studies Room					

Project Time Week: 7

	Monday	Tuesday	Wednesday	Thursday	Friday
Science Room	RATS Launch	RATS Launch	RATS Launch	RATS Launch	RATS Launch
Engineering Room	RATS Launch	RATS Launch	RATS Launch	RATS Launch	RATS Launch
Math Room	Trig Work	Trig Work	Trig Work	Trig Work	Trig Work
English Room	CYOA	CYOA	CYOA	CYOA	CYOA
Social Studies Room					

12. Resources and Links

Articles about Capstone Theme

Description	Link
Gemini Mission	http://www-pao.ksc.nasa.gov/history/gemini/gemini.htm
Mercury Mission	http://www.nasa.gov/mission_pages/mercury/index.html
Apollo Mission	http://www.nasa.gov/mission_pages/apollo/index.html
Pioneer Mission	http://www.nasa.gov/mission_pages/pioneer/index.html

Project Resources

Description	Link
Science Fiction Information	http://www.enotes.com/literary-terms/science-fiction
Rocket Science	http://spaceplace.nasa.gov/pop-rocket/
Introduction to Rocket Science	http://www.nasa.gov/externalflash/RocketScience101/RocketScience101.html

Others articles, links, resources:

Description	Link
Cold War Resources	http://www.history.com/topics/cold-war
Cold War Resources	http://www.coldwar.org/
Project Lead the Way	http://www.pltw.org/
Lego Robotics	http://www.firstlegoleague.org/

Others:

Description

PHASE 5:
CLASSROOM MAPPING

13.a Curriculum Overviews:

The **curriculum overview** section of the planning document allows teachers to create a syllabus for the length of the capstone project. This section brings together the capstone with the classroom.

Subject	Capstone	Time Frame
English	Robots and Rockets	April 16 - June 7 2012

Unit Big Idea:
We all have a mission, whether we know it or not. Your mission is defined by what you know, the morals you have, and the choices you make. You must know what your mission is, and then it's up to you to make that mission a success.

Capstone to Classroom Connection
Science Fiction and the Space Race - The Science of Technology

Classroom Readings:	Classroom Materials:
Literature Circles Novels * Little Brother * Uglies * Enders Game * 1984 * Farenheit 451 * Downsiders * The Adoration of Jenna Fox	Novels for literature circles Readings for students to summarize for the timeline

Classroom Unit Objectives:
1. Students will be able to formulate writing ideas and identify a topic appropriate to the purpose and audience with the use of organizers and prewriting for a Choose-Your-Own-Mission story. 2. Students will be able to prepare writing for publication that is legible, follows an appropriate format and uses techniques such as electronic resources and graphics for a Choose-Your-Own-Mission story. 3. Students will be able to compose narratives that establish a specific setting, plot and a consistent point of view, and develop characters by using sensory details and concrete language for a Choose-Your-Own- Adventure story. 4. Students will be able to compose reflective writings that balance reflections by using specific personal experiences to draw conclusions about life through a reflective memoir in which students explore the essential questions.

Template Tasks (Literacy Design Collaborative, August 2011)
How can you make the impossible possible? After reading various science-fiction novels* about the future of technology and science, write a choose-you-own-adventure narrative that relates -the future of technology to societal advancement. **L2** Use logical extrapolation to develop your work. Where are you going and how do you plan on getting there? After reading various science-fiction novels* on the future write an expository essay that relates how scientific knowledge, theory, speculation, and the effects of future events on human beings influence its plot, theme,

and setting. Support your discussion with evidence from the text.

Subject	Capstone	Time Frame
Math	**Rockets and Robots**	April 16 to June 6

Unit Big Idea:

Identifying and interpreting patterns in nature can be aided by technology. Patterns in nature can be modeled by polynomials. Heights and distances can be found without actually measuring them.

Capstone to Classroom Connection

Students will use technology as a tool to study natural occurrences and number patterns and use statistical graphing to interpret them. Students will collect data such as the diminishing height of a bouncing ball, the velocity of a person walking to and away from an object and the change in temperature when approaching and moving away from a heat source. They will display this data on a time chart, interpret it and make predictions based on the collected data. They will fit the data to quadratic models.

Classroom Readings:	Classroom Materials:
Ch. 5 and Ch. 6 Holt Algebra 2.	Laptops with Excel spreadsheet software CBR data collection device with distance and temperature probes. TI-84 Plus graphic calculator Graphing paper Birdfinder

Classroom Unit Objectives:

Students will be able to graph and transform quadratic functions.
Students will be able to solve quadratic equations and find the zeros of quadratic functions.
Students will be able to fit data to quadratic models.
Students will be able to use polynomials to model data.

