Tulare County Science & Engineering Fair

Judges Handbook

Recognizing the achievements of talented students in science, mathematics and engineering.

All information can be found at:
www.tcoe.org/sciencefair

Tulare County Office of Education

Jim Vidak, County Superintendent of Schools

Revised for 2010

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THE PHILOSOPHY & VALUE OF SCIENCE FAIRS

For effective science education, the multifaceted nature of science must be addressed. A student that creates a science fair project meets this demand. A Science Fair project promotes these four major goals of effective science education:

- Attainment of positive attitudes toward science
- Attainment of rational and creative thinking processes
- Attainment of manipulative and communication skills
- Attainment of scientific knowledge

All of these goals are exercised by the students in preparing a science fair project.

The Tulare County Science & Engineering Fair mission is to:

- Motivate and stimulate the interests of all students in the fields of science, engineering and mathematics.
- Recognize outstanding effort and scientific achievement by students through their science fair projects.
- Provide an educational experience for student participants.
- Make all students aware of opportunities in science, engineering and mathematics, and to encourage involvement of all ethnic and gender groups.
- Involve the corporate community in recognizing outstanding students in technological and scientific fields of study.
- Encourage independent research.
- Provide a public forum to acknowledge the efforts of students and teachers.
- Stimulate interest and support of science and mathematics within our schools.

INTRODUCTION

The success of the Tulare County Science & Engineering Fair depends to a large extent on the quality of your judging. This handbook will help prepare you. Please review it carefully. The information and guidelines here will make your task easier and more enjoyable.

A science and engineering fair is a competition based upon the quality of the projects and experiments done by students. You are judging the results of these experiments and projects.

The Tulare County Science & Engineering Fair (TCSEF) is primarily sponsored by Tulare County Office of Education and hosted by the Sequoia Mall. The Tulare County Science & Engineering Fair is a county fair affiliated with the California State Science Fair. Each year in May, TCSEF sends a group of students, representing Tulare County (from grades 6 through 12) to the California State Science Fair. Approximately 50 regional/county fairs participate in the California State Science Fair.

AWARDS

There are two kinds of awards.

Categorical Awards, which are given by the TCSEF for scientific merit, these include the Honor Level, Exemplary Level, and Distinguished Science Fair Project Ribbons. The top three projects in every category also receive a cash prize dispersed by the Tulare County Office of Education Foundation. All students participating in the TCSEF receive Distinguished Science Fair Project Participation ribbons. Students are judged on a point system with a perfect score equaling 100 points.

- Honor Level Ribbons (blue) are 85 – 100 points
- Exemplary Level Ribbons (red) are 70 – 84 points

Special Awards are given by various professional organizations. Special awards will receive plaques that recognize the students' efforts in the professional organizations' related field. An example of a special award is the "Environmental Vision" award given by the Gas Company to the top air quality/environmental project.

INTRODUCTION CONT.

The top 30 scores in all categories will be declared the "Sweepstakes Awards" and will be interviewed to determine who will go on to the California State Science Fair. The categories are as follows:

- Behavioral & Social Sciences
- Botany
- Earth & Space Science
- Engineering & Mathematics
- Environmental Science
- Medicine/Health
- Microbiology & Biochemistry
- Physical Science
- Product Testing & Materials Science
- Zoology

Special Awards
The criteria for the special awards are determined by the sponsoring organizations.

Presentation of Awards
Awards will be presented to the student exhibitors at the Awards' Ceremony, to which you are cordially invited. The ceremony will be held on Thursday, March 11th, 2010, at 6:30 p.m. in the Sequoia Mall. Details will be available at the Fair.

JUDGING: THE PROCESS

Overview

Judges should plan to arrive no later than 5:00 p.m. for the judges' dinner, briefing, and project judging. Each judge will be selected to judge in a specific category. The group of judges for each specific category will have a lead judge. The lead judge for each category will have the responsibility to monitor their category to make sure that each project in said category has been evaluated a minimum three times. After the judges' orientation, the lead judge will gather his/her group of judges to go over any last minute pertinent information. Judges may expect to judge approximately 5 -20 projects within their category. The Science Fair Coordinator will determine judging categories. Judges should plan to spend about 10 – 15 minutes with each project.

