

Science Fair Primer

A Guide for the Establishment and Administration of a Successful School Science Fair

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Introduction

The process of preparing a manuscript, grant application, or presentation at a scientific conference is a learning one. Although it is at times tedious, at the end of the day I always feel more knowledgeable, focused, excited, and even proud. When I'm through, no one knows as much about my little corner of nature as I do. A Science Fair can provide the same pleasure and opportunity for a child. If done properly, he or she can emerge with new knowledge — knowledge gained in fun — and excitement to learn more. And pride.

We organized our first Science Fair in 1996 for Little Oak Middle School in Slidell, Louisiana. Our fair is held on the last Friday in January. Like Mardi Gras, preparation for next year's event begins almost immediately after cleanup. Each year during the run-up to the big day, we are convinced that we just can't do it again next year. But on fair night, when the gymnasium is packed with kids, teachers, and family, and our friends, neighbors, and colleagues are all as energized (and exhausted) as we are, we know we'll be back.

In fact, we have been looking for opportunities to expand the effort and reach more schools. It has been a slow process. After two years at Little Oak, we have now involved Boyet Jr. High, right next door. Too slow for our lifetimes! The obvious answer was placed before my nose after a recent annual meeting of our Neuroscience Center membership here at LSU Medical Center. Each year the subject of community outreach is raised. A very active member of our community in this area is Dr. William Guido, a colleague of mine in the Department of Cell Biology and Anatomy. Bill has also been involved with our Science Fair effort since the first round, setting up a wonderfully popular exhibit on the human brain for our evening program. He told me all about the Neuroscience Society's web page, and suggested that I write a Science Fair primer that others may use in organizing and expanding their own event. And so here it is.

Our goal is to provide something of a blueprint for would-be Science Fair organizers. But more than that, we hope it will provide you with a road map to avoid and solve problems — and there will be ones that you might not imagine. Each of us may have a slightly different take on how to stimulate

excitement for science in kids; we'll give you ours. You will each, no doubt, find ways to improve on our approach. When you do, please communicate with us. We hope that this primer will elicit more questions and suggestions than we can possibly handle. More importantly, we hope it will trigger the growth of Science Fair efforts across the country to mirror the amazing advances our professional scientific community has generated. Some of our children will be the scientists of the future. Most will follow other roads. All can gain by the knowledge that science and scientists are part of our everyday lives, and fondly recall the grand Science Fair in their own grade school years.

Goals & Expectations

Goals

Our goals haven't changed significantly since our first Science Fair, but we have become more educated regarding reasonable expectations. As with some of the sections to follow, this one is presented in the form of a list in the interest of brevity and organization. A short explanation accompanies each item.

- **Make the importance of the Fair clear.** It is important to make parents and teachers understand that you are not just organizing another big "kidfest". This is not your mission, and there aren't too many people who want you to do that. You must convey that, yes, you aim to make it fun, but the purpose is for kids to get first-hand experience with scientific principles and materials. It will help them learn how to research and study topics of interest to them. It is to help them recognize that science and scientists are all around them in their everyday lives. A number of them may even want to pursue careers in science, and this is a great venue to stimulate that interest.
- **Make it exciting for all, including parents and other visitors.** We use several tools to accomplish this: a big crowd, a program of appropriate length, the anticipation of final judging, and exhibits by professional scientists. The sights and sounds of 800 people milling around projects and talking to the kids and each other alone keeps the evening moving. The evening program is never more than two hours. This leaves a few minutes for people to arrive and settle in before a few (emphasis on "few") opening remarks are made. One hour is allotted for final judging, during which children must remain by their projects. Parents and siblings are free to roam among student projects and professional exhibits. Following this are about 15 minutes of free time for the students to visit with friends and view the exhibits, and no more than 5 minutes of announcements and acknowledgments. The last 20-30 minutes is devoted to awards presentations.

