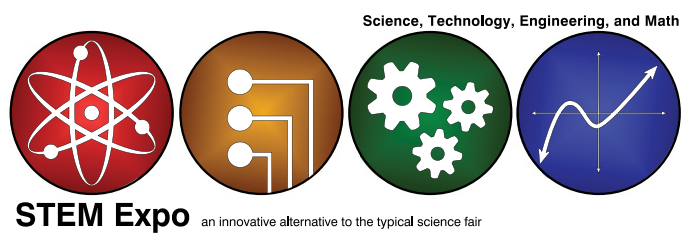


STEM Expo, Inc. Judging Handbook 2018-2019 Edition

Version for: Placer County, California



Revision 2: February 2019

Greetings!

On behalf of the Executive Board of STEM Expo, Inc. I thank you very much for agreeing to be a judge for STEM Expo.

For the many returning judges who have been with STEM Expo over the years, we offer our deepest thanks for your continued service. We created this handbook last year, and got lots of positive responses to the information. This year we've revised it and will (hopefully) be even more useful.

For first time judges, Welcome! You've joined an amazing group of people who are dedicated to the success and future of Science, Technology, Engineering, and Math in our youth in your area.

The success of STEM Expo is largely due to the contribution of your expertise and passion in the judging process. We hope that you enjoy the interaction with the students and your fellow judges.

I appreciate and encourage all comments and suggestions you may have regarding any aspect of STEM Expo. Please let me (us) know any ideas and thoughts by email at the email address below.

*Alan LeVezu
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Director of Judging
STEM Expo, Inc.*

STEM Expo, Inc. (2018-2019 School Year)

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STEM Expo Judging Handbook

STEM Expo

Our Mission: We seek to inspire the youth of this country to take a local leadership role in Science, Technology, Engineering, and Math (STEM). While partnering with our community, we provide a platform to both celebrate and reward their accomplishments.

Date, Times, Place

Placer County STEM Expo 9 is being held on

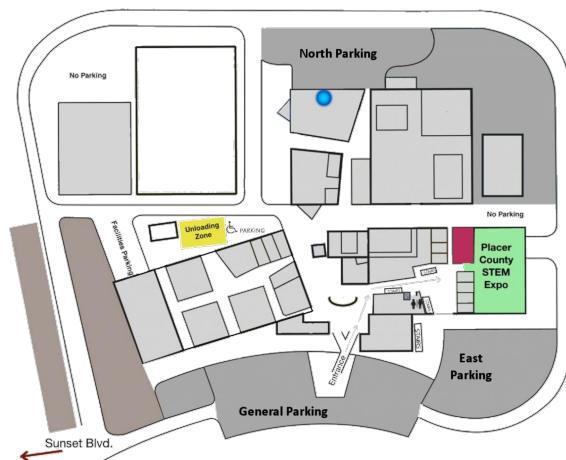
Saturday, March 2nd, 2019

at the Academic Warehouse on the William Jessup University (WJU) campus.

The address for WJU is

2121 University Ave., Rocklin, CA 95765

This is the same location we've always had STEM Expo, if you've been there before you probably don't need detailed instructions. If not, or if you've forgotten you can look up at <https://tinyurl.com/STEMExpoPlacer> (which links to a really long google map address). You can also go to our website at <http://www.stemexpo.org/location> and find info there.



The Pre-event training meeting will be held at 6:00 PM on Thursday February 28th, off campus in the Multi-Media room at the Sun City Lincoln Hills Community Association (965 Orchard Creek Ln., Lincoln, CA 95648) .

On the morning of STEM Expo, once you're on campus, you're welcome to come straight to the Judge Headquarters room (Judge HQ is in the Lecture Hall - the red zone on the map).

We will be ready starting at about 6:45 — please arrive and be checked in, **at latest, by 7:15 AM**

Event Day Schedule

6:45 AM – 7:10 AM	Judge Check-in
7:15 AM – 8:00 AM	Judge Orientation and Assignment (Judging HQ)
8:00 AM – 8:30 AM	Open Review (Student Entry Area Open – Setup may still be in progress)
8:30 AM – 11:30 AM	Interviews and initial judging (Entry Area Closed – Only Interviews in area)
11:30 AM – 1:30 PM	Deliberation and follow-up evaluations (Student Entry Area Open to Public)
1:30 PM – 3:00 PM	Special Category Award Panels evaluations and determinations
3:00 PM – 3:30 PM	Final Award Preparations
3:30 PM – 4:15 PM	Closing Awards Ceremony

Logistics

Arrival

Please arrive and check in at Judge HQ between 6:45 and 7:10 AM so we can begin our orientation. We'll be discussing the day, going over tasks, confirming judge teams, handing out schedules, answering questions, and basically doing everything to get ready to actually begin reviewing student projects at 8:00. PLEASE be on time!

