

## DVSF Workshop

1. **Inside Science Fair Judging** (12:30-1:45 PM) - The judging of science fair projects at Delaware Valley Science Fairs involves judges of three different types, each working to identify the best projects within specific criteria. The bulk of this presentation will focus on the judging process, the criteria that judges use in making selections, and what the students can do to improve the judges' impressions and evaluations of their project.

Presented by Bob Hranek, MS Computer Science, 6 years USAF Computer Programming, 34 years Senior Aerospace Systems Engineer, DVSF Judge every year since 1995, ISEF Judge every year since 1999.

Workshop Outline: "In the next hour I'll discuss DVSF from the judges, students, and your POV, and then answer your questions."

1) **JUDGES Information:** (Morning Display Review, Afternoon Student Interviews, then Making Awards Decisions)

- a. There are 3 Different Types of DVSF Judges. (all have **Blue-ribbon** badges at DVSF)
  - i. **Category Judges** – Blue-ribbon badges with specific grades & categories written on it.
    1. Category judges select the 1<sup>st</sup>, 2<sup>nd</sup>, & 3<sup>rd</sup> place winners for a given grade & category.
      - a. They can optionally award "Honorable Mentions" to up to 10% of the category.
    2. These judges usually have specialized knowledge of the category, based on availability.
  - ii. **Special Awards Judges** – Blue-ribbon badges and are representing an organization seeking to award students based on criteria that may span several categories.
    1. Special awards span everything from certificates to full multi-year college scholarships!
    2. The scoring criteria for special awards are uniquely set by that sponsoring organization.
  - iii. **Medals Judges** – Blue-ribbon badges but they only interview the 1<sup>st</sup> place category winners.
    1. Medals judges select the Gold, Silver, & Bronze winners in each grade to send to ISEF.
    2. Our selection is made based on relative merit and ability to answer in-depth questions.
- b. Category Awards Judging Suggested Criteria.
  - i. **Research, 10%**, explain the project's merit, what was learned, and how it relates to the project.
  - ii. **Design & Methodology, 15%**, well designed plan, detailed procedures, & appropriate controls.
  - iii. **Data Collection & Testing, 20%**, sufficient relevant data collected & reproducibility of results.
  - iv. **Analysis & Conclusion, 20%**, appropriate math & statistical methods applied, data supports the interpretation & conclusion, & identifies outliers or unexpected data (no hidden data).
  - v. **Creativity & Potential Impact, 10%**, in some aspect of the above 3 criteria.
  - vi. **Interview, 25%**, the ability for the student(s) to clearly communicate what they learned.
    1. For Team Projects, the judge is looking for equal work/knowledge from each teammate.
  - vii. The above 6 criteria are only guidelines to give judges (especially new ones) an idea of relative importance. The main thing all judges should be looking for are **what the student(s) learned**.
    1. Judges are impressed when students show enthusiasm for their project, do not hide 'bad' data and can explain what caused it, and how they overcame any obstacles.
    2. For Multi-year Projects: Be aware that if the student(s) did not learn significantly more in the last year, then I advise my judges to score them lower, especially at ISEF.

2) Notes for the STUDENT:

- a. Your 1st impression to the judges will be your Display without you there, so make it neat, complete, & easy for the judges to determine what your project is about, how you did it, & what you discovered.
  - i. Make sure all the elements (Abstract, Question, Hypothesis, Background Research, Materials, Procedure, Results, Conclusion, Future Directions, & Bibliography) are clearly visible, in that order.
    1. Some judges want to see your log book, others do not, but if you do use and provide a log book, then ensure it is the original, with date/times, and daily details of your work.
  - ii. Do not make statements and conclusions that are not supported by your data and analysis.
    1. Know the difference between accuracy & precision, and don't display inaccurate digits.
    2. Be aware of the limitations of your data. E.G., if you test something at just 0°C & 100°C, then you can't claim to 'know' the performance of that thing at all temps in between.
    3. If at all possible, perform as many experimental trials as possible & average the results.

