



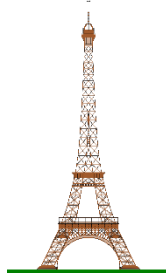
Science



Technology



Engineering



Art



Math

EXPO 2016

Hello Nevada County Superintendents, Principals, and Teachers!

It is a pleasure to announce the Nevada County STEAM Expo, 2016 to be held in the Main Street Center at the Nevada County Fairgrounds April 8th and 9th. Over the past 5 months, an impressive number of Nevada County educators, administrators, and community members have come together to create an event that celebrates our students capabilities and passions while also giving them a chance to experience the interconnectedness of the fields of science, technology, engineering, art, and math. We believe that an event of this nature reflects the college and career readiness goals we have set for our pupils.

In order to make the STEAM Expo a reality, we need your help. We begin by asking for your understanding as we move forward with short timelines and a roll-out of information and details that will happen in increments as each piece becomes available. This is a transition year of moving away from isolated competitions such as the Science Fair and Math Tournament into an inclusive, multi-faceted, 21st Century event. As with most transitions, this will come with some degree of challenge. We assure you that we are doing everything we can to minimize frustration while striving to make information available to you as soon as possible.

That being said, attached you will find the handbook of guidelines and rubrics for the project submission portion of the Expo (formerly the Nevada County Science Fair). Each campus has been allotted a particular number of entries. You may choose to allocate these using any method you see fit. It may be as simple as “the first ___ students who submit a request for entry” to doing a paper screening of project ideas to selecting from entries judged in a school competition. Should a school choose not to participate, there will be plenty of hands-on experiences, demonstrations, and other competitive events that can be enjoyed by all during the Expo.

We thank you for your patience and understanding as we work together to move forward on our maiden voyage of the Nevada County STEAM Expo! Please do not hesitate to contact Shar Johns, Kathleen Kiefer, or Judy Neilsen should you have any questions or a need for clarification of details.

Sincerely,
The STEAM Team



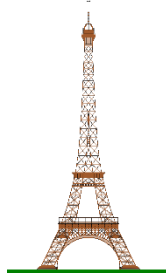
Science



Technology



Engineering



Art



Math

EXPO 2016

April 8th – 9th, 2016
Nevada County Fairgrounds
Main Street Center

Presented by
The Nevada County Superintendent of Schools

STEAM Handbook: Project Submissions

A Guide for Entries in the Categories of:

Invention

Robotics & Computer Science

Environmental/Agricultural Innovation

Reverse Engineering

Rube Goldberg Machines

Science Fiction

Scientific Inquiry

**Schools are allocated 4 total entries for grade levels K-5
and 4 total entries for grade levels 6-12**

Important - (Grades K-5): These projects will not be judged but will be provided with viewer comments and a certificate of participation.

Important - (Grades 6-12): These projects will be judged for possible submission to the California State Science Fair (3 in grades 6-8 in the Junior Division and 3 in grades 9-12 in the Senior Division). **It is the responsibility of any participant hoping to qualify for the California State Science Fair to personally verify that their project meets the CSSF guidelines - //www.usc.edu/CSSF/.**

Please fill out the Registration Form and email it to steam@nevco.org no later than 5:00 p.m. on Friday, March 18th. Each form includes a chance to request extra entry slots in case some become available once registration numbers are submitted that day.

Due to our tight timeline, there will be **NO EXCEPTIONS for late registration entries.**

NCSOS STEAM Expo, 2016

April 7th – 9th, 2016

Nevada County Fairgrounds
Main Street Center

Schedule of STEAM Expo Events (All times are close but approximate)

Thursday, April 7th

1:30 p.m. – 4:00 p.m.: STEAM project set-up

(All projects must be delivered to fairgrounds no later than 4 p.m)

Friday, April 8th

9:00 a.m. – 5:00 p.m.: STEAM Project judging & awards

Saturday, April 9th

9:00 a.m. - 3:00 p.m.: Open to the public

- Public viewing of STEAM Project Competition entries
- Robotics demonstration/on-the-spot team competition
- Hands-on STEAM experiences
- Music
- Demonstrations by local STEAM companies
- And many more surprises!

3:00 p.m. – 7:00 p.m.: Project Removal

Purpose of the NCSOS Nevada County STEAM Expo

- ❖ **To stimulate and active interest in science, technology, engineering, art, and math (and their interconnectedness) in young people by engaging them in original investigations, experiences, and demonstrations.**
- ❖ **To foster school & community cooperation in developing the S.T.E.A.M. potential of Nevada County students that could, in turn, lead to future careers in these fields.**
- ❖ **To support the California State Standards.**



NCSOS Nevada County STEAM Expo, 2016

Registration Form

STEAM Project (formerly the Nevada County Science Fair) Grades K-5

April 8 - 9, 2016
Nevada County Fairgrounds

Each school site housing grades K-5 students may select 4 entries from these grade levels.

These projects are not judged but will receive viewer comments and a certificate of participation.

Email this completed form to: steam@nevco.org

Due - Friday, March 18, 2016, by 5:00 p.m. – no exceptions

School Name: _____

The **certificated** adult who will be responsible for student entries:

Name: _____ Position: _____

We are requesting entry in the following categories for our allotted slots:

Entry #	Grade Level	Category
1		
2		
3		
4		

We are requesting _____ additional entries if they become available:

Entry #	Grade Level	Category
1		
2		
3		



NCSOS Nevada County STEAM Expo, 2016

Registration Form

STEAM Project (formerly the Nevada County Science Fair) Grades 6-12

April 8 - 9, 2016
Nevada County Fairgrounds

Each school site housing grades 6-12 students may select 4 entries from these grade levels.

