STEM Capstone Curriculum Guide

Content Area: **Science**
Course(s): STEM Capstone
Length: **Full Year Course**

Statement of purpose

Students will gain an understanding of what is involved and expected in real world scientific research by completing an independent scientific research project in this course. Skills related to data collection and analysis, report writing and presentation, conducting research as well as designing and conducting an experiment are explored in depth. Students will engage in authentic research and lab work in this advanced material rigorous course.

Curriculum Guide

TABLE OF CONTENTS:

Unit 1: PREPARING A RESEARCH PROJECT

Content Area: STEM
Course(s): STEM CAPSTONE
Time Period: 40 class periods
Length: 8 weeks
Status: **Not Published**

Summary of the Unit

The unit introduces students to preparing research. It will provide the necessary foundation to write their own research proposal. The topics will include reading sources, developing the purpose for the research, citing sources, and writing a research proposal.

Enduring Understandings

- Both qualitative and quantitative data can be used to explore and explain scientific phenomena.
- Observation followed by questioning leads to good experimental design and investigations.
- Organized data collection is essential to valid conclusions and solutions.
- Models are an excellent way to show abstract concepts and communicate scientific information.
- Data analysis will help to show patterns and anomalies. Consistency in data is the result of good experimental design.
- Research requires recognizing bias and annotation of the text.
- Citing pertinent sources is a requirement for expanding upon a research question.

Essential Questions

How do observations lead to precise experimental design?

How do we utilize scientific theory to advance our understanding of facts?

What are the requirements for developing a good research proposal?

How can data be organized?

What sources are valid and credible?

Summative Assessment and/or Summative Criteria

Summative Assessments (Quarterly Exams, Tests, Quizzes, Lab Analyses and Conclusions, Rubric based assessment. Peer evaluation) Formative Assessments

Resources

Research Matters- A Guide to Research Writing Rebecca Moore Howard Syracuse University and Amy Rupiper Taggart North Dakota State University, McGraw-Hill

https://ori.hhs.gov/

Unit 1 Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks /Assessments	Standards: NJSLS
Preparation of Research 2 weeks	SWBAT: build knowledge, develop analytical skills, practice supporting claims with evidence,	MAKE IT YOUR OWN Activity 1	Topic Assessment	Reading: Science & Technical Subjects Key Ideas and Details NJSLSA.R1 Read

	recognize academic discourse, demonstrate skills for life problem solving and workplace.	week/Research matters text. https://ori.hhs.gov/module-1-introduction-what-research https://ori.hhs.gov/module-2-research-design https://ori.hhs.gov/module-3-elements-research https://ori.hhs.gov/module-4-methods-information-collection https://ori.hhs.gov/module-5-handling-information	Peer Evaluation Quiz	closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.RST.11-12.1. Accurately cite strong and thorough evidence from the text to
Reading Sources 1 week	SWBAT: read an abstract, table of contents, headings, Illustrations, introduction, and conclusion and use an index, avoid patchwriting, Utilize tech appropriately	Keeping a Reading Journal, Blog, Wiki Reading an annotated text.	Peer Evaluation Presentation Rubric	NJSLSA.R2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

		How HipHop Music lost its way and Betrayed Its Fans Steps for writing a summary. Reading to Write Activity		RST.11-12.2. Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
Exploring your Topic 2 weeks	SWBAT: maintain an ideal journal, constructively use the internet, library, and classroom tools, organize thoughts by freewriting, brainstorming and clustering using maps and webs, develop questions, discuss topics with classmates and teacher, develop a research question	WORK TOGETHER ACTIVITY ACTIVITY Interest Inventory activity Narrowing and Broadening topics Develop a Research question- 1 week	Peer Evaluation Debate Rubric	NJSLSA.R5 Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole. RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
Researching with Purpose	SWBAT: Recognize genre, Address the audience, write with	MAKE IT YOUR OWN ACTIVITY	Peer Evaluation	NJSLSA.R3 Analyze how and why individuals, events, or

1 week	purpose, and respond to context.	Responding to context	Essay rubric	ideas develop and interact over the course of a text. RST.11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. Craft and Structure NJSLSA.R4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. RST.11-12.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to

				grades 11–12 texts and topics. NJSLSA.R5 Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole. RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
Writing a Research Proposal 2 weeks	SWBAT: Construct a well written research proposal.	Independent Research	Peer Evaluation Unit Assessment	NJSLSA.W1 Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence. WHST.11-12.1. Write arguments focused on discipline-specific content. WHST.11-12.1a. Introduce precise,

			Research Proposal rubric	knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. WHST.11-12.1b. Develop claim(s) and counterclaims using sound reasoning and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline appropriate form that anticipates the audience's knowledge level, concerns, values,

Suggested Modifications for Special Education, ELL, and Gifted Students

Consistent with individual plans, when appropriate.

