

The Ohio Academy of Science

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SCIENCE DAY PROGRAM UPDATE 2018-2019

September 1, 2018

To all State Science Day Officials, District Councils, Teachers, Mentors, Judges and Students,

The Junior Academy Council has reviewed the rules and procedures for the Science Day Program and has approved the enclosed *Science Day Standards* to apply to the 2019 State, District and Local Science Days. Please review them carefully.

Key points:

Project Display rules: In previous years, no materials or equipment from the project have been permitted. In 2019, students will be permitted to display some items with the intention that students will be better able to present their projects to the judges. International Science and Engineering (ISEF) display rules will apply. Items which are now Permitted, or Not Permitted, are listed in the updated Science Day Standards, Section III, parts (g-j). Please review carefully. If there are questions, contact the OAS office.

Photo Credit Form on project displays: This is not a new requirement; however, it will be more strictly enforced at the District and State levels. Students must complete and post the following form on the front of their displays:

Photographs taken by: _____

Graphics on display from: _____

Photographic permissions were obtained and are located: _____

Company approvals were obtained for use of trade-marked, registered or brand name products Yes No

Topic Categories: 2019 topic categories and sub-categories will follow ISEF list found here:

<https://student.societyforscience.org/intel-isef-categories-and-subcategories#BEHA>

In addition, an Engineering Design project is any project where a prototype is designed, built, and tested. Not all Engineering projects are considered Engineering Design, and not all Engineering Design projects fall under the Engineering category. Ex: Design of a medical device would fall under Medicine & Human Health. Regardless of the topic category, Engineering Design projects should be identified by students under the Statement of Purpose included in their Research Plan and Final Project Report. There will likely also be a place to indicate Engineering Design in the registration process at the District and State levels. It is important that these projects be identified correctly as a different judging scoring rubric will be used for these projects.

Sincerely,



Michael Woytek, CEO

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THE OHIO ACADEMY OF SCIENCE 2018-2019

SCIENCE DAY STANDARDS

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I. Introduction to Student Participants

Participation in a Science Day should be a rewarding experience. It offers an opportunity: 1) to learn and practice the principles of scientific research, 2) to meet others interested in scientific study, and 3) to earn recognition for academic excellence. Thus, those involved should not be limited to the gifted, although all should be aware of the long tedious work involved in scientific investigation. Accurate prediction of a student's potential is impossible until he or she has attempted a project a number of times. Most will not achieve perfection on the first attempt, but proficiency will come to those who are persistent.

When issues arise that are not covered in these standards, the student or teacher should seek guidance from the latest edition of the Rules for the Intel International Science and Engineering Fair. (See <http://student.societyforscience.org/international-rules-pre-college-science-research>). For specific rules or questions, please email: SRC@societyforscience.org

Teachers, other professionals, scientific organizations, industries, and parents can and will give much valuable aid if the request is made in the proper way. Reasonable response time, courtesy, and consideration coupled with sincere expressions of appreciation will eliminate many of the rough spots for a young scientist. Remember, others may advise and give aid, but they must not do any work for the participant.

II. Scientific Inquiry vs. Technological or Engineering Design Projects

Just as **scientific inquiry projects** require: 1) the identification of a problem or question and 2) a proposed hypothesis that might offer a solution to the problem or answer the question, so too, **engineering and technological design projects** require: 1) a problem or needs statement and 2) a design statement that identifies such limiting factors and criteria for success or meeting the design as cost or affordability, reliability (mean time between failure MTBF), material limits (strength, weight, resistance to corrosion, color, surface texture, ease of manufacture or reproducibility), operating environment or conditions (temperature, humidity, barometric pressure, caustic condition), ergonomics (human factors), health and safety and general ease of use or operation.

In a manner similar to the development of methods used to test a hypothesis, engineering and technological design projects must test the "design statement" to see how close the prototype, for example, comes to meeting the design criteria. A prototype developed for an engineering or technological design project must achieve stated design objectives and satisfy specified constraints. Generally, the results of an engineering or technological design project will describe the extent to which the prototype met the design criteria. An inquiry project shall state the extent to which the results derived from experimentation validate or invalidate a hypothesis. Thus a *hypothesis* is to *inquiry* as *design* is to *engineering* and *technology*. In all cases, the students must present the results of repeated trials. Use the figure below to determine whether your project is testing a hypothesis or a design/engineering.

