**NGSS ENGINEERING PRACTICES RUBRIC**

**STUDENT(S): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DATE: \_\_\_\_\_\_\_\_\_\_\_**

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| Engineering Practice (NGSS) | Goals | Beginning | Progressing | Proficient | Advanced |
| Defining problems | Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. | We understood the design problem. | We understood the design problem. We attended to some of the constraints of the problem. We used some science knowledge to limit possible solutions. | We had a good understanding of the design problem. We attended to multiple criterion and constraints. We used science knowledge to limit possible solutions. | We had an exceptional understanding of the design problem and could clearly articulate it. We attended to multiple criterion and constraints and understood the relationships between them. We used science knowledge and could clearly articulate the science behind our design. |
| Developing and using models | Develop or modify a model— based on evidence – to match what happens if a variable or component of a system is changed. | We noticed the direction of change when we changed one building or programming variable of the prototype. For example, we saw that if we increased the motor power, the prototype went faster. | We noticed the direction of change when we changed more than one building or programming variable of the prototype. | We created a mental model of our prototype’s behavior. We understood and could name the all inputs and outputs of the prototype and we understood the direction of each building or programming variable. | We used a mental model of the prototype to understand the relationships between inputs and outputs in the prototype and we could write the formula of each relationship between each input and output. |
| Planning and carrying out investigations | Collect data about the performance of a proposed object, tool, process or system under a range of conditions. Evaluate the accuracy of various methods for collecting data. | We collected data on the performance of our prototype under at least one condition. | We collected data on the performance of their prototype under more than one condition. | We collected data on the performance of our prototype under a range of conditions. We evaluated the accuracy of our data collection method(s). | We collected significant amounts of data under a wide range of conditions. We improved the accuracy of our data collection methods |
| Analyzing and interpreting data | Analyze data to define an optimal operational range for a proposed object, tool, process or system that best meets criteria for success. Consider limitations of data analysis (e.g., measurement error), and/or seek to improve precision and accuracy of data with better technological tools and methods (e.g., multiple trials). | We collected some performance data of our prototype. | We collected performance data on our prototype using a single trial. We analyzed the performance data of the single trial. | We collected performance data of our prototype using multiple trials. We analyzed the performance data from multiple trials. We considered the limitations of data collection and analysis. | We collected some performance data of our prototype using multiple trials. We analyzed data on the performance of our prototype using multiple trials. We created and/or used different tools to improve precision and accuracy of the data. |
| Using mathematics and computational thinking | Use digital tools and/or mathematical concepts and arguments to test and compare proposed solutions to an engineering design problem.   Apply mathematical concepts and/or processes (e.g., ratio, rate, percent, basic operations, simple algebra) to scientific and engineering questions and problems.  Create algorithms (a series of ordered steps) to solve a problem. | We found a good solution to the design problem using trial and error. | We used some digital tools and/or mathematical arguments to test and compare proposed solutions to an engineering design problem. | We used digital tools or mathematical concepts and arguments to test and compare proposed solutions to an engineering design problem.   We created algorithms to solve the problem. | We used digital tools and mathematical concepts and arguments to test and compare proposed solutions to an engineering design problem.   We created clever and efficient algorithms to solve the problem. |
| Designing solutions | Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and re- testing.   Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system. | We completed a design project, engaging in the design cycle, to construct and implement a solution. | We completed a design project, engaging in the design cycle, to construct and implement a solution that met specific design criteria and constraints. We applied some scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system. | We completed a design project, engaging in the design cycle, to construct and implement a solution that met specific design criteria and constraints. We optimized performance of a design by using some of the following: prioritizing criteria, making tradeoffs, testing, revising, and re- testing.   We applied scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system. | We creatively used the engineering design process to implement a solution that exceeded specific design criteria and constraints. We optimized performance of a design by using of the following: prioritizing criteria, making tradeoffs, testing, revising, and re- testing. We applied and could clearly articulate many a scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system. |
| Engaging in argument from evidence | Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. | We considered one design idea. | We evaluated at least 2 different competing design solutions. | We evaluated more than 2-3 competing design solutions based on jointly developed and agreed-upon design criteria. | We evaluated more than 3 competing design solutions based on jointly developed and agreed-upon design criteria. |
| Obtaining, evaluating, and communicating information | * Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations. | We described our solution in writing or through oral presentations. | We described our solution using scientific and technical information in writing or through oral presentations. | * We described our solution using clear and accurate scientific and technical information in writing or through oral presentations. | We creatively described our solution using clear and accurate scientific and technical information in writing or through oral presentations. |