

T-STEM Capstone Handbook 2013-2014

T-STEM ACADEMY
DESIGN BLUEPRINT



EDUCATE TEXAS
a public-private initiative of Communities Foundation of Texas



The T-STEM Design Blueprint is a guide to build and sustain STEM schools that incorporates the seven benchmarks of:

1 Mission Driven Leadership	2 T-STEM Culture	3 Student Outreach, Recruitment, and Retention	4 Teacher Selection, Development and Retention	5 Curriculum, Instruction, and Assessment	6 Strategic Alliances	7 Academy Advancement and Sustainability
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<http://t-stemcapstone.weebly.com>

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T-STEM Capstone Project: Definition

Capstone Projects engage students in personalized learning experiences. The Capstone Project affords students the opportunity to apply critical thinking skills while investigating a specialized area of interest. Students synthesize the teaching and learning from core courses and STEM elective pathways to solve real-world problems related to their chosen fields. Each student has the assistance of a Capstone Project teacher to guide the student through their project deliverables. In addition, each student will select an adult mentor in their field of research as well as two peers to serve as Critical Friends throughout the Capstone Project. The Capstone Project serves as a culminating demonstration of what a student has learned in his or her career pathway.

Throughout the Capstone Project, students activate prior academic and technical knowledge and skills to address complex, authentic problems. In addition, students incorporate 21st Century Skills in a real-world context through: brainstorming; thinking interdependently; questioning and posing problems; applying creativity, innovation, and invention; problem solving; researching; gathering data; thinking and communicating with clarity and precision; thinking about thinking via persistence, flexibility, and reflection; and interpersonal communication and connections with adults.

Key Phases and Performance Expectations:

- **Phase I - Proposal:** Pre-Proposal Topic Brainstorming/Selection; Pre-Proposal Core Question; Minor Literature Review, Service Learning Component. This phase culminates with the *T-STEM Project Proposal* and *Preliminary Task List/Timeline*
- **Phase II - Research Paper:** Bi-Weekly Reflective Journal Entries and Research Paper
- **Phase III – Project Creation:** Bi-Weekly Reflective Journal Entries and Product, System, or Event Development/Creation
- **Phase IV – Culminating Defense and Presentation:** Defense to Panel of Experts, Community Showcase, and Final Portfolio Reflection

The Student...

- ⇒ Selects or is assigned a problem related to his or her career pathway.
- ⇒ Conducts research related to the problem.
- ⇒ Identifies teachers, business and postsecondary education partners/mentors with relevant expertise of the problem and its solution.
- ⇒ Analyzes and synthesizes information to solve the problem.
- ⇒ Maintains periodic reflective journals, to include Critical Friends Protocols of the project's progress.
- ⇒ Establishes with teacher checkpoints for assessment to ensure the project time line is on track and he or she is meeting the standards for the project.
- ⇒ Develops a multimedia presentation to adult partners/mentors and panel committee detailing what he or she has learned.
- ⇒ Creates e-portfolio of T-STEM Capstone Project.

A Capstone Project **IS NOT**...

- Bounded by a few weeks to complete. Capstone Projects usually encompass one to two semesters.
- An internship program.
- A research paper. Capstone Projects result in a product. Capstone *research paper* requirements address current or anticipated problem(s) of practice; include a literature review and conceptual framework; incorporate service learning components; and detail the product. Capstone *product* requirements include the development or implementation of a product, service, or system; system improvement, or planning/organizing an event/activity. Capstone *presentation* requirements include visual and auditory presentation of the Capstone project, and panel of experts' review of said project. Capstone *reflection requirements* encompass a reflective journal and final reflection analysis paper.

Hallmarks of T-STEM Capstone Project

www.ode.state.oh.us/ctae

Research

The student selects a problem related to his or her career pathway. Research is collected and analyzed to begin formulating a solution to the problem or question. The student uses various methods and sources to investigate the problem.

Authenticity

Problems are meaningful to the student and related to the career field. Resources exist within the community and beyond to support this project. The capstone project represents a real problem encountered by individuals in this career field. Working to resolve the problem, the student demonstrates proficiency in technical and academic competencies.

Work-based Learning

The problem is connected to an area within the student's career field. The student selects an adult from an advisory committee, business partner or postsecondary partner to work closely with on the project. Adult partners provide the context for the project.

Academic Rigor

The project is cross-curricular and challenges the student to apply knowledge related to both academic and technical subject areas. The project is aligned with appropriate academic content and technical standards. The student develops high-order thinking skills through research and analysis.

Professional Relationships

The student works closely with adults of content expertise. Adults collaborate with each other and with students on the development and evaluation of projects. Students prepare professional oral and written communications for adult audiences.

Presentation

The student produces a multimedia presentation detailing problem identification, research and the student's solution or recommendation. The presentation is the culminating experience in which the student demonstrates what has been learned.

Assessment

Project criteria is communicated to the student and is used to gauge learning. Assessment is formative, with multiple checkpoints along the way, providing feedback to the student. Adults outside the classroom help the student develop a sense of real-world standards. The student's project is documented in their portfolio.



Pre-Proposal: Topic Brainstorming and Selection

Outlined below is a five step approach for brainstorming and selecting an exciting and interesting topic. The Capstone Project will require a significant amount of time and energy. Therefore, it should be something that each student is passionate and excited about so that they enjoy the learning experience.

STEP 1

Review college preparatory interest data such as: ACT Explorer/Plan; Career Clusters; Interest Surveys, etc.

STEP 2

Students are now asked to think about all of the things they are interested in – things they would like to do, learn, understand, see, improve, create, or experience. Students should brainstorm and journal their ideas as they pop into their mind; students should not limit themselves at this point. Ideas should be narrowed down to three or four ideas which are “do-able,” and prioritize them. When deciding whether or not a particular project idea is “do-able,” consider whether or not research information and resources to complete the project are available. Student projects should be designed to maintain student interest for an extended period of time and should also stretch student abilities; thereby allowing students to grow as life-long learners.

STEP 3

Students are now ready to develop questions that they would like to answer through research on their topic. Brainstorming starting points for research questions might be...

- I would like to improve...
- I am perplexed by...
- I am very curious by...
- I want to learn more about...
- Something I think would really make a difference is...
- Something I would like to do to change _____ is _____...
- Right now, some areas I am particularly interested in are...

STEP 4

Decide on a preliminary applied learning problem-solving standard:

- Design a product, service, or system
- Improve a system
- Plan and organize an event or activity

STEP 5

Complete Reflective Journal Entry: See Appendix A: Reflective Journal: Topic Brainstorming and Selection.

Additional Ideas to Consider...

A Capstone Project is about doing and learning something that each student wants to do and learn about. This is a student's chance to choose a topic that will be interesting and worthwhile and will extend his or her knowledge. As each student begins the Capstone Project, he or she should consider the following questions...

- Is the research topic one that is reflective of the student's own career interests?
- Is the research topic one that is broad enough to allow them to access enough information, yet narrow enough to make the research scope reasonable?
- Is the research topic one that is challenging to the student's academic and creative abilities?
- Has the student avoided choosing a topic that might endanger them?
- Has the student utilized good judgment to be certain that the topic chosen is appropriate for presentation to a review panel and the general public?

For additional resources in exploring Capstone Project Topics, please refer to the *T-STEM Capstone Weebly* website.