Scientific inquiry vs. technological or engineering design projects

The Scientific Method	The Technological or Engineering Design Process
State a question or problem	Define a problem or need
Gather background information	Gather background information
Formulate hypothesis; identify variables	Establish design statement or criteria for success
Design experiment; establish procedure(s)	Prepare preliminary designs
Test hypothesis multiple times by an experiment	Build a prototype and test multiple times
Analyze results & draw conclusions	Analyze results; verify, test & redesign as necessary
Present results.	Present results

III. General Information

a) Grade Levels

Participants in local science days may be in any grade level. Each Junior Academy Council District Science Day has the option of accepting participants in grades 5-12 or 7-12. Participants must earn a superior rating (36-40 points for individuals; 45-50 points for teams) to submit their projects to the next-in-line science day. District and State Science Days operate on a quota system that may further limit participation even if some students at a preceding science day received superior ratings.

b) Adherence to the Standards by Teachers

Teachers promoting local student research projects and conducting local science days leading to District and State Science Days, are expected to have their students follow the official Science Day Standards outlined here. Included in these Standards are the Judging Criteria for both Individual and team projects that teachers should use locally and that must be used at all District Science Days. **The Ohio Academy of Science discourages the assignment or use of special points or a scoring rubric unique to local science days, and does not permit their use by District or State Science Days.**

c) Project Duration

A student research project shall be used for only one year. It must not be repeated nor given to another person to represent his or her work. Each student may enter only one project which covers research done over a maximum of 12 continuous months between January of the year before the Science Day and May of the year of the State science Day. A project may continue only if it involves new or revised objectives, hypotheses or methods, and presents substantially new or different results each succeeding year.

d) Sampling and the Use of Statistical Analysis

Projects must provide adequate sampling and analyze results using statistics. This may require a great deal of time and many trials. Due to the nature of projects, it is not possible to state minimum sample sizes. Science or mathematics teachers, mentors, or advisors should be consulted to determine an adequate number.

Almost all scientific research involves statistics. A scientist should not draw a conclusion based on a single measurement or observation. Scientists usually repeat the same measurement three or more times, and use statistics to express its reproducibility or significance. If the term "significant" is used, then the actual statistical test of significance must be stated. Other scientists may repeat the

research to see if they can replicate the stated results. Sampling of subjects is of utmost importance. Students doing behavioral studies using vertebrates should learn what is the minimum number of subjects needed for adequate sampling. In project abstracts and reports always state the number of trials or the population samples as (N=number).

e) **Policy Statements: Preventing, Detecting and Penalizing Plagiarism in Science**

Projects:

- Any claim of plagiarism in a project made prior to, during or within one week after State Science Day shall be judged as usual, but all scores, ratings, and awards shall be retained until a review of the project is completed by the Academy office and/or its delegated inspectors. If the project is found to be plagiarized, the registration fees for State Science Day as well as awards and ratings will be forfeited. The district and school from which the project originated will be contacted. The student(s) future project(s) will be required to pass a review prior to presentation in any Academy Science Days.
- Scientific fraud and misconduct are not condoned at any level of research or competition. Such practices include plagiarism, forgery, use or presentation of other researcher's work as one's own, and fabrication of data. Fraudulent projects will fail to qualify for competition in affiliated fairs or the Intel ISEF.

f) **Team Project Policies**

- A team shall consist of a maximum of three students. A District Science Day may only allow a maximum of two students per team due to local limitations. Teams may not have more than three members at a local science day and then eliminate members to qualify for District or State Science Day. In a subsequent academic year, a continuing team project may be converted to an individual project or vice versa.
- Team projects shall be accepted at all District Science Days. A revised 50-point rating scale will be used to evaluate team projects.
- Individual and team projects shall be considered equally when District science day directors select projects to fill quotas to attend State Science Day.
- All currently active team members must be present to receive an official recorded score. Team projects with a missing participant will be evaluated with comments but a final score will not be given. Such projects will not be eligible for sponsored awards. This will be in effect at District and State Science Day.
- Each team shall appoint a team leader to coordinate the work and act as the primary spokesperson. However, each member of the team should be able to serve as spokesperson, be fully involved with the project, and be familiar with all aspects of the project.
- The final work should reflect the coordinated efforts of all team members. A supplemental sheet of the contribution each member made toward the team project shall be signed by each member and shall be displayed with the project and included in the research notebook, project report and with the applications to attend District and State Science Days.

- Full names of all team members must appear on the abstract and registration forms. The Judges will be instructed to ask each team member for a one or two sentence description of what they consider to be their most important contribution.

g) **Expectations of Display: Present Results**

Displays at District and State Science Days are strictly table-top poster format only. Table-top display dimensions shall not exceed 36 inches (91 cm) wide by 30 inches (76 cm) deep. The top of the display shall not be more than 85 inches (216 cm) above floor level or 55 inches (140 cm) above a 30inch high table. There shall not be any lettering or display materials extend in excess of 1 cm from the vertical front surface of a display board. Extensions of a project beyond the state limits will result in dismantling or severe modification of the display, and may disqualify the student's participation.

