

ORGANIZING A PRELIMINARY SCIENCE & ENGINEERING FAIR

*A guide to help you plan and organize
a science fair for your school or district*



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Introduction

Holding a science fair can be a rewarding and educational experience for students, teachers, parents and volunteers. This guide is designed to help you plan and organize a Fair at your school or district. We have outlined many of the major steps you will need to take to make your fair a success. We have also included sample forms and certificates that we use for the Greater Kansas City Science & Engineering Fair.

Holding a Fair takes a lot of time and energy, but with the right people to help, you will be able to put together an event that makes your school or district proud.

Committees

We suggest that you form several committees to help break up the responsibilities and keep volunteers focused on their tasks.

The size of your fair will determine how many of the following committees are needed.

1. **Steering** - This committee is responsible for coordinating all the other committees.
2. **Judges** - This committee is responsible for obtaining qualified judges.
3. **Refreshment** - This committee arranges for beverages, snacks or meals for judges, committee members, etc.
4. **Awards** - This committee is responsible for selecting the awards (ribbons certificates, trophies, etc.) to be presented to winners. They are also responsible for organizing the awards ceremony or presentation.
5. **Public Relations** - This committee is responsible for publicity, i.e., posters, school paper, local business, etc. They also arrange for the tables and decorations at the fair.
6. **Clean-up** - This committee is responsible for the final clean-up after the event and returning any borrowed or rented items used in the fair.

Timeline

It takes time to organize and conduct a science fair. You must begin planning at the start of the school year and stay on task in order for everything to run smoothly.

Again, the size of your fair will determine how far in advance you must take the following steps.

1. **September** - Organize the steering committee, select a chairperson, choose a date and location, and begin to publicize the fair.
2. **September/October** - Prepare a list of all the teachers in your school or district who might be interested in your science fair.
3. **October** - Mail information to interested teachers regarding the fair date and location, what grade levels will be invited, and what research categories will be accepted.

4. **November** - Send invitations to selected judges.
5. **December** - Finalize list of judges who have agreed to help with the fair.
6. **January** - Mail application forms to teachers who will have students entering the fair, mail reminder letters to judges, order plaques and certificates to be given to the students.
7. **January/February** - Catalog application forms as they arrive. Design a floor plan for your fair, including where each project will go.
8. **February** - Send press release to local paper, invite media and parents to attend, and hold fair. Submit outstanding projects for entry in the Greater Kansas City Science Fair & Engineering Fair.

Suggested Time Schedule for Your Science Fair

Day 1 - Prepare location: set-up tables, signs, etc. Students set-up exhibits.

Day 2 - Morning: Judging of student exhibits.

Afternoon: Organize and place student certificates and awards.

Evening: Open fair to the public, hold awards ceremony.

Day 3 - Students tear down exhibits. Clean location.

Organization of the Projects

Depending on the size of your fair, you will need to separate the projects based on the age of the individuals and the discipline of science they are researching. Having the students submit an application form is an easy way for you to track and properly place each project in the fair.

The Greater Kansas City Science & Engineering Fair is organized in the following manner.

There are three grade divisions:

1. Intermediate - 4th, 5th and 6th grades
2. Junior - 7th and 8th grades
3. Senior - 9th, 10th, 11th and 12th grades

The categories are as follows:

Animal Science (AS): Study of animals, their life cycles, anatomy, and classification; physiology; animal husbandry; entomology; ichthyology; ornithology; herpetology; mammalogy; development; nutrition and growth; animal Mendelian genetics; ecology; systematics and evolution.

Behavioral and Social Sciences (BE): Study of human and animal behavior; social and community relationships; psychology (cognitive, physiological, and social); sociology; anthropology; linguistics; learning; perception; reading problems; educational testing; social media dynamics.

Chemistry (CH): Study of the composition, structure, properties, and reactions of matter. Includes all forms of chemistry investigations – analytical; environmental; computational; inorganic; organic; materials; physical; and nanomaterials.

Chemical Energy (CE): Alternative fuels; fossil fuel energy, fuel cells and battery development; microbial fuel cells (also **MI**); solar materials; fluid and gas dynamics; thermodynamics; remediation; waste management; chemical pollution.