- a. Performing 10 experiments at 10 different temperatures is NOT 10 trials. Having 10 trials in this case would mean 100 tests, 10 tests at each of the temps.
      - b. Only by repeating the exact same starting conditions multiple times can give you confidence that your results are consistent, reliable, and repeatable by others.
    - 4. Try to eliminate uncontrolled variables as much as possible. For instance, testing throwing distance outside during a severe storm is going to adversely affect your results.
  - b. Please be at your project during the interview period.
    - i. On Wednesday, **wear your badge**. You will be allowed to enter the Exhibit Hall starting at **11:30**.
    - ii. For highly structured events like ISEF there will be a formal schedule of 15-minute time slots for when students can expect a Category Awards Judge to interview them, but Special Awards judges can show up at any time during the overall interview period.
    - iii. DVSF is not so rigidly structured; Category Awards judges will use the available time to interview every student in their categories ASAP, and cannot afford to wait or look for missing students.
    - iv. Try to make use of the College Fair as much as you can, while keeping an eye out for judges at your project or coming back every few minutes.
  - c. The Interview.
    - i. Greeting anyone with a smile and showing genuine interest always helps, so stand up, show your enthusiasm for your project, & the opportunity to show it to professionals in the category!
      - 1. Hand-shakes are nice, but not mandatory. Some people prefer not to shake hands, and some may choose not to if they're ill, just be aware and respect everyone's boundaries.
    - ii. Professional dress is preferred, speak clearly, and put away all distractions, like smartphones.
    - iii. Have a prepared presentation for your project, but don't expect to deliver all of it.
      - 1. This is meant to be an interview, with the judge(s) asking you questions, and you answering those questions as concisely, completely, and accurately as possible.
      - 2. Be prepared for a variety of questions. Some judges may know little about your project and need to be walked through the basics, whereas others may have PhDs in your topic.
    - iv. Category Awards judges usually are pressed for time to cover their entire category, sometimes splitting up into teams to cover a subset of the projects and combining their results to save time.
      - 1. In order to be fair (splitting time evenly among all projects) this means that typically there will only be 10 minutes (or even as little as 5 minutes☺) per project.
      - 2. This is why it is so critical to answer judge's questions as concisely as you can, because there will rarely be enough time to tell the long version of what you did and why.
      - 3. You may have a dozen more things you 'must' tell the judges before they go, but be prepared for them to end the interview before you're 'done'. They are not being rude, and it does not mean you've performed poorly, it's just a reality of their limited time.
    - v. You ARE allowed (& encouraged) to use judges' feedback to improve your project.
      - 1. This usually involves performing additional experimentation, more trials, corrections of data analyses, revising Conclusions, or even just fixing grammatical & spelling mistakes.
      - 2. This applies at every stage, such as from County Level to DVSF, and DVSF to ISEF.
      - 3. DVSF Project Feedback forms should be returned to students by the end of the day.
    - vi. **RELAX!** I know all of this seems very intimidating, but you have already done the work and earned your right to be a finalist, this is an opportunity to explain your efforts to adults that can really appreciate what you've accomplished, so enjoy the moment. ☺
- 3) Notes for PARENTs, TEACHERs, & MENTORs:
  - a. Help the student(s) do their work, but do not do the project for them.
    - i. Tutoring sessions walking them from question to hypothesis to planned procedures can be very effective, but if the student(s) are not actually thinking these things out for themselves, then they won't be able to explain what they did (& more importantly, why they did it) to the judges.

- ii. It's important to ensure student(s) are working without harming anyone, but once the safety procedures are in place, have the student(s) perform as much of the procedure as possible.
  - iii. The same goes for the analysis, conclusions, and future ideas. You can review their work to prevent them from making scientifically invalid statements, but they will not be able to explain it to the judges unless the results come from their own minds.
- b. Make them document ALL of their work, even procedures and data that will not be on the display.
  - i. The judges should not give them credit for 'hidden' work, even if they can describe it verbally.
  - ii. Some of the 'best' knowledge gained (in projects and professionally) comes from 'failures', investigating what went wrong, and then overcoming those obstacles.
- c. **All Judging placement decisions are FINAL.**
  - i. The only project disqualifications that could occur AFTER judging is done would be proven fraudulent work, including plagiarism or unattributed work done by others or AI.
  - ii. There is no credible way to change project rankings AFTER the fair, especially since so much of the judges' decisions should be based on the student's performance during their interview.
- d. All students that have been selected for any award will be notified by email to please attend the Thursday Awards Ceremony.