Students are expected to **present the results** of their original research and experimentation/design plan. They **are not expected** to perform, demonstrate or repeat an experiment for judges or visitors. Students should have already completed an experiment or conducted many research trials, and thus have adequate results in the form of charts, graphs, data tables, and a required research notebook—all recorded with dates—which should be with project display. ***Equipment used in research is not required for a presentation, but is permitted if needed to explain a procedure to judges.*** Use photographs or drawings of equipment on the poster boards, in the technical report and in the research notebook to document and explain the equipment used. Items on the display backdrop, or poster boards, should be used as visual cues to keep the students' oral presentation to the judges on track or to refer to when responding to questions. The whole project, in simple form, should be visible on the poster boards. Abstracts, a research notebook, technical reports, and additional data should be in folders for immediate reference. **"The score of the student's project may be impacted by the violation(s) if either the physical dimensions or physical items rules are not followed."**

h) **Safe Project Displays**

Project displays shall not involve materials or elements that might be dangerous to exhibitors, judges or onlookers. However, it is understood that explosives, toxic elements, injurious chemicals or gases, open flames, or any unprotected moving parts, etc. may be necessary in a research project. The experimenter should always exercise the greatest care, and conduct these phases of the work under qualified supervision and follow all protocols as required and listed by the Rules of the Intel International Science and Engineering Fair. **These materials or elements cannot be on the display poster, on the display table, or under the table at a Science Day.**

i) **Items ALLOWED at Project with the Restrictions Indicated**

Posters should display an abstract and data tables, diagrams, charts, photographs and graphs that summarize results. Research notebooks, research reports, research plans and documentation of research protocols are expected, and may be in notebooks or folders on the table for use by science day officials and judges. Information such as postal, web and e-mail addresses, telephone and fax numbers is allowed only for the exhibitor. The only photographs or visual depictions of identifiable or recognizable people allowed are photographs of the exhibitor, photographs taken by the exhibitor (with displayed individuals documented permission), or photographs/graphics for which credit is displayed (such as from magazines, newspapers, journals, websites or other electronic media). Battery powered computers may be used only for simulation, modeling, animation or data display integral and essential to the project results.

NEW: List of Items Permitted at Project Display - Effective in 2018

Equipment or materials used, or developed, as part of this project may be displayed if:

1. It fits within the display dimensions described in Section III, part g.
(Free-standing floor exhibits not permitted, must fit on table); and
2. It is not listed in Section III, parts h and j “items NOT ALLOWED at Project Display”; and
3. It meets Safety Regulations found in Section III, part j, that is deemed safe by the Display and Safety Committee upon inspection.

Permitted items may include Engineering Design prototypes and equipment designed and built to complete scientific research and to collect data for a project, assuming it meets the criteria above.

(Note: All items included in project display must fit within the display dimensions described in these Science Day Standards, Section III. General Information, part g “Expectations of Display”)

j) Items NOT ALLOWED at Project Display

1. Living organisms, including plants
2. Soil, sand, rock, cement and/or waste samples
3. Taxidermy specimens or parts
4. Preserved vertebrate or invertebrate animals
5. Human or animal food as part of the exhibitor demonstration of the project.
6. Human/animal parts or body fluids (for example, blood, urine) NO exceptions for teeth, hair, nails, dried animal bones, histological dry mount sections, and completely sealed wet mount tissue slides.
7. Petri dishes or culture tubes with living or dead cultures
8. Plant materials (living, dead, or preserved) that are in their raw, unprocessed, or non-manufactured state (Exception: manufactured construction materials used in building the project or display)
9. All chemicals including water (exception: sealed bottled water for human consumption)
10. All hazardous substances or devices (Example: poisons, drugs, firearms, weapons, ammunition, reloading devices)
11. Large vacuum tubes or dangerous ray-generation devices (exceptions: computer monitors on battery-operated notebook computers when used for computer modeling projects)
12. Items that may have contained or been in contact with hazardous chemicals (Exception: Item may be permitted if professionally cleaned and document for such cleaning is available)
13. 3-D Printers
14. Dry ice or other sublimating solids
15. Sharp items (for example, syringes, needles, pipettes, knives)
16. Flames or highly flammable materials (including magnified light sources). A Fresnel Lens cannot be used in conjunction with a light source - it becomes an open flame.
17. Any apparatus producing heat above room temperature (e.g. heat lamp, hotplates, Bunsen burner)
18. Batteries with open-top cells or wet cells
19. Glass, or glass objects, (including mirrors in hologram or laser apparatus), unless deemed by the Display and Safety Committee to be an integral and necessary part of the project (for example, glass that is an integral part of a commercial product such as a computer screen)
20. Any apparatus deemed unsafe by the Scientific Review Committee, or the Display and Safety Committee (Example: empty tanks that previously contained combustible liquids or gases, pressurized tanks, etc.)
21. The Display and Safety Committee reserve the right to remove any project for safety reasons or to protect the integrity of the State Science Day and its rules and regulations.
22. Awards, medals. Flags, etc. (Exceptions: Academy membership or State Science Day lapel pins)
23. Organizational/school/mentor/grant provider/etc. logos or reference statements