These projects will be judged for possible submission to the California State Science Fair

It is the responsibility of any participant hoping to qualify for the California State Science Fair to personally verify that their project meets the CSSF guidelines - //www.usc.edu/CSSF/.

Email this completed form to: steam@nevco.org

Due - Friday, March 18, 2016 by 5:00 p.m. – no exceptions

School Name: _____

The **certificated** adult who will be responsible for student entries:

Name: _____ Position: _____

We are requesting entry in the following categories for our allotted slots:

Entry #	Grade Level	Category
1		
2		
3		
4		

We are requesting _____ additional entries if they become available:

Entry #	Grade Level	Category
1		
2		
3		

Rules and Regulations:

Eligibility:

- A. Students in 6th – 12th grades attending a public or private school in Nevada County who have filled out an application form are eligible to enter. **Note:** Students in grade K – 5 may enter projects for display only (not to be judged).
- B. All projects regardless of grade level must be entered by a certificated adult who is responsible for student entries at each school site. **Students and parents cannot enter projects directly to the STEAM Expo.**
- C. The certificated adult who is responsible for student entries at each school site will be responsible for reviewing all entries from his/her school to ensure compliance with regulations.

School Allotments:

It is the responsibility of each school and its certificated adult responsible for student entries to develop a plan for selection of projects to be entered in the STEAM Expo. This may be as simple as “the first ___ students who submit a request for an eligible entry” to doing a paper screening of project ideas to selecting from entries judged in a school competition. Each school must complete a registration form on which they will list their chosen entries as well as extra entries for consideration should spaces become available. The registration forms are due to NCSOS no later than Friday, March 18, 2016 by 5:00 p.m. – **NO EXCEPTIONS will be made for forms submitted after that date.**

Project Removal:

It is the responsibility of each certificated adult responsible for student entries to make certain all projects from his/her school are removed between 3:00 p.m. and 5:00 p.m. on Saturday, April 9th. **Projects not picked up by 5:00 p.m. on April 9th will be disposed of.**

NCSOS STEAM Expo, 2016

Safety Guidelines

- No hazardous substances or devices (e.g. poisons, drugs, firearms, weapons, ammunition, and reloading devices, etc.) are allowed.
- No flames, explosives, highly flammable materials, or dangerous chemicals are allowed.
- No live animals (including invertebrates) or human/animal parts or body fluids (ie. blood, urine, etc.) are allowed.
- Any inadequately insulated apparatus producing extreme temperatures that may cause physical burns is not allowed.
- Any apparatus with unshielded belts, pulleys, chains, or moving parts with tension or pinch points must be inactive and for display only.
- Project sounds, lights, odors, or any other display items must not be distracting (Exceptions to this rule may be permitted for judging demonstrations. Approval must be given prior to judging.)
- Under no circumstances may students display:
 - ✓ live cultures (molds, bacteria, etc.) in Petri dishes or any other container.
 - ✓ food samples
 - ✓ medications or drugs of any type



Science Technology Engineering Art Math

EXPO 2016

Presented by the Nevada County Superintendent of Schools

Science Competition Category General Descriptions

Each individual category has pertinent information and definitions as well as entry, review and judging guidelines and a rubric. These pieces are included below this table.

	Invention	In the <i>Invention</i> Category, students have the opportunity to share an innovative solution to a problem or their own single item invention! Submissions should include illustrative design detail, a description of the invention's use and benefits, and design prototype construction.
	Robotics & Computer Science	In the <i>Robotics & Computer Science</i> Category, students may design a mechanical agent that can perform tasks automatically (robot) or use computer science to design software that can perform tasks. Both can be automatically, semi-autonomously, or remotely controlled.
	Environmental/Agricultural Innovation	In the <i>Environmental/Agricultural Innovation</i> Category, students may share environmentally and/or agriculturally innovative ideas. These may be in the form of new products, procedures, inventions, promotional projects, community events, etc.
	Reverse Engineering	In the <i>Reverse Engineering</i> Category, students have a chance to share their discovery of engineering concepts and methods by taking something apart, learning how it works, and then explaining it!
	Rube Goldberg Machines	In the <i>Rube Goldberg</i> Category, students allows students to explore physics and engineering concepts and methods in order to construct their own Rube Goldberg device.
	Science Fiction	In the <i>Science Fiction</i> Category, students are asked to define and then consistently use alternative physical rules or thought processes for the environment to create a great science fiction story. Besides being written pieces, they could be videos, plays, radio shows, graphic novels, etc.
	Scientific Inquiry	In the <i>Scientific Inquiry</i> Category, students have the opportunity to design, conduct, and share an experiment using scientific methodology, hypothesis, research, data collection, and analysis.



Invention

Definition:

An invention is a new device, contrivance, process, or an improvement on an existing machine or product that solves a real or perceived problem or need. The category provides a means of presenting an invention to the general public.