**Bob Hranek's 2024 DVSF addition: Artificial Intelligence (AI) use vs misuse in Science Projects**

- 1) DVSF's provided written guidance on the use of Artificial Intelligence (AI) in Science Projects:
  - a. "Student researchers must clearly document in their Procedure how Artificial Intelligence was used in their project."
  - b. "Artificial Intelligence (AI) is a powerful research tool and any AI use must be clearly written in your Procedure, so the judges can completely understand how AI was used in your project."
  - c. "Students should document exactly how they used AI in their project, just like they should document the use of any other technology. Students must cite the use of AI just as they should cite research, results, conclusions, and tools from the literature. This documentation should be clearly cited in their procedure, logbook, research paper, or poster. The absence of this documentation will result in disqualification from the competition."
  - d. "Judges must be able to understand the details of their use of AI, and not some bare-minimum statement of "I used AI in my project.""
  - e. "It is the responsibility of the student(s) to disclose the use of artificial intelligence (AI) tools. There are legitimate uses for AI. The student should expect to explain why and how AI was used. Just as students cannot claim someone else's research as their own, they cannot claim text, data, or conclusions generated by AI as their own."
- 2) When using AI, extra effort must be taken to prevent presentation of false or unsupported data.
  - a. AI under some circumstances can 'hallucinate' and invent data in response to queries.
  - b. You must check every data point and citation provided by AI to independently verify that that data is accurate from a trusted information source.
  - c. Making a separate AI query to perform your data check is NOT a valid procedure.
- 3) Some examples of appropriate AI use in Science Projects:
  - a. As a research tool, to refine your hypothesis or find information that you need for your project, as long as you verify that information's validity once the AI has collected it for you.
  - b. To check your procedure for possible missed steps or suggestions to improve your data collection.
  - c. As an analysis tool, to find correlations or trends in your data that you may not have spotted yet.
  - d. As an editor, to double-check your work in progress, to refine your already written analyses and conclusions, or spot inconsistencies in your procedure.
  - e. You could even input your project's graphs, poster, or other visual materials to see if AI has any suggestions to improve the clarity of your project's display.
  - f. ALL of the above is fine, as long as you fully explain all such uses to your judges.

- 4) For my own AI-use example, I wrote all of the above (a few updates have been made since 2024), input it into <https://chat.openai.com/> on 2024/02/10 with the following preface “How would you suggest I improve the guidance for Science Fair Students for the ethical use of AI in their projects, based on what I've already written, as follows:”, and it responded with:

Your existing guidance provides a solid foundation for ensuring the ethical use of AI in science fair projects. Here are some additional suggestions to further enhance the guidance:

1. **Ethical Considerations and Bias Awareness:** a. Emphasize the importance of considering ethical implications when using AI, including issues related to bias, fairness, and privacy. b. Encourage students to be aware of potential biases in the data used to train AI models and to mitigate these biases as much as possible. c. Remind students to consider the potential impacts of their AI usage on different stakeholders and to prioritize ethical decision-making throughout their projects.
2. **Transparency and Interpretability:** a. Stress the importance of transparency in AI usage, including explaining the algorithms and methodologies employed. b. Encourage students to provide explanations for AI-generated results to help judges and audiences understand how conclusions were reached. c. Remind students to document any limitations or uncertainties associated with AI-generated findings.
3. **Data Privacy and Security:** a. Remind students to handle data responsibly and to respect the privacy of individuals whose data may be used in their projects. b. Encourage students to implement appropriate security measures to protect sensitive data from unauthorized access or misuse. c. Advise students to obtain necessary permissions and consent when collecting or using data, especially if it involves personal or sensitive information.
4. **Responsible AI Development:** a. Encourage students to consider the potential long-term impacts of their AI projects on society and the environment. b. Remind students to prioritize the development of AI systems that align with ethical principles and contribute positively to the greater good. c. Encourage students to engage in ongoing learning and reflection on ethical AI practices to continuously improve their projects and contributions.
5. **Collaboration and Peer Review:** a. Encourage students to seek feedback from peers, mentors, and experts in AI ethics to ensure that their projects adhere to best practices. b. Promote collaboration and knowledge-sharing among students to foster a supportive community focused on responsible AI use in science fair projects. c. Highlight the importance of peer review in evaluating the ethical implications of AI usage and encourage students to actively participate in the review process.

By integrating these additional considerations into your guidance, students will be better equipped to navigate the ethical complexities of using AI in their science fair projects responsibly and ethically.