Pre-Proposal: Core Question

The first step in creating a Capstone Projects asks you to identify a core question. Core questions arise out of your interests and should lead you to applied problem solving.

The core question should be open-ended and exploratory. It is a path to knowledge, which allows you to acquire knowledge and use that knowledge to solve problems. Your core question should focus on applied learning and works best when it is rooted in real-world issues. Your core question will lead you to the creation of an identifiable product that can be judged for how well it meets the applied learning and content standards you have chosen.

Your Core Question should fall within one of the following categories:

- Designing a product, service or system** Identify needs that could be met by new products, services, or systems and create solutions for meeting them;
- Improving a system** Develop an understanding of the way systems of people, machines, and processes work; trouble shoot problems in their operation and devise strategies for improving their effectiveness; or
- Planning and organizing an event or activity** Take responsibility for all aspects of planning and organizing an event or activity from concept to completion, making good use of the resources of people, time, money, materials and facilities. This event must include content standards.

Your Capstone Project is an opportunity to think critically about a subject of profound interest to you. Your Capstone Project will demonstrate that you have mastered a content area and can apply what you have learned to create a tangible product or service. Some examples are:

Examples of Design a Product, Service, or System

- Design a business plan; for example, a publication of a magazine for a student venture.
- Design a plan for development of a park or recreation area.
- Investigate an issue (social, political, scientific, moral/ethical, artistic) and propose possible solutions.
- Design a tutoring program for a software application.

Examples of Improve a System

- Improve the system for water treatment in a community.
- Design a curriculum unit to address a gap or a problem you have identified.
- Identify a problem within the structure of student government and make a proposed solution.
- Troubleshoot and repair faults in the operation of an automobile, mechanical device, or computer based system.

Examples of Plan and Organize an Event or an Activity

- Plan and organize a voter registration drive within the school or community.
- Arrange a series of career information seminars.
- Organize a community festival/business exposition.
- Organize an exhibition of student artwork.
- Capstone Presentation

Pre-Proposal: Service Learning Component

Service learning means that the student will not only help a community, but will also learn about that community and the specific area of need. For example, community service is putting in hours in a soup kitchen. Service learning, however, is providing that service and learning about the causes of homelessness and why there is a need for the soup kitchen in the first place. Ideally, service learning leads to greater sensitivity and participation in the global community. Therefore, all Capstone Projects will include:

- ◇ Project Proposal delineation of the Service-Learning Components aligned to the research and product/service/system/event
- ◇ Reflective Journal Entry at the end of the Capstone Project that incorporates the investigation and preparation, action, and reflection components of service learning.

Investigation and Preparation are the first steps of service-learning in which students work with teachers and community members to:

- Identify issues affecting the community in areas related to health, education, environment, or public safety
- Select project site(s) and how to address a selected issue
- Plan service-learning reflection
- Explore the concept of active citizenship via deep thinking and analysis about oneself and one's relationship to society.

Action is the next step of service-learning in which students carry out their service through one of the following:

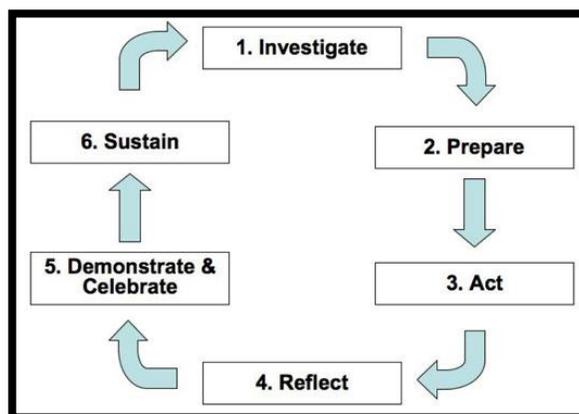
Direct Service – Students have face-to-face contact with service recipients. Examples include tutoring other students, serving meals at a homeless shelter, working with the elderly in a senior citizen community, etc...

Indirect Service – Students perform a service without having direct contact with the recipient. Usually resources are channeled to help alleviate a problem. Examples include food and clothing drives, environmental projects, raising money for a cause through activities such as a walk-a-thon, etc...

Advocacy – Students educate others about a selected issue with the goal of eliminating the causes of a particular problem. Examples include writing letters to legislators or newspaper editors, creating web pages, creating and displaying posters within the community, writing and performing informative plays, creating educational materials for other target groups, legislative testimony, etc...

Reflection is the final step of service-learning in which students look back upon the completed project and review what they have learned.

The Service Learning Cycle



Project Proposal

Student Name _____

Project Advisor _____

1. **Proposed Project Title:**
2. **My Core Question:** *(Based on your interests, clearly stated as a question, open-ended and exploratory, related to real-world issues whenever possible, and directed toward a path to knowledge.)*
3. **My Goal(s) for this Project:**
4. **My Strategy to Accomplish this Project:**
5. **Projected Project Costs & Funding Proposal:** *(State your estimated costs and funding partner(s). **Attach** excel spreadsheet.*
6. **Oral Presentation & Panel Review:** I plan to use the following materials...
7. **Overview of the Proposed Capstone Project:**
Attach on a separate sheet of paper a two page written description of your project plan. Include the following in your description:
 - a. Describe your top 3 brainstorming choices and why you chose this topic for your project.
 - b. Identify the research that you plan to pursue and describe the problem that your Capstone Project will solve.
 - c. Identify whether your Capstone Project will: Design a product, service, or system; Improve a system; or Plan and organize an event or activity.
 - d. Cite several (at least five) resources (people, books, equipment) you will use to create this project.
 - e. Delineate the product you will create.
 - f. Describe you plan for attracting funding partners.
 - g. Describe the Service-Learning component of your project.
 - h. What will be the most important ideas you wish to convey during your presentation and panel evaluation.
 - i. How will you present your product and the knowledge you gained from this experience?
8. **Preliminary Task List/Timeline Worksheet** *(Attach Preliminary Timeline Worksheet from Appendix A)*

Student Signature

Date

Parent/Guardian Signature

Date

Advisor Signature

Date

Accepted Yes No Minor Revisions Major Revisions

If Advisor checks "No," please check Major or Minor Revisions and explain below the areas that the student needs to address.

Preliminary Task List/Timeline

A timeline is extremely important for the management of a project. When creating a timeline, one should consider the timeframe available in order to complete the project. For instance, when developing a timeline, keep in mind school holidays and testing days. The following is a list of major phases/components to complete. Use this as a framework to develop all the minor steps within each major phase in order to complete your project on time for the final defense to a panel of experts and the community showcase.

Project Start Date: _____

Final Defense to Expert Panel Date: _____

Community Showcase Date: _____

Total number of class days available to complete project: _____

Major Phase	Components	Estimated Class Days to Complete
Phase I Proposal	Pre-Proposal Topic Brainstorming/Selection	
	Pre-Proposal Core Question	
	Minor Literature Review	
	Service Learning Component	
	T-STEM Project Proposal	
	Preliminary Task List/Timeline	
Phase II Research Paper	Research Problem: Rationale for studying this concern	
	Literature Review	
	Purpose Statement, Research Question(s)	
	Inquiry Format, Methodology, Design, Ethical Concerns	
	Analysis and Conclusions (Completed after product/system/event is developed)	
Phase III Project Creation	Development/Creation of product, service, or system	
	Development/Creation of improvement to a system	
	Planning and organizing an event or activity	
Phase IV Defense & Presentation	Defense to Panel of Experts: Presentation Materials	
	Community Showcase: Presentation Materials	

In chronological order, complete the Preliminary Task List/Timeline in Appendix A. Expand the timeline to include major as well as minor tasks that must be completed for the successful completion of the Capstone Project. Assign tentative checkpoint dates to each entry and identify due dates for when each task will be completed.

