

**61st Annual  
San Juan Basin Regional Science Fair  
2018-2019 Project Guidelines**



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Mancos Middle School

For Students in Grades Six through Twelve  
from Archuleta, Dolores, Hinsdale, La Plata, Montezuma and San Juan Counties

**Thursday, March 7th, 2019**

Main Exhibit Hall  
La Plata County Fairgrounds  
2500 North Main Avenue, Durango, Colorado

**MISSION STATEMENT**

The purpose of the fair is to encourage student learning and exploration and to promote interest in math, science, engineering and technology. We do this by:

- Recognizing research knowledge, ability, effort and achievement.
- Encouraging strong mentoring relationships.
- Emphasizing safety for all project designs.
- Supporting student growth through an open evaluation process.
- Providing opportunity to our most promising students to advance in competition.

proudly sponsored by the **San Juan Board of Cooperative Educational Services**

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## 61ST ANNUAL SAN JUAN BASIN REGIONAL SCIENCE FAIR 2018-2019 PROJECT GUIDELINES

The 2019 San Juan Basin Regional Science Fair will be held on **Thursday, March 7th** at the La Plata County Fairgrounds in Durango. The Science Fair serves Southwest Colorado, open to students in grades 6-12 from Archuleta, Dolores, Hinsdale, La Plata, Montezuma and San Juan Counties. The purpose of the fair is to encourage student learning and exploration and to promote interest in math, science, engineering and technology.

### AFFILIATIONS

#### Colorado Science and Engineering Fair

The San Juan Basin Regional Science Fair is affiliated with the Colorado Science and Engineering Fair (CSEF). The top projects in each division will qualify to enter the state level fair held at Colorado State University in Fort Collins **April 11-13, 2019**. Awards given at CSEF include cash prizes, internships, and scholarships. Information about CSEF is available online at [www.csef.colostate.edu](http://www.csef.colostate.edu).

#### Intel International Science and Engineering Fair

The San Juan Basin Regional Science Fair is affiliated with the Intel International Science and Engineering Fair (ISEF) for high school students grades 9-12. The top senior division project will qualify to enter the international fair held in Phoenix, Arizona **May 12-17, 2019**. Information about ISEF is available online at <https://student.societyscience.org/intel-isef>.

### REGISTRATION

#### How to Qualify

Students may qualify for the Regional Science Fair by excelling at the Science Fair held in their schools. The top students from each school then compete against each other at the San Juan Basin Regional Science Fair. Home-educated students and those from schools that do not hold a science fair may enter the Regional Science Fair independently. Interested students, teachers and parents should contact the Regional Science Fair Coordinator for details.

#### Registration Date

The deadline for registration is **Friday, February 15th, 2019**, allowing time for the review and planning process. Please plan accordingly; late registrations may not be accepted. Registration for the 2019 Regional Science Fair will be conducted online and begins December, 2018 through the link provided on [www.science-swco.org](http://www.science-swco.org). Using this online registration, students must submit a detailed research plan and project abstract along with other project material as outlined in the *Project Rules and Requirements* beginning on page 5 of these Guidelines.

#### Registration Fees

There is a registration fee of \$15 per student. Checks should be made out to San Juan BOCES. Schools have different policies for the payment of these fees; many schools pay these fees for their students but some do not. Students should check with their teachers about the policy for their school.

As part of an effort to increase senior high school participation, **the registration fees for all senior high school students, grades 9-12, will be waived for the 2019 regional science fair.**



# 61ST ANNUAL SAN JUAN BASIN REGIONAL SCIENCE FAIR 2018-2019 PROJECT GUIDELINES

## Permission to Publish

San Juan BOCES would like to publicly showcase our students' efforts by publishing information about the fair in press releases, programs, newsletters and bulletins, as well as in newspapers and the San Juan BOCES website. Specific information to be published about students may include: name, grade, school, project title, category, and awards received plus photographs of students and exhibits. By participating in the San Juan Basin Regional Science Fair, you are giving San Juan BOCES permission to publish your information and picture. Students with any safety or religious concerns should contact the Regional Coordinator when they register in order to make proper arrangements before the fair.