1. Pertinent Information and Definitions

Project Display

A successful entry display in this category should contain the following:

- A description of the use of the invention, and the associated benefits
- A 'mock-up', prototype, or construction of all or part of the invention (optional)
- Any marketing or promotional concept for the invention
- Aesthetically pleasing design and presentation

Descriptive Paper

A descriptive paper should be provided to show additional information:

- Overall invention clearly described including what it is, how it would be used, benefits, and intended audience
- Description of the design process that occurred in the creation of the invention, including any problems encountered and the solutions
- Drawings or descriptive text that describes the construction process and any materials required
- Any further steps taken beyond initial concept, including competitor research, publicity, etc.

Marketing Materials

Promotional materials may be provided to show how this invention would be presented for use

- This could include signs, video and/or audio clips or concepts, advertising copy, etc.
- The artistic and creative content of this material (if present) will be evaluated for additional artistic recognition

2. Entry, Review, and Judging

An entry in this category will be reviewed and judged on the following:

1. Following the Entry Rules and achievement on each Rubric item
2. Preparation and display of the invention and/or its component
3. Prototype or mock-up design and construction
4. Descriptive paper showing further details about the invention

Additional items which will affect the review and judging conclusions

- Research evidence that no similar product or process exists
- Invention offers functionality that solves a problem efficiently
- Invention addresses a real-world need
- Practicality in terms of size, cost, materials, etc. for the problem being solved
- Unique or innovative methodologies used



Invention: Rubric

NCSOS STEAM Expo

Name: _____

Grade: _____

Location: _____

General Requirements Evaluation*				
Presentation Display		Descriptive Document		
Attractive, easy to read, and layout is in appropriate, logical order A	ND 1 – 2 – 3 – 4 – 5 NA	Organization is clear and complete without extraneous information.	ND 1 – 2 – 3 – 4 – 5 NA	
Visual aids promote understanding A	ND 1 – 2 – 3 – 4 – 5 NA	Spelling and grammar correct	ND 1 – 2 – 3 – 4 – 5 NA	
Shows project in appropriate detail for understanding by audience	ND 1 – 2 – 3 – 4 – 5 NA	Visual aids promote understanding A	ND 1 – 2 – 3 – 4 – 5 NA	
Invention Category Evaluation**				
Display and Documentation		Marketing/Promotional Material (if present)		
The invention, its use and the benefits associated are clearly described.	ND 1 – 2 – 3 – 4 – 5 NA	Visual marketing material design is well prepared and presented. Promotional copy (text) is prepared and appropriate for invention. A	ND 1 – 2 – 3 – 4 – 5 NA	
Target audience or users of invention are identified and have a valid need.	ND 1 – 2 – 3 – 4 – 5 NA	Material is appropriate for target audience.	ND 1 – 2 – 3 – 4 – 5 NA	
Materials required to build the invention are described and specified.	ND 1 – 2 – 3 – 4 – 5 NA	Marketing plan developed with multiple promotion approaches prepared.	ND 1 – 2 – 3 – 4 – 5 NA	
Original design, development, and analysis process explained and/or documented, including descriptions of any problems encountered and their solutions.	ND 1 – 2 – 3 – 4 – 5 NA	Other considerations specific to category		
		The invention uses unique or innovative methodologies in solving the problem or need.	ND 1 – 2 – 3 – 4 – 5 NA	
Construction process clearly defined by drawings and/or descriptive text. A	ND 1 – 2 – 3 – 4 – 5 NA	The invention offers functionality that solves a problem or need efficiently and/or effectively	ND 1 – 2 – 3 – 4 – 5 NA	
Research into competing/similar products is presented and complete.	ND 1 – 2 – 3 – 4 – 5 NA	The invention is practical in terms of size, cost, materials, etc. for the problem/need being solved.	ND 1 – 2 – 3 – 4 – 5 NA	
Prototype or “Mock-up”		The invention addresses a real-world problem or need.	ND 1 – 2 – 3 – 4 – 5 NA	
Prototype is relevant and complete enough to show the important aspects of the invention.	ND 1 – 2 – 3 – 4 – 5 NA	Further steps beyond creation of invention have been initiated or taken (e.g. patents, market research, public presentations, etc.)	ND 1 – 2 – 3 – 4 – 5 NA	
Parts and components of prototype are described, and their function is identified.	ND 1 – 2 – 3 – 4 – 5 NA			
Prototype is well designed and constructed. A	ND 1 – 2 – 3 – 4 – 5 NA			
Additional Items for Consideration				
Safety Considerations				
Team/External Considerations				
Special Category Considerations				

ND: Not Demonstrated, 1: Beginning, 2: Developing, 3: Average, 4: Accomplished, 5: Advanced, NA: Not Applicable
 (*See General Entry Rules and Requirements for further information, **See Category Description for further information)

A = Score for this item to be used to evaluate overall artistic aspect inherent in the project.

Record additional notes and comments on the back of this sheet



Robotics and Computer Science

Definition:

A robot is a mechanical agent that can perform tasks automatically. Similarly, computer science is the design of software that can perform tasks. Robots and computer software can both be operated automatically (autonomous), semi-autonomous, or remotely controlled. Both robots and computers are designed to be used for one or more specific purposes.

1. Pertinent Information and Definitions

Physical Design

Good physical design may refer to mechanical functionality and/or UI (User Interface).

- Sensors and/or operator input is appropriate and understandable for the planned purpose(s)
- Manipulators and/or displays are used as needed to accomplish the necessary tasks
- Physical or interface construction is appropriate and elegant

Operational Functionality

Several operability concepts are used to help define the capability of an entry.

