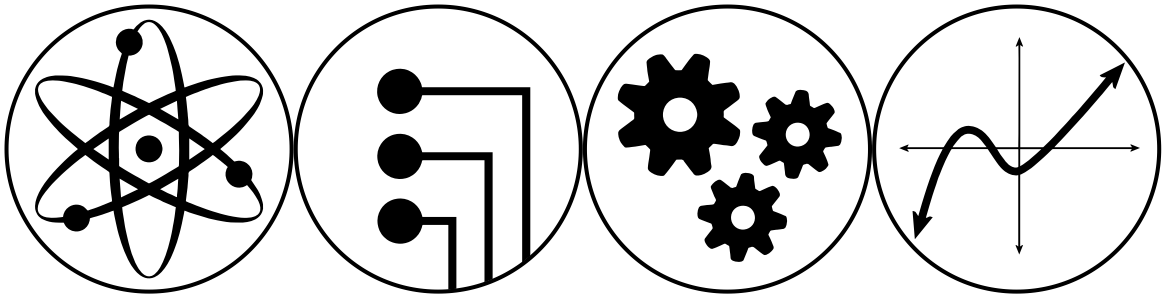

Placer County STEM Expo 7 (2017)

Category Descriptions and Recommendations

CONTENTS

Revisions

09 December 2016 – Original Release

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1. Environmental/Agricultural Innovation

1.1. Category Description

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.

1.2. Pertinent Information and Definitions

1.2.1. 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.

1.2.2. 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.

1.3. Entry, Review, and Judging

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

- Entry rules and general requirements judging points
- Description of the problem or issue
- Review of plan of implementation
- Preparation and display of information about the innovation

1.3.2. 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

1.3.3. The presented display will be evaluated for consideration as part of the Creative Arts award category (see section 8).

1.3.4. Please review the judging rubric for this category, and the entry rules and general requirements for other items that may be considered.

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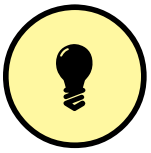
2. Invention

2.1. Category Description:

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.

This category provides a means of presenting an invention to the general public.



2.2. Pertinent Information and Definitions

2.2.1. Project Display

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

- A description of the use of the invention, and the benefits associated
- A 'mock-up', prototype, or construction of all or part of the invention
- A marketing or promotional concept for the invention

2.2.2. Descriptive Paper

A descriptive paper may 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.

2.2.3. 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) may be evaluated for additional consideration in the Creative Arts awards section.

2.3. Entry, Review, and Judging

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

- Entry rules and general requirements judging points
- Preparation and display of the invention and/or its component
- Prototype or mock-up design and construction
- Descriptive paper showing further details about the invention

2.3.2. 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

2.3.3. The presented display will be evaluated for consideration as part of the Creative Arts award category (see section 8).

2.3.4. Please review the judging rubric for this category, and the entry rules and general requirements for other items that may be considered.

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3. Reverse Engineering

3.1. Category Description:

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.

3.2. Pertinent Information and Definitions

3.2.1. 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.

3.2.2. Project Display and Description

A successful entry 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, material is identified, and its function explained
- Components are arranged so that they are located to the assembled unit correctly

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

3.3. Entry, Review, and Judging

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

- Entry rules and general requirements judging points
- Preparation and display of the components or subcomponents of the original object
- Descriptive paper showing accuracy in explanation of components and overall operation

3.3.2. 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 generally understood
- High degree of complexity or complex disassembly procedure required

3.3.3. The presented display will be evaluated for consideration as part of the Creative Arts award category (see section 8).

3.3.4. Please review the judging rubric for this category, and the entry rules and general requirements for other items that may be considered.

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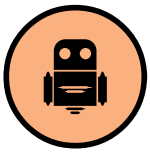
4. Robotics and Computer Science

4.1. Category Description:

A robot is a mechanical agent that can perform tasks automatically. Similarly computer science is the design of software that can perform tasks.

Computer software and robots can both be operated automatically (autonomous), semi-autonomous, or remotely controlled. Both computers and robots are designed to be used for one or more specific purposes.



4.2. Pertinent Information and Definitions

4.2.1. 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 needed tasks.
- Physical or interface construction is appropriate and elegant.

4.2.2. 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

4.2.3. Display, Documentation, and Software

The project display should show the following and may 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 of the robot or software may be included.

4.2.4. 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)

4.3. Entry, Review, and Judging

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

- Entry rules and general requirements judging points
- Physical design and operational functionality
- Software source code evaluation (if applicable) (note: this can be confidential if desired)
- Display and documentation provided

4.3.2. 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

4.3.3. The presented display will be evaluated for consideration as part of the Creative Arts award category (see section 8).