Food

When you arrive at orientation time we will be providing coffee, water, juice, and some sort of pastry - we should have that ready for you by 6:45. At lunch we'll have food, drinks, etc. And throughout the day we will provide coffee and water.

If you have any dietary restrictions, please let the event team know as soon as possible and we'll work to accommodate your needs and requests.

Attire

As part of the judging process, students are invited to be interviewed by the judges (you!). As a judge we ask that you be a role model for these students, with attire to match that model. That being said, it IS a Saturday and business very casual is appropriate (no ties!), nice jeans and polo shirts are great.

If you judged with us last year, hopefully you kept the STEM Expo Judging shirt we gave you. If you're new or weren't able to be there, we've got a classy red polo shirt that we'll give you. We're hoping that you like doing this enough that you're willing to save the shirts and re-use them when you come back next year!

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Judging Assignments

We close student registration at midnight on the Monday night before the event and, while a couple stragglers may be allowed in after that, the final interview schedules and judging panels will be set on Tuesday morning. Thus, you should be getting an email providing you with your specific category and grade group in the middle of the week before the event. If there is something you cannot do (due to a conflict of interest), please let the Judging Director know in advance so the panels can be worked around that.

Training

Although we do talk a little bit about the judging process on Saturday morning during the orientation meeting, it's always a bit of a rushed discussion. So, we offer an advance judge training session... We usually schedule that for the Thursday before the event, at 6:00 PM. This will be held on the WJU campus, and you will get an email with details of location in the week or so prior to the event.

This is a voluntary event, but if you can make it we would love to see you there.

The Judge-Student Relationship

It is important to remember that students participating in STEM Expo are of elementary, middle, and high school age. They are not adults. The relationship of student to judge is that of a minor to an adult in a position of authority. Judges must adhere to the highest standards of professionalism in all cases. It is the responsibility of all judges to ensure that all interactions between themselves and the students are in the best interests of the students.

Not infrequently, a judge is especially impressed with a student or project and would like to offer help or advice, or even offer the student a job. There are acceptable methods for establishing contact with a student. Judges may not ask students for their phone numbers and should not initiate or propose any form of future contact. Instead, contact the Judging Director and indicate to them your availability to the student for future assistance. Such contact will be facilitated by the Judging Director with the approval of the student's parents or guardians. Student-initiated requests will always be facilitated.

Inappropriate comments of a personal nature by a judge to any participant are unacceptable. Such behavior is sufficient grounds for barring that judge from future events.

Judging Sequence

Your day will be separated into four sections of three basic tasks: Interviews, Evaluations, and Awards.

Interviews

The interviews will be your primary interaction with the students who created all of the judged projects. It should be remembered while interviewing that one of the primary goals of the judges is to INSPIRE the students.

Deliberations and Decisions

Interviews are followed by your evaluations and deliberations. If there are multiple judging panels for your category, you will be working with the others to review and perhaps re-visit entries.

During the deliberations you will also be asked to nominate entries for the special category awards.

Special Category Judging

After determining the rankings of the students in your category, you will likely be tasked with determining additional special awards. These awards do not have a specific rubric, but the category description will guide you in that decision.

Award Ceremony

We will be giving out awards to participants at the awards ceremony which begins at 3:30. These awards cover all basic categories, in up to three different age groups, and the special awards. One of the fun “responsibilities” of the judges is to help us hand out these awards. All of them will be presented at the ceremony, and we want it to be fun, but we also want it to be quick! With your help we can make both happen — if everything goes right we should be done by 4:15. At latest I expect that time to be 4:30.

Interviews

All entries will be assigned a specific time for review by judges. The student(s) involved in the entry are invited to be there for a discussion and interview at that time. The interview is voluntary for the student(s); however, it is also recommended. The interview gives the judges the opportunity to consider the depth of understanding by the entrant and clarify any information that is in question.