Other Display Safety Regulations

1. Any inadequately insulated apparatus producing extreme temperatures that may cause physical burns is not allowed.
2. Any apparatus with unshielded belts, pulleys, chains, or moving parts with tension or pinch points must be for display only.
3. Project sounds, lights, odors, or any other display items must not be distracting. Exceptions to this rule may be permitted for judging demonstrations. Approval must be given prior to judging. Exhibitors must endeavor to limit the distraction to be as brief as possible. Extended distraction(s) may cause the exception to be revoked by the Safety and Display Committee.

Electrical Regulations at State Science Day

1. No AC electrical power will be provided or shall be used.
2. Battery powered devices must be protectively enclosed. Any enclosure must be non-combustible. All external non-current carrying metal parts must be grounded.
3. Energized wiring, switches, and metal parts must have adequate insulation and over-current safety devices (such as fuses) and must be inaccessible to anyone other than the student(s) for the project.

Laser Requirements

Any Class 1 or Class 2 lasers, along with only Class 3A or 3R lasers, are allowed to be used provided a finalist avoids indiscriminate exposure to other finalists, judges, or visitors (except if passed through magnifying optics such as microscopes and telescopes, in which case they may not be used). No other lasers may be used or displayed.

1. Any laser must be labeled by the manufacturer so that power output can be inspected. Lasers without labels will NOT be "cleared."
2. LED's that consume over 1 watt, unless they are in a commercial light bulb/fixture or otherwise shielded, will not be allowed.
3. Lasers will be confiscated with no warning if not used in a safe manner. Serious offenses may result in failure to qualify.

Due to unavailability of electrical power supply at State Science Day, use of lasers is limited to battery-powered equipment (Laser classifications defined:

<https://www.rli.com/resources/articles/classification.aspx>)

k) Eligibility for District Science Day

Students shall be admitted to only one District Science Day per year. District Science Days shall not accept duplicate projects from the same school. To be eligible for a District Science Day, a student shall earn a superior rating from participation in a local or county science day. A student at a school that does not have a local science day or a home schooled or virtually schooled student shall earn a superior rating from participation in a local science day at any public or non-public school within their school district that is based on where the student lives. If no science day exists within their school district, the student may participate in an adjacent local science day, or a county science day, within the same or adjacent OAS District, with continuation, if eligible, at the student's local OAS District Science Day. A virtual school may hold a real local science day for all of its students who reside within a county or all counties of a District Science Day.

A local or county science day is expected to use the same forms, follow the same rules and criteria on safety and judging as the District and State Science Days.

Each District is expected to accept only students who live in the boundaries of the District, with the exception of existing agreements between districts.

Under unusual circumstances, the director of the home district may request the director of the temporary district for permission for one or more students of the home district to participate in the temporary district for one year only. The director of the home district must contact the director of the temporary district directly in order to request to be made and permission be granted. Specifically, the director of the temporary district will NOT accept requests for transfer by any representative other than the director of the home district.

If permission is granted, the home district will send to the temporary district one (1) accommodating judge for every three (3) accommodated students sent, with a minimum of one (1) accommodating judge. If permission is granted, the accommodated student will: 1) pay their fees to the temporary district, 2) be eligible for prizes from the temporary district, at the discretion of the temporary district director, and 3) be counted in the State Science Day quota for the temporary district, at the discretion of both district directors, if they are eligible to go to State Science Day. The only exception is they will not be eligible to participate in the Regional Science and Engineering Fair (RSEF) at the home district if not permitted by the affiliation agreement of the RSEF with ISEF.