- Operational methods of the software or robot are complete and appropriate for the purpose
- Design allows for variables in the operating environment and error handling
- Operation is repeatable and consistent with the planned function

Display, Documentation, and Software

The project display should show the following and will include a paper with more information.

- A working robot or sub-assembly or, if software, the working software should be presented
- The function or purpose of the robot or software should be described
- The description and clarification of any sub-components should be explained
- A description of the methodology used to operate the robot or software will be included

Additional items that may be explained as part of the entry include:

- Considerations for alternative operation based on variations in operating parameters
- Documented code or design information
- Efficiency of design (software code and /or mechanical design)

2. Entry, Review, and Judging

An entry in this category will be reviewed and judged on the following:

- Following the Entry Rules and achievement on each Rubric item
- Physical design and/or operational functionality
- Software source code evaluation (if applicable) **Note:** this can be confidential if desired.
- Display and documentation provided

Additional items which will affect the review and judging conclusions

- Entry relates to real-world applications
- Robot or software and/or the associated purpose is original or innovative.
- Illustrations, images, or other media that is presented as supporting information



Robotics and Computer Science: Rubric

NCSOS STEAM Expo

Name: _____

Grade: _____

Location: _____

General Requirements Evaluation*

Presentation Display		Descriptive Document (if present)			
Attractive, easy to read, and layout is in appropriate, logical order A	ND 1 – 2 – 3 – 4 – 5 NA	Organization is clear and complete without extraneous information.	ND 1 – 2 – 3 – 4 – 5 NA		
Visual aids promote understanding A	ND 1 – 2 – 3 – 4 – 5 NA	Spelling and grammar correct	ND 1 – 2 – 3 – 4 – 5 NA		
Shows project in appropriate detail for understanding by audience	ND 1 – 2 – 3 – 4 – 5 NA	Visual aids promote understanding A	ND 1 – 2 – 3 – 4 – 5 NA		

Robotics and Computer Science Category Evaluation**

Display and Documentation		Other Considerations Specific to Category			
The entered robot or software is complete and operational, or if a sub-assembly, it is a critical portion that demonstrates operability.	ND 1 – 2 – 3 – 4 – 5 NA	Methods of handling errors or alternative operating parameters (power, environment, etc.) are included in design considerations.	ND 1 – 2 – 3 – 4 – 5 NA		
The function and purpose of the entry is clearly explained.	ND 1 – 2 – 3 – 4 – 5 NA	Entry and/or associated purpose is original or innovative	ND 1 – 2 – 3 – 4 – 5 NA		
Any sub-components are described and clarified completely.	ND 1 – 2 – 3 – 4 – 5 NA	Operation is repeatable and consistent with the planned function	ND 1 – 2 – 3 – 4 – 5 NA		
The means of operation of the robot or software is explained to an appropriate level for the intended audience.	ND 1 – 2 – 3 – 4 – 5 NA	Overall design is efficient with extraneous components only for aesthetic reasons A			
		Entry shows completeness of thought and cause and effect are clearly explained.	ND 1 – 2 – 3 – 4 – 5 NA		
Design information and/or software source code (if provided) is documented and explained adequately.	ND 1 – 2 – 3 – 4 – 5 NA	Some part of the operational methodology, materials used, and/or design process is innovative or creative in approach. A	ND 1 – 2 – 3 – 4 – 5 NA		
Physical Interface Design and Functionality		Entry relates to real-world applications	ND 1 – 2 – 3 – 4 – 5 NA		
Physical or interface construction is appropriate and elegant A	ND 1 – 2 – 3 – 4 – 5 NA				
Manipulators and/or displays are used as needed to accomplish the desired tasks.	ND 1 – 2 – 3 – 4 – 5 NA				
Operator input and/or physical sensors are appropriate and understandable for the planned purpose.	ND 1 – 2 – 3 – 4 – 5 NA				
Operational methods are complete and appropriate for the stated purpose.	ND 1 – 2 – 3 – 4 – 5 NA				
Additional Items for Consideration					
Safety Considerations					
Team/External Considerations					
Special Category Considerations					

ND: Not Demonstrated, 1: Beginning, 2: Developing, 3: Average, 4: Accomplished, 5: Advanced, NA: Not Applicable
 (*See General Entry Rules and Requirements for further information, **See Category Description for further information)
A = Score for this item to be used to evaluate overall artistic aspect inherent in the project.

Record additional notes and comments on the back of this sheet



Environmental/Agricultural Innovation

Definition:

The Environmental/Agricultural Innovation category is intended to provide a means of sharing environmentally and/or agriculturally innovative ideas. These ideas may be new products, procedures, inventions, promotional projects, community events, etc.

1. Pertinent Information and Definitions

Definition of Innovation

In terms of this category, an innovation is something that addresses an observed (real-world) or theoretical agricultural or environmental problem in some new manner.

- It may include ways to minimize environmental impact and protect ecosystems and biodiversity.
- It can include such issues as ecological restoration, green building, product stewardship, pollution prevention, eco-efficiency, agricultural management, enhancement, etc.
- The innovation should provide benefits over current methods.
- This may be a physical construction, a procedure, a community event, or something else.