Duration and Time

Ideally, each interview should last 8-10 minutes; however, logistically this is not always possible. An interview of less than 5 minutes is unlikely to satisfactorily determine the extent of a student's knowledge of his/her project, while interviews of longer than 10 minutes can delay and hinder the judging process.

On the other hand, students are expected to be at their display at the time of the interview. If they are not there when the scheduled period starts the interview may need to be abbreviated. If they are not there within 5 minutes of the time, it may be cancelled. But, if the student arrives late, and you have the time in your schedule, please complete an entire interview. (Note that exceptions do happen, and, at the discretion of the judging director, missed interviews may be rescheduled.)

Every student should be treated with respect

This should be self-evident, but is sometimes forgotten. While these students are young, they are aspiring, though inexperienced, scientists and engineers. They and their projects should be treated with due consideration, even if the science is flawed. Each judge should introduce him/herself, be polite, and try to put the student at ease.

Every interview should have educational value

The interview should provide some educational benefit to the student, particularly those who are not serious contenders for a prize. This is an opportunity to educate the student as to how a scientist thinks, and how to identify important questions others will ask, and the questions they should be asking themselves about their project. Your interview could set the student on the track to a better project for next year.

After the interview

Once the interview is complete, any notes or comments made by the judging team should be kept private. Please be sure to have discussions or scale the rubric in places with privacy. It is a really good idea to fill out the rubric immediately after the interview.

Rubrics (Evaluation Forms)

The judging rubrics that you fill out will be given to the students at the end of the day for their feedback. What you, as a judge, say on these can affect the student even more than what is said in the interviews. As a judge you should be honest, but respectful in both scale values and comments

Rank as you go

It is critical that you complete the ranking and general marks of the rubric as soon as you finish the interview! You will find yourself overwhelmed at deliberation time if you do not. If you are judging for the first time and are unsure as to your ranking relative to later projects, we are happy to provide new forms for any you may wish to correct prior to turning them in to us.

Scale

The judging rubric scale allows for a range of 1 to 5 for evaluation in each of the areas - and judges can mark on (or anywhere between) the following general values:

1. Beginning, 2. Developing, 3. Acceptable, 4. Accomplished, 5. Advanced

There are two additional indicators in these rubrics:

NA Not Applicable: used to indicate that the ranking item does not apply to this entry

ND Not Demonstrated - Used to indicate that although the judge believes that this item applies to the entry, the information was not presented in the display or documentation.

Comments

Comments are intended to assist the entrant by pointing out both successes and possible areas of improvement. Although there is space on the rubric for judges to enter comments, these are not required. Note that comments like “the best project here”, “awesome” or “this project sucks” are all inviting issues between the entrant and the judging team. To that end, all comments on each rubric will be reviewed prior to release.

Sections

All of the rubrics are in the same format, there are three primary sections: the top and bottom are generic and the same on all of the categories.

The topmost part has space to indicate your rating for the display and a location to rate the key judging criteria (described later). Directly under that is a section on Science and Engineering Practices (also discussed later in this document).

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The bottom is a place to make comments specific to safety, external issues (e.g. parental involvement, team dynamics, etc.) and considerations for the special award categories.

The center section of the rubric is specific to each category. It will (in most categories) have three sections, one relating to the presentation and documentation, a second with specifics for the type of items being judged, and an “Other Considerations Specific to this Category” section.

Project Display Requirements and General Judging Criteria Evaluation*	
Presentation Display and Documents (if Present)	General Judging Criteria
Attractive, easy to read, and layout is in appropriate logical order	Organization and Completeness
Shows project in appropriate detail for understanding by audience	Clarity
Visual aids promote understanding	Comprehension
Thorough, without extraneous data	Effort and Motivation
	Originality / Innovation
	Elegance and Artistry

Additional Items for Consideration	
Safety Considerations	
Team/External Considerations	
Special Category Considerations	
ND: Not Demonstrated, 1: Beginning, 2: Developing, 3: Acceptable, 4: Accomplished, 5: Advanced, NA: Not Applicable	
(* See General Entry Rules and Requirements for further information. ** See Category Description for further information)	

Special Categories

In addition to judging your category, you should be on the lookout for any project that may be a contender for one of the special category awards. These are provided to recognize projects that show special strengths in areas that may not be regularly awarded in other STEM competitions.

