2011-12 Official Scientific Inquiry/Engineering Design Scoring Guides
Grades 4 and 5

	SI- Forming a Question or Hypothesis *Based on observations and science principles, select a question or form a hypothesis that can be tested through scientific investigation.*	ED- Identifying and Defining a Problem to be Solved *Based on observations and scientific principles, formulate the statement of a problem or a need that can be addressed through the process of engineering design.*	
5/6**	• Forms a testable question or forms a hypothesis that clearly guides the design of a scientific investigation. • Uses specific observations and relevant scientific principles from multiple sources to independently frame an investigation.	• Clearly identifies a problem that needs to be addressed, and defines and prioritizes design criteria and constraints. • Clearly connects prior knowledge, observations, or scientific principles to clarify and explain the problem.	**5/6****
4	• Selects a testable question or forms a hypothesis that can be used to guide the design of a scientific investigation. • Uses observations and relevant scientific principles to frame an investigation.	• Identifies a problem that needs to be addressed, and specifies design criteria and constraints. • Uses prior knowledge, preliminary observations, or scientific principles to clarify the problem.	**4**
3	• Selects a question or forms a hypothesis that is of partial use in the design of a scientific investigation. • Uses observations and limited scientific principles to frame an investigation.	• Identifies a problem that needs to be addressed, and partially identifies design criteria and constraints. • Uses limited and/or some irrelevant prior knowledge, preliminary observations, or scientific principles to clarify the problem.	**3**
1/2*	• Selects a question that cannot be used to design a scientific investigation or form a hypothesis. • Uses limited observations and/or scientific principles to frame an incomplete investigation.	• Identifies a problem that needs to be addressed, but design criteria and constraints are minimal or lacking. • Uses only irrelevant prior knowledge, preliminary observations, or scientific principles to clarify the problem.	**1/2***

**5 for preponderance (most) completed, 6 for all completed.
* 2 for preponderance (most) completed, 1 for less completed or missing.
A hypothesis may be stated as a claim.
Observations may include background information.

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	SI- Designing an Investigation. *Design a scientific investigation to answer a question or test hypotheses using appropriate tools and procedures.*	**ED- Generating Possible Solutions** *Select an engineering solution, and evaluate that solution using criteria and constraints.*	
5/6**	• Designs a practical and reproducible plan that includes relevant tools and detailed procedures for an investigation that addresses the question. • Describes a logical procedure that identifies the relevant variables for collecting accurate and reliable data. • Presents a detailed, systematic plan and procedure incorporating consistent multiple trials or observations.	• Proposes and describes a variety of possible engineering solutions that are distinctly and individually different. • Evaluates the proposed solutions in terms of the degree to which they meet design and performance criteria, constraints and priorities. • Selects and justifies a proposed solution for testing.	**5/6****
4	• Designs a practical plan that includes relevant tools and procedures for an investigation that addresses the question. • Describes a logical procedure for collecting appropriate data. • Presents a plan and procedure incorporating multiple trials or observations.	• Proposes an engineering solution to the identified problem. • Evaluates the proposed solution in terms of design criteria and constraints.	**4**
3	• Designs a plan that includes inappropriate tools or limited procedures which do not adequately address the question. • Describes a procedure which would result in the collection of incomplete data. • Presents a plan and procedure with inadequate trials or observations.	• Proposes an engineering solution that incompletely addresses the problem. • Partially evaluates the proposed solution in terms of design criteria and constraints.	**3**
1/2*	• Designs a plan that does not address the question. • Describes a procedure which would result in the collection of inaccurate or irrelevant data. • Presents a plan and procedure lacking multiple trials or observations.	• Proposes an impractical engineering solution to the problem identified. • Evaluates the proposed solution without consideration of design criteria and constraints.	**1/2***