l) Eligibility for District Science Day Under Extraordinary Circumstances

The intent of this policy is to accommodate extraordinary instances where it is not possible for a student to participate in a local science day. Using the Judging Criteria in the Science Day Standards, District Science Day Directors shall determine the eligibility of the applicant to participate in the District Science Day in extraordinary instances: 1) Where admission to a local science day is prohibited by public or non-public schools within their own district or in an adjacent school district, 2) where there is no local science day at a public or a non-public school within his or her district or in an adjacent school district. Students in groups (1) and (2) must include a complete project report and all plans and protocol forms with their application to a District Science Day. Two judges approved by the district science day director shall evaluate that report independently and blindly. The District science day director shall admit a student whose project meets basic criteria and research protocols required by the Science Day Standards adopted by the Junior Academy Council.

m) Policy for District Procedures for Registering Students for State Science Day

Students selected to enter State Science Day are personally responsible and must be present for the announcement of their eligibility for State Science Day unless excused in advance of the event by the District Science Day Director. If a student anticipates that he or she will not be present for announcement and receipt of registration instructions and materials, then with permission of the District Science Day Director, he or she must designate in advance of the event and in writing an adult to be responsible for hearing the announcement, obtaining the registration materials, and promptly delivering the materials to the absent student. **Absence from the announcement does not relieve the student of the responsibility to meet the postmarked registration deadline.** The District Science Day Director shall have final authority for selection of State Science Day registrants who are certified as eligible to the executive office of the Ohio Academy of Science by noon on the first Monday after the district science day.

n) **Eligibility for State Science Day**

The Junior Academy Council assigns State Science Day participation quotas for each District Science Day based equally on the percent of Superiors earned by projects of that district at the most recent State Science Day and on the number of District Science Day participants at the previous year's District Science Day. Team scores shall be converted to the 40 point scale. Projects of students that have received a superior rating at the District level will fill the District quotas to attend State Science Day by the following policy:

- 40 points for grades 12 through 5
- 39 points for grades 12 through 5
- 38 points for grades 12 through 5
- 37 points for grades 12 through 5
- 36 points for grades 12 through 5

Lottery: If there are more student projects than spaces available within the quota, a lottery shall be used to determine the projects selected. E.g. if there are twenty (20) 7th graders each with 37 points, but only ten (10) slots, a lottery would be held to determine the ten (10) projects to fill the quota. Alternates shall be selected according to the above policy too. The District quota shall be filled equally based on the above policy for both individuals and teams participating in the District Science Day. Duplicate projects from the same school will not be accepted.

o) **Preparation for State Science Day**

District Science Day Directors shall make special efforts to meet with all eligible students, parents and teachers or mentors well in advance of State Science Day **to coach and prepare students for participation in State Science Day. Special emphasis shall be given to display rules, quality of abstracts, data analysis and display, and report writing.**

IV. Required Material

a) **Abstract: *REQUIRED for all Student Participants***

All students at Local, District, and State Science Days shall have an abstract and written research report, which documents that the student has researched relevant literature, stated a question and/or tested a hypothesis or technological design statement, collected and analyzed data, and drawn conclusions.

Abstracts of 250 or fewer words are required and must be submitted with applications for both District and State Science Days. The abstract must contain a heading that includes a project title and name(s) of the author(s). The heading does not contribute to the word count. The purpose of an abstract is to provide a summary of the project that will inform interested individuals of the contents. The wording must be written in a manner that any scientifically minded individual, who may not be familiar with the topic, can quickly understand the project's important points. Keep the wording brief and concise and use complete sentences.

Summarize in a few sentences:

1. Background information necessary to understand the project and its importance
2. The problem that was investigated and the hypothesis or technological design statement
3. Outline the materials and methods used in the actual experimentation
4. Summary of the results obtained from experimentation
5. The conclusions drawn from results
6. The importance or potential applications that the research offers

b) **Research Report: **REQUIRED for all Student Participants****

The following statement is REQUIRED to be signed by both student and parent:

***Scientific fraud and misconduct are not condoned at any level of research or competition. Such practices include plagiarism, forgery, use or presentation of other researcher's work as one's own, and fabrication of data. Fraudulent projects will fail to qualify for competition in affiliated fairs or the Intel ISEF.**

- **All written reports and log books must disclose and cite where appropriate the specific source(s) of the idea for the project. Citations must be fully documented with references such as author(s), date, publication and URL if website.**
 - The Ohio Journal of Science follows the citation and reference plan of the 8th Edition of Scientific Style and Format: The CSE (Council of Science Editors) Manual for Authors, Editors and Publishers.
 - Research Report must follow an accepted form of technical writing such as: MLA, APA, and others.