An entry should include a plan of implementation

A plan for implementing the innovation usually includes the following types of information:

- A time line
- Partnerships or required resources
- Budgetary considerations
- Comparison of existing methodologies
- A description of the innovation, including steps necessary to implement or create
- The plan may include promotional material or concepts that would assist in implementing the innovation

2. Entry, Review, and Judging

An entry in this category will be reviewed and judged on the following:

- Following the Entry Rules and achievement on each Rubric item
- Description of the problem or issue
- Review of plan of implementation
- Preparation and display of information about the innovation

Additional items which will affect the review and judging conclusions

- Originality and/or innovative approaches or concepts
- Understanding of how the innovation addresses environmental concerns
- Consideration of tradeoffs between economics, efficiency, and sustainability
- Presentation of the innovation outside of this event



Environmental/Agricultural Innovation

NCSOS STEAM Expo

Name: _____

Grade: _____

Location: _____

General Requirements Evaluation*					
Presentation Display			Descriptive Document (if present)		
Attractive, easy to read, and layout is in appropriate, logical order A	ND	1 – 2 – 3 – 4 – 5	Organization is clear and complete without extraneous information.	ND	1 – 2 – 3 – 4 – 5
Visual aids promote understanding A	ND	1 – 2 – 3 – 4 – 5	Spelling and grammar correct	ND	1 – 2 – 3 – 4 – 5
Shows project in appropriate detail for understanding by audience	ND	1 – 2 – 3 – 4 – 5	Visual aids promote understanding A	ND	1 – 2 – 3 – 4 – 5
Environmental/Agricultural Innovation Category Evaluation**					
Innovation and Implementation Plan			Other Considerations Specific to Category		
Observed or theoretical problem is identified and accurately described.	ND	1 – 2 – 3 – 4 – 5 NA	Benefits of innovation over existing methods or concepts are clearly and accurately presented.	ND	1 – 2 – 3 – 4 – 5 NA
The presented innovation appropriately identifies a means to minimize impact and counter the threat or problem.	ND	1 – 2 – 3 – 4 – 5 NA	Environmental concerns are addressed as part of the consideration of this innovation.	ND	1 – 2 – 3 – 4 – 5 NA
Type of innovation (construction, procedure, event, etc.) is defined and described appropriately.	ND	1 – 2 – 3 – 4 – 5 NA	The project considers the tradeoffs between economics, efficiency, and sustainability.	ND	1 – 2 – 3 – 4 – 5 NA
The implementation plan presents a complete description of the innovation.	ND	1 – 2 – 3 – 4 – 5 NA	The project is original and/or innovative in approach or concept, or has original aspects. A	ND	1 – 2 – 3 – 4 – 5 NA
			Further steps beyond the creation of the innovation concept have been taken (e.g. presentation to others, fundraising, publicity materials created, event held, etc.)		
The plan for implementation includes planned budgets, timelines, etc.	ND	1 – 2 – 3 – 4 – 5 NA	Some part of the operational methodology, materials used, and/or design process is innovative or creative in approach. A	ND	1 – 2 – 3 – 4 – 5 NA
Partnerships and/or other required resources are explained in the plan.	ND	1 – 2 – 3 – 4 – 5 NA			
The plan includes a comparison of existing methodologies that are used to correct the problem, including research notes and sources.	ND	1 – 2 – 3 – 4 – 5 NA			
Additional Items for Consideration					
Safety Considerations					
Team/External Considerations					
Special Category Considerations					

ND: Not Demonstrated, 1: Beginning, 2: Developing, 3: Average, 4: Accomplished, 5: Advanced, NA: Not Applicable
 (*See General Entry Rules and Requirements for further information, **See Category Description for further information)

A = Score for this item to be used to evaluate overall artistic aspect inherent in the project.

Record additional notes and comments on the back of this sheet



Reverse Engineering

Definition:

Reverse engineering is the process of discovering the technological principles of a device, object, or system through analysis of its structure, function, and operation. It often involves taking something (e.g., a mechanical device or electronic component) apart and analyzing its workings in detail to be used in maintenance.

1. Pertinent Information and Definitions

Project Scope

A Reverse Engineering project should be of enough complexity to allow the student to gain an understanding of how something works in detail, without being overwhelming.

- Select and acquire at least one product (typically, mechanical in nature), disassemble the unit, then mount and label all components.
- A successful entry may have sub-components that are further disassembled.
- The tools used can be simple or complex, but the methods and sequence for disassembly should be documented.

Project Display and Description

A successful entry in this category will have the components of the product mounted and labeled to show the following:

- The overall unit and operation of the unit is described
- Each component is described adequately, materials are identified, and its function explained.
- Components are arranged so that they are correctly located by location to the assembled unit.

A paper describing the operation and functionality of all of the components should be created and may include:

- Illustrations or images of components and how they fit together
- A description of the steps for deconstruction
- Any notes or logs that are taken during the disassembly
- A description of how the original object actually functions

2. Entry, Review, and Judging

An entry in this category will be reviewed and judged on the following:

- Following the Entry Rules and achievement on each Rubric item
- Preparation and display of the components or subcomponents of the original object
- Descriptive paper showing accuracy in explanation of components and overall operation.