Reminders:

- Consider the time constraints of both teacher and student schedules. How do these constraints affect the completion of the work? Plan ahead. Regularly update and refer to the Preliminary Task List/Timeline in your Bi-weekly Journal Reflections.
- If you are dependent upon input from another person, such as your mentor, or need to order supplies, provide sufficient time for response and or acquisition of supplies.
 - Complete the Preliminary Task List/Timeline electronically for ease in editing.

Research Paper

The purpose of a the Capstone Research Paper is to present an investigation and inquiry into a question, examine the community impact, ascertain the service learning component for the project, define a product, service, system, improvement to a system, or event/activity, develop same, then analysis the results and reflect on the entire process to inform future research. An outline of the key elements of the Capstone Research Paper is delineated below. Your Capstone Advisor will inform you as to whether you are following APA or MLA formatting.

Initial Pages:

- Title/Cover page
- Acknowledgement
- Abstract

Chapter One Introduction

- Introduction
- Statement of the Problem (clearly define the issue, address important and relevant concepts, examine contextual concerns)
- Purpose of the Capstone Project
- Service Learning Component
- Significance of the Capstone Project

Chapter Two Literature Review

- Focuses on important research
- Clearly explains what is known and not known about the issue and this particular problem of practice

Chapter Three Methods

- Design
- Materials
- Ethical Concerns
- Cost Analysis
- Data Analysis

Chapter Four Results and Reflection

- Implementation: Product, Service, System, Improvement to System, Event/Activity
- Conclusion (So What)
- Recommendations for Future Practice
- Recommendations for Future Research
- Self-Reflection on the Capstone Project

General Writing

Organization: Each chapter requires an introduction, body and conclusion. The introduction provides a sufficient background on the topic and previews major points. Paragraph transitions are present, logical, and maintain the flow throughout the paper. The tone is appropriate to the content and assignment. The conclusion is logical, flows from the body of the paper, and reviews the major points.

Mechanics: The paper—including tables and graphs, headings, title page, and reference page—is consistent with APA/MLA formatting guidelines and meets course-level requirements. Intellectual property is recognized with in-text citations and a reference page. Rules of spelling, grammar, usage, and punctuation are followed. Sentences are complete, clear, concise, and varied.

Product, Service, System, Improvement to System, or Event/Activity

The Capstone Project provides you with a forum for analyzing, synthesizing, and implementing the skills and knowledge gained throughout your education. The Capstone Project will demonstrate that you have mastered a content area and can apply what you have learned to create a tangible product, service, system, improvement to a system, or organized an event or activity. Therefore, carefully choose a product or process that you can build or produce, or a community-based service you could provide. Consider the following questions to help guide your decision.

- ◇ Does the research enhance the product? Is there a clear connection between the research topic and the product/service/system/event you want to produce?
- ◇ Does the product/service/system/event represent significant amounts of time, effort and appropriate complexity? Does it go beyond what you already know how to do?
- ◇ Will the product/service/system/event involve tangible evidence of your work – either something physical that can be seen and touched, or a community-based service that can be documented as beneficial, or something that can be written, produced, digitized and presented?

Modifications to Proposal for Product, Service, System, Improvement to System, Event or Activity

As sometimes happens, students may need to modify their original Capstone Project Proposal. If that happens, students must address in writing a Modified Proposal that contains the following information. In addition, students must have their parents, mentor, and Capstone Advisor sign the Modified Proposal.

- ◇ How do you wish to change your proposed project and why?
- ◇ What is the purpose of the proposed changes?
- ◇ How will these changes help you more fully explore your area of interest?
- ◇ How will these changes allow you to better demonstrate or represent your learning?
- ◇ Have you discussed the proposed changes with others such as your parents, mentor, and Capstone Advisor? What response have you received?
- ◇ How will these changes affect your product/service/system/event Preliminary Task List / Timeline?



Mentor

A mentor is someone you trust who knows the subject of your project and will take a sincere interest in guiding you to successful completion of your product.

A mentor provides:

- ◇ Expertise in the product/service/system, improvement to system, or event/activity area
- ◇ Gives suggestions and advice
- ◇ Supports your efforts
- ◇ Gives you feedback.

Before you choose a mentor:

- ◇ Clearly define your product
- ◇ Be specific about what you expect from your mentor, including time commitments
- ◇ Be able to demonstrate how mentorship will benefit the mentor

How do you choose a mentor?

- ◇ Brainstorm possible experts within your chosen field of study
- ◇ Talk to parents, friends and /or teachers about possible mentors
- ◇ Look for someone who has the expertise and is interested in mentoring you through the completion of your product/service/system/event.

Once you have a mentor.

- ◇ Meet with your mentor
- ◇ Determine how often you will meet with your mentor – set dates and times
- ◇ Decide what areas of your project they will assist with ie: project details, review speech, actual product development, access to technology/lab equipment, etc.
- ◇ Ask mentor to be part of Defense / Presentation team.

Mentor Forms (See Appendix A)

- ◇ [Mentor Agreement](#) / Mentor Verification
- ◇ Sample Student Letter to Potential Mentor



Reflective Journal

The Capstone Project is an exciting and dynamic culminating assignment that requires the student to incorporate the skills, competencies, and core knowledge acquired throughout their STEM schooling experience. To facilitate students staying on task, completing scheduled timeline deliverables, and effectively reflecting on the Capstone Project experience, the student will be required to complete weekly Reflective Journal Entries. (See Appendix A for Checklist Timelines for Reflective Journal Postings.)

Required Journal Postings

1. Topic Brainstorming and Selection (See Appendix A: Reflective Journal: Topic Brainstorming and Selection)
2. Proposal Feedback Reflection (See guidelines below)
3. 10 Bi-Weekly Reflective Journal Entries (See guidelines below)
4. Research Paper 1st Draft Feedback Reflection.
5. Project: Critical Friends Reflection 1 (See Appendix A for Critical Friends)
6. Project: Critical Friends Reflection 2
7. Service Learning Component Reflection (completed at the end of the project)
8. Presentation Proposal Feedback Reflection (See guidelines below)
9. Portfolio Completion Reflection (See Appendix A for Portfolio Completion Reflection)

10 Bi-Weekly Reflective Journal Entries Guidelines

The first entry each week addresses what the student anticipates accomplishing this week:

- What you plan to accomplish this week (Refer to your Preliminary Task List/Timeline)
- Your needs, including time, space, materials, and personal contacts.
- Any obstacles you anticipate

The second entry each week summarizes the student's progress this week:

- A summary of the progress made this week.
- Pertinent Information/Data
- General Observations
- Personal Reflections

Pertinent Information/Data/Resources

- ✓ Who did you talk with? What facts did you gather?
- ✓ What work did you do?
- ✓ What is the next step as a result of talking with your mentor, resources, or research?
- ✓ Record names of people, addresses, phone numbers, email addresses, best time to reach people.
- ✓ Record for your bibliography internet sites, resources, printed materials.
- ✓ Include different forms of documentation (databases, spread sheets, etc.)