Judging Procedure (Categorical Awards)

1. The judging materials consist of the following:

   - **This Handbook**
   - **Judging Criteria**
   - **Scientific Method**
   - **Judging Score Sheets**
   - **Clipboard, Nametag/Judges' Button** (all provided at check-in).

   Please return all of the above items, except your nametag, to the judging table in the lobby when you are done. You may keep your nametag as a souvenir or return it to us for next year.

2. At the conclusion of each evaluation, score the exhibit independently from the other categorical group members. Then, under the direction of the lead judge, determine which exhibits are to receive the 1st, 2nd, and 3rd place awards. The lead judge will coordinate this activity and turn in the results at the judging desk.

4. Each exhibit should contain an abstract. Examining the abstract is a good way to start the evaluation. This abstract should include:

   - The hypothesis or problem being addressed
   - A brief statement about the procedures and instrumentation used
   - The main findings
   - The main conclusion (or tentative conclusions)

JUDGING CRITERIA

Keep these four main concepts in mind while evaluating a project:

- How well the students understand the project or experiment.
- How creative the students were and how they dealt with problems that arose.
- Did the students do the work themselves? It is expected and desirable that they obtain assistance from experts, but they are ultimately responsible for the project.
- How the project compares to other projects in the same category and grade.

Exhibits are scored on the following basis:

- **Scientific Thought / Engineering Goals:** 30 Points
- **Creative Ability:** 30 Points
- **Thoroughness:** 15 Points
- **Skill:** 15 Points
- **Clarity:** 10 Points

Maximum Total Points: 100 Points

JUDGING CRITERIA CONT.

Scientific Thought (Science projects: Up to 30 points)

- Is the problem stated clearly and unambiguously?
- Was the problem sufficiently limited to allow plausible attack? Good scientists can identify important problems capable of solutions. Neither working on a difficult problem without getting anywhere, nor solving an extremely simple problem is a substantial contribution.
- Was there a procedural plan for obtaining a solution?
- Are the variables clearly recognized and defined?
- If controls are necessary, did the student recognize their need and were they correctly used?
- Is there adequate data to support the conclusions?
- Does the student or team recognize the data's limitations?
- Does the student/team understand the project's ties to related research?
- Does the student/team have an idea of what further research is warranted?
- Did the student/team cite scientific literature, or only popular magazines?

Engineering Goals (Engineering projects: Up to 30 points)

- Does the project have a clear objective?
- Is the objective relevant to the potential user's needs
- Is the solution:
  (a) workable?
  (b) acceptable to the potential user?
  (c) economically feasible?

  Unworkable solutions might seem interesting, but are not practical. Solutions that will be rejected or ignored are not valuable. A solution so expensive it cannot be utilized is not valuable.
- Could the solution be utilized successfully in design or construction of some end product?
- Is the solution a significant improvement over previous alternatives?
- Has the solution been tested for performance under the conditions of use? (Testing might prove difficult, but should be considered.)

Creative Ability (Up to 30 points)

- Does the project show creativity and originality in
  (a) the question asked ?
  (b) the approach to solving the problem?
  (c) the analysis of the data?
  (d) the interpretation of the data?
  (e) the use of equipment?
  (f) the construction or design of new equipment?

- An original idea for a project would show greater creativity than a suggested project from a textbook. Obviously, no project is creative and original in every aspect. Remember that a creative and original project for middle school students is different from that of professionals. Conversely, some projects may contain elements that seem original; the materials may have come from new curricula in textbooks or laboratory manuals unfamiliar to judges.

- Also consider how much help a student received. A student or team's approach to solving a problem may seem original, but may have come from a scientist's or engineer's suggestions. If a student received help on a project, any credit for creative ability and originality should reflect the student's own contributions.

- Creative research should support an investigation and help answer a question in an original way. The assembly of a kit would not be creative unless an unusual approach was taken. Collections should not be considered creative unless they are used to support an investigation, and to help answer a question in an original way.