Required Research Report

Each project must include a research report covering in detail all of the work, references consulted, and acknowledgement of assistance received. The experimental data, statistics, notes, and computations should be recorded in a research notebook. The report should include a description of the work, the results, and the conclusions. This report should follow an accepted form of technical reporting and be checked for correct punctuation, spelling, and grammar preferably by an English teacher. If possible, the report should contain illustrations in the form of photographs, sketches, graphs, data tables or chart that contribute to the effectiveness of the material presented. The Ohio Academy of Science recommends the following format for sections of the research report:

- Title Page including the date and name of student
- Table of Contents (optional for reports fewer than 10 pages)
- Abstract
- Background Information
- Problem and hypothesis or problem and design statement
- Methods and Materials used to study the problem
- Results, including an analysis of collected data with graphs, tables, photographs, and diagrams to illustrate investigation
- Conclusions and Implications for further research
- References or Literature Cited

c) **Research Plan: **REQUIRED for all Student Participants****

All students who participate in District and State Science Days shall complete a research plan **prior to beginning their experimentation or research trials**. Modifications in the plans are permitted during the process of research. The modifications must be prepared and dated as a research plan. If the modifications involve new protocols that must be approved before experimentation, it must be approved before the student resumes experimentation. The initial research plan must be kept if any data obtained before the modification will be used in the final project.

A student research plan shall include: 1) The name and address of each student involved in the research, 2) The teacher's name or name of research supervisor, 3) Whether the project is a continuation of work or a new project, 4) Where the work will be done (home, school, research institution, industry, or in the field), 5) The project title, 6) The research question (s) or problem, 7)

The hypothesis or technological design statement, 8) The experimental methods or procedures, and 9) At least five major references specifically applicable to the proposed research; e.g., science journal articles, books, or internet sites. For internet sites, research plans must cite the complete URL, a title of the report, the name of the author if known, and the date of the publication or update of the site.

If the proposed research involves vertebrate animals, then the research plan must also: 1) provide a detailed justification for their use, 2) briefly discuss non-vertebrate alternatives and 3) give an additional animal care reference for the species being used.

d) **Additional Student Research Plan for Special Protocols or Adult Supervision**
REQUIRED

These projects include those associated with:

- Human subjects
- Nonhuman vertebrate animals including observation projects
- Potentially hazardous biological agents including microorganism, recombinant DNA technologies, or human or animal fresh tissues, blood or body fluids
- Controlled substances and alcohol and tobacco
- Hazardous substances or devices including certain chemicals, equipment, firearms, radioactive substances and radiation

e) **ISEF and Consent Forms *REQUIRED for all Student Participants***

A Consent and Release Form <http://www.ohiosci.org/s/consent.pdf> must be completed by all students and signed by parents to register in District and State Science Days. This form must be sent to the District Science Day Director with the registration material and to The Ohio Academy of Science for State Science Day.

The Intel International Science and Engineering Fair Forms

The documents for the Intel ISEF are available at <http://www.societyforscience.org/isef/document> and at <http://ohiosci.org/state-science-day-forms/> procedures of a particular year must be used by all students who participate in District and State Science Days of the same year. These rules require adherence to special student research protocols and supervision, including **prior approval of student research projects** by local scientific review committees (SRC) or, in the case of human subjects, institutional review boards (IRB). **Local schools must appoint and manage these committees.** Depending upon the project(s), committee members must have sufficient professional expertise by way of education and experience to review both human subjects and non-human vertebrate projects. **When in doubt, review all projects and contact info@ohiosci.org.**

V. Judging Information

a) Instructions to Judges

The attitude and conduct of the judges determine the success of any Science Day Activity. Therefore, it is vital that each judge understands thoroughly his or her duties and obligations. All judges need to have a genuine interest in young people combined with a desire to offer encouragement and guidance in their efforts to pursue learning in the various fields of science.

Students shall have an opportunity to present their project to two judges, one of whom (where possible) should be a K-12 teacher. This may be achieved as a team of judges or separately, with the scores averaged. Although judges should discuss the performance of the student, each judge shall score independently of the other judge and shall not reveal the scores to the other judge(s) or to the student. Only Science Day officials may inform the student of the scores or ratings after judging.