Additional items which will affect the review and judging conclusions

- Shows completeness of thought, and cause and effect are clearly identified
- Project scope is reasonable and allows for disassembly to adequate levels.
- The understanding of how the object works is not shown to be generally understood
- High degree of complexity or complex disassembly procedure required



Reverse Engineering: Rubric

NCSOS STEAM Expo

Name: _____

Grade: _____

Location: _____

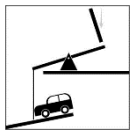
General Requirements Evaluation*			
Presentation Display		Descriptive Document (if present)	
Attractive, easy to read, and layout is in appropriate, logical order A	ND 1-2-3-4-5 NA	Organization is clear and complete without extraneous information.	ND 1-2-3-4-5 NA
Visual aids promote understanding A	ND 1-2-3-4-5 NA	Spelling and grammar correct	ND 1-2-3-4-5 NA
Shows project in appropriate detail for understanding by audience	ND 1-2-3-4-5 NA	Visual aids promote understanding A	ND 1-2-3-4-5 NA
Reverse Engineering Category Evaluation**			
Display		Other Considerations Specific to Category	
Operation of original (assembled) unit is explained adequately.	ND 1-2-3-4-5 NA	Product selected has appropriate complexity or materials used in the construction.	ND 1-2-3-4-5 NA
All disassembled components have been labeled and described accurately.	ND 1-2-3-4-5 NA	Project scope is reasonable and allows for disassembly to adequate levels.	ND 1-2-3-4-5 NA
Function of each part is identified and correct.	ND 1-2-3-4-5 NA	Disassembly of this product will help the audience understand an unfamiliar operational concept.	ND 1-2-3-4-5 NA
Components are presented appropriately to accurately show their location within the completed unit. A	ND 1-2-3-4-5 NA	Product has been disassembled to accurately represent all components.	ND 1-2-3-4-5 NA
		Components are identified into sub-assembly groups by purpose (or location).	ND 1-2-3-4-5 NA
		Cause and effect between and within sub-assemblies is correctly identified.	ND 1-2-3-4-5 NA
The material of composition is identified for each component.	ND 1-2-3-4-5 NA	Additional steps beyond disassembly are discussed or taken (assembly procedure created, second unit rebuilt, etc.)	ND 1-2-3-4-5 NA
Descriptive Document (if present)		Project shows that the student grasps the purpose of the components and sub-assemblies and how they work together.	ND 1-2-3-4-5 NA
Images or illustrations of components and how they fit together are presented and appropriate. A	ND 1-2-3-4-5 NA		
Each sub-assembly is defined and its operation explained.	ND 1-2-3-4-5 NA		
The deconstruction sequence description is complete and accurate.	ND 1-2-3-4-5 NA		
Tools used are listed and their use is defined within the sequential listing.	ND 1-2-3-4-5 NA		
How the original unit operates based on the disassembled components' works is described completely and accurately.	ND 1-2-3-4-5 NA		
Additional Items for Consideration			
Safety Considerations			
Team/External Considerations			
Special Category Considerations			

ND: Not Demonstrated, 1: Beginning, 2: Developing, 3: Average, 4: Accomplished, 5: Advanced, NA: Not Applicable

(*See General Entry Rules and Requirements for further information, **See Category Description for further information)

A = Score for this item to be used to evaluate overall artistic aspect inherent in the project.

Record additional notes and comments on the back of this sheet



Rube Goldberg Machines

Definition:

A Rube Goldberg assembly, contraption, invention, device, or apparatus is a deliberately over-engineered or overdone machine that performs a very simple task in a very complex fashion, usually in a chain reaction. The category is named for American cartoonist and inventor Rube Goldberg (1883-1970).

1. Pertinent Information and Definitions

Sequential Progression

This type of entry requires a sequential progression of cause-and-effect steps.

- Starts with a single, simple initialization action
- Continues through multiple steps which may branch and then merge again
- Finally performs a clearly defined and (usually) simple task

Simple Machines and Forces

Entries in this category will make use of several types of simple machines and physical forces during the sequence of operation.

- Simple machines include lever, wheel and axle, pulley, incline plane, screw, and wedge.
- Physical forces include inertia, gravity, friction, stored energy, combustion, etc. (note that no flames are allowed on site, combustion should only be used diagrammatically).

Display (diagram), Documentation, and Construction

- The entry should have a diagram (illustration) of the sequence from initial step to conclusion.
- The entry may also have a complete construction or partial mock-up of the sequence.
- Should be documented with a written sequential procession from beginning to final step.
- Illustrations should clearly define the sequence of operation, including direction of force.
- If the entire sequence is built, it is recommended that a video of a complete, successful run be brought to the event for display to the judges and the public.
- The entry size is limited to one end (1/2) of a 96" x 30" table.

2. Entry, Review, and Judging

An entry in this category will be reviewed and judged on the following:

- Following the Entry Rules and achievement on each Rubric item
- Sequential progression clearly labeled with indications of simple machines and physical forces
- Diagram of operation is complete and understandable
- If constructed, and/or videoed, sequence fully runs with little to no outside intervention
- If 'mock-up' portion of sequence is displayed, it should be an important, understandable piece of the whole sequence

Additional items which will affect the review and judging conclusions

- Thematic construction, grouping of materials, task and initiation
- Complexity of device, including multiple paths
- Duration of progression – use of timing of operation as a consideration