- Structure lessons around questions that are authentic, relate to students' interests, social/family background, and knowledge of their community.

- Provide students with multiple choices for how they can represent their understandings (e.g., multisensory techniques auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g., conversations via digital tools, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g., multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understanding.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide English Language Learners students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.

Suggested Technological Innovations/Use

- 8.2.12.E.1: Use research to create a product or system that addresses a problem and make modifications based on input from potential consumers.

- 8.1.8. E.1: Effective use of digital tools assists in gathering and managing information.

- 8.2.8. F.2: Technology is created through the application and appropriate use of technological resources.

- 8.2.8. D.1: Information literacy skills, research, data analysis and prediction are the basis for the effective design of technology systems.

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Cross Curricular/21st Century Connections

- 9.1 21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
- 9.2 21st Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.

- 9.3 21st Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

Unit 2: GATHERING AND EVALUATING INFORMATION

Content Area: STEM
Course(s): STEM CAPSTONE
Time Period: 28 Class Periods
Length: 6 weeks
Status: **Not Published**

Summary of the Unit

The unit will focus on gathering and evaluating information for research.

Enduring Understandings

- Recognizing high quality and relevant research is unbelievably valuable to the researcher.
- Utilizing good data collection strategies leads to data supported conclusions and solutions to problems.
- Data analysis and evaluation of evidence is the most important thing in determining if information is valuable.
- Asking valid questions with a follow-up is a skillset necessary to conduct a good interview and gain the information sought.

Essential Questions

How relevant is the source being utilized in relation to the research topic?

Why is logic important in conducting good research in databases?

How does one meet the challenges of online research?

What should be the preparation and approach to conducting an interview?

Summative Assessment and/or Summative Criteria

Summative Assessments (Quarterly Exams, Tests, Quizzes, Lab Analyses and Conclusions, Rubric based assessment. Peer evaluation) Formative Assessments

Resources

Research Matters- A Guide to Research Writing Rebecca Moore Howard Syracuse University and Amy Rupipe

Unit 2 Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks /Assessments	Standards
Gathering Information 3 Days	SWBAT: Find sources that are high quality and relevant	MAKE IT YOUR OWN- Gathering Information	Topic Assessment Peer Evaluation Quiz	NJSLSA.R2 Determine central ideas or themes of a text and analyze explanatio or their development; summarize the ke supporting details and ideas. RST.11-12.2. Determine the central idea themes, or conclusions of a text; summarize complex concepts, processes or information presented in a text by paraphrasing them in simpler but still accurate terms.
Online Research 1 Week	SWBAT: Utilize engine math and Boolean searches, Use advanced search options, access government libraries	Independent Research Group Activity	Peer Evaluation	NJSLSA.R2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. RST.11-12.2. Determine the central idea themes, or conclusions of a text; summarize complex concepts, processes or information presented in a text by

				paraphrasing them in simpler but still accurate terms.
Creating New Information 2 weeks	SWBAT: Distinguish between primary and secondary sources, utilize multimedia archives, conduct an interview, make observations, and conduct surveys.		QUIZ	NJSLSA.W1 Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence. WHST.11-12.1. Write arguments focused on discipline-specific content. WHST.11-12.1a. Introduce precise, knowledgeable claim(s), .
Evaluation of Relevant Information 3 Days	SWBAT: Determine which sources are relevant, judge reliability of sources, evaluate visual sources	Independent Research Group Activity on bias	Peer Evaluation	NJSLSA.R5 Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole. RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
Applying Organization to Research 3 Days	SWBAT: create organizers and folders to organize research, determine what to include in research notes.	Making a Graphic Organizer	Peer Evaluation	NJSLSA.W1 Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence. WHST.11-12.1. Write arguments focused on discipline-specific content.