In addition to your normal category assignment, you will likely be assigned as a judge on one of these special award panels. Once your normal category awards are determined you and the new panel will review the entries for these potentials. Note that there are no separate rubrics for these awards, but the category descriptions should be the primary guide.

Any and all entries are automatically qualified for these awards. The possible entries are mainly focused on the nominees by the judges, but they are not limited to them. If, while reviewing entries, you spot another entry that was not nominated, but fits the special category, you are welcome to (and, indeed, are expected to) review that one for inclusion in the award.

Judges Notes

You will be provided with a separate “Judges Notes” page for each entrant you are judging. We may do research on any project prior to the event and notes about this work will be on this page. You are also free to use this to annotate any comments that you wish. These pages will NOT be returned to the students and are confidential. They will be shredded when the event is completed.

Judge Panel Deliberations

When you return to your judging panel and deliberate on the projects, you can use a few simple criteria for selecting the winners:

Simple Criteria

- The quality of the student's work is what matters, not the amount of work
- Derivative work is allowed, copied work is frowned upon. Each project should have an original component, that originality is a good comparative tool.
- The General Criteria defines most of the descriptions of quality of the work
- Team projects are judged like other projects — it is the quality of the work that matters (an individual project of equal quality to that of a team project may be ranked higher because of the comparatively greater effort required by the individual)
- A less sophisticated project that the student understands gets higher marks than a more sophisticated project that is not understood.

High marks go to:

- Discovering knowledge not readily available to the student
- Correctly interpreting data
- Repetitions to verify experimental result data
- Clever and/or unique processes or apparatus that fit the project
- Predicting and/or reducing experimental results with analytical techniques
- In engineering categories, projects applicable to the "real world"
- Ability to clearly portray and explain the project and its results

Low marks go to:

- Ignoring readily available information (*e.g.*, not doing basic library research)
- An apparatus (*e.g.*, model) not related to the subject at hand.
- Improperly using jargon, not understanding terminology, and/or not knowing how equipment or instrumentation works
- Presenting results that were not derived from experimentation (*e.g.*, literature search)

Subjectively, the best project is often the one you would be proudest to tell others was your choice.

Revisiting projects and additional interviews

After the interview period is complete, judges may re-visit entries. In fact, if there is more than one panel in the same category/age group there will likely be comparative re-visits. If the student(s) are present they are welcome to discuss the project further with the judges.

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Note also that numerous panels of judges for several different types of awards will be evaluating many factors throughout the day.

While out among the projects, after the interview period is over, it is important to remember that the general public will also be among the projects. You will need to be diligent in protecting the confidentiality of the judging process and potential award winning entries. Conversations about entries should be subdued and away from any public.

Evaluation Only

Some entrants are placed in STEM Expo in an “Evaluation Only” mode. These entries still have the interview, and still get feedback via the rubric, but are not in consideration for any award.

Award Count

The judging director will inform you how many places will receive awards.

Ties

STEM Expo normally allows ties for entry positions with no loss of a place (in other words there could be two first places, a second, and two thirds). However, the preference is to correctly rank entries – and ties may be limited by the resources (e.g. number of medals, etc.) available.

Age Appropriate Ranking

We define three age/grade groups for evaluation and competition: Elementary (typically 3rd–5th), Middle (typically 6th–8th), and High School (typically 9th–12th).

Within the grade level groups, entries are ranked the same. In other words, although a 3rd grade entry (elementary) is not expected to be at the same level as a 6th grade entry (middle), 6th and 8th grade entries are both judged at the same level.

If a team consists of students in different grade levels, the higher grade is used for evaluation.

Comparing Projects That Aren’t Comparable

One of the most difficult judging tasks is comparing projects carried out in an laboratory environment with projects done at home and no professional help. Among students with access to well-equipped laboratories, there are those for whom the facilities are the enabling mechanism for their efforts, but there are also those for whom the facilities are a mask for little effort. Both types of students should be judged on their personal accomplishment and their ability to exploit the resources available. Students who work entirely

on their own may appear to be at a disadvantage when judged solely on the basis of the project's title and display. If their accomplishments are equivalent or even superior to others, the interview is where the playing field is leveled and you can more accurately gauge their investment.

It is important to identify how the student made a difference in the direction of the project. Regardless of where the project is conducted, good scientific principles and engineering practices must be evident. The student's level of understanding should be consistent with the project's level of technical sophistication and complexity. Judges should apply this standard in evaluating the student's project.