- A creative contribution promotes an efficient and reliable way to solve a problem. When judging, make sure to distinguish between gadgeteering and genuine creativity.

Thoroughness (Up to 15 points)

- Was the purpose carried out to completion within the scope of the original intent?
- How completely was the problem covered?
- Are the conclusions based on a single experiment, or are there replications?
- How complete are the project notes?
- Is the student/team aware of other approaches or theories?
- How much time did the student/team spend on the project?
- Is the student/team familiar with scientific literature in the field?

Skill (Up to 15 points)

- Does the student/team have the skills required to do all the work necessary to obtain the data that support the project? Laboratory skills? Computational skills? Observational skills? Design skills?

- Where was the project done? (i.e., home, school laboratory, university laboratory) Did the student or team receive assistance from parents, teachers, scientists, or engineers?

- Was the project done under adult supervision, or did the student/team work largely alone?

- Where did the equipment come from? Was it built independently by the student or team? Was it obtained on loan? Was it part of a laboratory where the student or team worked?

Clarity (Up to 10 points)

- How clearly can the student discuss the project and explain the project's purpose, procedure, and conclusions? Make allowances for nervousness. Watch out for memorized speeches that reflect little understanding of the principles.

- Does the written material reflect the student's or team's understanding of the research? (Take outside help into account.)

- Are the important phases of the project presented in an orderly manner?
- How clearly is the data presented?

QUALITIES OF A GOOD SCIENCE FAIR PROJECT

- Display Board: Neat, concise, easy to read, informative.
- Project Report: Neat, complete, well organized, including good background, research, abstract, statement of problem, hypothesis (or statement of goals), procedures, materials used, findings, analysis, conclusions. Pictures are appropriate in the report, if they are germane to the subject of the study.
- Daily Log: Complete and in order. What was done and when was it done. (NOT REQUIRED for initial judging)
- Project Design: Experimentation using good scientific method (including large sample size, repeat runs and control of variables) or clearly **stated engineering/computer/mathematics goals with well documented results.**
- Creativity and involvement of student.
- Analysis of data.
- Communication skills.
- Completed Forms: Animals, human subjects, tissue samples where required.
- Compliance with the rules and regulations of the Tulare County Science & Engineering Fair.

DETERMINING THE CATEGORICAL AWARDS

After the evaluations of the projects are completed, each categorical judging team needs to work together to agree upon which projects deserve the 1st, 2nd and 3rd place awards for their category. Some points to consider are:

- The quality of the student's work is what matters, not the amount of work.
- Team projects are judged the same as 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 should get higher marks than a more sophisticated project that is not understood.
- Sometimes a hand-made graph is better than a computer generated one; it might indicate more understanding.
- Access to sophisticated lab equipment and endorsement from professionals does not guarantee a high quality project. (Did the student really understand what was going on?)
- It is acceptable if the student ended up disproving the objective or hypothesis of the experiment.

High marks go to:

- A well-formulated hypothesis.
- A logical plan to solve the "problem".
- Genuine scientific breakthroughs.
- Discovering knowledge not readily available to the student.
- Correctly interpreting data.
- A clever experimental apparatus.
- Repetitions to verify experimental results.
- Predicting and/or reducing experimental results with analytical techniques.
- In engineering categories, experiments applicable to the "real world".
- Ability to clearly portray and explain the project and its results.
- Understand what constitutes a proof.

CONCLUSION

The purpose of the Science Fair is to educate and encourage these potential scientists and engineers to excel. Certainly, the students are encouraged by the awards you give, but sometimes a constructive suggestion or recommendation may inspire a student to continue his/her studies. We hope that you enjoy the experience and return next year to judge.

Please contact us if you have any questions or comments about your judging experience.

As judges, please do your utmost to ensure that all participants remember the Science Fair as a positive experience in their lives.