Rube Goldberg: Rubric

NCSOS STEAM Expo

Name: _____ **Grade:** _____ **Location:** _____

General Requirements Evaluation*			
Presentation Display		Descriptive Document (if present)	
Attractive, easy to read, and layout is in appropriate, logical order A	ND 1-2-3-4-5 NA	Organization is clear and complete without extraneous information.	ND 1-2-3-4-5 NA
Visual aids promote understanding A	ND 1-2-3-4-5 NA	Spelling and grammar correct	ND 1-2-3-4-5 NA
Shows project in appropriate detail for understanding by audience	ND 1-2-3-4-5 NA	Visual aids promote understanding A	ND 1-2-3-4-5 NA
Rube Goldberg Category Evaluation**			
Display and Documentation		Sequence of Operation	
Diagram (illustration) is complete and shows operation from initial step to conclusion. A	ND 1-2-3-4-5 NA	Numerous types of simple machines are used and identified accurately.	ND 1-2-3-4-5 NA
Diagram of operation is understandable. A	ND 1-2-3-4-5 NA	Several types of physical forces are used and identified accurately, including indication of direction.	ND 1-2-3-4-5 NA
Sequential steps of progression are clearly labeled.	ND 1-2-3-4-5 NA	Duration of sequential events (time) is taken into account as part of sequence.	ND 1-2-3-4-5 NA
If a 'mock-up' of a portion of the sequence is presented, it is an important, understandable piece of the whole.	ND 1-2-3-4-5 NA	Complexity of steps and quantity of steps are considered in development.	ND 1-2-3-4-5 NA
		Multiple converging simultaneous, recurring, or re-useable paths are provided.	ND 1-2-3-4-5 NA
Any construction that is presented is built appropriately (including any presented via photo or video).	ND 1-2-3-4-5 NA		
Other Considerations Specific to Category			
Images or illustrations of components and how they fit together are presented and appropriate and attractive. A	ND 1-2-3-4-5 NA		
Each sub-assembly is defined and its operation explained.	ND 1-2-3-4-5 NA		
The deconstruction sequence description is complete and accurate.	ND 1-2-3-4-5 NA		
Tools used are listed and their use is defined within the sequential listing.	ND 1-2-3-4-5 NA		
How the original unit operates based on the disassembled components' works is described completely and accurately.	ND 1-2-3-4-5 NA		
Additional Items for Consideration			
Safety Considerations			
Team/External Considerations			
Special Category Considerations			

ND: Not Demonstrated, 1: Beginning, 2: Developing, 3: Average, 4: Accomplished, 5: Advanced, NA: Not Applicable
 (*See General Entry Rules and Requirements for further information, **See Category Description for further information)
A = Score for this item to be used to evaluate overall artistic aspect inherent in the project.

Record additional notes and comments on the back of this sheet



Science Fiction

Definition:

Science fiction is a genre of fiction dealing with imaginary and more-or-less plausible content such as future settings, futuristic technology, space travel, aliens, etc. Exploring the consequences of scientific innovations is one purpose of science fiction, making it a "literature of ideas".

1. Pertinent Information and Definitions

Presentation

As in all categories, the general requirements must be followed for this category as well, including some form of display for the day of the event. This display may include:

- Description of the entry (an outline, a storyboard, etc. as appropriate).
- References to supporting or similar works
- A copy of the actual story/entry (see first item below in Media and Format)
- Any illustrations or images that represent the project

Media and Format

This category includes presentations in the form of stories, graphic novels, comic books, plays, set design, make-up, costumes, videos, radio shows, etc..

- An electronic version of the primary entry (not the display) should be submitted no later than three days prior to the STEAM Expo event. If an entry is over 10 pages (10 minutes if in Audio or Video format) then the deadline is 7 days prior. See notes on website for entry procedure.
- There is no minimum or maximum length for any entry, but the quality of the entry should be "grade level appropriate"
- Illustrations for written stories, and storylines for non-written entries are appreciated, and collaborative efforts to provide those (and other) combinations are welcomed.

Definition of "willful suspension of disbelief"

- This phrase describes a reader's ability to accept what they know to be untrue (or not yet proven) to be real for the duration of the story.

2. Entry, Review, and Judging

An entry in this category will be reviewed and judged on the following:

- Following the Entry Rules and achievement on each Rubric item
- General standards for the media chosen (e.g. well written for stories, good production values for A/V items)
- Use of creative ideas and imagination is important to the storyline of the entry

Additional items which will affect the review and judging conclusions

- Alternative thought process or physical rules are clearly expressed (but not necessarily described in detail)
- Alternative rules are consistent throughout the story
- Willful suspension of disbelief effort is almost negligible