- **Place emphasis on science and learning, not on awards.** Sadly, there are always those who see the awards as more important than the day's activities. This is not what we should convey. Winning is fun, but honestly, first place in a grade school Science Fair a millionaire does not one make. We present all kids with certificates of merit, but ribbons and medals are kept to a minimum. A following section describes our approach in more detail.
- **Keep it simple — at least on the surface.** Complexity will make a lot of people apprehensive and keep participation low. In our case, we were loathe to have our daughter participate in her first Science Fair the moment we glimpsed the information packet. We know for a fact that other parents who were professional biologists like ourselves did shun earlier fairs. If you want a successful Science Fair, don't make it complex for the parents, children, or teachers.
- **Let everyone who wants to help do so, and be sure to let everyone who helps know that they are appreciated.** This can be a little more complicated than it would appear. Everyone is a volunteer, so you should be especially considerate of feelings. In the months leading up to the Fair there are a number of people who call and offer to help, or register as volunteers with the PTA specifically to help with the Science Fair. Inevitably, we lose track of a few, or we never receive the names from the individuals to whom they originally communicated their interest. Some are understanding, some feel slighted. You can only apologize.
- **Convey enthusiasm.** When you speak with the kids at their exhibits. In your communications with teachers and parents. To do this thing, you truly have to be enthusiastic. Just show it at every opportunity.
- **Avoid parent overload.** Parents are called on to attend a number of evening events at school during the academic year. In many families both parents hold down outside jobs, and one or both may not arrive at home until six or seven in the evening. As much as we may love our kids, shoving down a burger and running to the school with sore feet is a burden. Don't make parents regret it! Be punctual and be brief. Let them come, enjoy, and go home.

Expectations & Extra Pointers

- We're not quite sure where it came from, but there has developed an attitude that all science must be hypothesis-driven. You are very likely to encounter that attitude in developing your Science Fair. As professional scientists, most of us know that there are many times we design experiments to directly test hypotheses, and many other times when what we do more closely resembles pure observation. Some of us have become very adept at retroactively making the latter look like the former. Let's not expect that of our kids. If they want to test a hypothesis, great. If they want to observe some natural phenomenon and describe it for the Science Fair, that's great too.
- Some people will have the preconception that a Science Fair is not serious, not important (as say, basketball practice). You should try to convey otherwise, as it may cut into the level of participation that you experience; e.g. "there are plenty of cute things for kids to participate in, this is just one more that we don't have time for." Your Science Fair should be fun, and many of the kids are cute, but a Science Fair should be considered and conducted in a serious manner. It is, first and foremost, a learning experience.
- You may be pleasantly surprised at how many science professionals will be willing and eager to help with judging, exhibits, etc. This is especially true if you can convey to them that this is a special, and highly educational affair. The same holds true for locally-based government office (e.g. NASA) and large companies. Many have specific offices that handle outreach and educational programs. Don't hesitate to ask.
- Again, the process of assembling a project and presenting it at the Science Fair is primarily an educational one. It is not a "self-esteem thing". The students will indeed derive self-esteem if they understand what they are doing and emphasis is placed on the process, not awards.

- You will encounter victory-driven parents. Be polite in answering their questions, and ignore them as best as you can.
- We were surprised at the number of people who are not sure of what is expected and what they should do. In retrospect, we should not have been for at least two reasons: 1) For many of these kids and their parents, this is the first time they are encountering a Science Fair of this type; 2) We do this for a living, and take many things for granted. We would find ourselves in exactly the same place if someone else was organizing an event related to their jobs. So expect to receive a number of phone calls from parents and kids, and expect the number to increase as Fair day approaches. Many will be interesting questions that will help to improve your plans for the next time around.
- Lastly, you can't please everyone, so expect some people to be displeased. Oh well.

Expenses & Support

A Science Fair involving 250 children, 25 judges, and over 1000 visitors and volunteers should cost less than \$300. This includes medals, certificates, refreshments for judges and other volunteers. Putting together a swanky program brochure can drive up the cost slightly. We have had support from several sources to cover expenses. We ask the school Principals to pay for the cost of certificates and medals. This usually amounts to about \$75 per school. You are likely to find the PTA willing to contribute to the price of coffee, donuts (in this part of the country, king cake), and cold drinks for judges during the day. The largest (though still modest) expense is probably providing judges and professional exhibitors with something to eat in the late afternoon. Many of our judges arrive at 8:00am and work until the conclusion of the Fair at 9:00pm. They need a place, between school dismissal and the beginning of the evening program, to rest and eat. In addition, some judges and exhibitors come from nearby towns directly from work. We are extremely grateful to these people and have each year been happy to provide our home for these purposes. The gathering also serves as an occasion to talk informally about the day's events, for these good people to meet each other socially, and for a mid-day meeting before final judging takes place in the evening. We arrange for a few platters of sandwiches, etc. from the grocery store deli. The school PTAs have contributed in the past to these expenses.