4.3.4. Please review the judging rubric for this category, and the entry rules and general requirements for other items that may be considered.

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5. Rube Goldberg

5.1. Category Description:

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)

5.2. Pertinent Information and Definitions

5.2.1. 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

5.2.2. 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).

5.2.3. 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 (½) of a standard 8-foot banquet table (approximately 47” x 30”). A limited number of larger (approx. 4’ x 7’) floor spaces will be available (by reservation only). See the Entry Rules for details.

5.3. Entry, Review, and Judging

5.3.1. If you make a complete contraption, please video the sequence of operation and post it to an internet video site (such as YouTube) and provide the link to the video as part of your display.

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

- Entry rules and general requirements judging points
- 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

5.3.3. 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

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5.3.4. The presented display will be evaluated for consideration as part of the Creative Arts award category (see section 8).

5.3.5. Please review the judging rubric for this category, and the entry rules and general requirements for other items that may be considered.

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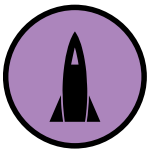
6. Science Fiction

6.1. Category Description:

Science Fiction is a genre of fiction dealing with imaginary, but 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"



6.2. Pertinent Information and Definitions

6.2.1. 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 Section 6.2.2)
- Any illustrations or images that represent the story

6.2.2. Media and Format

This category includes presentations in the form of stories, graphic novels, comic books, plays, videos, etc.

- An electronic version of the primary entry (not the display) should be submitted no later than three days prior to the STEM Expo event. If an entry is over 10 pages (10 minutes if in Audio or Video format) then this 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.

6.2.3. 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.

6.3. Entry, Review, and Judging

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

- Entry rules and general requirements judging points
- 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

6.3.2. 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 through the story
- Willful suspension of disbelief effort is almost negligible

6.3.3. The presented display will be evaluated for consideration as part of the Creative Arts award category (see section 8).

6.3.4. Please review the judging rubric for this category, and the entry rules and general requirements for other items that may be considered.

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7. Scientific Inquiry

7.1. Category Description:

The Scientific Inquiry category requires students to use higher order thinking skills as they learn science using a hands-on, minds-on approach.

This is the basic experimentation category where a question is asked, a hypothesis is created, an investigation is performed, and a conclusion is reached.

7.2. Pertinent Information and Definitions

7.2.1. 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

7.3. Entry, Review, and Judging

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

- Entry rules and general requirements judging points
- The scientific method (including completeness of thought processes and presentation of cause and effect)
- Preparation and display of information about the entry

7.3.2. 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

7.3.3. The presented display will be evaluated for consideration as part of the Creative Arts award category (see section 8).

7.3.4. Please review the judging rubric for this category, and the entry rules and general requirements for other items that may be considered.

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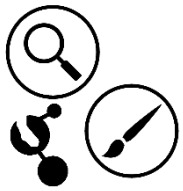
8. Special Award Categories



STEM Expo may offer awards in special or extra areas (categories) for entries that show a focus on these particular aspects in their project. Unless noted below, these awards are open to all entrants, and are awarded in addition to the normal awards for the category.

Entrants are automatically entered into the special categories when they enter the primary category: no separate entry for the special category is required.

There are no rubrics specific to these categories. During the course of judging, the judges may elect to nominate entries into these areas, then a special individual judge or panel of judges will determine the category award after reviewing the entries.

Note that projects that include some aspect of all of these categories are commonly among the most successful in their primary category.

STEM Expo may elect to include or exclude any or all of these award categories on the day of the event.

8.1. Creative Arts Category

The Creative Arts category focuses on the presentation from an artistic standpoint. The intent is to recognize the entry(s) that have artistry in their presentation.

This artistry could be represented in one aspect (for instance a single drawing or graphical element) or as part of the project presentation as a whole.

Creative Arts is applicable for all categories.

8.2. Research Category

The Research category focuses on the research that an individual entrant did in the preparation of the entry. The intent is to recognize the value of the research as a separate context and appreciate an entrant who has gone above and beyond the normal level of research for their category.

Research is applicable for all categories, and may be presented in any form as part of the entry.

8.3. California State Science Fair Advancement

STEM Expo is the local nominating affiliate for the California State Science Fair (CSSF). As such, entries in appropriate categories are considered for advancement to that event. STEM Expo is given a certain number of attendees that we may advance and they are expected to be the best representation of the standards at STEM Expo.

The CSSF advancement is applicable for the categories of: Environmental/Agricultural Innovation, Invention, Robotics, and Scientific Inquiry.

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9. Major changes from last year

9.1. General

Defined California State Science Fair Advancement as a Special Category award.

9.2. Rube Goldberg Category

Revised Space Limitation (See the General Rules section 3 exception for this category for details)

Added request for video link

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