Rubrics

Engineering Design Project Rubric (4th-12th grade)

All engineering projects must clearly distinguish between your work and thoughts and the work and thoughts of others. Students participating in an engineering opportunity in industry, a university, hospital, or institution other than their school, must explain what are their ideas in the log book vs. information given by professionals. Higher points will be awarded for depth of scientific thinking and thoroughness of descriptions.

	Exemplary	Accomplished	Developing	Beginning
Design 8 total points	**Original and/or unique** problem is **clearly defined** (i.e.what is the problem, who has it, why it's important to solve).	**Practical** problem is **clearly defined** (i.e.what is the problem, who has it, why it's important to solve).	Problem is **defined** (i.e.what is the problem, who has it, why it's important to solve).	Problem is **generally defined** (i.e.what is the problem, who has it, why it's important to solve).
	4	3	2	1
	Criteria (i.e. requirements) for proposed solution are defined. Solution is **unique**. Constraints (i.e. limitations) for proposed solutions are **explained**.	Criteria (i.e. requirements) for proposed solution are defined. Constraints (i.e. limitations) for proposed are **explained**.	Criteria (i.e. requirements) for proposed solution are **listed or generally defined**. Constraints (i.e. limitations) are **listed or generally explained**.	Criteria (i.e. requirements) for proposed solution are **listed or generally defined** ***OR*** Constraints (i.e. limitations) are **listed**.
	4	3	2	1
	Notes: *Depth and breadth of engineering design should take into consideration the student's grade level.*			
Solution: Develop and Test 12 total points	Prototype solution demonstrates intended design. Prototype has been tested in **multiple conditions/trials**.	Prototype solution demonstrates intended design. Prototype has been tested in **multiple conditions/trials.**	Prototype solution may demonstrate intended design. Prototype has been **tested.**	Prototype solution may demonstrate intended design. Prototype may be **untested** or testing is general or unclear.
	4	3	2	1
	Testing procedures are systematic **and** can be replicated. Design changes are explained and **clearly related** to data collection during tests. Equipment and materials are used **ingeniously.**	Testing procedures are systematic **and/or** can be replicated. Some design changes are **described or explained**. Equipment and materials are used as **intended**.	Testing procedures are described.	Testing procedures may be described, but unclear.
	4	3	2	1

Solution: Develop and Test (continued)	Prototype solution demonstrates engineering skill (i.e. final design is **markedly** improved from process of testing **and** data analysis).	Prototype solution demonstrates engineering skill (i.e. final design is improved from process of testing **and** data analysis).	Prototype solution demonstrates **developing** engineering skill (i.e. final design is improved from process of testing **or** data analysis).	Prototype solution demonstrates **beginning** engineering skill (i.e. final design **may be** improved).
	4	3	2	1
	Notes: Any level of assistance received is clearly identified.			
Conclusion 12 total points	Data is **interpreted** and logical conclusions are **drawn and justified** using evidence (relevant data) from testing.	Data is **interpreted** and logical conclusions are **drawn** using evidence (relevant data) from testing. Conclusions **connect** to the RQ and hypothesis. .	Data is **described**. Conclusions, if drawn, generally relate to data from testing. Conclusions **generally relate** to RQ and hypothesis or prediction.	Data may be **identified**. Conclusions, if drawn, simply relate to data in the study or to the field of study in general. Conclusions connect to the field of study or other areas of interest.
	4	3	2	1
	Conclusions **directly address** the final solution and are **compared** to research done prior to testing.	Conclusions **connect to** the final solution and are **compared** to research done prior to testing.	Conclusions **generally relate to** the final solution and **may be compared** to research done prior to testing.	Conclusions, if drawn, connect to the field of study or other areas of interest rather than testing or prior research.
	4	3	2	1
	Learning from project completion is **explained**. Product or process has a **strong potential** to eventually become feasible economically and ecologically.	Learning from project completion is **described.** Product or process has the **potential** to eventually become feasible economically and ecologically.	Learning from project completion is **identified.** Product or process **may have the potential** to eventually become feasible economically and ecologically. **More testing** is needed.	Learning from project completion may be **identified.** Product or process is **hypothetical**, may need **more testing and developmen**t to become feasible economically and ecologically.
	4	3	2	1
	Note: *Students interpret data after data analysis to identify patterns or relationships especially related to the final solution. Interpretation of data is appropriate for a student's grade level (i.e. middle and high school students may consider limitations in their data analysis such as measurement error, but this is not expected of younger students). A data description would be re-stating data rather than finding patterns or meaning (interpretation)*			