There are two additional sources of revenue to support the Science Fair. As described in the section on preparation for the Fair, we purchase cardboard display boards in bulk for sale to students. As a result, the students pay less than had they been purchased individually. Rounding off the cost to make collection simpler for us also provides a few dollars to help support the Fair. This year we also attempted to raise some money by producing an attractive evening program brochure and soliciting advertisement on a limited basis (the layout can be viewed on the last page of the brochure link). For this coming year we may seek to add two to four more advertisers, but we do not foresee exceeding eight quarter-page ads. For the present this would add too much work to the project. However, if you have a helper who is good at this sort of thing, it can easily add up to a cost-free Science Fair and worthwhile advertising for community-minded businesses.

Rules

We keep rules to a minimum:

- No vertebrate animals allowed on-site.
- No open flames or devices that are likely to harm someone.
- We ask that students visiting during the day not handle their classmates' projects because they have to survive all day and into the evening (and some through state and regional fairs).

Written reports are not required — no one is going to read them. Rock collections and volcanoes are welcome; it is amazing how much some kids learn, and are able to relate enthusiastically from these kinds of projects. We must warn you that collections and demonstrations are not as welcome at some state and regional fairs. Some individuals are under the mistaken impression that all science is, or should be hypothesis-driven. We consider this unnecessary for ten year-old children.

Beyond this, there are many, many rules imposed by regional, state, and national Science Fair administrations. Most are simply common sense, others are driven by the issues of political correctness and legal liability that plague our everyday lives. If you are particularly interested in seeing students from your fair advance to state and national levels and want to be sure that they are in compliance, we recommend that you contact one of the two following organizations:

Intel International Science & Engineering Fair Scientific Review Committee

Intel ISEF SRC Chairperson:

Dr. Virginia Rhodes

vrhodes@enoble.k12.in.us

Science Service

Science Education Department

sciedu@sciserv.org

for the International Rules for Precollege Science Research: Guidelines for Science & Engineering Fairs

Preparation and Material Needs

There are a lot of things to do in preparation for the Fair. In the interest of getting this site up and running, we are providing a list with only brief comments below. As time permits, we will elaborate on any points that we deem appropriate.

- Meet with the school's science teachers at least 4 months in advance. Let them know that you will need their help. You will find that some teachers are very enthusiastic about the prospects of a first-rate Science Fair and will perhaps even take the lead in the project. Others are too pressed for time or less interested for other reasons. The former group will help you to organize and communicate. Some of the latter group may become more interested as they see the fair develop.
- Meet with the Principal and be sure you have his/her permission and support. To add to your ability to convey the possibilities, you may want to direct them to this website. Set the date very early-on with the Principal to be sure there are no scheduling conflicts.
- Prepare an informational packet for students and parents. It should contain guidelines and registration forms. These packets should be distributed months before the Fair. Registration may seem superfluous, but it will help you keep organized and judge the size of the response. Beware: the first Science Fair information packet our child ever brought home was an overwhelming document. It was, without a doubt, more complicated and extensive than the registration packets we receive for our professional meetings. We knew for a fact that it was keeping some kids from entering the Fair. The lesson learned is to keep it as simple as possible. A downloadable version of the packet we use is available on this website. Look for ways to simplify our version (and please tell us of any you have found).
- At the same time, distribute an informational packet to the science teachers, including a copy of what you provided for the students and their parents.