Team Projects vs. Individual Projects

Judging the Project

It is important that judges keep in mind that all projects, regardless of the number of participants, are evaluated on the quality of the personal contribution(s) of the student(s) involved. In order for the judge to be able to evaluate the level of a team project, it is helpful if all students in the team participate in the interview (unless otherwise acknowledged).

All students on the team should have general and specific knowledge of the project such as how the question was conceived and subsequently attempted to be answered. The judge has the freedom to ask a question of anyone in the group. However, the judge should be aware that team dynamics apply, and the group has the equivalent freedom to choose a spokesperson and may refer a particular question to a specialist.

Judging the Effort

In your comparison of a team project with one done by an individual, it is fair to have a higher expectation of the team project regarding the overall level of effort involved in the project. In other words, team projects have greater resources (the number of minds working together) and therefore a greater capacity for more research and data collection, more time, effort, and thought spent on the project, and more analysis than someone acting alone. There should also be evidence of team collaboration and synergy among team members (which should become evident during the interview process). In particular, the judge should try to ascertain how fully the resources of the group have been exploited.

Remember that one of the goals of team projects is to encourage students to work as a team (mimicking the way it is done in the real world), and to encourage project management. Each team member should have made a significant contribution to the overall project. Finally, do not discount any student for having been in a team because you feel they had an unfair advantage.

Miscellaneous

Conflict of Interest

A potential for a conflict of interest arises when a judge is personally acquainted with a student that he/she will be judging. This acquaintance can be the result of a biological relationship (*i.e.*, a family member), mentoring, teaching, etc. It is the responsibility of the individual judge to notify the Judging Director of any potential for conflict of interest at the earliest possible time so that the judge can be reassigned to a different category that would eliminate the conflict.

Confidentiality

In fairness to the participants it is absolutely necessary to maintain the confidentiality of the results of the judging process. Judges are not to disclose in any way the results of the judging process to anyone other than the Judging Director or other appropriate event officials. Winners will not be disclosed to the public or students before the Awards Ceremony.

Ethics and Original Work

Scientific fraud and misconduct are not condoned at any level of research or competition. This includes plagiarism, forgery, use or presentation of another researcher's work as one's own and fabrication of data. Fraudulent projects will fail to qualify for competition in any STEM Expo and/or any subsequent follow-up event.

All projects should have an original or innovative aspect to the work at least in either concept or approach. If a pre-existing project is modified or continued from a previous year, the initial work should be credited and the expanded or innovative portions clarified or explained and documented.

Photographs

Because of potential liability issues it is recommended that judges do not take photographs of the students during the interviews. Remember you are in a position of authority. On the other hand, it is also appropriate to take pictures of the entry display and project information for later review during deliberations.

Multiple and Wrong Categories

It is very much allowed and expected that entries that do not quite fit into a specific category, or ones that definitely fit into more than one category, will enter in multiple categories. Interviews are scheduled for each category.

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It also happens that an entry is sometimes placed into the wrong category by the student when registering. If this is the case, the judges should inform the judging director as soon as possible, so they can be set for a review with the correct judging panel.

Parental Involvement

STEM Expo allows parents to assist/guide students with their projects... However, if that assistance/involvement is in place, they must be entered in the event as “Evaluation Only” and are ineligible for awards.

If you, as a judge, suspect or believe that there was excessive parental involvement in a competitive entry, then the judging director must be informed, and that entry will be reset to an Evaluation Only state.

Other Resources

The STEM Expo web site has many other resources available. The most important key elements though are the official rules, rubrics, and category documents.

You can always find the most current versions of these documents (and the most current version of this judging handbook) at

<https://www.stemexpo.org/JudgingInfo>

There are numerous other documents, photos, educator and parent resources, etc. on the website itself, please feel free to browse through any and all of it!

How to be a Good STEM Expo Judge

Being a judge can be challenging, but it's worth the effort. You are making a memorable impact on the lives of talented young people. For some students, you are the first professional they have ever met who is involved in science or engineering for a living.

Be an Ambassador

Part of your job at STEM Expo is to be an ambassador for your profession. Students' perceptions of you could influence their career choices. As a judge, it is important for you to show the students that you are both fair and knowledgeable. Your fairness is indicated by a few simple actions: spend the same amount of time with each student, listen to the student's explanation of the project, ask questions intending to find out more about the project and how it was done — *not* to embarrass or intimidate the student.