## GENERAL INFORMATION

### Divisions by Grade

Projects are divided into three divisions based on grade level:

- Sixth Grade Division: 6th Grade only
- Junior Division: 7th and 8th Grades
- Senior Division: 9th through 12th Grades

### Individual Projects

An individual project represents the work of a single student, with research performed over a one-year maximum period within 2018-2019. Students with individual projects will select one of twelve categories that represent different scientific disciplines and specialties. Categories and descriptions are listed on page 11 of these Guidelines. Many projects could fit very well into several categories. When choosing the category that best matches the project, students should consider the overall focus of the project and the specific techniques being used.

### Team Projects

Team projects are completed and entered together by two or three students who have worked together over a one-year maximum period within 2018-2019. Team projects are evaluated and scored for teamwork in addition to the regular judging criteria. For Sixth Grade and Junior Division, Team Projects are judged against other Team Projects as a separate project category.

### Judging

Judges look for well thought-out, original projects that have been thoroughly researched, well executed and carefully displayed. Judging will be based on the combination of the written materials received with registrations, interviews conducted on fair day, and the material on display at the fair. Judges will be talking with students about their research to see if they have a good grasp of the project. Judges are not looking for lengthy speeches but rather the ability to clearly and concisely summarize their projects. Students should be able to speak freely and confidently about the research: answering questions, explaining what was done and why, and showing their insight into the project.

With a very limited amount of time available to review students' written material, judges depend heavily on the interview process to gauge a student's understanding. Students should be prepared to provide a summary of their project to the judges and to answer questions related to their project. Students should be able to explain all of the terminology used and concepts presented in their project.

Copies of the scoring sheets used for judging are available online at [www.science-swco.org](http://www.science-swco.org). Copies of students' completed scoresheets will be made available to teachers and adult sponsors after the fair by contacting the Regional Coordinator.



# 61ST ANNUAL SAN JUAN BASIN REGIONAL SCIENCE FAIR 2018-2019 PROJECT GUIDELINES

## Awards

### ***Category Awards***

Prizes will be awarded to the best projects for each category of the Sixth Grade and Junior Divisions.

### ***Colorado Science and Engineering Fair Nomination***

Students with the top 5 projects in each division (6th Grade, Junior Division, and Senior Division) will be nominated to attend CSEF. Additional nominations may be awarded to outstanding students across all divisions, depending on the number of projects our region is allotted. Travel expenses are the responsibility of the student and his/her parents or school. Check with your school to see if funds are available to offset travel expenses.

### ***Intel International Science and Engineering Fair Nomination***

The top senior division project overall will be nominated to attend ISEF. Additional student(s) may be nominated to participate as ISEF Student Observers. Travel expenses for the nominated students are paid by the regional fair.

### ***Broadcom Masters Nomination***

Broadcom MASTERS (Math, Applied Science, Technology and Engineering Rising Stars) is a middle school science and engineering competition. The top projects in the Sixth Grade and Junior Divisions will receive nominations to compete in this highly regarded international program.

### ***Other Special Awards***

Special awards will be presented to outstanding entries identified by award sponsors.

### ***Technical Writing Award***

Students may submit a Research Paper about their project for a Technical Writing Award that is judged separately from the regular category awards. A research paper is an organized presentation of the entire project: the question being considered, background research, hypothesis or goal, methods, data and results, conclusions, acknowledgements and bibliography references. The [ISEF Student Handbook](#) contains more information about writing a Research Paper. To be considered for this award, students must turn in a copy of their Research Paper before judging begins on the morning of the science fair. This must be a separate copy than what is displayed with the project and will not be returned.

### **Ethics Policy**

The San Juan Basin Regional Science Fair will not condone scientific fraud or misconduct. Fabrication or falsification of data, forgery of approval signatures, or plagiarism (the use or presentation of someone else's work as one's own) will not be tolerated.

## PROJECT RULES AND REQUIREMENTS

Good science involves a thorough examination of all aspects of research to identify and minimize potential risks and hazards. All projects should be designed with safety and risk management in mind and every student's initial research plan must document appropriate safety measures to be taken. The San Juan Basin Regional Science Fair follows the rules and requirements of the Intel International Science and Engineering Fair (ISEF). The [ISEF website](#) is a valuable resource that contains suggestions for projects, the full text of rules, copies of required forms and a [Rules Wizard](#) to help determine which rules and forms apply to any specific project.