- Judges should have full knowledge of all The Ohio Academy of Science's requirements and expectations for Science Day participants.
- Judges should introduce themselves upon approaching a student and attempt to establish a friendly rapport to help reduce the participant's tension. Judges are expected to be exceptionally courteous to all students.
- The student should first be asked to give her/his oral presentation of the project while judges listen carefully to the complete presentation. Secondly, Students are expected to answer questions about her/his work on the specific problem. It is also proper for Judges to ask questions within the discipline or subject matter involved at the student's level of learning.
- Judges should feel free to question the participant on the materials and tools used, the methods of construction, terms used, the sources of information, and the amount and type of assistance enlisted in the preparation of the project.
- Judges should take an active part in the evaluation; silence may be interpreted as disinterest or boredom, which can have a very discouraging effect on the participant.
- Judges are required to check through the abstract, the research plan, and research report to determine their quality. A check of the references will assist in making fair determination of the scope and depth of the literature search. The quality and quantity of the references should be taken into account to evaluate the student's research methodology.
- Judges should determine the span of sustained interest in the particular field of science, as well as the approximate amount of time spent in developing the project being evaluated. Some premium should be granted for considerable extended interest and effort to encourage this quality of persistence.
- Judges are to review the Project Data Book/notebook/logbook for the project. Note the number of entries, the dates, as well as the number of subjects or specimens used. Is the number adequate to generalize to the larger group what the sample is intended to represent?
- Judges are expected to write statements to the student/s in a professional manner on the back of each score card. The scorecard will be returned to the student thus the comments should reflect reasons for the rating, as well as suggestions for improvement.
- Judges are expected to discuss the final scoring of the project a considerable distance from the participant, since disclosure of scores is delayed until judging is completed.

b) Judging - The Process

The score received by a project is the average of the scores of the two judges. Fractional scores should be rounded up.

Minimum number of points for each rating:

Individual Projects: Superior 36, Excellent 24, Good 12, Satisfactory 4 (Satisfactory not given at State Science Day).

Team Projects: Superior 45, Excellent 30, Good 15, Satisfactory 5 (Satisfactory not given at State Science Day).

All students at local, District or State Science Days shall have an abstract and a written report, which documents that the student has searched relevant literature, state a question and/or tested a hypothesis or technological design statement, collected and analyzed data, and drawn conclusions. For a superior rating, an individual student shall receive a minimum of 36 points, or 45 points for a team, based on the criteria of: 1) Knowledge Achieved, 2) Effective Use of Scientific Method or Technological Design, 3) Clarity of Expression, 4) Originality and Creativity. A fifth criterion, Teamwork, consisting of a maximum of 10 points, shall be applied to team student research projects. Thus, a team research project needs a minimum of 45 points for a superior rating.

c) Judging Criteria for Individual and Team Projects

▪ **Individual Projects will be judged on the following criteria:**

- Knowledge Achieved (considering student’s age and grade level)
- Effective use of Scientific Method or Technological Design
- Clarity of Expression
- Originality and Creativity

Each criterion is rated 1 through 10 points with 40 points being the maximum

- | | | |
|---|--------------|-----------------------|
| ▪ | Superior | range is 36-40 points |
| ▪ | Excellent | range is 24-35 points |
| ▪ | Good | range is 12-23 points |
| ▪ | Satisfactory | range is 04-11 points |

▪ **Team Projects will be judged on the following criteria:**

- Knowledge Achieved (considering student’s age and grade level)
- Effective Use of Scientific Method or Technological Design
- Clarity of Expression
- Originality and Creativity
- Teamwork

Each criterion is rated 1 through 10 points with 50 being the maximum

- | | | |
|---|--------------|-----------------------|
| ▪ | Superior | range is 45-50 points |
| ▪ | Excellent | range is 30-44 points |
| ▪ | Good | range is 15-29 points |
| ▪ | Satisfactory | range is 05-14 points |

d) The Criteria Interpreted

The following explanations interpret the various criteria on which the student’s project or exhibit will be judged. The bullets do not have pre-determined numerical value.

1) For all projects, except those involving Engineering Design

Knowledge Achieved (considering the student’s age and grade level)

- Correct use and understanding of terms and principles
- Evidence that student acquired in-depth knowledge
- Literature search: extent of scientific, engineering or medical journals/sources or just popular literature citations
- Supplements answers with additional information

Effective Use of Scientific Method or Technological Design

- Well-documented Project Data Book/notebook/ lab journal.
- Experimental Design: specific problem or question, clearly stated hypothesis or technological design statement
- Experimental Design: clear method(s) with correctly defined and measured variables and controls
- Experimental Design: sufficient understanding of methods from related studies in the literature
- Data handling, data tables, graphs, statistics; sufficient number of trials or samples for the problem
- Valid conclusion(s) or discussion of results
- Effective Use of professional equipment, or correct construction/use of home-made apparatus, equipment, experimental materials, or models

Clarity of Expression

- Explanation and understanding of the project is demonstrated in Oral Presentation; questions answered clearly and correctly
- Written report: title, organization, results, citations, references
- Abstract with clear statement of results
- Ability to explain written passages of the Abstract, Research Report, and Project Data Book/notebook/logbook.