Display **(Communicating Scientifically)** 12 total points	Parts of the engineering process are identified and **logically** organized. Text is appropriate for **communicating scientifically** and vocabulary is specific to the field of study.	Parts of the engineering process are identified and organized. Text is appropriate for **communicating scientifically** and vocabulary is specific to the field of study.	Parts of the engineering process are identified. Text is **descriptive** and errors do not detract from meaning or understanding.	Some parts of the engineering process are included. Text is **general** and errors do not detract from meaning or understanding
	4	3	2	1
	Patterns and **relationships** are revealed from data represented visually (i.e flowcharts, schematics, etc.) **and** descriptively (i.e. written, graphs etc.). Data displays **clearly support** the design of the final solution.	**Patterns** are revealed from data represented visually (i.e flowcharts, schematics, etc.) **and/or** descriptively (i.e. written, graphs etc.). Data displays **support** the design of the final solution.	**Results** are displayed visually and/or descriptively. Data displays **generally support** the design of the final solution.	**Results** are displayed visually or numerically with unclear connections to the design of the final solution.
	4	3	2	1
	Independent and imaginative approach uses color for emphasis and visuals that **add to depth and clarity of the selection of the final solution.**	Independent and imaginative approach uses color for emphasis and visuals that **promote understanding of the final solution.**	Imaginative approach uses color and/or visuals that **relate to the final solution.**	Approach uses color and/or visuals that may **relate to the final solution or field of study.**
	4	3	2	1
	Notes: *"Independent" is defined as independent from adult support. Visual displays can include but are not limited to, drawings, photos, flowcharts, or schematics that reveal patterns and show relationships. Descriptive displays describe the data in writing, using graphs, etc.). Communicating scientifically includes communicating clearly and persuasively generated ideas.*			
Logbook **(Communicating Scientifically)** 12 points total	Engineering process is communicated in **detail and is descriptive and thorough.** There is evidence of exploration of alternatives to proposed solution**.** **Detailed descriptions** of thoughts, ideas, observations, revisions and actions are included. Research notes and bibliography; at least 3 **varied** sources (i.e. interview, website, book).	Engineering process is **descriptively** communicated**.** There is evidence of exploration of alternatives to proposed solution**.** **Descriptions** of thoughts, ideas, observations, revisions and actions are included. Research notes and bibliography; **3 sources** (i.e. websites).	Engineering process is communicated**.** Thoughts, ideas, observations, revisions and actions are included. Research notes and bibliography; **some sources** noted.	Engineering process is **simply** communicated**.** **Some** thoughts, ideas, observations, revisions and actions are included. Research notes and bibliography, **some sources** noted.

Logbook (continued)	4	3	2	1
	Steps of the development of a prototype/model/solution are **described in detail** (i.e. words **and** drawings, diagrams, and/or schematics).	Steps of the development of a prototype/model are **described.**	Most steps of the development of a prototype/model are generally **described**.	Most steps of the development of a prototype/model are **identified** (i.e. listed).
	4	3	2	1
	Entries include **clearly** labeled and **organized** data tables with raw data and trials. **All** entries include dates and times are logically organized.	Entries include labeled data tables with raw data and trials. Entries include dates and times.	Entries include data tables with **most** raw data and **most** trials. **Most** entries include dates and times.	Entries include some raw data and/or trails. **Some** entries are labeled with dates and times
	4	3	2	1
	***Notes**: Entries and logbook in its entirety demonstrate a clear degree of independence (i.e. student is working independently using research and testing to make decisions). All adult input is noted and described.*			