STL SCIENCE FAIR
Supporting the Advancement of Youth Scientists
A Program of the Academy of Science of St. Louis

Senior Regional Division
MAKER PROJECTS

All projects are required to have a signed approval document and must follow the STL Science Fair Rules and Regulations.

Project Elements	*Category Score*	*4*	*3*	*2*	*1*
Research Statement	x2	• Clearly and completely identifies the engineering problem, need, or opportunity being addressed. • Includes a focused design objective or engineering question that guides the project.	• Has a mostly clear engineering problem, need, or opportunity addressed. • Includes a mostly focused design objective or engineering question that guides the project.	• Has a somewhat clear statement of the engineering problem, need, or opportunity. • Includes a somewhat focused design objective or engineering question that guides the project.	• Has a vague or missing statement of the engineering problem. • No design objective present or design objective is not connected to the outcome of the project
Abstract	x2	• Provides a concise and comprehensive summary of the engineering project. • Clearly describes the engineering problem, proposed solution, and project objectives. • Introduces the overall design approach and intended outcome.	• Provides a mostly comprehensive summary, but includes extraneous information. • Clearly describes the engineering problem and objectives, but loosely describes the solution. • Describes the intended outcome of the design but has a basic review of the design approach.	• Provides some summary of the engineering project but is lacking important details. • Describes the engineering problem, but vaguely describes the objectives and solution. • Suggests a final outcome with no specifics or design approach.	• Provides a basic or no summary of the engineering project. • Missing any or vague descriptions of all components; engineering problem, objectives, and solution. • No description of the final outcome.
Significance	x2	• Clearly and completely describes specific examples of the potential societal, environmental, economic, or technological impact of the proposed solution.	• Describes some specifics of the societal, environmental, or technological impact of the proposed solution. • Provides a mostly clear	• Describes some of the general societal, environmental, or technological impact of the proposed solution. • Provides some	• Does not address potential impacts of the solution. • Does not include a justification for the engineering solution.

		• Provides a clear justification why the engineering problem is worthy of investigation and engineering effort.	justification why the engineering problem is worthy of investigation and engineering effort.	justification for why the engineering problem is worthy of investigation and engineering effort.	
Defining the Problem	x2	• Clearly and completely defines the engineering problem or need. • Identifies all measurable design criteria that determine project success. • Identifies all realistic constraints, such as cost, materials, safety, environmental impact, manufacturability, time, ethics, or applicable regulations.	• Mostly defines the engineering problem or need with some missing details. • Identifies most of the design criteria that determines project success. • Identifies most of the constraints of the project.	• Somewhat defines the engineering problem. • Identifies some of the design criteria. • Identifies a few constraints or identifies that there are no constraints to the project.	• Alludes to an engineering problem that needs to be solved. • Incorrect defines or does not define design criteria and constraints,
Research the problem	x1	• Synthesizes information from multiple credible scientific, engineering, and technical sources into a comprehensive summary. • Reviews existing technologies or engineering solutions and identifies their strengths and limitations. • Explains how research informed the design requirements and engineering decisions. • Demonstrates a complete understanding of the underlying scientific and engineering principles connected to the project.	• Lists individual facts from credible scientific, engineering, and technical sources and does not synthesize them into a summary. • Several existing solutions are addressed but not in reference to the project. • Some evidence of findings from research affecting overall project design. • Shows a general understanding of the underlying scientific and engineering principles connected to the project.	• Explains or lists general concepts related to the project without citing sources. • Few existing or unrelated solutions to the project are addressed. • Findings from research are presented but not related to the final design solution. • Basic understanding of underlying scientific and engineering principles with some misconceptions present.	• No evidence of research or context for the project. • No existing solutions are addressed. • Incorrect findings from research are used to develop the solution OR • No research findings are used to develop the final design. • Incorrect understanding of scientific and engineering principles connected to the project.