Template Tasks (Literacy Design Collaborative, August 2011)

TI-84 Plus CBR data collection activities
Excel spreadsheet graphing activities
Clinometer activities
Trigonometric quizzes

Subject	Capstone	Time Frame
SOCIAL STUDIES	**Rockets & Robots**	April 16 - June 7 2012

Unit Big Idea:

War and competition are often a spring board for technological advancement, the cold war drove space exploration to new heights.

Capstone to Classroom Connection

How does history influence technological advancement?

Classroom Readings:	Classroom Materials:
Articles: *Allies to Adversaries* *United States Influence* *The Atomic Age* *Fighting Communism at Home* *Examples of Civil Defense Cards and Propaganda*	· Primary Source Analysis Worksheets · Graphic Organizers · Vocabulary Strategies · Writing Strategies · Social Studies Assessment Rubrics · Reading Strategies in Social Studies · Active Learning Strategies in Social Studies

Classroom Unit Objectives:

The student will come to understand that…..

· History is more than things happening in sequence; it's about understanding connections across time.
· Order, power and systems of government have never been guaranteed.
· The identity of a society is a composite of other groups encountered, absorbed or conquered.
· Economic needs and wants determine individual and group decisions.
· Innovations influence the development, interactions and ultimately the success of societies.

Template Tasks (Literacy Design Collaborative, August 2011)

After researching primary and secondary sources on the cold war, write a report that analyzes critical decisions made throughout the cold war and how they influenced the outcome providing evidence to clarify your analysis. What conclusions or implications can you draw? **L2** In your discussion, address the credibility and origin of sources in view of your research topic. **L3** Identify any gaps or unanswered questions.

Subject	Capstone	Time Frame
Physics	**Rockets and Robots**	April 16 - June 7 2012

Unit Big Idea:

We all have a mission, whether we know it or not. Your mission is defined by what you know, the morals you have, and the choices you make. You must know what your mission is, and then it's up to you to make that mission a success.

Capstone to Classroom Connection

In physics, students will focus on NASA missions, study Earth and Space information obtained through these NASA missions, and analyze the trajectories of launch vehicles. These ideas will parallel the projects on robots (NASA probes), rockets (NASA rockets), and birdfinder (trig applications).

Classroom Readings:	Classroom Materials:
NASA Spinoffs NASA Mission Profiles	Rockets Rocket Launchers Birdfinders

Classroom Unit Objectives:

- Student can construct a robot that describes one physical property of a substance in the center of the maze
- Student can explain how the mission they have chosen for their rocket is parallleled in actual rocket missions used for scientific research citing specific examples via a taped interview (30-45 seconds)
- Student can produce a worksheet that neatly and completely analyzes the motion of their group's rocket based on Newton's Laws and the equations of motion (RATS)

Template Tasks (Literacy Design Collaborative, August 2011)

- Geology Activity
- Planetary Formation Activity
- NASA Mission Profiles
- Physical Properties Activity
- Pre-launch Activity
- Sci-Fi Profiles

Subject	Capstone	Time Frame
Engineering	**Rockets and Robots**	April 16 to June 6

Unit Big Idea:

We all have a mission, whether we know it or not. Your mission is defined by what you know, the morals you possess, and the choices you make. You must discover what your mission is, and there you will find your destiny. It is then up to you to make your mission successful.

Capstone to Classroom Connection

Students will learn the fundamentals of robotics, programming, CAD and precision measurement using precision instruments. Students will apply that knowledge to the build of programmable robots, rockets and angle calculators(bird-finders). They will then represent these objects on orthographic projection drawings and AutoCAD.

Classroom Readings:	Classroom Materials:
Web based articles and research. Textbook readings. Technical journal articles. Poetry reading.	LEGO robot kits Masking tape PVC pipe PVC glue Card stock Modeling clay (2) 4 x 8 x ⅛ luan wood

Classroom Unit Objectives:

Fundamentals of engineering in robotics.
Fundamentals of rocketry.
Precision measurement using dial caliper and micrometer.
Fundamentals of orthographic projection.
Fundamentals of AutoCAD.
Working understanding of trigonometry and telemetry.

Template Tasks (Literacy Design Collaborative, August 2011)

Assessments:
- Successful build of robot.
- Success in programming protocols.
- Successful build of rocket.
- Success in telemetry calculations.
- Success in transfer of orthographic projection into AutoCAD.
- Quizzes and tests on dial caliper.
- Quizzes and tests on trigonometry.