General Observations

- ✓ Write about what you see, hear, and experience.
- ✓ About how you feel and/or reacted to what you did and/or saw.
- ✓ Observations you make on work completed, in progress, and what lies ahead.
- ✓ Outline your next action plan

Personal Reflections

- ✓ Cite examples of your personal growth and understanding (Intrapersonal Skills)
- ✓ Describe your relationship with your mentor/project facilitator, or people with whom you came into contact for your Senior Project (Interpersonal Skills)
- ✓ Write a self-evaluation of your experiences this week (including a situation you handled well or not so well; to include what you learned from it? How did you become a more reflective practitioner?
- ✓ Comment on challenges (obstacles) and triumphs (private victories) you encountered throughout the process.

Defense / Presentation and Community Showcase

Defense / Presentation

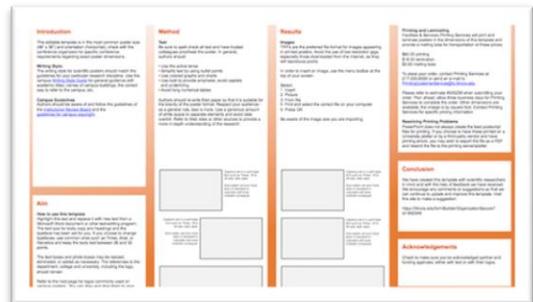
The Capstone Defense / Presentation is the culminating event required after completing the Capstone product. This is the student's chance to showcase their work to an audience of experts. Prior to this night, students selected a topic of personal interest, researched it, created a core question, developed a product or service, improved a system, or planned and organized an event/activity, and completed a reflective journal. Now the student has the opportunity to describe the process of learning, along with the results, to a judging panel. Once the student's Capstone Project Advisor agrees that the Capstone Product is ready, the advisor will work with the student to contact individuals for the panel defense / presentation. See Appendix A for:

- ◇ Defense/Presentation Success Tips
- ◇ Defense/Presentation Expert Panel Guidelines
- ◇ Defense/Presentation Rubric Sample
- ◇ Defense/Presentation Product Sample

Community Showcase

The Community Showcase night is a mandatory attendance requirement for the Capstone Project. The Community Showcase night is scheduled for Day _____ Date _____ from _____ to _____.

This event is open to the public and will be publicized in the local media. Please be sure to invite family and friends as you will be showcasing your project to the public. You will have a small section to showcase your research and product, your portfolio, and any audio visual aids created for the project defense/presentation. A guest speaker will kick off the event followed by time for individuals to peruse the project displays. The event will close with reflections from two Capstone Project Seniors who will be chosen to present by their peers.



Portfolio

A portfolio is a source of authentic assessment that provides examples of the growth in your learning throughout the Capstone Project, evidence of your product/service/system/event, and personal reflections on the Capstone Experience. Your portfolio will need to be collected into two sources, Binder (for Defense/Presentation) and digital platform. The following items, plus any additional items you deem necessary must be included in your portfolio in a neat, organized, labeled, and sequenced manner. Be sure to include a table of contents in your portfolio. Please remember that the community will be viewing your portfolio at the Defense/Presentation and at the Community Showcase.

#	Content	Digital	Hard Copy	Cleared by Advisor
	Parent/Student Acknowledgement			
	Reflective Journal Section			
	Topic Brainstorming and Selection (Appendix A)			
	Proposal Feedback Reflection			
	10 Bi-Weekly Reflective Journal Entries			
	Research Paper 1 st Draft Feedback Reflection (Appendix A)			
	Research Paper 2 nd Draft Feedback Reflection			
	Project: Critical Friends Reflection 1			
	Project: Critical Friends Reflection 2			
	Service Learning Component Reflection			
	Presentation Proposal Feedback Reflection			
	Portfolio Completion Reflection (Appendix A)			
	Project Proposal			
	Project Creation (evidence of work, i.e.: pictures, materials collected, newspaper articles, etc.)			
	Mentor Agreement / Mentor Verification			
	Defense Presentation			
	Speech / Presentation Outline			
	Feedback			
	Rubric(s)			
	Project Advisor Rubric(s) (i.e.: research paper and product grades/rubrics)			



Frequently Asked Questions

1. **When should students complete a Capstone Project?** Generally, during the senior year. However, some students may complete their Capstone Project during the summer between their junior and senior year due to mentor schedules and/or scheduling of their project event.
2. **Can students work in pairs?** As part of a 21st Century learning experience, students should be able to work independently and collaboratively to problem solve. In this spirit, student teams of two will turn in one Capstone Project. However, the Reflective Journal sections must be completed by both team members individually.
3. **How long should a Capstone Project take?** Capstone Projects typically encompass one to two semesters. However, some schools have students begin exploring capstone topics as early as their freshman year, and annually thereafter. In this way, students are exposed to multiple research fields, current or future problems, systems that need improvement, or events/activities that could be planned.
4. **Where should a Capstone Project be housed?** Capstone Projects are typically housed in the 4th year senior STEM elective course such as: Project Lead the Way (PLTW) Biomedical Innovation, PLTW Engineering Design and Development, Texas Education Agency (TEA) Engineering Design and Problem Solving, TEA Advanced Biotechnology, TEA Forensic Science, TEA Independent Study in Mathematics, TEA Statistics and Risk Management, TEA Engineering Mathematics, TEA Scientific Research and Design, TEA Engineering Design and Problem Solving. However, some schools also house the projects with a separate Capstone Project Advisor, or an English teacher.
5. **When do students present their Capstone Project?** The presentation is the culminating event of a Capstone Project. Students present to panels of experts in the subject matter they researched. Expert panels ask questions and score projects based on rubrics provided by the Capstone Project Advisor. In addition, many schools host a Capstone Project Presentation night for parents and community members to attend. Some schools combine the presentation to panels of experts with the parent/community night presentation.
6. **Defense / Presentation** Do all students in the course defend/present on the same day? Does the defense count as part of the project grade? Some schools schedule a Project Defense/Presentation day at the end of the semester in which students present their projects to various panels of experts. Other schools organize projects around similar research topics and invite panels of experts to judge the defense/presentation of said projects on particular days. All schools include the Defense/Presentation as part of the project grade. (See Appendix A for sample Defense/Presentation Rubrics).
7. **Community Showcase.** Some schools include this event as part of the senior banquet and/or senior graduation day events.

Appendix A: Templates / Forms



Parent/Guardian and Student Capstone Project Commitment

To the parents/guardians of _____:

You are about to embark on a major assignment that will connect your knowledge and skills to a real-world, service-learning project that will culminate in a research paper; creation of a product, service, system, system improvement, or activity/event; defense presentation to a panel of experts; and a community showcase event.

The Capstone Project has four phases.

- **Phase I Proposal:** This includes topic brainstorming and selection; core question, minor literature review, service learning component, cost analysis, and task list/timeline. You will complete bi-weekly Reflective Journal entries beginning in this phase and throughout the entire project.
- **Phase II Research Paper:** To prepare you to be an independent thinker in a democratic society, you need to be aware of the various issues and needs present in the global community. During this phase you will research and write a research paper of approximately 8-10 pages, based on your identified area of need. You will use both primary and secondary sources to gather information for your paper.
- **Phase III Project:** Creation of a product, service, system, improvement to a system, event or activity.
- **Phase IV Culminating Defense/Presentation:** You will deliver an 8-10 minute oral presentation that describes your research, and demonstrates your product in order to display your mastery of learning in your chosen area. Part of this presentation will include your overall project portfolio. This presentation is done before a panel of experts whose feedback will comprise 10% of your overall project grade. Lastly, you will participate in a Community Showcase event that highlights the Capstone Projects for our school.