### **Alternative Forms for Middle School Students**

CSEF has published a [Middle School Rulebook](#) that should be easier for younger students to understand and complete. Middle school students may opt to use these forms instead of the regular ISEF form. Please know that the basic rules and content of all the documents remains the same, only the language used to explain the rules and to ask the questions has been revised.

### **Appropriate Levels of Review**

#### ***All Projects***

All projects must have the research plan reviewed and approved by the student's parent or guardian and an adult sponsor **BEFORE** the experimental/data collection part of research begins. All projects registered for the San Juan Basin Regional Science Fair will be reviewed by the regional Scientific Review Committee (SRC) prior to the regional fair for safety and appropriateness. Projects that do not follow the rules may be disqualified. Students, teachers, parents and sponsors are encouraged to contact the Regional Science Fair Coordinator with questions about the safety or appropriateness of a project (much preferably before research begins).

#### ***Projects using Human Participants***

Projects that involve any type of research with human beings require a special safety review and approval **before data collection may begin**. This review is done by an Institutional Review Board (IRB) at the school, research location, or regional level. The IRB will approve or deny the research plan based on the potential risks to human beings who are participating, including concerns about physical and emotional wellbeing as well as privacy. The IRB will specify the appropriate level of supervision and determine how people will need to document their informed consent to participate in the study.

#### ***Projects using Animals or Potentially Hazardous Biological Agents***

Projects that involve vertebrate animals, microorganisms (known or unknown), fresh or frozen tissue samples, blood, body fluids, or rDNA require a special safety review and approval **before data collection may begin**. This review is done by a Scientific Review Committee (SRC) at the school or regional level. The SRC will evaluate the research plan based on the potential risks of the project, including concerns about student safety, animal welfare or the environment. The SRC will specify the appropriate level of supervision required and may sometimes require that research be conducted in a specialized facility.

### **Appropriate Levels of Supervision**

#### ***Parent or Guardian***

Parents/guardians must review and approve of all student research plans. Parents and guardians may also serve as Adult Sponsor, Designated Supervisor or Qualified Scientist for their child's project if they have the required skills and training as described.

#### ***Adult Sponsor***

All projects must have an Adult Sponsor who maintains close contact with the student throughout the project to provide guidance and oversight. The Adult Sponsor should have a solid understanding of science and is ultimately responsible for the health and safety of the student and all others involved. The Adult Sponsor is also responsible for ensuring that applicable laws are followed and that science fair rules are observed and documented. Adult Sponsors can be parents, teachers, college professors, community mentors or scientists in whose laboratories students are working.

### ***Designated Supervisor***

Projects of a more hazardous nature also require a Designated Supervisor who is directly responsible for overseeing student experimentation. The Designated Supervisor must have specific training relating to the student's activities. Parents, Guardians and Adult Sponsors may serve as Designated Supervisors if they have the training required. Almost all projects will require a designated supervisor.

### ***Qualified Scientist***

Projects posing the most serious risk to humans or animals require a Qualified Scientist who must have extensive experience and expertise, typically holding an advanced professional degree related to the student's area of research. Adult Sponsors may serve as Qualified Scientists if they have the required credentials. The Qualified Scientist should complete ISEF Form 2 prior to the start of research, describing the planned safety precautions, training, and supervision.

## **Required Elements for ALL Projects**

### ***San Juan BOCES Registration***

Students must complete the 2019 Student Registration online before February 15, 2019. Registration opens early December, 2018 at [www.science-swco.org](http://www.science-swco.org).

### ***Research Plan***

After choosing a subject and doing library research about the topic, students work with their adult sponsors to develop a research plan. This plan should include the question or need being addressed, the specific hypothesis or goal of the project, detailed information about the methods and materials to be used, explanation of how data will be analyzed, plus a bibliography listing at least five major references from the student's library research.

The explanation of materials and procedures must be very detailed and specific – sufficient to properly evaluate the potential safety risks and safety procedures of the project. Students should review the [International Rules and Guidelines](#) for specific instructions on writing a research plan. Any changes to the research plan must be documented as an amendment to the original and be approved by all involved, including the adult sponsor and the IRB and/or SRC when required for sensitive areas of research, before work may continue.