Computational Science, Bioinformatics and Mathematics (CM): *Applications of computers to analyze a particular problem – see CS below for computer systems.* **Biological applications of computers**: biomedical engineering; various computer applications,

including pharmacology, biomodeling, bioinformatics; evolutionary biology; neuroscience, and genomics. **Mathematics:** the study of measurement; properties and relationships of quantities and sets; using numbers and symbols; deductive study of numbers, geometry, various abstract constructs, sets or structures; algebra analysis; combinatorics; graph theory; game theory; topology; number theory; probability and statistics.

Computer Systems, Electronics, Robotics (CS): Computers include: the study of information processes including structures, process procedures, and implementation of processing systems; systems analysis and design; data analysis; network design and operations; application and system software design; programming; data center operations; networking and data communications; algorithms. **Electronics:** circuits; microcontrollers; integrated optics; sensors; signal processing; energy conservation. **Robotics:** biomechanics; cognitive systems; control theory; machine learning (includes AI); robotic kinematics; algorithms; databases; operating systems; programming languages.

Earth and Environmental Sciences (EA): EA differs from EE by measuring/monitoring these areas, not applying a solution to problem. Earth Science: the study of science related to plant earth to include geosciences; mineralogy; water science; physiography; oceanography; meteorology; speleology; seismology; geography. **Ecology:** populations, communities; ecosystems. **Environmental Science defined Man's interaction with the ecosystem:** climatology; atmospheric science; environmental effects on ecosystems; geosciences, (mining, fracking etc.); water sciences (aquifers, pollution); recycling; waste management; water resources management.

Energy and Environmental Engineering (EE): Energy: solar; Power including hydro, nuclear, solar, thermal, geothermal, wind; sustainable design; renewable energies – also includes the theories, principles and laws governing energy and the effect of energy on matter – solid state; optics; acoustics; particle; nuclear; atomic; plasma; superconductivity; fluid and gas dynamics; thermodynamics; semiconductors; magnetism; quantum mechanics; biophysics. **Environmental Engineering: EE differs from EA by applying science to solve a problem** and includes bioremediation, land reclamation, pollution control, recycling and waste management; water resources management.

Engineering Mechanics (EM): Engineering including aerospace and aeronautical, civil, mechanical; computational mechanics; control theory; ground vehicle systems; industrial engineering-processing; naval systems; space travel equipment such as rockets, etc.

Materials Science (MS): Biomaterials; ceramics and glasses; composite materials; computation and theory (as applied to materials) electronic materials; optical materials; magnetic materials; nanomaterials; polymers; plastics.

Microbiology (MI): Antimicrobials; antibiotics; bacteriology; applied microbiology; environmental microbiology; microbial genetics; virology; prions; study of prokaryotic cell processes and organelles.

Molecular Bio/Chem & Health Sciences (MO): Study of vital processes occurring in living macromolecular systems (Eukaryotic) including the processes by which these substances enter into, or are formed in the organisms (chemically and/or genetically), and/or react with each other and the environment; biochemistry (analytical, medicinal, structural); disease diagnostics and treatment: drug development and testing; epidemiology; nutrition; physiology; pathology; cell physiology; eukaryotic genetics; immunology; neurobiology; pathophysiology.

Physics and Astronomy (PA): Physics: atomic, molecular, optical, biological, computational, nuclear and particle physics, theoretical; condensed matter and materials; instrumentation; magnetism – electromagnetic and plasmas; mechanics; optics, lasers, and masers. **Astronomy:** Anything in the universe beyond Earth such as the positions, dimensions, distribution, motion, composition, energy, and evolution of celestial bodies and related phenomena; astronomy; cosmology; computational astrophysics.

Plant Science (PS): Study of plants and their life cycles; structure; growth; macro processes, classification; evolution; agronomy; macro genetics; development; pathology; physiology; organics; GMO's; taxonomy; ecology; hydroponics.

Inventions (NV): (Grades 4-8 only) Creation or modification of devices or processes that solve or alleviate challenges in our lives.

Students may enter a project individually or as part of a team of no more than **3 students**.