Completion of the Capstone Project is a requirement for graduation.

As a parent/guardian of a student at _____, I am aware that my son/daughter is required to successfully complete a Capstone Project in order to graduate with his/her class. I fully understand that the project selection decision is made by my student, but is subject to the Capstone Advisor's approval. ***The project selection and approval is student and parent-centered. I therefore assume all responsibility for any risks and costs associated with project completion.*** I understand that my son/daughter will be required to complete at least **15 hours** working with a mentor in the area of research chosen by my son/daughter. Lastly, I understand that if the Capstone Project is a product, it must be physically present for the Defense/Presentation and the Community Showcase. If the product is a service or event/activity, it must be documented by photos and video.

Parent/Guardian Signature: _____ Date: _____

Parent/Guardian E-mail: _____ Cell Phone: _____

Student Signature: _____ Date: _____

Reflective Journal - Topic Brainstorming and Selection

Outlined below is a five step approach for brainstorming and selecting an exciting and interesting topic. The Capstone Project will require a significant amount of time and energy. Therefore, it should be something that each student is passionate and excited about so that they enjoy the learning experience. Your journal entry must be marked acceptable in all areas before proceeding to the Capstone Project Proposal.

Student: _____ Date: _____ Period: _____

Proposed Topic: _____

	Content	ACCEPTABLE	MINOR Revisions Necessary	MAJOR Revisions Necessary
1	Step 1: College Preparatory Interest Review			
2	Step 2: Personal Interests Brainstorm, Feasibility, etc.			
3	Step 3: Research Questions Brainstorm: <ul style="list-style-type: none"> • I would like to improve... • I am perplexed by... • I am very curious by... • I want to learn more about... • Something I think would really make a difference... 			
4	Step 4: Design a product, service, or system, Improve a system, or Organize and event/Activity			
	Research Topic Choice Reflection <ul style="list-style-type: none"> • Is the research topic one that is reflective of the student's own career interests? • Is the research topic one that is broad enough to allow the student to access enough information, yet narrow enough to make the research scope reasonable? • Is the research topic one that is challenging to the student's academic and creative abilities? • Has the student avoided choosing a topic that might endanger them? • Is the topic appropriate for presentation to a review panel and the general public? 			

Reviewed by: _____

Date: _____

Additional Comments:

Reflective Journal – Critical Friends Reflection Protocol

A Critical Friends Tuning/Reflection Protocol focuses on developing collegial relationships and encouraging reflective practice. This process is based in cooperative learning. The Critical Friends process provides an opportunity both to solicit and provide feedback in a manner that promotes reflective learning.

Critical Friends (CF) Protocol

- **Time Keeper:** One person is designated as the time keeper (*Keep participants to their allotted time, and ensure that only the designated person talks*)
- **Note Taker:** One person is designated as the note taker
- **Probing/Clarifying Questions** ask questions learn more about the topic. These questions do not offer advice.
- **Warm Feedback** should begin with “**I really like...**” followed by specific, supportive, appreciative comments
- **Cool Feedback** should begin with “**I wonder if... I wonder if you thought of...**” Cool feedback statements offer different ways to think about the work presented, and/or raise questions/concerns, and/or extend the presenter’s thinking.
- **Presenter Reflection** Presenter shares insights gained from the CF process. Presenter does not need to defend their work, merely share any insights gained.
- **Debrief the Process** Entire group reflects on the CF process

Critical Friends (CF) Protocol – 40 minutes

- 5 min. Presenter Shares their Capstone Project to date **Only the presenter talks**
- 5 min. Each Critical Friend asks **Probing/Clarifying Questions** – no advice (1 min per person)
Only the person asking the question can talk. *The presenter can respond to the questions.*
- 10 min. Each team member provides **Warm Feedback** (2 min per person) **Only that team member talks.**
The presenter may not respond (Empathic listening: listen to hear, not to respond)
- 10 min. Each team member provides **Cool Feedback** (2 min per person)
Only that team member talks.
The presenter may not respond (Empathic listening: listen to hear, not to respond)
- 5 min. **Presenter Reflection:** Presenter shares thoughts/insights on experience - **Avoid defending**
- 5 min **Debrief the Process:** CF Team discusses/critiques the CF process

Reflective Journal - Portfolio Completion Reflection

Congratulations on successfully completing and presenting your Capstone Project! The last requirement of the Capstone Project is to reflect on the process by writing a **three to four page reflection** that summarizes the project, addresses problems encountered, analyzes problem-solving strategies employed, describes resulting learning and personal growth, and offers advice to improve the Capstone Project experience. It provides your evaluators with the background and context needed to understand the depth and scope of your project.

	Component	✓ Present – Not Present	Evaluator Notes	Score 0, 1, 2
1	Summary of the research and major project components to include results			
2	Obstacles faced, or difficulty encountered and your problem solving process and proposed solutions			
3	What solutions did you bring forth and/or what results did you conclude?			
4	How accurately did you address your Core Question? Did your Core Question change during your project? Why?			
5	What would you have done differently and why?			
6	How will you use what you have learned in the future?			
7	What component are you the most proud of and why?			
8	Describe the role that your mentor or outside sources played in your project.			
9	Presentation Method: – Was your presentation method clear, and engaging? Why was it effective? – Would you change your presentation method now if you could? Why?			
10	What advice would you give to a student undertaking a similar process?			
11	Organizational Structure & Grammar: – Introduction engages reader and establishes context – Logical progression of ideas – Paragraph transitions flow – Clear development of ideas – Conclusion is logical and flows from major points – Rules of spelling, grammar, usage, and punctuation are followed			
12	Advise to Improve the Capstone Project Experience			

Preliminary Task List / Timeline

Based on your project needs, add rows for major and minor tasks associated with each Phase. Be sure to establish contact with a mentor early in the project to ensure that you and the mentor can blend your schedules for the product, service, system or even that you will develop.

Examples of Major / Minor rows to add: Bi-weekly Journal Entries. Outlines for each section of the Research Paper. 1st Draft, 2nd Draft, and Final Version of Research paper. Initial contact and successive mentor dates. Creation of audio-visuals for Presentation/Defense. Acquisition of supplies to develop product, service, system, or event. Practice Presentation/Defense. Critical Friends Feedback on Research Paper and product, service, system, or event. Service Learning component dates and deliverables.

