



**Dr. Nelson Ying
Tri Region Science
and Engineering Fair**

MEMO

TO: Homeschooling Parents with HIGH SCHOOL children
FR: Mary Eileen Wood, Director
RE: Science Fairs for Homeschooling Families – IHIPs, quarterly reports

Young people develop skills and discover strengths and interests when doing science projects. From our family's experience and in discussions with families, we have identified a number of subject areas in which to include the work a high school student is doing.

Science: The science fair topic can serve as the central theme of a science program each year of homeschooling. Remember: By high school, your community college can provide the necessary challenge, especially if a student is eager for laboratory experience. And where you have professors, you have great science fair project mentors!

Sample IHIP: Science fair project (Senior Level). She plans to continue her exploration of alternative space drive systems. Evaluation: Judging at the Ying TRSEF in the spring.

Sample Quarterly: ... She continues her exploration of alternative space drive systems. With the librarians at the Community College Library, she has learned to expand her search parameters for research documents. She continues to communicate with the staff at the Pisa Laboratory via email. She has emailed graduate student XXX, who has agreed to be her mentor this year. She spent a day at Princeton University, meeting with Dr. Samuel Cohen of PPPL about his work with plasmas, and touring both those labs and the MPD (magneto plasma dynamic) laboratories on the main campus with graduate students.

Math: The real-world application of math evolves in sophistication as projects become more complex in senior high. Some students find their research triggers an interest in statistics, so they take online statistics courses for college credit as high school students. By our son's senior year, his data involved complex analyses of chemical composition, production analyses, machine and process efficiency analyses – way over my head, but his mentor could handle it, and it really impressed the school's homeschooling liaison!

Sample Quarterly: To compare the heat resistance of each coating, he coated the entire surface of each sheet of compact foam, and brought it to a lab where they could be exposed to carefully-regulated heat. Timed observations identified melting thresholds, and statistical analysis of mass and deformation provided comparative measures.

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English: To prepare for their research, high school students conduct an extensive literature review with summaries of articles in academic and professional journals, maintain a laboratory notebook, produce an abstract, and as the pièce de resistance, write a detailed final research report. Note: Xerox copies of the bound lab notebook pages are accepted as documentation of a student's actually completing one. Students do NOT let their actual laboratory journals leave their hands.

Sample IHIP: As part of his science research course, he will develop more sophisticated journal entries in his experimental documentation. The literature review will include citation and synopsis of at least one journal article per week. Evaluation: Submitted to XXX, an engineer at Dresser-Rand, for review and mark-up.

Sample IHIP: His primary research paper this year will derive from his science fair project. Evaluation: Series of editing stages, then submitted to XXX as part of his science research course and to the Ying TRSEF as part of his science project presentation.

Public speaking: Each student prepares a 3-5 minute talk on her research which opens the presentation to each judge. At the high school level, science fair judges are degreed adults in the field of the student's research. At the Ying TRSEF, high school students can also submit their research for the Ying Scholars Award of \$1000 scholarships by presenting to a panel of PhDs and high-ranking military officers. Note: When a young person presents to absolute strangers, she really does have to communicate accurately and efficiently.

Sample Quarterly: She presented to three Fair Judges and two Special Award Judges on Fair Day, each presentation to a separate individual. The attached Fair Program documents her participation in the Ying TRSEF.

Art: Especially at the high school level, many science and engineering projects use careful photography as part of the documentation process. These are NOT shots you take to document that the child himself has done the work, but rather photos taken by the student to track progress on the experiment – plant growth patterns, design stages in an engineering project, etc. Depending upon the artistic bent of the student, the science fair display board can become an artistic endeavor in and of itself. While a dazzling artistic achievement does not impress judges, the kids enjoy it.

Sample IHIP: Art course: Photography. He will learn how to adjust shutter speed and aperture to maximize detail in still and moving shots. To demonstrate his successful learning, he will produce a photographic time study as part of his science fair project.

Sample Quarterly: He built a frame to position his camera in exactly the same place to photograph the section of sky observed in his Hubble data download. He chose a set sequence of foci, shutter speeds and apertures to create a visual light version of "his point in the skies." See photos attached and his records of camera settings.

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