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Unit Number and Name:

TEMPLATE - NNPS Integrative STEM Unit Plan - http://goo.gl/vy9xZJ

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Overview
Author(s): Integrative STEM Connections: Biology, Life Science, Biotechnology, Health and Medical Science, English language Arts, Civics, Government, or other **STEM hands-on courses** (*change these links as necessary*)

Estimated Time Frame:	Days:	or	90-Minute Meetings:	Quarter:

Why the Unit Exists (Learning Rationale) (explanation)
UNIT NAME (from above) - This unit exists to provide students with a deeper understanding of _____. Students will understand how _____. Other enduring understandings and key concepts include _____.

Additional Information / Context (as needed) (explanation)
Instructors will continue to build upon _____ ideas and concepts that were covered in _____ SOL ____ and _____ (previous units or courses)..

Safety:

Safety must be given the highest priority in implementing the K-12 instructional program for science. Instructors should be aware of the Virginia guidelines for safety and the 2012 safety list for this unit and instruct students in safety.

Inquiry (remove or replace if not applicable)

- Instructors should use Inquiry methods like the 4-Question Strategy to lead students to discovering concepts for themselves using the questioning guides and hands-on investigations.
- Official position of the NSTA which includes more detailed information about Scientific Inquiry (remove if not applicable)
- The Nature of Science (remove or replace if not applicable) : This unit will continue to focus on student growth in understanding _____
- SOL 1 in most all Science courses

"C" - Instructors should note those lessons which require computer labs and reserve them in advance.
"R" – Required activities

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Stage 1: DESIRED RESULTS (explanation)		
College, Career, & Citizen Ready Skills	**Meaning: Enduring Understandings and Essential Questions**	
Skill 1: Critical Thinking Skill 2: Social Responsibility Skill 3: Problem Solving	Students will understand that… ● ● ●	Students will keep considering… ● ● ● ●

Stage 1: DESIRED RESULTS (explanation) – continued
Standards of Learning / National Standards
[Insert Standards or Competencies from the primary course(s) served by this unit.

Stage 1: DESIRED RESULTS (explanation)– continued		
Critical Vocabulary		**Acquisition: Knowledge and Skills**
		Students will know and be skilled at… Review VDOE Curriculum Framework to obtain the knowledge and skills for SOLs

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Stage 2: ASSESSMENT EVIDENCE (explanation)

Performance Assessment(s): Transfer of Learning

Students will be able to independently use their learning to…
The _____ Rubric (hyperlink if possible) is included for grading.

Sample Skills-Based Rubric

Rating	General Description	Unit-Specific Examples
4 - Exemplary	Student can teach others or provided demonstration-quality work	The model or prototype is sophisticated, publishable and without errors. The model and/or the student can lead others to complete the task at a proficient level.
3 - Proficient	Student is able to demonstrate understanding of the concepts without coaching or mentoring	The model or prototype is publishable and without errors, reflecting [relevant concepts].
2 - Improving	Student can demonstrate understanding with support or mentoring.	The model or prototype requires additional work to demonstrate an understanding of [relevant concepts].
1 - Remedial	Student participated but demonstrated no understanding	The student cannot explain her//his group model or prototype, and the model does not address the criteria established by the class.
0- No Participation	Student did not participate.	

Other Evidence (Tests, Quizzes, Academic Prompts, etc.)

_____ Unit

Quiz 1 (consider ungraded pop quizzes)
Quiz 2
Quiz 3
Quiz 4

Class or small group discussions

Online assessments

Test or Exam – Word and/or PDF versions
Test – Answer Key

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Design Process or Experimental criteria/constraints

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Stage 3: LEARNING PLAN AND RESOURCES (explanation)
7-E Learning Plan

Meeting 1

Hook: Activity, Demonstration, Video

ELICIT: Access prior knowledge.

ENGAGE: Focus on the desired topic(s) with a provocative question, image or demonstration.

Create a discussion utilizing larger themes, current events, controversy, or other strategies for engaging students and generating interest.

EXPLORE: Provide students with a common experience and foundation for developing an understanding of the concept.

Share the relevant NNPS objectives, SOL's or VERSO Skills / Competencies.

Provide an overview of concepts, essential questions, vocabulary, and resources.

Have students use a graphic organizer (e.g., a K-W-L chart) to determine a path for exploring the topic, concept, or problem.

Identify independent learning goals and homework timelines. Publish resources for student use.

7-E Learning Plan – continued

Meeting 2

Hook: Follow-up activity, demonstration or video.

EXPLAIN: Create an interactive environment for teaching and learning the concept.

Have students share their findings from individual or collaborations using any combination of traditional presentations or new digital storytelling strategies, wikis, blogs or other tools.

Introduce Performance Assessment and Essential Questions

Essential questions and the assessment plan will be introduced. At the end of this unit, you should be able to.....

Develop a collaborative summary document or portal connecting students findings.

Provide additional learning strategies (including lecture, notes, or hands-on exploration) to expand the scope of findings to the necessary breadth of the unit objectives, SOL's or VERSO skills/competencies.

Exit Ticket – Quick Write: Have students draft a summary of their understanding in their STEM notebook.

Identify independent learning goals and homework timelines. Publish additional resources for student use.

7-E Learning Plan – continued

Meeting 3 (add additional Meetings here as necessary)

Hook – Relevant Experimentation, Observations, or Readings: Explore recent or historical research or writings that demonstrate the relevance of the unit.

ELABORATE and EXPERIMENT: Have students apply their understandings to answer relevant questions or solve problems.

