**QUALITY PERFORMANCE ASSESSMENT PLAN**

Task Title: Wiring a Real-World Circuit

**Subject Area/Course: Physical Science**

**Grade Level:** HS

**Abstract/Summary:** Students are tasked with designing a complex circuit that incorporates at least five different electrical devices. All devices must be run using a 15 volt DC power supply, but must operate at design voltages between 2 to 15 volts. This requires the use of resistors in the circuit.

**Time Needed to Complete Task: 2 weeks**

**Original Author:** Robert Rotier and Nathan Carle

|  |
| --- |
| **ALIGN: Instructional Goals***Please select competencies, work study practices, skills, and content that you will assess with this Performance Assessment Task.*  |
| **New Hampshire Competencies** Please write out the entire competency. We recommend no more than 2-3 competencies. We are looking to assess every aspect of the competency chosen. * **Math competencies**
* **Science competencies**
* **ELA competencies**
 |
| * Science 4. Analyze, investigate, or design models that incorporate inputs, outputs, interactions, and behaviors of a natural or human designed system and use data to evaluate the accuracy of models.
* Science 5.  Analyze evidence from a variety of sources (investigations, models) to predict, connect and/or evaluate the cycling of matter and flow of energy within, between or among increasingly complex systems.
* Science 6. Explain or evaluate the relationships among structure and functions of natural and human designed objects and systems using evidence to support claims.
* Science 8. Generate testable questions or define problems, plan and conduct investigations, analyze and interpret data, construct explanations, and effectively communicate conclusions.
 |
| **New Hampshire Work Study Practices** Please write out the entire work study practice. We recommend no more than 1-2 work study practices. * **Work study practices**
 |
| Collaboration I can work in diverse groups to achieve a common goal. Graduating seniors will be able to demonstrate that they can: •Contribute respectfully •Listen and share resources and ideas •Accept and fulfill roles for the purpose of completing a complex task •Exercise flexibility and willingness to compromise |
| **Other Goals** * **Standards, 21st century skills, and school-specific goals**
 |
| n/a |
| **Depth of Knowledge Alignment*** **What is the DOK of this task? Provide evidence.**
 |
| This task reaches a DOK 3. The task requires students to explain the data that they gathered and connect that data to their understanding of the science of electricity and energy transfer. Students also have to explain the difference between their calculated and actual values.  |
| **Essential Questions to Guide Learning and Inquiry** * What is the big idea and/or enduring understanding? Example: How are angles used in building a house?
* How does the essential question connect with the enduring understanding of the curriculum unit?
 |
| How does energy flow through the circuitry in your house?  |
| **Students will know (content) . . .** * Bullet points
* Specify discreet content and key concepts that align to the competencies and standards (e.g., types of angles)
 | **Students will be able to (skills). . .** * Bullet points
* Specify process and skills that align to the competencies and standards
* Start with a verb (e.g., justify why an angle is classified the way it is)
 |
| * Energy flow in electricity
* Electrical power
* Voltage
* Electrical current
* Components and function of circuits.
 | * justify the data collected in an experiment
* compare the calculated vs. actual data and explain difference
* analyze inputs and outputs of a system and explain how these interact
* design and test a model of a system
 |
| **DESIGN: Performance Task and Evidence** *Please design a performance task that will provide evidence of the competencies, work study practices, skills, and content that are listed above.* |
| **Common performance task summary** This is a high level summary about what the students will be doing. It should be no more than 3-5 sentences or bullet points.  |
| Students are tasked with designing a complex circuit that incorporates at least five different electrical devices. All devices must be run using a 15 volt DC power supply, but must operate at design voltages between 2 to 15 volts. This requires the use of resistors in the circuit. |
| **Key criteria for performance assessment** Please list the criteria used in the rubric. We recommend no more than 4-5 criteria. These criteria should come from the competencies, standards, work study practices, skills and/or content. |
| * Preliminary Drawing and Plan
* Experimental Data
* Final Schematic Drawing
* Anticipated Results Calculations
* Measured Data and Results
* Calculations
* Communication of Findings
 |
| **Possible Accommodations** What will teachers do in terms of instruction, curriculum and assessment to support the learning of SPED/ELL/other students in class? * Presentation accommodations
* Response accommodations
* Setting accommodations
* Timing and scheduling accommodations
 | **Resources/Texts/Scaffolding Materials** What’s included here depends on the task assignment. It is recommended that a variety of resources are provided that allow students to make choices to access the information needed to complete the assignment. |
| * Some students may be given additional time to complete the written report requirements.
* The directions may be read aloud or they may be explained individually to a particular student.
* Anything that is done in groups can be supported as needed with additional scaffolding. The assessment is measuring the students’ understanding of the science concepts in the individual written explanations, not in the construction of the circuit.
 | * A motor with a two-way switch
* a holiday bulb
* A DC Power Supply capable of providing 15.0 V DC at 1.5 amperes maximum
* Wire
* A switch to turn everything on or off (A circuit breaker)
* A supply of various resistors (you have a limited number of resistors and limited resistance values)
* Potentially drawing software (can be done by hand)
 |
| **Teacher Guide**  |
| **Pre-requisites and Placement in the Curriculum**When in the year will this take place? What skills and concepts should be covered before the students perform this task? |
| Basics of electrical power, voltage, current, and circuits.  |
| **Possible Formative Assessments**How do I assess my students’ understanding about the performance requirements of the task (e.g., milestones, benchmarks, observations, dialogues, student reflection, quizzes)? How do I adjust my instruction accordingly? |
| The three phases serve as milestones and a chance for feedback. |
| **Teacher Instructions**To ensure the fidelity in implementation, this section includes:* Step-by-step procedures to implement task as designed
* Information on the time allotted for each step of the task
* Materials needed
 |
| 1. Review the instructions for the materials. If you do not have access to these materials or if you do not have access to enough of these materials for each small group, you may need to modify the task accordingly. If you modify the task, be sure to maintain the same written pieces. 2. Start by giving the students the overall instructions (pages 1 and 2). The sheets with instructions for each phase can be handed out as the phases come up. 3. Review the task and the rubric and any questions that the students may have before beginning the task. You may wish to give students a sample engineering design plan for a different product to support their thinking about the written pieces. There are no formatting requirements for this piece as it is left open to the student to decide how to organize and communicate their thoughts. 4. Have the students form groups. You can form these groups if you feel necessary. Groups should be 2-4 students. 5. As needed, you may support students with some of the technical pieces of the task. Always encourage students to try something before asking for assistance. Only give assistance if a student can articulate a concrete question that shows thought about the science. While the goal is to have the students construct a circuit, the true scientific understanding that we are trying to measure is whether or not the student understands how energy flows throughout the system. This will be measured using the written reports that are handed in. 6. At each phase, collect the information from the groups. It is encouraged to provide feedback to the groups.  |
| **Teaching/Learning Plan***To be completed by individual teacher, as learning plan may vary by teacher* The lesson plan is written as an outline that other teachers could understand and/or apply in their respective classroom (s). This generally outlines the scope and sequence of the lesson plans within the unit. It is recommended that the following are included: * The lesson plan includes how the goals will be addressed (what students know and can do
* The different steps and the specific instructions that correspond with each step of the process
* A timeline for each task
* Time or space for student reflection and feedback
 |
| **Sample Timeline:** Phase 1: Introduce task, form groups, and group sections. (2 days) Phase 1: Individual plan write-up (1 day)Phase 2: calculations and final drawing (1 day)Phase 3: construction of circuit (1 day)Phase 3: collection of data (2 days)Phase 3: Report (2 days)Reflection (1 day) |