				WHST.11-12.1a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. WHST.11-12.1b. Develop claim(s) and counterclaims using sound reasoning and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
Avoiding Plagiarism 2 Days	SWBAT: Take notes to avoid plagiarism, paraphrase and patch write, cite research.	Group Activity-paraphrasing		NJSLSA.W1 Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence. WHST.11-12.1. Write arguments focused on discipline-specific content. WHST.11-12.1a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. WHST.11-12.1b. Develop claim(s) and counterclaims using sound reasoning and thoroughly, supplying the most relevant data the relationships between claim(s)

				and reasons, between reasons and evidence, and between claim(s) and counterclaims. And evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. WHST.11-12.1c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify.
Formatting a Bibliography 2 Days	SWBAT: prepare an annotated bibliography.	Make it your own- Bibliography		NJSLSA.R7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. RST.11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) to address a question or solve a problem.

Suggested Modifications for Special Education, ELL, and Gifted Students

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Suggested Technological Innovations/Use

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- 8.1.8. E.1: Effective use of digital tools assists in gathering and managing information.

- 8.2.8. F.2: Technology is created through the application and appropriate use of technological resources.

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Cross Curricular/21st Century Connections

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Unit 3: DESIGNING AND CONDUCTING AN EXPERIMENT

Content Area: STEM
Course(s): STEM CAPSTONE
Time Period: 30 class Periods
Length: 6 weeks
Status: **Not Published**

Summary of the Unit

The unit will develop the ability of the student to design and conduct and experiment. Students will design a scientific experiment to answer a specific question. Good experimental design will be the focus.

Enduring Understandings

- Precise experimental design is necessary for scientific inquiry.
- Identifying and eliminating variables are important for efficiency.
- Writing clear procedures is paramount to performing an experiment in every setting.

- Constructive criticism by peers may result in better design outcomes.

Essential Questions

What question do you want answered in the experiment?
How are investigations/experiments planned?
What is the variable being tested?
How will the data be analyzed and interpreted?

Summative Assessment and/or Summative Criteria

Summative Assessments (Quarterly Exams, Tests, Quizzes, Lab Analyses and Conclusions, Rubric based assessment. Peer evaluation) Formative Assessments

Resources

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Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks /Assessments	Standards

				Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2), (HS-LS1-4) Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts Developing and Using Models Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.
Designing an experiment 3 weeks	SWBAT: Design a research project for another student/s to perform.	Design an experiment. Writing Clear Procedures Activity	Peer Evaluation Experiment Rubric	

Performance of student experiments 2 weeks	SWBAT: Perform an experiment designed by peers.	Perform an experiment that was designed by classmates.	Experiment Rubric Peer Evaluation	(HS-LS1-2) Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4), (HS-LS1-5), (HS-LS1-7) Planning and Carrying Out Investigations Planning and carrying out in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HSLS1-3)
Analysis of Data, Feedback and Design Improvements 1 week	SWBAT: provide and receive constructive feedback of experimental design. Discuss data and conclusions of each experiment.	Group Activity- Presentation of design and data	Presentation rubric	

				Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories. Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1) Construct and revise an explanation based on valid and reliable evidence

				obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6) NJSLSA.R1 Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. RST.11-12.1. Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.

Suggested Modifications for Special Education, ELL, and Gifted Students

Consistent with individual plans, when appropriate.

- Structure lessons around questions that are authentic, relate to students' interests, social/family background, and knowledge of their community.
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Suggested Technological Innovations/Use

- 8.2.12.E.1: Use research to create a product or system that addresses a problem and make modifications based on input from potential consumers.

- 8.1.8. E.1: Effective use of digital tools assists in gathering and managing information.

- 8.2.8. F.2: Technology is created through the application and appropriate use of technological resources.

- 8.2.8. D.1: Information literacy skills, research, data analysis and prediction are the basis for the effective design of technology systems.

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Cross Curricular/21st Century Connections

- 9.1 21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and critical thinking skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
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Unit 4: EXTERNSHIP

Content Area: STEM
Course(s): STEM CAPSTONE
Time Period: Half Year
Length: January-June
Status: **Not Published**

Summary of the Unit

The unit will provide students with the opportunity to observe and work in a STEM field of their choosing.

Enduring Understandings

- Real world experience will provide insight into career objectives.
- Observations of professionals is invaluable to learning.
- Reflection and documentation are immensely helpful to understand an experience.

Essential Questions

What does the profession look like on a day-to-day basis?
How can my skillset be valuable to the profession?
What are some areas of focus that will help successful outcomes?