Have students propose an experiment to answer a question or and engineering design process to create and test a solution to a problem. In either case, it's best if the question or problem is identified by the student(s).

Scientific Experiment:

1. Propose a question
2. Conduct background research (in addition to previous exploration)
3. Propose a hypothesis and experimental design
4. Conduct the experiment
5. Revise the hypothesis or experimental design as necessary
6. Share findings

Engineering Design Process:

1. Identify a problem
2. Conduct background research (in addition to previous exploration)
3. Identify criteria and constraints (safety, costs, size, and Instructor restrictions)
4. Explore and select a proposed solution
5. Build a model or prototype
6. Test the model or prototype against the criteria and constraints
7. Revise or refine the model (redesign)
8. Share findings

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Provide additional learning strategies (including lecture, notes, or hands-on exploration) to expand the scope of findings to the necessary breadth of the unit objectives, SOL's or VERSO skills/competencies.

Exit Ticket – Quick Write: Have students draft a summary of their understanding in their STEM notebook.

Identify independent learning goals and homework timelines. Publish additional resources for student use.

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7-E Learning Plan – continued

Meeting 4

Hook:

EVALUATE: Have students demonstrate their understandings and reflect on their learning.

Activities:

A summative assessment, built on two or more earlier formative assessments may include any of the following:

1. **a test or exam**
2. **a presentation of their experiment or design process with an established rubric; or**
3. **relevant writing formats such as a research report / article, white paper, advocacy or opinion paper, technical manual, etc.**

Provide additional learning strategies and tools for addressing misunderstandings (including supplemental lecture, notes, or hands-on exploration) to expand the scope of findings to the necessary breadth of the unit objectives, SOL's or VERSO skills/competencies.

Exit Ticket – Quick Write: Have students draft a summary of their understanding in their STEM notebook.

Identify independent learning goals and homework timelines. Publish additional resources for student use.

Learning Plan – continued

Discussion/Workshop 5 – can be extended throughout the duration of the quarter, semester or school year.

Hook:

EXTEND: Reinforce understandings with new contexts or challenges.

Provide individual or collaborative approaches that facilitate creativity, synthesis and synergy.

Encourage students to identify new community or global contexts, products, and solutions.

Provide suggestions or examples for students or teams that do not identify their own extended learning constructs.

This can be the foundation for a STEM expo, Science and Engineering Fair, VJAS, or other event.

Stage 3: LEARNING PLAN AND RESOURCES (explanation) – continued
Wrap-Up

(Review enduring understanding(s), essential questions.)

1. What questions remain?

2. What next steps would you consider in exploring protein synthesis and other DNA technologies?

3. What recommendations do you have for someone wanting to learn about protein synthesis?

4. Why will DNA technologies be increasingly important, and possibly controversial?

(continued)

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Stage 3: LEARNING PLAN AND RESOURCES (explanation) – continued
Language Objectives
Reading: Preparation, review **Listening**: Initial instructions, collaborating **Speaking**: Summarizing, mentoring, asking questions **Writing**: Documentation, sharing and reporting, summarizing **Guiding Questions**: How did you create your project, model or prototype? Analyze how your project, model or prototype addresses the assignment's criteria and constraints. Evaluate whether your products, or solutions address the problem or objective you are trying to solve. Key vocabulary: (see above)

Stage 3: LEARNING PLAN AND RESOURCES (explanation) – continued
Differentiation / Personalized Learning
Accommodations: Work with resource Instructors to guide students through online forms and collaboration tools; provide a presentation template with additional infrastructure already added (additional headings, suggested images or web resources); allow for recorded presentations with guest student narrators. **Other support**: **Remediation** – Provide review materials from relevant earlier lessons and units. Provide online resources; Collaborate with resource Instructors. **Enrichment or early finishers** – After-school lab time, emphasize "Extended Learning Activities or additional research or modeling. **Various learning styles** – Encourage strategic delegation of project responsibilities. **Limited English proficiency** – Use Google Translate or Chrome Browser Translate features to provide templates and online resources in multiple languages.

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Stage 3: LEARNING PLAN AND RESOURCES (explanation) – continued
Integration with Other Subject Areas (Interdisciplinary Connections)

Include any overlapping concepts and big ideas from other disciplines.

- **Language Arts**: Presentations and technical writing
- **Math**:
- **Other Sciences**: molecular structures, bonds
- **Social Sciences**: policy-making, government incentives and regulation;
- **Health/PE**: safety, pollution, nutrition, medicine
- **World Languages**: translations, cultural perspectives
- **Economics/Finance**: budgeting and cost-benefit analysis
- **Technology**: design and design processes; history of genetic engineering
- **Engineering**: design processes, criteria and constraints, models and prototypes, evaluation and testing, problem-solving
- **Other CTE**: biotechnology, biotechnology in agriculture, health and medical technologies
- **Visual Arts**: models and simulations, drawings
- **Performing Arts**: presentation, interpretive dance simulations

Stage 3: LEARNING PLAN AND RESOURCES (explanation) – continued
Instructor REFLECTION

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Were my students talking about the subject, or was I doing all of the talking and students were just listening to me? **Were my students engaged at the beginning of the lesson?** **How much time did I spend reviewing homework, and how much time did I spend on new material?** **Did the students respond to "How" and "Why" questions?** **Did my students have an opportunity to discuss and/or write about the topic?** **What changes would I make next time the lesson is taught?** **What steps do I need to take next in this topic?**

Stage 3: LEARNING PLAN AND RESOURCES (explanation) – continued
Resources
Instructor Helpful Hints Below are the links, passwords and information on how to get signed up, or how to use the tool.