- Begin lining up your judges and exhibitors early. One judge for approximately every 10 students works well for us (see section on judging for breakdown). Let them know that you will be in contact with them several times between now and the fair, but give them plenty of time to prepare and arrange for a day off from work.
- Produce judging forms (a downloadable version of our form is available on this website), procure clipboards, pencils, badges, and other small supplies you will need (don't forget some spare electrical extensions and duct tape).
- Make arrangements for tables to place exhibits on. Procuring, setting up, breaking down, and returning tables can be a very big job, so get volunteers to help haul. We require approximately 60, 8-foot folding tables for our fair (four projects per table, plus extras for exhibitors, etc.). Our local churches have been very generous in loaning tables each year. In return we are meticulous about their care and return (in the right quantity!).
- Order medals/ribbons. In your calculations, don't forget to factor-in that some places will be won by teams of students, and that there may be some ties. Do not have dates inscribed, and you can save any extras for next year.
- Make arrangements with the Principal to have a podium and public address system.
- Prepare certificates for participants.
- We serve as a distribution source for cardboard display boards. This is not necessary, but does serve several purposes. First, by buying in bulk, we provide boards for students at a lower cost. Secondly, any surplus we generate by rounding off the price is used to provide boards for children who might otherwise have difficulty affording one. They are not expensive, but some families may have a little less spare change lying around than others. Lastly, any leftover cash can be used to help cover Fair expenses.

- Periodically distribute reminders and arrange for school announcements that the Science Fair is approaching. Persistence is required. Your first response may be, "if teachers can't at least distribute forms and return them to me in a timely fashion, then what am I breaking my neck for?" The simple answer is, for the kids.

Fair Day

Setup and Schedule

Tables to hold student projects should be set up the night before the fair. Be sure to allow enough room between tables to allow for students on opposite sides of an aisle to be simultaneously presenting to two or three visitors. Label the end of each aisle with the grade and range of project numbers (e.g. 5-1 through 5-24 for 5th grade projects #1-25; a sample floor plan is included amongst the downloadable forms).

You will need approximately 1 1/2 hours before the start of judging time, along with a handful of morning helpers to:

- Set up coffee and refreshments for judges and other volunteers
- Place extension cords for projects requiring electricity (be sure to tape these down over their entire length for safety)
- Perform miscellaneous chores like checking the PA system
- Organize your morning volunteers — you will need at least one person assigned to each grade to help students locate their assigned positions. Have several copies of your floor plan available for this purpose.

Be sure that parents and children understand that children are to report to homeroom immediately after setup. They need to be in school, and you need the gym to be project-filled and people-empty to organize your judges for the day.

As your judges arrive, have ready for them a pencil and clipboard with their assignments, judging criteria, and judging forms (available as a download). We give them ample time to have coffee and mill around the projects before calling the first set (grade) of students. Each judging session should last no more than one to 1 1/2 hours. Any longer turns excitement into utter torture for any normal grade-schooler.

Be sure that you have enough judges so that each child is visited by three. As mentioned in a previous section, a ratio of one judge per 10

entrants has worked well for us. Give your judges time enough for 7-10 minutes with each project. This allows enough time for the student to relate what they have learned; they will have learned a lot, and deserve the time to show it. This also leaves time for a good interaction between judge and student, and here is where the real advantage of having judges with scientific backgrounds is most valuable. The ability to walk through and hash out their findings with "another" scientist is rewarding for judge and student alike. It is not an exaggeration to say that the judges often come to us after these meetings just as excited as the students. It is part of what makes the judges' day, and one of the major reasons they are so willing to come back and help each year.

Also remember that teachers will be bringing their classes around to view the projects during the day. It will be helpful to periodically request that visiting students make a quiet passage as they observe their classmates' work. Some conversation is part of the experience, but be prepared for a quiet murmur to slowly grow into a dull roar. It makes hearing the littlest ones difficult as they are speaking with the judges.

Judging & Awards

Our decision to handle awards as we do stems from what may be some outdated values, and from experiences at other events our children are involved with. Nevertheless, we have found that our reasoning works, and works well. In the first place, we do not believe that every child must come away from an event with a medal or ribbon. This does not build self esteem, but cheapens the meaning of a really good performance that deserves special accolades. And it detracts from the incentive to work hard towards a successful performance. Excessive awards are not valued by the children as an award should be. They pile up in boxes all over the country like Mardi Gras beads in a New Orleans attic.