Each of the projects are separated and judged by age level and category. This allows a fair judging of each project, and it allows you to give more awards.

Judges

A science & engineering fair is an exhibition of student work, but it is also a competition. In order for the students to be judged in a Fair and appropriate manner it is important that you find experienced individuals to serve as judges. Many people are willing to serve as a judge for a local science fair. We suggest asking

doctors and STEM professionals who work near your school or within your district. Also, teachers from other schools or districts are often very willing to help.

The earlier you make contact with a potential judge the better. This gives them a chance to mark the event on their calendar. It also gives you a chance to contact more individuals if your response levels are not high. We suggest having a judge review no more than 10 projects.

Obtaining Judges

The following is a sample letter that can be modified to meet your needs. A postcard, modified from the example, should be returned to you so you have a written confirmation.

Dear Dr./Mr./Ms./Science/Math Teacher:

The science and math teachers of the _____ School District are planning to have a Science Fair for junior and senior high school students on **(date)** in the _____ school auditorium. As you know, this involves obtaining qualified individuals to serve as judges of the exhibits. It has been our experience that **(teachers/professionals)** from this area make the best judges. Not only do they have the professional background to judge an exhibit on the grounds of its scientific merit, but they also realize the abilities of the students. We need judges in the areas of **(categories.)**

I invite you to serve as a judge on **(date)** from **(time)**, in the gymnasium of the _____ Senior High School. There will be a continental breakfast served before the judging begins and a light lunch after the judging. Please fill out the form below and mail it back to us at your earliest convenience.

Sincerely,

Sample postcard - Include your school and address on reverse side

Name: _____

_____ I accept your invitation to serve as a judge on **(date, time & location)**

_____ I accept your invitation to lunch.

_____ Sorry, I will be unable to accept your invitation to lunch.

I prefer to judge _____
(category and grade level)

School/Business: _____

Address: _____

City, State Zip: _____

Phone: _____

E-mail: _____

Final Reminder To Judges

A reminder letter should be sent to the judges at least two weeks prior to the judging day of the fair. This letter not only serves as a reminder of their commitment, but also provides information concerning the exact location, date, and time. We suggest including a detailed map showing exactly how to get to the fair location.

Dear Dr./Mr./Ms. _____:

This is a reminder that you are scheduled to help judge in the _____ School District Science Fair to be held at **(location/address/date/time.)** We are planning a "coffee hour" from **(time)** which we hope you can attend.

Sincerely,

The following information should be mailed with the reminder letter and reviewed before judging begins.

Instructions to the Judges

1. Science exhibits are not intended to be contests between students or schools. Each exhibitor is to be judged strictly on the merits of his/her research or engineering project.
2. Even though many exhibits may show a remarkable degree of scientific knowledge, judges are asked to keep in mind that all of the exhibitors are elementary, middle, junior or senior high school students, many of whom are experiencing their first taste of scientific evaluation by a distinguished critic.
3. Use your own good judgment at all times. Be honest with yourself and the student. Only a small number of the students will ever enter actual scientific research, but many may influence the future. A valuable experience with science at this level might potentially reap valuable rewards later.
4. Keep in mind that a spectacular-looking exhibit or one composed of costly equipment is not necessarily the best science project.
5. When leaving comments for the students, please make sure they are positive and instructive. Do not highlight what they did wrong. Highlight what they did right and how they can improve in the future.

Judging Mechanics

1. Each judging team should include two judges.
2. Each team should be assigned a specific number of exhibits to judge and should receive a list of the exhibits. A team should not judge more than 10 exhibits if possible.
3. Try to have each judging team's exhibits adjacent to each other.
4. Each judge should record the exhibit number, score the exhibit after examining the exhibit fully, and on the BACK of the card write comments which he/she feels may be useful to the student.

Judges Scoring Guides

A sample of the scoring guides used at the Greater Kansas City Science & Engineering Fair on the Fair website.

Public Relations

It is very important to spread the word about your fair. Publicity should start in the fall and continue all the way through your fair.

Poster

Design a poster or flyer that has "eye-catching" graphics, but more importantly includes the date, time and location of your fair. These flyers should be posted throughout your school and district. Have the flyers available at PTA meetings and other school events.