Summative Assessment and/or Summative Criteria

Summative Assessments (Quarterly Exams, Tests, Quizzes, Lab Analyses and Conclusions, Rubric based assessment. Peer evaluation) Formative Assessments

Resources

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Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks /Assessments	Standards
Externship Half year January-June	SWBAT: Evaluate good practices in a STEM profession. Document the daily experience of a professional setting. Present findings of a profession to a peer group.	Journal writing Daily log of externship observations Presentation of externship experience	Presentation Rubric Observation logbook	NJSLSA.W9 Draw evidence from literary or informational texts to support analysis, reflection, and research. WHST.11-12.9. Draw evidence from informational texts to support analysis, reflection, and research. NJSLSA.W6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. WHST.11-12.6. Use technology, including the Internet, to produce, share, and update writing products in response to ongoing feedback, including new arguments or information.

Suggested Modifications for Special Education, ELL, and Gifted Students

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Suggested Technological Innovations/Use

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Unit 5: SCIENTIFIC ANALYSIS

Content Area: STEM
Course(s): STEM CAPSTONE
Time Period: 4 Weeks
Length: 20 Class Periods
Status: **Not Published**

Summary of the Unit

The unit will focus on developing analytical skills that can be applied to a real-world setting. Students will analyze models, graphs and charts and use mathematics to explain scientific phenomena.

Enduring Understandings

- Proper use of the scientific method is essential for accurate data analysis.
- Descriptive, Predictive and Prescriptive analysis of data all provide for good decision making and problem solving.
- Mathematics applied appropriately is extremely useful in explaining scientific phenomena.

Essential Questions

How can statistics be used to support scientific phenomena?
How can organization of data help with scientific analysis?
Why are models so useful in understanding science?

Summative Assessment and/or Summative Criteria

Summative Assessments (Quarterly Exams, Tests, Quizzes, Lab Analyses and Conclusions, Rubric based assessment. Peer evaluation) Formative Assessments

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Unit Plan

Topic/ Selection Timeframe	General Objectives	Instructional Activities	Benchmarks Assessments	Standards
Analyzing data from Scientific research 2 weeks Using Mathematics to explain Scientific Phenomena 1 week	SWBAT: Evaluate, analyze, and describe models of natural science phenomena and systems. Utilize models, charts, and graphs to analyze situations or solve problems. SWBAT: Utilize mathematics to explain scientific phenomena.	Research of Scientific Journals in field of interest. Analyze specific real-world research and present findings. Chi- Square Analysis	Presentation Rubric Quiz Assessment	NJSLSA.R1 Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. RST.11-12.1. Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. NJSLSA.R2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. RST.11-12.1. Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. NJSLSA.R3 Analyze how and why individuals, events, or ideas develop and interact over the course of a text. RST.11-12.3. Follow precisely a complex multistep procedure when carrying out experiments,

Refine a Scientific study. 1 week	SWBAT: Apply models and analysis to refine a scientific study.	Group Activity- Refining a study	Presentation Rubric	taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

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Unit 6: RESEARCH PROJECT AND PRESENTATION

Content Area: STEM
Course(s): STEM CAPSTONE
Time Period: 35 Class Periods
Length: 7 weeks
Status: **Not Published**

Summary of the Unit

The unit will provide students the opportunity to design a research project and present the research to their peers, school administration and experts in their field. The unit will focus on planning and designing a research project as well as presenting the research in a clear coherent fashion.

Enduring Understandings

- Research is developed by writing and refining the thesis, outline, and viewing counterevidence if available.
- Revising with the teacher and classmates allows for suggestions and improvements.
- Using a checklist for proofreading helps find and correct errors.
- Applying the pillars of superior design will assist in the creation of the presentation.

Essential Questions

What are the components of designing and presenting scientific information?

How can my classmates and teacher provide effective feedback that does not judge?

How can a presentation design be most effective in conveying research results?

How do you prepare to effectively defend research during a presentation?