At our Science Fair, from the first notice to the final evening program brochure, the importance of participation, learning, and striving to do a good job are emphasized. Having said that, when the children arrive with their families in the evening, every one will find at their place a certificate commending them for their efforts. And it is roundly deserved. But when

final judging is complete, we present a first, second, and third place ribbon for each grade, several honorable mentions to those for whom it was really a close call (completely at the judges' discretion; usually 2 or 3 per grade), and one overall grand prize.

We know this system works because the enthusiasm after the fair is greater for both children and parents than it was before. And it carries right into the next school year when people begin asking us in September if there will be another Science Fair this year and when will we be sending the information. It works, and grandly. The children are not psychologically scarred because they did not receive a medal, but as we have seen clearly, are eager to work harder, learn more, and do better the next time around. The results have been one of the great pleasures of running the Science Fair.

Follow-up

This is another of the difficult tasks, because when the Fair is over, you want it to be over. However, it is important to express your gratitude to certain of your supporters (including exhibitors, table lenders, judges, volunteers). Many can be thanked with a phone call or a note in the mailbox at work. Others should receive a letter. We are often two to three months in doing this, and so it has become standard to include a brief disclaimer/apology. Judging from the repeat support we receive from all of these people, it seems they are all understanding.

It is also a good idea to make a few notes for improvements on next year's Fair. Each year we think of a better way to do one thing or another, but have not always been diligent in writing these ideas down (translation: Mary Anne writes them down, I don't). On the few occasions when we have, it was well worth it. If you are like us, you will not have the time or inclination to keep up with some of these details, but a few notes on scrap paper thrown into a box (or piled on the floor of your closet) that you can access next year will be a help.

Epilogue

The purpose of this primer was to stimulate interest in building a Science Fair program at other schools and to provide some tips and templates to make the job easier. There are already many schools across the country that hold a successful fair, and we would be happy to hear from their organizers as well; any suggestions to make our event better and easier will be appreciated. Another aim was to present our philosophy on Science Fairs and science education in general, which we have developed by observation. There are certain things that science education and fairs should and should not be.

- Science should be fun, but it is not child's play. A Science Fair should be treated the same way. While the participants may be cute, what you have set out to do should not.
- The fun, the learning, and the achievement is in the doing, not the winning. Emphasize that from the beginning and at every opportunity. Do not cheapen this principle by pushing for advancement to regional and state fairs, nor by presenting more awards than there are children.
- One of the most important elements in science is imagination. Science fairs should therefore not be restrictive. If your participating 10 year-olds want to assemble a project that does not fall under the mantra of "hypothesis testing", let it be. Let them use their imagination and learn. We believe it is far better for a pupil to study the rocks and soil in their backyard or in their local nature preserve than to test the hypothesis that Huggies hold more baby-derived fluids than Pampers. Let them wonder about the natural world around them rather than force hypothesis testing.

We wish you good luck in building a Science Fair program at your school. It is our hope that you derive as much pleasure and satisfaction from it as we have had the good fortune to do ourselves.

Contact the Authors

We welcome your questions and suggestions. Feel free to contact the authors:

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E-mail is the preferred mode of correspondence. Please be patient in waiting for replies!

Acknowledgments

We thank Dr. William Guido (Chair, Society for Neuroscience Committee on Neuroscience Literacy) for suggesting we prepare this primer, and offering a link from the Society for Neuroscience web site. And, although we thank the following people year after year for contributing to the success of the Science Fair, we are obliged to thank them again, here, because we would not have prepared this primer without the accumulated successes that they so generously contributed to. These include Mrs. Marilyn Faust and Mr. Dana Magee, Principals of Little Oak and Boyet Schools, respectively. Mrs. Karla Caruso (Little Oak) and Naif Shahady (Boyet), dedicated teachers who help us to coordinate the Fair. The list of our practically-every-year volunteers and judges is too long to reproduce here. These generous individuals are acknowledged in our evening program brochure, which can be viewed via the link on our Science Fair Homepage.