Ask Questions

Your best tool in judging is your ability to ask questions!

Be sensitive to what the student knows. You can always ask questions that the student can answer, and keep a conversation going for ten minutes. There are some sample questions that almost every student should be able to answer at the end of this section.

One type of question to avoid is "Why didn't you do . . .?" Probing questions are useful to stimulate the thought processes of the student. A solution to or extension of the work presented may be obvious to you, but the student may not understand why you're asking such a question. Be sure to imply the correct intent, as in "Could you have done . . .?" or "What do you think would have happened if you had done . . .?" The question then is an invitation for the student to think about the experiment in a different way and can turn the question into a positive experience.

Later in this document you can find a set of Sample Questions. Use these as a place to start. Make them yours! Just like you probably don't want to hear a "canned" response, the student doesn't need to hear a "canned" question. Use the questions as a reminder of what topics you might ask about. Go ahead and determine some questions that seem right to you and jot them down before you go out. On the other hand, sometimes it's revealing to ask the same question of each entrant to see how they react.

SAMPLE QUESTIONS

Use these samples as a basis to create your own questions that apply to your category and the projects you are reviewing. Please DO NOT read them as-is to the students!

- How did you come up with the idea for this project?
- What did you learn from your background search?
- How long did it take you to build the apparatus?
- How did you construct the devices involved?
- How much time (many days) did it take to run the experiments (grow the plants) (collect each data point) (build the invention) (try different options) (etc.)?
- How many times did you run the experiment with each configuration?
- How many experiment runs are represented by each data point on the chart?
- Did you take all data (run the experiment) (run the robot) (etc) under the same conditions, *e.g.*, at the same temperature (time of day) (lighting conditions)?
- How does your apparatus (equipment) (instrument) work?
- What do you mean by (terminology or jargon used by the student)?
- Do you think there is an application in the real world for this knowledge (technique)?
- Were there any books that helped you do your analysis (build your apparatus)?
- When did you start this project? or, how much of the work did you do this year? (*Some students bring last year's winning project back, with only a few enhancements*)
- If you were to start over, what would you do different?
- What is the next thing to do in continuing this study?
- What excited (inspired) you about this project (topic) (idea) (machine)
- Are there any areas that we have not covered which you feel are important?
- What is the answer to Life, the Universe, Everything?
- Do you have any questions for me?

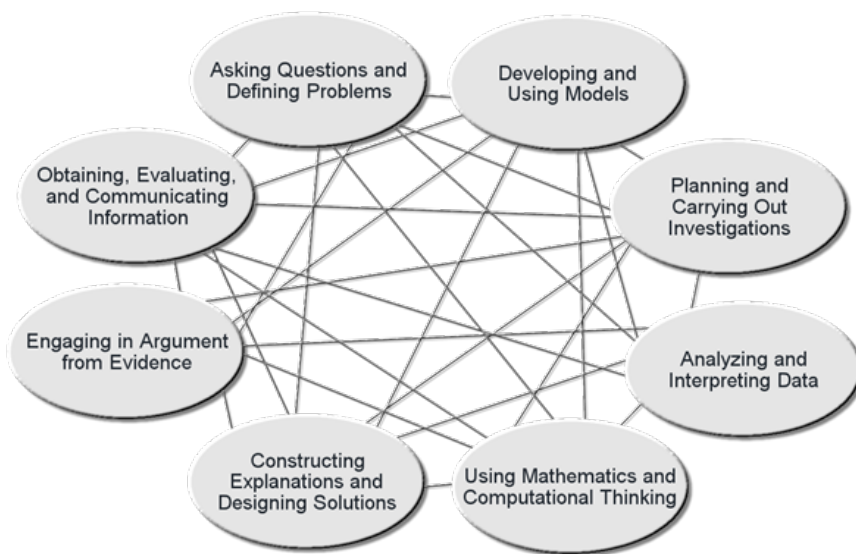
SCIENCE AND ENGINEERING PRACTICES

The traditional model of the Scientific Method is outdated in that it depicts a linear process, while actual scientific advances happen through significantly more non-linear ones. Although many of the concepts are the same, as part of the next generation science standards they have been re-arranged and re-thought out and are now in a different form.