TULARE COUNTY SCIENCE & ENGINEERING FAIR

JUDGES' COMMENTS & RECOMMENDATIONS

Scoring Form

Tulare County Science & Engineering Fair

Commendations:

- ❍ Shows originality – unique problem or approach.
- ❍ Exhibits creative use of materials or equipment.
- ❍ Project is particularly well designed and the reasoning is clear.
- ❍ Project shows good familiarity with previous work in the subject (use of scientific literature).
- ❍ Project shows a comprehensive understanding of the scientific principles involved.
- ❍ Project shows good understanding of unanswered questions remaining to be investigated.
- ❍ Experimental method is clear (experiment could be replicated).
- ❍ Project shows exemplary treatment of data: sample selection, collection, display, replication of trials.
- ❍ Conclusions are well justified by the data, relate directly to the formulation of the problem, and are clearly presented.
- ❍ Project exhibits exceptional student skills in mathematics, statistics, computer use, or observation.
- ❍ The project notebook is exceptionally neat, organized and clear.
- ❍ Display board is exceptionally attractive, organized, and clear.
- ❍ Project shows evidence of an exceptional amount of hard work.
- ❍ Project is clearly the work of the student, without adult assistance.

Suggestions for Improvement:

- ❍ The project notebook is absent or difficult to follow.
- ❍ More data is needed.
- ❍ Attention to variables is needed.
- ❍ Graphs are incomplete or incorrectly drawn.
- ❍ The display board is not neat or is difficult to follow.
- ❍ Important components of a study like this have been omitted.
- ❍ Data is misinterpreted, or all likely interpretations of the data have not been considered.
- ❍ Needs more clarity or attention to scientific concepts and/or accuracy.

Additional judges' comments: _____

_____

_____

_____

SEE OTHER SIDE FOR SCORE

Project # _____ Project Title: _____

Scientific Thought: Testable question; identification of variables; scientific procedures; appropriate sampling; organization and analysis of data; logical conclusions based on evidence; project notebook present.

30 Points Possible. (*Please check one.*)

- ❍ Problem/objective is stated clearly; clear identifiable variables; precise procedure involving data collection.
- ❍ Problem/objective is stated; variables are discussed; procedure that utilizes data; moderate sampling.
- ❍ Problem/objective is stated; possible variables identified; small sampling size.
- ❍ Limited problem/objective; procedures and variables vague; minimal sampling.
- ❍ Vague problem/objective; variables not defined; procedure and data collection limit experimental scope.

Total Points _____

Creativity: Originality of problem uniqueness of approach; ingenious use of equipment & materials.

30 Points Possible. (*Please check one.*)

- ❍ Very original project with unique design.
- ❍ Unique approach to a project that is frequently done.
- ❍ Well done project that has been frequently done.
- ❍ Project does not go beyond demonstrating a known principle.

Total Points _____

Thoroughness: Literature search; multiple trials; careful record keeping in a project notebook. Study is complete within the scope of the problem.

15 Points Possible. (*Please check one.*)

- ❍ Exceptional research, multiple trials; careful data analysis and conclusion. All elements of scientific experimentation complete and of a high standard.
- ❍ All elements of scientific experimentation complete. Good research and adequate sampling size in trials.
- ❍ Average research represented. Minimal trials with adequate elements of experimentation.
- ❍ Experimental trials not repeated, reproducibility in question.
- ❍ Conclusion not clearly supported by data.

Total Points _____

Skill: Skill in design; construction or use of equipment; skill in observation, computation, analysis or design of experiment.

15 Points Possible. (*Please check one.*)

- ❍ Quality construction and use of equipment, no apparent mistakes.
- ❍ Apparent mistakes in observation or measurements.
- ❍ Construction not reflective of expected grade-level skill.

Total Points _____

Clarity: Exhibit is easy to read. Purpose, procedures, data analysis and conclusions are clearly explained.

10 Points Possible. (*Please check one.*)

- ❍ Project clear, complete and well done.
- ❍ Project complete, work to improve neatness and quality.
- ❍ Difficulty in understanding project.

Total Points _____

Grand Total _____

SEE OTHER SIDE FOR COMMENDATIONS & RECOMMENDATIONS

For Science Fair Coordinator Only	Ribbon Awarded:	Blue	Red	Purple
Science Fair Coordinator's Comments, if any:				