Summative Assessment and/or Summative Criteria

Summative Assessments (Quarterly Exams, Tests, Quizzes, Lab Analyses and Conclusions, Rubric based assessment. Peer evaluation) Formative Assessments

Resources

Research Matters- A Guide to Research Writing Rebecca Moore Howard Syracuse University and Amy Rupipe Taggart North Dakota State University, McGraw-Hill

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks /Assessments	Standards
Understanding design principles 1 week	SWBAT: Prepare good research by developing a good draft, outline, title, paragraphs, and conclusion. SWBAT: Explain and support ideas, provide evidence and utilize counterevidence, use visuals, and provide good analysis of text.	Provide a draft of research paper. Activity: Matching visual evidence to claims	Topic Assessment Rough draft rubric	
Planning a design for project and using design principles 3 weeks	SWBAT: gain perspective of research by looking at the big picture to address purpose. Design a research paper/project by utilizing a personal checklist and revising with peer help.	Design research project Work together activity- Evaluating draft.	Peer Evaluation	NJSLSA.W8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. WHST.11-12.8. Gather relevan information from multiple authoritative print and digital sources, using advanced

				searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
Presenting research 3 weeks	SWBAT: apply principles of presentation design. Design and academic research essay. Organize and present research.	Creating a Presentation Group activity on writing an academic essay	Presentation Rubric Peer Evaluation Unit Assessment	Production and Distribution of Writing NJSLSA.W4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. WHST.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. NJSLSA.W5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. WHST.11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on

				addressing what is most significant for a specific purpose and audience. NJSLSA.W6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. WHST.11-12.6. Use technology, including the Internet, to produce, share, and update writing products in response to ongoing feedback, including new arguments or information. Research to Build and Present Knowledge NJSLSA.W7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. WHST.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

STANDARDS:

NJ: 2016 SLS: Literacy in History, Social Studies, Science, & Technical Subjects 6-12

Reading: Science & Technical Subjects

Key Ideas and Details
NJSLSA.R1 Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

RST.11-12.1. Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.

NJSLSA.R2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

RST.11-12.2. Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

NJSLSA.R3 Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

RST.11-12.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure
NJSLSA.R4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

RST.11-12.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

NJSLSA.R5 Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

NJSLSA.R6 Assess how point of view or purpose shapes the content and style of a text.

RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas
NJSLSA.R7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

RST.11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

NJSLSA.R8 Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

RST.11-12.8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

NJSLSA.R9 Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

RST.11-12.9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

NJSLSA.R10 Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.

RST.11-12.10. By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Writing

Text Types and Purposes
NJSLSA.W1 Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

WHST.11-12.1. Write arguments focused on discipline-specific content.

WHST.11-12.1a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

WHST.11-12.1b. Develop claim(s) and counterclaims using sound reasoning and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

WHST.11-12.1c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

WHST.11-12.1d. Establish and maintain a style and tone appropriate to the audience and purpose (e.g., formal and objective for academic writing) while attending to the norms and conventions of the discipline in which they are writing.

WHST.11-12.1e. Provide a concluding paragraph or section that supports the argument presented.

NJSLSA.W2 Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

WHST.11-12.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.11-12.2a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

WHST.11-12.2b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

WHST.11-12.2c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

WHST.11-12.2d. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

WHST.11-12.2e. Provide a concluding paragraph or section that supports the argument presented.

NJSLSA.W3 Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

NJSLSA.W4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

WHST.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

NJSLSA.W5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

WHST.11-12.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

NJSLSA.W6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

WHST.11-12.6. Use technology, including the Internet, to produce, share, and update writing products in response to ongoing feedback, including new arguments or information.

NJSLSA.W7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

WHST.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

NJSLSA.W8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

WHST.11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

NJSLSA.W9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

WHST.11-12.9. Draw evidence from informational texts to support analysis, reflection, and research.

NJSLSA.W10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

WHST.11-12.10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Suggested Modifications for Special Education, ELL, and Gifted Students

Consistent with individual plans, when appropriate.

- Structure lessons around questions that are authentic, relate to students' interests, social/family background, and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g., multisensory techniques auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g., conversations via digital tools, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g., multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understanding.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide English Language Learners students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.

Suggested Technological Innovations/Use

- 8.2.12.E.1: Use research to create a product or system that addresses a problem and make modifications based on input from potential consumers.

- 8.1.8. E.1: Effective use of digital tools assists in gathering and managing information.

- 8.2.8. F.2: Technology is created through the application and appropriate use of technological resources.

- 8.2.8. D.1: Information literacy skills, research, data analysis and prediction are the basis for the effective design of technology systems.

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Cross Curricular/21st Century Connections

- 9.1 21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
- 9.2 21st Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.

- 9.3 21st Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.