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	SI- Collecting and Presenting Data *Collect, record, and organize data from investigations.* (Student-directed with Teacher Support)	**ED- Testing Solution(s) and Collecting Data** *Test solution(s) by collecting, organizing, and displaying data to facilitate the analysis of test results.*	
5/6**	• Designs a detailed and logical data-collection method using multiple trials and/or observations. • Collects and records accurate and detailed data or observations consistent with the planned procedure. • Accurately transfers original data into a useful format that enhances thorough analysis (e.g., graphs, tables, diagrams, averages, percentages) with minimal teacher support.	• Design and build a prototype of a solution that addresses the criteria and constraints and can be tested with appropriate tools, materials and resources. Design may incorporate modifications made during construction. • Thoroughly records the results from testing the solution and identifies unexpected outcomes. • Presents complete results in a format that facilitates analysis, informs conclusions and addresses the criteria and constraints.	**5/6****
4	• Designs an appropriate data-collection method using multiple trials and/or observations. • Collects and records data or observations generally consistent with the planned procedure. • Transfers original data into a useful format for analysis (e.g., graphs, tables, diagrams, averages, percentages).	• Design and build a prototype of a solution that addresses the problem and can be tested with appropriate tools, materials and resources. • Records the results from testing the solution. • Presents results in a format that facilitates analysis.	**4**
3	• Designs a data-collection method lacking multiple trials and/or observations. • Collects and records data or observations only partially consistent with the planned procedure. • Transfers original data into a format that is not useful for analysis (e.g., graphs, tables, diagrams, averages, percentages) or is presented with several errors.	• Design and build a prototype of a solution that partially addresses the problem and can be tested with appropriate tools, materials and resources. • Records limited results from testing the solution. • Presents results that are incomplete or in a format that does not facilitate analysis.	**3**
1/2*	• Designs a data-collection method that includes unclear or disconnected observations. • Collects and records data or observations inconsistent with the planned procedure. • Incorrectly or does not transfer original data.	• Design and build a prototype of a solution that does not address the problem or cannot be tested with appropriate tools, materials and resources. • Records inaccurate or irrelevant results from testing the solution. • Presents results that are incomplete or inaccurate and do not facilitate analysis.	**1/2***

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(Teacher guidance in safety and ethics is necessary.)

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	SI- Analyzing and Interpreting Results *Summarize, analyze and interpret data from an investigation that address the identified question or hypothesis.*	**ED- Analyzing and Interpreting Results** *Summarize and analyze test results to evaluate the success of the proposed solution in terms of criteria, constraints, and other factors.*	
5/6**	• Uses data or observations to clearly support and defend a thorough and accurate explanation of the results. • States a detailed conclusion which identifies and explains variables, errors, limitations, patterns in the data, and possible explanations for results. Suggests changes to improve the investigation. • Clearly communicates and identifies the most relevant results to fully address the original question or hypothesis.	• Comprehensively summarizes results from testing with attention to whether criteria and constraints were met. • Makes a detailed determination as to whether the proposed solution is feasible in terms of factors such as cost, safety, appearance and environmental impact. • Explains the degree to which the solution may create other problems and/or suggests implications if the solution fails and suggests design modifications to address negative outcomes.	**5/6****
4	• Uses data or observations to support a reasonable explanation of the results. • States a conclusion which discusses some variables, errors, limitations, patterns in the data, or possible explanations for results. • Clearly communicates the relationship of the results to the original question or hypothesis.	• Summarizes results from testing with attention to whether criteria and constraints were met. • Makes a determination as to whether the proposed solution is feasible in terms of factors such as cost, safety, appearance and environmental impact. • Explains how the solution may create other problems and/or suggests implications if the solution fails.	**4**
3	• Partially uses the data or observations to support a reasonable explanation of the results. • States a conclusion with minimal discussion of variables, errors, limitations, patterns in the data, or possible explanations for results. • Partially communicates the relationship of the results to the original question or hypothesis.	• Summarizes results from testing with limited attention to whether criteria and constraints were met. • Makes a limited determination as to whether the proposed solution is feasible in terms of factors such as cost, safety, appearance and environmental impact. • Demonstrates some understanding that the solution may create other problems or the implications if the solution fails.	**3**
1/2*	• Data or observations are not connected to an explanation of the results. • States a conclusion that does not include discussion of variables, errors, limitations, patterns in the data, or possible explanations for results. • Inaccurately communicates the relationship of the results to the original question or hypothesis.	• Summarized results from testing are presented without consideration of criteria and constraints. • Determination of the proposed solution's feasibility does not consider cost, safety, appearance or environmental impact. • Demonstrates little understanding that the solution may create other problems or the implications if the solution fails.	**1/2***

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