Imagine Solutions	x2	• Clearly develops and completely evaluates multiple feasible design alternatives. • Demonstrates a complete understanding of the trade-offs between competing design requirements. • Justifies the selected design using evidence from research, engineering principles, and clearly defined decision-making tools.	• Develops and evaluates several design alternatives, some are feasible. • General comparison of the advantages and disadvantages for different solutions. • Gives a mostly clear explanation as to why the final design was chosen based on using mostly evidence from research, and engineering principles.	• Develops one design solution and discusses ideas for other possible designs. • Some general disadvantages and advantages of each design are addressed, but not compared. • Explanation of final design is based on some opinions and some evidence from research, and engineering principles.	• Develops one design solution with no evidence of other possible designs. • Incorrect or absent discussion of advantages and disadvantages of each design. • Explanation of final design is based on mostly opinions rather than using evidence from research, and engineering principles.
Plan the Design	x3	• Clearly develops a detailed design plan before construction. • Includes all labeled sketches, diagrams, or digital models, when appropriate. • Lists all materials, dimensions, and construction methods clearly enough for another person to understand and replicate the design.	• Clearly develops a design plan before construction but with unexplained changes between the design and final build. • Includes most labeled sketches, diagrams, or digital models, when appropriate. OR • Labels are present on all sketches, diagrams, and digital models, but are confusing. • Lists all materials, but has incomplete dimensions, and construction methods so another person would be able to understand and replicate some of the design.	• Develops a vague design plan before construction. • Includes some sketches, diagrams, or digital models, but the labels are inaccurate or incorrect. • Lists all materials, but has incomplete dimensions, and construction methods so another person would be able to understand and replicate parts of the design.	• Did not provide a plan for the design. • Some sketches or diagrams are included but are irrelevant to the final design. • Based on the information provided, the design could not be replicated.

Create and Construct	x2	• Constructs a functional prototype or proof-of-concept model that accurately and clearly reflects the proposed design. • Demonstrates appropriate engineering techniques, precision, and safe practices during construction. • Completely documents design modifications and provides engineering justification for all revisions made during development.	• Attempts to construct a functional prototype or proof-of-concept model that mostly reflects the proposed design. • Evidence of some appropriate engineering techniques, precision, and safe practices during construction. • Documents most design modifications without engineering justification for revisions made during development.	• Attempts to construct some of the prototype or proof-of-concept model. • Evidence of some unsafe or unethical practices during construction or model development. • Design modifications are made with minimal or misleading documentation and justification.	• No attempt to construct a prototype or proof-of-concept model. • Evidence of unsafe or unethical practices during construction or model development. • Design modifications are made without documentation and justification.
Test *<u>*Points should NOT be deducted for prototype failure.*</u> *We encourage open-ended problem solving as students nurture their ability for creative innovative solutions.**	x2	• Develops a clear systematic testing protocol aligned with the design criteria. • Collects reliable quantitative and qualitative performance data using appropriate, consistent, and clear measurement techniques based on a testing procedure. • Conducts multiple trials or iterative testing based on a testing procedure. • Clearly and completely documents all testing procedures sufficiently for replication.	• Develops a testing protocol that mostly controls for confounding variables. • Collects qualitative OR quantitative data for each test. • Conducts multiple trials or iterative testing mostly based on a testing procedure. • Documents most data points, but testing is unable to be replicated.	• Develops a testing protocol that works for some design iterations but not for others. • Data (qualitative or quantitative) is collected from each test is inconsistent or contains many outliers. • Trials or iterative testing are attempted but not completed with consistency.	• Testing protocol is different for every design iteration. • Data is not collected or trials are completed without data presented. • Trials or iterative testing are appropriate but not attempted. • Data missing from design tests.
Evaluate	x3	• Clearly and completely evaluates the effectiveness of the design using evidence from testing. • Clearly and completely	• The effectiveness of the design is evaluated mostly based on evidence from testing, but includes some opinions.	• The effectiveness of the design is evaluated based on some evidence from testing, but mostly uses opinions.	• The design is evaluated independently of the evidence, criteria, and constraints, and its success is based on