Item	Deliverable	In-Progress Check Date	Student Signature	Teacher Signature	Due Date	Student Signature	Teacher Signature
PHASE I - Proposal							
1	Pre-Proposal Reflective Journal: Topic Brainstorming and Selection						
	Pre-Proposal Core Question						
	Minor Literature Review						
	Service Learning Component						
	T-STEM Capstone Project Proposal						
	Project Proposal Excel Cost Estimate						
	Project Proposal Project Overview						
	Preliminary Task List / Timeline						
PHASE II – Research Paper							
1	Research Problem						
	Literature Review						
	Purpose Statement & Research Question(s)						
	Inquiry Format, Methodology, Design, Ethical Concerns						
	Analysis and Conclusions (completed after product, service, system, or event is developed)						
PHASE III – Project Creation							
1	Development/Creation of product, service, system						
	Development/Creation of Improvement to a system						
	Planning and organizing an event or activity						
PHASE IV – Defense and Presentation							
1	Defense to Panel of Experts						
	Community Showcase						

Mentor Agreement and Mentor Verification

Mentor Agreement

Student Name: _____ Project: _____

Mentor Name: _____ Phone: _____ Email: _____

Mentor Address: _____

In order for students to complete their Capstone Project, students must work with a mentor who has expertise in the area being explored. The mentor must be willing to verify the student's efforts and time spent. In addition, the mentor must complete the Mentor Verification at the end of the student's Capstone Project. Each student must spend at least 15 hours creating their product/service/system/event as well as additional hours with the mentor. If you are willing to serve as this student's mentor, please complete your Name, Phone, Email, Address, and sign below. The bottom half of this form will be completed at the end of the Capstone Project.

Mentor Signature _____ Date: _____

Student Signature _____ Date: _____

Mentor Verification

1. Student spent at least 15 hours creating this project? Yes No
Comments:

2. Have you seen this project at different stages of completion, not just the final phase? Yes No
Comments:

3. What specific problems did this student encounter and overcome?

4. What success have you seen this student achieve?

5. Recommendations for future research/product development?

Mentor Signature _____ Date: _____

Student Signature _____ Date: _____

Thank you for your support and contribution to the student.

Sample Student Letter to Potential Mentor

[Date]

[Person's name]

[Full address]

Dear [person's name—Mr. X, Ms. X, Dr. X—]:

I am [a/an] [grade level] student at [name of school]. Would your [company, business, institution] be interested in mentoring me in an unpaid, [time period] during which you can assist me in a real-world Capstone Research Project that also includes the development of a Product, Service, System, Improvement to a System, or anEvent/Activity.

My Capstone Project for this year will be [briefly explain your project]. [Explain how this particular company can help you complete your project in one or two sentences.] I believe my project will help [company name] by [explain how the project will help the company; a bulleted list would be helpful for companies].

[Sample ideas for the student to consider telling the company:]

- I will not expect payment for my work; this is a learning activity for me.
- I will work on the project for [complete length of time you expect to work with the company].
- I will provide my own transportation to and from [company name and/or location].
- The work I do will not be confidential (or, if it will be confidential, explain why)
- My parents and I will sign a waiver releasing your company from liability in connection with this project.
- [Name of company] will appoint one or more person as a mentor or sponsor, and I will report to that person while on your company's premises.

Sincerely,

[Your name]

[Your contact information]

Defense/Presentation Success Tips

Preparation

Develop a PowerPoint, Prezi, or Weebly that takes the expert panel through the entire process of your Capstone Project from ideation, research, design, production, and reflection. Be sure to discuss the conclusions you drew from your research, your service learning component, how your research shaped your thinking, any obstacles to product completion, and the successes that demonstrate pride in your work. The presentation should include pictures/videos of the process as well as static representations of your work such as your Portfolio Binder.

If your product was a service, event, or activity, the presentation should include items such as research, resources, calendars, contacts, marketing, documentation of the steps in the planning process, and images of the service, event, or activity.

If your product was a product, system, or improvement for a system, the presentation should include items such as research, resources, materials, documentation of the design process, and the stages of the product development.

- ◇ Practice your presentation and know your subject well.
- ◇ Prepare handouts for the panel of experts that highlights the main points of your presentation.
- ◇ Think “multimedia!” Use a variety of formats to include video images, slides, computer graphics, 3-D models, and “professional style” 2-D presentation boards. Plan carefully to ensure you have the requisite technology to display your work.
- ◇ Set high standards. Review all work for grammar and spelling. Create a clear graphic layout. Thoroughly label all products and exhibition boards.

Speech Organization

Introduction: Introduce your topic and try to capture the panels’ attention.

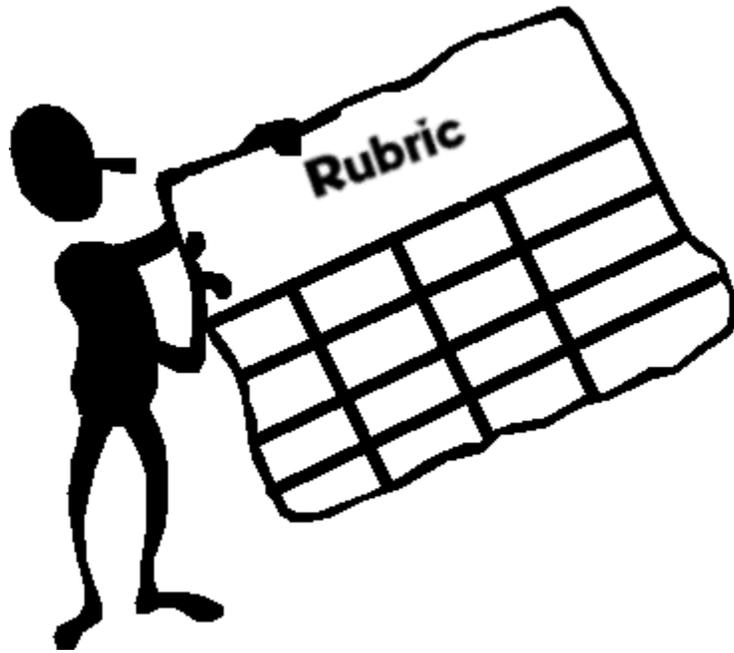
Body: List and explain four key points

1. How did you become interested in the topic?
2. What did you learn from the research, and how does this connect to your product?
3. What did you learn from the project?
4. What did you learn about yourself and your citizenship (service learning component), and how might this information affect your future plans.

Conclusion: Connect the introduction, implications for learning and possible plans for the future.

Speech Techniques to Remember: Eye Contact, Posture, Voice, Gestures, Props, Time Constraints

Appendix B: Rubrics



Capstone Proposal and Task List/Timeline Rubric

This rubric explains the elements of the proposal and Task List/Timeline that should be included in the work. To achieve a successful score on this task, a student must MEET standard for all expectations. A student cannot meet standard on this task if he/she receives “**Below Standard**” on any of the expectations.

Expectations	Exceeds Standard	Meets Standard	Below Standard
Proposal	<p>Uses exemplary description of project with exceptional detail Identifies all components necessary.</p> <p>Thoroughly identifies a learning stretch or a path to new knowledge.</p> <p>Identifies all appropriate standards with a comprehensive link to the particular project.</p> <p>Fully explains why this field of inquiry, industry, or discipline was chosen.</p>	<p>Accurately describes the project plan with sufficient detail.</p> <p>Identifies many of the components necessary to complete the project.</p> <p>Identifies a learning stretch or a path to new knowledge</p> <p>Identifies most of the standards and includes a link to applied learning and content standards.</p> <p>Nearly explains why this field of inquiry, industry, or discipline was chosen.</p>	<p>Does not accurately describe project.</p> <p>Lacks necessary detail.</p> <p>Lacks many of the appropriate components to complete the project.</p> <p>Does not address a learning stretch.</p> <p>Lacks one or more standards appropriate to project.</p> <p>Choice of field of inquiry not explained.</p>
Timeline	<p>Identifies all tasks necessary to successfully complete the project.</p> <p>Develops a detailed timeline that accounts for the time required to complete the project.</p> <p>Includes all individual due dates as well as projected completion dates in the timeline.</p>	<p>Identifies most of the tasks necessary to complete the project.</p> <p>Develops an incomplete schedule that fails to account for the time required to complete the project.</p> <p>Includes many of the required due dates as well as projected completion dates in the timeline.</p>	<p>Develops an unrealistic and/or incomplete timeline to complete components of the project.</p> <p>Timeline is missing most of the required due dates as well as projected completion dates.</p>
Solutions and Strategies for Achievement	<p>Addresses innovative solutions and strategies necessary to complete each component in relationship to the final product.</p>	<p>Identifies most of the effective solutions and strategies necessary to complete each component in relationship to final project.</p>	<p>Does not identify effective solutions and strategies necessary to complete each component in relationship to final project.</p>