Science Fiction: Rubric

NCSOS STEAM Expo

Name: _____ **Grade:** _____ **Location:** _____

General Requirements Evaluation*			
Presentation Display		Descriptive Document (if present)	
Attractive, easy to read, and layout is in appropriate, logical order A	ND 1-2-3-4-5 NA	Organization is clear and complete without extraneous information.	ND 1-2-3-4-5 NA
Visual aids promote understanding A	ND 1-2-3-4-5 NA	Spelling and grammar correct	ND 1-2-3-4-5 NA
Shows project in appropriate detail for understanding by audience	ND 1-2-3-4-5 NA	Visual aids promote understanding A	ND 1-2-3-4-5 NA
Science Fiction Category Evaluation**			
Project Production		Other Considerations Specific to Category	
Writing and/or production standards for the selected media are well done and are appropriate for the project.	ND 1-2-3-4-5 NA	Structure of entry is well designed for the intended storyline (may include unusual formatting or unique sequencing). A	ND 1-2-3-4-5 NA
Dialogue (if used) is used well and flows appropriately.	ND 1-2-3-4-5 NA	Combinations of entry formats (illustrations with storylines, storyboards with plays, etc.) are well done and appropriate. A	ND 1-2-3-4-5 NA
Use of details (descriptions, adjectives, etc.) is well done and appropriate.	ND 1-2-3-4-5 NA	"Willful suspension of disbelief" effort is present.	ND 1-2-3-4-5 NA
Illustrations or images (if used) are appropriate and add to the story. A	ND 1-2-3-4-5 NA	Stories (and/or characters) keep the reader's attention and interest.	ND 1-2-3-4-5 NA
		Knowledge and understanding of the topic are conveyed.	ND 1-2-3-4-5 NA
Scientific Concepts			
Use of an alternative scientific idea or concept which is not currently proven is important to the storyline of the entry.	ND 1-2-3-4-5 NA		
Alternative thought process or physical rules are clearly expressed (but not necessarily described in detail).	ND 1-2-3-4-5 NA		
Alternative rules are consistent throughout the story.	ND 1-2-3-4-5 NA		
Alternative rules or thought processes are derived from existing physical laws and/or current scientific principles.	ND 1-2-3-4-5 NA		
Additional Items for Consideration			
Safety Considerations			
Team/External Considerations			
Special Category Considerations			

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 (*See General Entry Rules and Requirements for further information, **See Category Description for further information)
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Scientific Inquiry

Definition:

Scientific Inquiry is the basic experimentation category where a question is asked, a hypothesis is created, an investigation is performed, and a conclusion is reached. **Scientific Inquiry requires students to use higher order thinking skills as they learn science using a hands-on, minds-on approach.**

1. Pertinent Information and Definitions

Scientific Method

The Scientific Method is a fundamental part of this category. It is, in essence, a sequence of operation for any Scientific Inquiry. The steps are:

- Ask a testable question.
- Research the topic.
- Make a hypothesis about the outcome based on that research and/or the entrant's own knowledge.
- Design the investigation.
- Conduct the investigation.
- Collect data.
- Make sense of the data and draw a conclusion.

2. Entry, Review, and Judging

An entry in this category will be reviewed and judged on the following:

- Following the Entry Rules and achievement on each Rubric item
- The scientific method (including completeness of thought processes and presentation of cause and effect)
- Preparation and display of information about the entry

Additional items which will affect the review and judging conclusions

- Presentation of the inquiry findings for peer review.
- Understanding of how the inquiry relates to broader scientific principles and real world applications
- Originality and/or innovative approaches or concepts



Scientific Inquiry: Rubric

NCSOS STEAM Expo

Name: _____ **Grade:** _____ **Location:** _____

General Requirements Evaluation*			
Presentation Display		Descriptive Document (if present)	
Attractive, easy to read, and layout is in appropriate, logical order A	ND 1-2-3-4-5 NA	Organization is clear and complete without extraneous information.	ND 1-2-3-4-5 NA
Visual aids promote understanding A	ND 1-2-3-4-5 NA	Spelling and grammar correct	ND 1-2-3-4-5 NA
Shows project in appropriate detail for understanding by audience	ND 1-2-3-4-5 NA	Visual aids promote understanding A	ND 1-2-3-4-5 NA
Scientific Inquiry Category Evaluation**			
Display and Documentation		General Process and Scientific Method	
Describes how/why the inquiry was formed and development of a hypothesis	ND 1-2-3-4-5 NA	The purpose or problem clearly explains what is going to be experimented.	ND 1-2-3-4-5 NA
Investigation procedure is clearly explained.	ND 1-2-3-4-5 NA	Appropriate and complete research was conducted.	ND 1-2-3-4-5 NA
Materials listed with units of measure (consistently), graphs, data tables etc. labeled correctly, data is summarized	ND 1-2-3-4-5 NA	Hypothesis shows a relationship between independent and dependent variables.	ND 1-2-3-4-5 NA
Results/Summary of data is clearly stated and addresses ALL variables.	ND 1-2-3-4-5 NA	Procedure description shows what observations will be made, what data will be collected, defines the number of trials, lists variables and control items.	ND 1-2-3-4-5 NA
Display is attractive and easy to understand A	ND 1-2-3-4-5 NA	Procedure is sequential, replicable, provides a control and variables and was repeated for validity.	ND 1-2-3-4-5 NA
		Qualitative (observations) and quantitative (recorded data) observations are used and recorded.	ND 1-2-3-4-5 NA
		Record of experiment includes observations, appropriate use of terms and measurement, analysis and reflections.	ND 1-2-3-4-5 NA
		Conclusion relates to the problem statement and incorporates results/the data supports or doesn't support the hypothesis, lists possible source of error, and unresolved questions.	ND 1-2-3-4-5 NA
		Other Considerations Specific to Category	
		Peer/Scientific review	ND 1-2-3-4-5 NA
		Understanding of how the inquiry relates to broader scientific principles and real world application.	ND 1-2-3-4-5 NA
		The idea for investigation is original or innovative.	ND 1-2-3-4-5 NA
		Offers advancement of understanding of scientific principles and/or the world around us.	ND 1-2-3-4-5 NA
Additional Items for Consideration			
Safety Considerations			
Team/External Considerations			
Special Category Considerations			

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