### ***Student Checklist (ISEF Form 1A)***

This form is completed by student(s) in collaboration with their adult sponsor before research begins. This form serves as a very basic summary of the project listing the title, contact information, dates and locations the research will be conducted.

### ***Checklist for Adult Sponsor (ISEF Form 1)***

This form is completed by the adult sponsor in collaboration with the student researcher(s) before the experiment begins. The sponsor agrees to work with the student and acknowledges their review and acceptance of the research plan and risk assessment, indicating any sensitive areas of research and acknowledging that all required forms are complete and approvals will be sought as needed.

***Approval Form (ISEF Form 1B)***

This form is completed by each student before the experiment begins. A parent or guardian must sign this form to indicate their knowledge and acceptance of the research plan and its risks. The student also signs this form to indicate his or her knowledge of the ethics statement and to certify the work will be his or her own. When committee approval from an SRC or IRB is needed for a sensitive project, the committee chair also signs and dates this form before the student begins collecting data.

***Risk Assessment (ISEF Form 3)***

This form is completed by student(s) in collaboration with their adult sponsor before research begins. Many materials and devices routinely used in everyday life become more hazardous when used in a research setting. The hands-on nature of investigation and the close contact required for observations can increase the risk presented by an activity. Many procedures require a certain amount of training and practice in order to perform them safely. When completing a risk assessment, students should be encouraged to list all of the materials they are using then think about the very worst thing that could happen to someone using those things. Depending on the particular hazards, some safety measures to consider include finding an appropriate location for the project, material storage and disposal, ventilation, protective face/eyewear, gloves, lab coat or other dedicated clothing, fire extinguishers, water, hand washing and other sanitation, plus all necessary training and supervision. A designated supervisor should review the student's full research plan and approve the risk assessment and safety plan on ISEF Form 3 before research begins then work with the student throughout the project to supervise hazardous activities and ensure safety precautions are followed as needed.

Regulated substances (including prescription medicines, alcohol, tobacco, DEA-controlled substances, firearms and explosives) have additional requirements by law and for use in science fair. Students planning to use any of these materials should consult the full ISEF rules and/or the Regional Science Fair Coordinator before beginning the project. Additional information about hazardous chemicals, activities and devices can be found in the [ISEF International Rules and Guidelines](#).

***Abstract***

Students must prepare an abstract after the experiment has ended. The abstract is a short summary of the finished research project that includes the original hypothesis or purpose of the experiment, a brief description of the procedures used, data collected, and conclusions drawn. The abstract must be typed on one single page and approximately 250 words. Great examples of abstracts are available on the CSEF and ISEF websites.

***Research Notebook***

While not required, a research notebook, journal or log is highly recommended and may be considered by the judges during their evaluation. In a research notebook, students record all of the day-to-day activities of the project, including notes, observations, details about the procedures used, and raw data as it was collected. Careful, accurate note-taking shows consistency and thoroughness to the judges.

***Retain Original Documents for Display at Fair***

Students must retain all original ISEF forms for their project and should bring them to the regional fair. Whenever asked to submit forms, please submit COPIES ONLY and retain all original forms and documents for display with the project.



### **Continuation Projects**

Students may choose to continue research in the same field of study as a previous year's project. The current project must document new and different research done this year and not be just a resubmission of a past project. ISEF Form 7 must be filled out for all continuation projects.

### **Research Conducted in an Industrial Setting**

Research performed in an industrial setting requires completion of ISEF Form 1C by the scientist who supervised the student's research. Other than the student's school, any business location shall be considered an industrial setting, including colleges and hospitals.

### **Sensitive Areas of Research**

Research is considered sensitive when it involves:

- Human Participants
- Vertebrate Animals
- Biological Agents: microorganisms, animal tissue, blood, body fluids, recombinant DNA (rDNA)

***Before starting projects in these areas***, students must conduct a thorough risk assessment for the project and must properly address all risk and safety issues in their research plan. "No Risks" is never an acceptable assessment. Prior approval from a local or regional SRC or IRB is required for these projects. Examples and requirements are listed below for each sensitive area.