Score _____ Scorer’s Initials _____

Oral Presentation Rubric

Rhode Island Diploma System Local Assessment Toolkits

Category	Below Standard	Meets Standard	Exceeds Standard
Language Use and Delivery	<ul style="list-style-type: none"> · Uses inappropriate and/or simplistic vocabulary, makes consistent errors in grammar · Engages in numerous and distracting verbal pauses, and does not make effective use of eye contact or body language · Fails to speak clearly and audibly and/or delivers material in a flat or lifeless way dresses inappropriately · Does not present within the allotted time frame 	<ul style="list-style-type: none"> · Selects words appropriate for an audience and uses correct grammar · Engages the audience with appropriate verbal cues and eye contact · Speaks clearly and confidently, limits the uses of vocalized pauses, and varies tone and pitch appropriately · Projects a sense of individuality and personality dresses appropriately · Paces delivery 	<ul style="list-style-type: none"> · Uses rich, varied, and appropriate vocabulary · Captivates the audience with effective verbal cues and body language, while maintaining excellent eye contact · Speaks clearly, effectively and confidently, avoids all unnecessary pauses and varies tone and pitch appropriately · Projects a sense of individuality and an engaging personality dresses appropriately · Times the delivery to optimum advantage
Content	<ul style="list-style-type: none"> · Does not clearly define the topic or present the main idea or logically organize the information · Presentation lacks coherence, does not successfully answer the core question · Presents material that is lacking in substance and/ or relevance · Makes recommendations based on insufficient evidence 	<ul style="list-style-type: none"> · Clearly defines the topic and organizes the information logically and appropriately for its purpose. · Explains key findings and points. · Answers core question effectively and with an understanding of its relevancy, clearly linking evidence to thesis · Provides recommendations based on research 	<ul style="list-style-type: none"> · Clearly defines the topic and its significance · Organizes the information logically and appropriately for its purpose · Explains key findings and points with accurate and detailed evidence · Specifically addresses the core question and proposes viable solutions to the problem with detailed supporting evidence · Provides complex recommendations based on extensive research
Organization and Preparation	<ul style="list-style-type: none"> · Exhibits lack of planning and organization which results in a confusing overall presentation. · Presents in a choppy, hesitant manner lacking transitions. · Simplistically explains key points without appropriate and relevant supporting evidence, · Does not make effective use of notes or memory aides, · Ends the presentation without conclusions based on evidence 	<ul style="list-style-type: none"> · Presents logical transitions between main topics and ideas · Emphasizes key points · Uses notes or other memory aides effectively to structure presentation if necessary · Adjusts style of presentation to purpose and audience · Coherently ends presentation with conclusions based on evidence 	<ul style="list-style-type: none"> · Presents ideas and information with logical sequencing and seamless transitions · Develops and connects key points throughout and emphasizes them with rich, varied, and relevant supporting materials · Executes a flowing presentation, using notes or other memory aides if necessary · Ends the presentation with a logical, effective, and relevant conclusion
Media Use	<ul style="list-style-type: none"> · Selects inappropriate mediums for various elements of the presentation, · Use of media detracts from overall presentation 	<ul style="list-style-type: none"> · Selects and uses appropriate medium (text, images, sound, etc.) for each element of the presentation · Achieves coherence in the presentation as a whole and makes information easily understood 	<ul style="list-style-type: none"> · Selects and successfully uses appropriate medium for each element of the presentation · Enhances the overall quality of the presentation with skillful and judicious use of media
Responds to Questions	<ul style="list-style-type: none"> · Is unable to reference the appropriate content and performance standards · Is unable to answer the questions with accurate supporting evidence · Is tentative or unclear in 	<ul style="list-style-type: none"> · Is able to reference the appropriate content and applied learning standards, · Responds to all questions accurately, thoughtfully and truthfully 	<ul style="list-style-type: none"> · Connects the appropriate content and performance standards to all aspects of the presentation · Answers questions coherently and completely, addressing clearly each part to the question

Final Product Rubric

Rhode Island Diploma System Local Assessment Toolkits

Category	Below Standard	Meets Standard	Exceeds Standard
Finding/ Citing Information	<ul style="list-style-type: none"> · Does not provide necessary information from outside sources · Shows limited evidence of adequate research processes · Lacks proper MLA or APA citations 	<ul style="list-style-type: none"> · Acquires adequate information from multiple sources such as print, graphic, internet, computer databases, experimentation, and when appropriate generates primary source information · Supports arguments with detailed evidence, citing sources of information as appropriate using proper MLA or APA format 	<ul style="list-style-type: none"> · Acquires extensive and relevant information from multiple sources such as print, graphic, internet, computer databases, experimentation, and when appropriate generates primary source information · Shows evidence that is both extensive and relevant in research processes and uses a variety of appropriate options to enhance
Evaluating Information	<ul style="list-style-type: none"> · Excludes information that is relevant and/or critical that could enhance report · Is unable to differentiate between what is and is not accurate or reliable material 	<ul style="list-style-type: none"> · Includes relevant, accurate, and reliable information appropriate for the topic · Differentiates between what is relevant and credible to understanding of premise/topic. · Uses a range of strategies to elaborate and persuade such as definitions, descriptions, illustrations, and examples from 	<ul style="list-style-type: none"> · Clearly distinguishes the relevancy and reliability of information and its impact on the credibility of topic · Evaluates the accuracy and quality of the information along with sources used to access it
Analyzing and Synthesizing Information	<ul style="list-style-type: none"> · Includes a basic analysis with little or no attempt at synthesizing information into new knowledge 	<ul style="list-style-type: none"> · Conducts clear analysis of the information gathered · Advances a judgment that is interpretive or analytic 	<ul style="list-style-type: none"> · Conducts a thorough analysis of information and synthesizes it into new knowledge · Advances a judgment that is interpretive, analytical, evaluative, and reflective
Conventions	<ul style="list-style-type: none"> · Displays intrusive errors in control of most aspects of grammar, paragraph structure, punctuation that detract from the purpose and meaning of writing · Lack a clear introduction and/or closure 	<ul style="list-style-type: none"> · Demonstrates control of grammar, paragraph structure, punctuation, sentence construction, spelling, and usage · Uses appropriate methods of transitions including an introduction and a sense of closure 	<ul style="list-style-type: none"> · Demonstrates exemplary control of grammar, paragraph structure, punctuation, sentence construction, spelling, usage, and mastery of all aspects of writing process · Uses appropriate methods of transition and exhibits an awareness of the importance of precise word
Organization and Structure of Information	<ul style="list-style-type: none"> · Does not adequately address the core question and/or thesis statement · Fails to organize paper in a format that will enhance over-all integrity of topic and its purpose 	<ul style="list-style-type: none"> · Includes a well-defined thesis statement · Uses a range of appropriate strategies to answer the core question and /or thesis statement · Supplies pertinent facts and details to validate and/or support conceptualization of material 	<ul style="list-style-type: none"> · Uses a wide variety of skilled methods to reply to core question and /or thesis statement in a very substantive and meaningful manner · Provides extensive facts and details: describing or analyzing the subject, comparing and contrasting, naming and explaining benefits and limitations, demonstrating claims or assertions and providing a scenario