These eight practices are parts of any good scientific or engineering project:

1. Asking questions (science) and defining problems (engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (science) and designing solutions (engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

But rather than thinking of them numerically, it is better to think of them interdependently as shown in the image below.



Each practice connects to and leads to-and-from every other one.

There is no specific sequence that needs to be followed, and steps can be visited more than once.

Additionally, there's no starting or stopping point, indicating the ongoing scientific work that can be done.

Note that these concepts can be applied to all of the categories in STEM Expo.

If you are looking for further information on these concepts, you can find the detail NGSS Appendix PDF document at <https://tinyurl.com/SciEng-Pract> and additional information at <https://nextgenscience.org> and <https://ngss.nsta.org>

GENERAL CRITERIA

In addition to the rubrics and category descriptions, judges will use general criteria to help evaluate entries. The following six key elements directly refer to areas on each of the rubrics

Organization and Completeness

The project should have a well-defined goal or objective. The materials, methods, and design should be sufficient to answer all the appropriate questions, and they should be organized to assist in that manner.

Completeness (thoroughness) not only includes the issue of how well the original questions have been answered, but also the issue of how fully questions arising during the project have been addressed.

Clarity

Written and oral communication skills are very important in all STEM fields. Ideas should be clearly presented and easy to understand. Projects should have well-defined goals or purposes which indicate clear understanding. A well-written presentation, easy to follow visual aids, and clear and concise answers all add to the quality of a project.

Comprehension

Comprehension is the understanding and appropriate use of concepts, terms, techniques, and methodologies. Students should have a depth of knowledge about the principles and practices involved, which can be shown by the ability to extrapolate what was learned from the project to the subject in general. Depth includes understanding basic STEM concepts behind the project topic, comprehension at a finer level of detail, and awareness of the influence that the project has on related material.

Originality / Innovation

Original ideas and the creative use of resources are usually impressive. This originality may be in the general concept, a new approach to solve an old problem, or a new interpretation of data. However, an original project must be well executed. Original projects are those that go beyond the books and explore new ground and innovative techniques.










Effort and Motivation

The amount of time a student has spent doing the actual project and the amount of time the student has spent reading and learning the subject should both be considered. While motivation and effort are not the same, the amount of effort that goes into a project is usually an indication of a student's motivation. It is important to know if a student enjoyed the experience and is interested in learning more.

Elegance and Artistry

An elegant and artistic project display provides the same information as those without these aspects, but does so with a certain stylistic element that sets the work apart from others. An elegant project presents the data with an aesthetic that is pleasing to the viewer. Artistry draws the viewers in and keeps them interested in the display.

STEM EXPO CATEGORIES

	The Robotics and Computation category includes robotics, computer science and mathematical analysis or ideas. This includes such applied sciences as engineering, programming, and mechanical design and such formal sciences as mathematics, logic, and statistics. Entrants in this category design, build, and operate mechanical and/or software constructions.
	An Infernal Contraption is a deliberately over-engineered or overdone machine that performs a simple task in a very complex fashion, usually in a chain reaction. The category is fashioned after the American cartoonist and inventor Rube Goldberg (1883-1970).
	The Intelligence & Behavior Category covers the study of the mind and its processes. This includes psychology, philosophy, linguistics, anthropology and neuroscience. Scientists in these fields study how human systems represent, process, and transform information.
	The Reverse Engineering and Invention category involves the understanding of how things work together in either a creative or evaluative manner. Reverse Engineering is to take something apart and analyze its workings, while Invention involves creating something new. Both aspects focus on a product that solves a specific problem or need.
	The Living World category includes anything to do with living organisms. This includes microorganisms, plants, animals, and human beings as well as bioethics, medicine, molecular biology and biotechnology, etc. Entrants in this category develop an investigation to explore aspects of the living world
	The Physical Universe category covers the broad fields of chemistry, physics, earth science and space science. Entrants in this category develop an investigation to explore physical aspects of the world around us
	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 the true future of STEM.
	The Things category focuses on the design and engineering of 3-dimensional physical objects. Primarily focused on engineering and design principles, this category provides a venue for everything from 3-D printing to architectural design, from woodworking to welding,
	SPECIAL Categories: are provided to recognize projects that show special strengths in areas that may not be regularly awarded in other STEM competitions. These include the Creative Arts, Research, Imagination, CSSF Advancement, and Judges Awards.