#### ***Human Participants***

Projects that involve human participants are those where the researcher obtains data or samples through interaction or intervention with living human beings or their identifiable personal information. This includes asking friends, family, or other people questions and doing experiments on yourself. Human participant projects must carefully consider and minimize all potential risks, both physical and emotional. Students may not administer medication to human participants or perform invasive procedures.

The following projects are not considered human participant projects and do not need special review:

- Studies using publicly available records and data sets, such as sports teams or crime statistics.
- Behavioral observations of people in unrestricted public settings where the researcher does not interact with the people being observed, does not manipulate the environment in any way and does not record any personally identifiable data.
- Student-designed devices and inventions (including computer applications) where the student is the only person testing the invention and testing does not pose a health or safety risk.

All other projects that involve human beings require a special review and risk assessment, including projects where people are only testing an invention, not the actual topic of investigation. Most projects require a statement from each person that they voluntarily agree to participate in the study and that they understand and accept the risks associated with participating and that they understand they may withdraw from the study at any time. This important part of human subject research is called "informed consent." Informed consent is almost always required for human participants.

Students doing research that involves human participants must provide a thorough risk assessment on ISEF Form 4 and need approval from an Institutional Review Board (IRB) **before starting research**. The IRB will approve or deny the research plan based on the potential risks to human beings, including concerns about physical and psychological well-being and privacy. The IRB will specify whether informed consent is required or waived and whether review or supervision by a qualified scientist is needed. Additional information about human participant studies, risk assessment and informed consent can be found in the [ISEF International Rules and Guidelines](#).

### ***Vertebrate Animals***

Vertebrate animals are animals with a backbone. Projects are considered to involve vertebrate animals when they include live animals, embryos or fetuses or bird or reptile eggs within 3 days of hatching.

Animals must be treated kindly and well cared for. Proper care is required at all times and animals used for research must be checked every day, including weekends and holidays. Students should consult an appropriate animal care guide to determine proper standards for the particular species being studied, such as nutritional requirements and minimum cage size. Animals may not be killed or die as a result of the research project. Projects may not cause more than momentary discomfort.

Students doing research with animals must complete ISEF Form 5A and get approval from the Scientific Review Committee (SRC) **before starting the experiment**. The SRC will consider the potential risks of the projects when deciding to approve the research plan or to require modifications. Once a plan has been accepted, the SRC signs off on both the Approval Form (ISEF Form 1B) and the Vertebrate Animal Form (ISEF Form 5A), indicating the required level of supervision for the project:

The designated supervisor, qualified scientist, and/or veterinarian must review the full research plan and indicate their approval on ISEF Form 5A before research begins. Additional information about vertebrate animal studies can be found in the [ISEF International .Rules and Guidelines](#).

### ***Biological Agents: Microorganisms, Tissue from Humans or Animals, rDNA***

Potentially hazardous biological agents may be present in human or animal tissue, blood and body fluids, recombinant DNA, or microorganisms including bacteria, viruses and mold. Projects involving any of these must go through a rigorous risk assessment documented on ISEF Form 6A. Projects using fresh or frozen tissue samples must also complete ISEF Form 6B, documenting the source of the tissue. The student should identify the specific procedures, safety precautions, and Biosafety Level appropriate for the project.

Projects with any potentially hazardous biological agents (other than moldy food projects under certain conditions) **MAY NOT** be conducted in a home environment.

The Scientific Review Committee (SRC) reviews the research plan and risk assessment **before the student starts the experiment**. The SRC will consider the potential risks and safety precautions when deciding to approve the research plan or to require modifications. Once a plan has been accepted, the SRC signs off on both the Approval Form (ISEF Form 1B) and the Biological Agents Form (ISEF Form 6A), indicating the appropriate Biosafety Level needed for the project. The designated supervisor or qualified scientist should review the full research plan plus risk assessment and indicate their approval on Form 6A **before research begins**. Additional information about projects using potentially hazardous biological agents can be found in the [ISEF International Rules and Guidelines](#).

## **EXHIBIT CATEGORIES**

### **ANIMAL SCIENCES**

Studies related to all aspects of non-human animals (including insects), including animal life, health, behavior, and interactions with one another or their environment.