		compares performance results against the established criteria and constraints. ● Correctly uses tables, graphs, calculations, and statistical analysis, when appropriate, to support all conclusions with specific pieces of data.	● The results of the test are evaluated based on most of the design criteria and constraints. ● Most tables, graphs, calculations, and statistical analyses present all the data without identifying specific sections of importance.	● The results of the test are evaluated based on some of the design criteria and constraints. ● Some tables, graphs, calculations and statistical analyses are used mostly correctly but might be missing labels or are irrelevant.	opinions. ● Tables, graphs, calculations, and statistical analyses are used incorrectly.
Future Work	x1	● Proposes clear, complete, evidence-based improvements to the design. ● Clearly explains what specific modifications could improve performance, reliability, efficiency, cost-effectiveness, or usability. ● Discusses opportunities for scaling, commercialization, or broader application.	● Proposes mostly clear evidence-based improvements to design. ● Mostly explains what modifications could improve performance, but does not give specific examples. ● Identifies possible scalability opportunities, with few specifics.	● Proposes some unrealistic improvements to the design, based on the existing problem. ● Somewhat ex[plains what modifications could improve performance, based on opinions instead of data collected. ● Identifies possible scalability opportunities, without specifics.	● Does not propose improvements to design. ● Explain modifications but not how they would impact performance. ● Does not address scalability of the model or design.
Works Cited	x1	● Lists the books, websites, or people used to learn about the topic. *(Includes 5 or more sources)* ● Includes enough information so someone else can easily find the source. ● Uses the same format for each source.	● Lists the books, websites, or people used to learn about the topic. (*Includes 3-4 sources)* ● Includes most relevant information so someone else can find the source. ● Uses a similar format for each source.	● Lists the books, websites, or people used to learn about the topic. *(Between 1-2 sources)* ● Includes some information, but would be difficult to verify the source. ● Uses a different format for each source.	● No sources are included.
Display Items	x1	● Project includes <u>all (13)</u> sections: title, research statement, abstract, significance, defining the problem, research, imagine	● Project includes between <u>12-10</u> sections: title, research statement, abstract, significance, defining the problem,	● Project includes between <u>9-7</u> sections: title, research statement, abstract, significance, defining the problem,	● Project includes <u>6 or less</u> sections: title, research statement, abstract, significance, defining the problem,

		solutions, plan the design, create/construct, test, evaluate, future work, and works cited. ● Includes a complete and clear acknowledgment if someone outside the family, such as a mentor or scientist, helped with the project. ● Pictures, graphs, logbook, models, and other visuals are relevant and help explain the project.	research, imagine solutions, plan the design, create/construct, test, evaluate, future work, and works cited. ● Includes an mostly clear acknowledgment if someone outside the family, such as a mentor or scientist, helped with the project. ● Most of the pictures, graphs, logbook, models, and other visuals are relevant and help explain the project.	research, imagine solutions, plan the design, create/construct, test, evaluate, future work, and works cited. ● Includes a somewhat clear acknowledgment if someone outside the family, such as a mentor or scientist, helped with the project. ● Some pictures, graphs, logbook, models and other visuals are minimally relevant but do not negatively impact understanding..	research, imagine solutions, plan the design, create/construct, test, evaluate, future work, and works cited. ● Assistance is mentioned throughout the project but does not include an acknowledgement. ● Pictures, graphs, logbook, models, and other visuals are not relevant and negatively impact understanding of the project.
Originality	x1	● Project is based on a unique question, idea, or way of solving a problem that has deep significance to the student. ● Clearly identifies all help received from adults, AI, teachers, or mentors while showing the student's own work and ideas and that the student completed the project themselves.	● Project is based on an interesting or creative (but not unique) idea or question that has significance to the student. ● Mostly identifies what help was received from adults, AI, teachers, or mentors while showing that the student did most of the thinking and that the student completed most of the project themselves.	● Project is based on an interesting or creative (but not unique) idea or question that has no significance to the student. ● Identifies some, but not all, help, resources, or use of AI or mentors, while showing that the student did some of the thinking and that the student completed some of the project themselves, but had significant assistance.	● Project is an exact replica of an existing activity. (ie. popsicle stick harmonicas). ● Does not clearly identify any help, resources, or use of AI or mentors, but does reference assistance throughout the project.