Designing a Product, Service, or System Rubric

Rhode Island Diploma System Local Assessment Toolkits

Category	Below Standard	Meets Standard	Exceeds Standard
Design Ideas	Demonstrates sophisticated ideas for the design of the service or system, which reflects awareness of similar work done by others and relevant design standards and regulations.	Demonstrates clear ideas for the design, which reflects awareness of similar work done by others and relevant design standards and regulations.	Demonstrates limited ideas for the design, which may not reflect awareness of similar work done by others and relevant design standards and regulations.
Choices	Provides detailed justification of choices made in finalizing the design, for example, functional, aesthetic, social, economic, and environmental consideration.	Justifies choices made in finalizing the design, for example, functional, aesthetic, social, economic, and/or environmental considerations.	Lacks justification of choices made in finalizing the design
Establishes Criteria	<ul style="list-style-type: none"> · Demonstrates considerable thought in establishing criteria for evaluating the product, service, or system. · Uses sophisticated conventions to represent 	<ul style="list-style-type: none"> · Demonstrates thought in establishing criteria for evaluating the product, service or system. · Uses appropriate conventions to represent the design. 	<ul style="list-style-type: none"> · Lacks criteria for evaluation of the product, service or system. · Lacks appropriate conventions to represent the product, service or system.
Implementation	<ul style="list-style-type: none"> · Provides a detailed outline of the planning and implementation steps necessary to create the product, service or system. · Makes creative adjustments as needed to conform with specified standards or regulations regarding quality or safety. 	<ul style="list-style-type: none"> · Provides evidence of good planning and implementing of steps needed to create the product, service, or system. · Makes adjustments as needed to conform with specified standards or regulations regarding quality or safety. 	<ul style="list-style-type: none"> · Does not provide description of the steps needed to plan and implement the product, service or system. · Lacks evidence of adjustments needed to conform with specified standards or regulations regarding quality or safety.
Product Evaluation	<ul style="list-style-type: none"> · Provides sophisticated evaluation of the product, service or system in terms of the criteria established in the design proposal and with reference to information gathered. · Provides accurate and in-depth comparisons with similar work done by others. 	<ul style="list-style-type: none"> · Provides thoughtful evaluation of the product, service, or system in terms of criteria established in the design proposal and with reference to information gathered. · Demonstrates relevant comparisons with similar work done by others. 	<ul style="list-style-type: none"> · Exhibits limited evaluation of the product, service or system in terms of the criteria established in the design proposal and with reference to information gathered. · Does not provide sufficient comparisons with similar work done by others.

Additional Annotated Rubric Sources

1. Rhode Island Capstone Handbook

Includes Rubrics for: Designing a Product, Improving a System, Planning an Event or Activity

Also includes Rubrics for *final product rubric* and for *oral presentation rubric*

Source: <http://www.ri.net/Skills/capstone/rubrics.html>

2. Assessment Framework for Capstone Design Courses.

Includes a Framework for assessing the roles and holistic behaviors of an engineer to include: Technical Roles, Interpersonal Roles, and Professional Roles.

Source: http://seniordesign.engr.uidaho.edu/papers/assessment_framework_for_capstone_design_courses.pdf

3. Oral Presentation Scoring Rubric

Source: www.oxfordpublicschools.org/file/4601/download

4. MASUK HS Capstone Handbook

This handbook details the following rubrics: fieldwork experience, reflection paper, and oral presentation

Source: <http://www.monroeps.org/resources/6/Documents/Capstone%20Handbook.pdf>

5. 2009-2010 High School Capstone Manual - Memphis City Schools

This manual for capstone projects has a rubric for the research paper, a presentation rubric and an overall product/performance rubric.

Source: www.mcsk12.net/schools/kingsbury.hs/.../CapstoneManual091049.p..

6. Coventry High School Capstone Rubrics

This website from a Rhode Island high school includes rubrics for: proposal, research, reflection, intellectual product, physical product, improving a system product, planning an event product, and oral presentation.

Source: <http://faculty.coventryschools.net/MarsellaAnthony/rubrics.htm>

7. Middletown High School Capstone Project Manual

This manual details the following rubrics: research paper, reflective essay, and an oral presentation.

Source: http://www.ri.net/middletown/mhs/graduation/capstone_manual.pdf

8. Mt. Ararat High School Capstone Project

This website provides a handbook, timeline, rubrics, and samples.

Source: <http://mta.msad75.schoolfusion.us/modules/cms/pages.phtml?sessionId=&pageid=244230>

9. Capstone Rubrics - Weymouth Public Schools.

This rubric gives points to each section to establish an overall proficiency rating for the project.

Source: www.weymouthschools.org/...High.../Capstone%20Rubric.pdf

10. Joseph Case High School Capstone Rubrics

Rubrics for: Proposal and Reflective Journal

Sources:

<http://casehigh.swanseaschools.org/modules/groups/homepagefiles/cms/1005133/File/capstone%20proposal%20rubric.pdf>

<http://casehigh.swanseaschools.org/modules/groups/homepagefiles/cms/1005133/File/Capstone%20Reflection%20Rubric.pdf>

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- East Windsor High School senior project handbook. (n.d.) Retrieved from <http://www.eastwindsork12.org/Content/WWW/CMS/files/Originals/attachments/Senior%20Project%201112.doc>
- Kansas City, Missouri School District. (n.d.). *Senior capstone project*. Retrieved from <http://www.kcpublicschools.org/cms/lib6/MO01001840/Centricity/Domain/101/KCPS%20Capstone%20Guide.pdf>
- Ohio Department of Education. (n.d.). *Senior capstone project*. Retrieved on April 1, 2013 from www.ode.state.oh.us/ctae
- Rhode Island Skills Commission. (2005, October). *Capstone project manual*. Retrieved on April 1, 2013 from <http://www.ride.ri.gov/highschoolreform/dslat/>
- Tech Prep senior project manual. (2002, Spring). Retrieved on April 30, 2013 from http://wvde.state.wv.us/counselors/students/senior_project_manual.doc.
- WHS capstone project handbook 2012-2013. (n.d.). Retrieved from http://www.weymouthschools.org/uploadedFiles/Weymouth_High_School/Teaching_and_Learning/Capstone%20Project%20Handbook%20Proposed%202013%20V4%203.pdf

You Tube Resources

- WHS 21 Capstone Project: The YOU credit** (3:28 min)
<http://www.youtube.com/watch?v=HwGpZTP199Q>
- Capstone - Real-World Learning in High School** (4:00 min)
<http://www.youtube.com/watch?v=5Qun80mKzc0>
- Bringing it all together: The Senior Capstone Project** (2:46 min)
<http://www.youtube.com/watch?v=7CM8AYjj1Ss>
- Capstone Projects- Webcast (Palos Verdes HS) (for parents)** (9:30 min)
<http://www.youtube.com/watch?v=U44eYkkam2Q>