### **BEHAVIORAL & SOCIAL SCIENCES**

Studies related to the thought processes and behavior of humans and their interactions with the environment.

### **CHEMISTRY**

Studies related to the composition, structure, properties and reactions of matter.

### **EARTH AND SPACE SCIENCES**

Studies related to Earth geological and atmospheric systems and their evolution, including climate science; studies related to anything in the universe beyond the Earth.

### **ENERGY AND TRANSPORTATION**

Studies related to biological, physical and chemical processes of energy production, efficiency, renewable energy sources, alternative fuels, and transportation.

### **ENGINEERING**

Projects that use scientific principles and methods to design or modify a device or process that serves a need.

### **ENVIRONMENTAL SCIENCES**

Studies related to the environment and its effect on organisms or systems, including environmental problems in the supply of water, the disposal of waste or the control of pollution.

### **MATH AND COMPUTER SCIENCES**

Studies related to the measurement, properties, and relationships of quantities and sets; the development of software, information processes or methodologies to demonstrate, analyze, or control a process.

### **MEDICINE AND HEALTH**

Studies related to the issues of human health and disease, including disease prevention, diagnosis and treatment.

### **MICROBIOLOGY**

Studies related to micro-organisms, including bacteria, fungi and viruses.

### **PHYSICS**

Studies related to the science of matter and energy and of the interactions between the two.

### **PLANT SCIENCES**

Studies related to plants and how they live, including structure, physiology, development and classification.

### **TEAM PROJECTS**

Projects completed by two or three students in any discipline.

## DISPLAY REGULATIONS

To protect the health and safety of all participants, many items that are used to conduct a student's project may not be brought into the exhibit hall or displayed at the regional fair. Students should bring **THE RESULTS** of their projects and may include pictures of important aspects along the way.

Maximum dimensions for the exhibit are 9' tall, 2 ½' deep, and 4' wide. The exhibit should be self-supporting on either a table or the floor. The visual display should be neat, easy to read and well organized. The title of the project should be clearly visible at a glance. The experiment, results and conclusions should be logically organized and presented, such that anyone looking at the display can easily assess the study methods and results obtained. Graphs and charts should be clear and well labeled. Spelling and grammar should be perfect.

### Photographs and other Images

All photographs, pictures and images on the project display must have a credit line explaining their origin: "Pictures taken by ..." naming the person taking the photographs or "Image taken from ..." naming the book, website or other source that an image was copied from.

### Photos of People

Pictures of any identifiable people **other than the student** submitting the project must have written permission from all the people in the photograph for that photo to be displayed.

### Restricted Items

- No active internet or e-mail connections may run as part of the project or display. All computer programs must run locally from student's computer or device.
- No living or previously living organisms are allowed including all plants and animals, vertebrate or invertebrate, living, dead or preserved, except manufactured materials used to construct the project or display are allowed.
- Human or animal parts or fluids are not allowed.
- No depictions of vertebrate animals in surgical procedures are allowed, including dissections or necropsies.
- No food, drug, alcohol, tobacco or other ingestible substances are allowed – human or animal.
- Any soil or waste samples must be permanently encased in a slab of acrylic.
- No chemicals are allowed, including all household cleaners, dry ice, and all laboratory chemicals. This includes water, except for water integral to the operation of an apparatus that is fully enclosed.
- No items that may have contained or been in contact with hazardous chemicals are allowed.
- No hazardous devices are allowed, including firearms, weapons, ammunitions, sharp items including needles, knives or scalpels, open-top battery cells, large vacuum tubes, unshielded ray-generating devices, flames or highly flammable materials, or uninsulated apparatus producing temperatures that will cause physical burns.
- Any apparatus with unshielded belts, pulleys, chains or moving parts with tension or pinch points may not be operated. The only exception is at the request of judges during judging.
- Class II, III or IV lasers may not be operated. The only exception is for Class II lasers that may be operated at the request of judges during judging.
- No awards, medals, business cards, flags, endorsements or advertisements may be displayed.
- Nothing offensive or inappropriate is allowed, as determined by the Regional Science Fair Coordinator.