Press Release

Media coverage of your fair is a great way to generate excitement and motivation for students and volunteers. Send a press release to the Kansas City Star and your local paper. Invite a reporter to visit your fair and write a story on the event. It is also nice to have television coverage of your event.

Construction of Exhibits

A helpful booklet titled ***How to Construct a Science Fair Exhibit.***

The following are general rules for the construction and display of exhibits.

1. All work on exhibits must be done by the exhibitors. Sponsors/parents may only provide advice.
2. The exhibit must be a completely self-contained unit. Many students give stability to their exhibits by constructing it as one transportable unit which is mounted on a suitable base.
3. The exhibit must be no larger than 81cm (32 in) wide x 76cm (30 in) deep. Students in grades 7-12 should be allowed a width of 122cm (48in).
4. Each exhibit is to be accompanied by a written paper that explains in detail what the exhibitor did throughout his/her research study. Science Pioneers offers a booklet titled ***A Manual for Writing a Science Research Paper.***
5. Experimental equipment and materials may be placed in front of the display board as long as they fall within the safety guidelines.

Safety Rules

The following rules are necessary for the safety of exhibitors and visitors. Exhibits that do not satisfactorily comply with these rules should be disqualified.

1. All electrical equipment must be constructed according to standard electrical safety law. Exhibits requiring electrical current for operation or illumination must be designed for operation on alternating current at 110 volts. If batteries are used, they should be storage batteries to ensure continuity of operation.
2. Ordinary doorbell push buttons and open knife switches may not be used to control 110 volt apparatus. Only suitably rated UL 110 volt toggle or push button type switches mounted on panels or switch boxes are allowed.
3. All wiring, switches and metal parts carrying 110 volt current must be grounded properly and out of reach of visitors.
4. All electrical points must be soldered and taped properly (following UL regulations.)
5. Nails, tacks and uninsulated staples must not be used for fastening wires. Use porcelain or other approved types of insulators.
6. All wiring must be properly insulated for voltage used.
7. Dangerous chemicals, open flames, flammable liquids, and explosives are strictly prohibited.

8. If bacteria are displayed, they **must** be in sealed containers.
9. No live animals, vertebrate or invertebrate, are to be displayed at the fair.

Awards

It is important to recognize students for their hard work. You may want to give ribbons, pins or certificates to every student and trophies to the top winners. If you are interested in sources for these kinds of awards, check the yellow pages under "trophies", or you may find a variety of award catalogs in your school office or library.

How to Obtain Money for Awards

Nearly any type of award you present will cost money, but the presentation of something tangible gives a status comparable to the kind of recognition they might receive in athletic competition. The following are possible sources of obtaining money for awards, ribbons, printed certificates, pins or trophies.

1. Ask your school district or PTSA if funds might be available to finance a local science & engineering fair.
2. Contact a scientific research laboratory, supply house, or manufacturing company located within your school district. They may be willing to provide money for the publicity and reputation of supporting young scientists. A representative of the company might be invited to present the award(s) and make a short speech at the Fair. This could be covered by the school or community newspaper.
3. Sell drinks, candy bars, popcorn, etc. at the science & engineering fair. Announce to visitors that profits will help defray the cost of the Fair.
4. Charge a modest entrance fee to view the Fair.
5. Charge a modest entry fee for each project.

Evaluation

One way to determine the success of your fair is through an evaluation. It is important to see if holding a science fair helps you, your school and your district achieve necessary goals.

This sample form is geared towards individuals who worked at your fair. You can rework the questions for parents, teachers and students who participated in your fair.

1. Do you think our science fair was a worthwhile learning experience for the students?
Comments:
2. Was the physical setup (table, electrical outlets, etc.) adequate?
Comments:
3. Do you feel the judging was adequate?
Comments:
4. Do you feel the awards were sufficient?
Comments:
5. Do you think the awards ceremony was worthy of the students' efforts?
Comments:
6. Was there sufficient organization in the operation of the fair?
Comments:
7. Do you feel you were asked to do more than your share in the running of the fair?
Comments:

Please list on the back of this page ways you feel we could improve the organization and operation of this science fair.