Originality and Creativity

- New idea, concept, principle, hypothesis, insight or non-obvious approach or problem definition
- Novel association or relationship of previous discoveries or knowledge
- Inquiry or Designed based rather than a summary of knowledge
- Unique approach to a problem, ingenious use of materials
- Evidence of initiative; rigorous analyses of extensive or robust data or results that reveal previously unknown relations

2) For projects involving Engineering Design

Knowledge Achieved (considering the student's age and grade level)

- Correct use and understanding of terms and principles
- Literature search: appropriate use of scientific, engineering or medical journals /sources vs just popular literature citations
- Student shows they have gained knowledge and understanding unique to their project
- Adequate depth of knowledge and skills in technology systems involved
- In interview student supplements answers with additional relevant information

Use of Engineering Design

- Engineering design: specific problem or need defined, background information gathered and analyzed, criteria for success established, preliminary designs prepared and prototype or model created, prototype or model tested and results analyzed, results clearly communicated
- Sufficient testing of the prototype or model; data appropriately measured, presented and analyzed
- Prototype meets criteria for success that were established

- Well-documented design/engineering notebook
- Student effectively used materials and processes to correctly build prototype or model
- Student identifies and applies scientific principles in their design

Clarity of Expression

- Clear statement of technological problem or need and the appropriate criteria for success
- Design notebook: organization, sketches/photos, iterations, testing data and results, references
- Written report: unambiguous title, organization, results, conclusions, reflections, correct grammar and spelling, citations, references
- Visual display: neatness, conveys essence of the problem statement, background, design statement, prototype, testing & results, and conclusion(s)
- Oral presentation: understanding or from memory; questions answered correctly and clearly

Originality and Creativity

- New idea, concept, principle, design, or non-obvious approach
- Novel association or relationship of previous designs or knowledge
- Design effectively addresses problem or need creatively
- Design-based rather than a summary of knowledge

3) For team projects

Teamwork

- A team shall consist of a maximum of three students. A District Science Day may only allow a maximum of two students per team due to local limitations. Teams may not have more than three members at a local science day and then eliminate members to qualify for District or State Science Day. In a subsequent academic year, a continuing team project may be converted to an individual project or vice versa.
- Team projects shall be accepted at all District Science Days. A revised 50-point rating scale will be used to evaluate team projects.
- Individual and team projects shall be considered equally when District science day directors select projects to fill quotas to attend State Science Day.
- All currently active team members must be present to receive an official recorded score. Team projects with a missing participant will be evaluated with comments but a final score will not be given. Such projects will not be eligible for sponsored awards. This will be in effect at District and State Science Day.
- Each team shall appoint a team leader to coordinate the work and act as the primary spokesperson. However, each member of the team should be able to serve as spokesperson, be fully involved with the project, and be familiar with all aspects of the project.
- The final work should reflect the coordinated efforts of all team members. A supplemental sheet of the contribution each member made toward the team project shall be signed by

each member and shall be displayed with the project and included in the research notebook, project report and with the applications to attend District and State Science Days.

- Full names of all team members must appear on the abstract and registration forms. The Judges will be instructed to ask each team member for a one or two sentence description of what they consider to be their most important contribution.

e) **Ranking vs Criteria**

Except to fill quotas for participation in District and State Science Days, The Ohio Academy of Science does not rank students at local, District, or State Science Days. Rather, Judges for the Academy compare students against the judging criteria described above.

f) **Re-judging Criteria to be used at Local, District and State Science Days**

Teachers promoting local student research projects and conducting local science fairs or science days leading to District Science Days and to State Science Day are expected to have their students follow the official Science Day Standards outlined herein. Included in these Standards are the following Re-judging Criteria for both individual and team projects that teachers should use locally and that must be used at all District and State Science Days.

- Two judges will judge each project for the Ohio Academy of Science ratings.
- If each judge grants a total score within any one rating category (Superior, Excellent, Good, or *Satisfactory), that specific rating (Superior, Excellent, Good, or *Satisfactory) will be granted to the student and no re-judging is permitted.
- Re-judging is automatic *if all three* of the following conditions apply:
 - The judges' final ratings are in different categories,
 - The average of the judges' scores is in the lower category, and
 - If the judges differ in their total points by more than five points.

*Satisfactory category is not used at State Science Day

No project will be re-judged at State Science Day based solely on rating. Individual districts, however, may choose to re-judge based on rating provided a consistent policy is developed and consistently applied within the individual district.

Under exceptional circumstances, a project may be re-judged at a District Science Day with the approval of the District Science Day Director or designee.

Under exceptional circumstances, a project may be re-judged at State Science Day with the approval of the CEO of The Ohio Academy of Science, or the Director of the Junior Academy Council, or designee.

g) **Provisional Judging Policy**

If a project is not registered for State Science Day, but the student (or team of students) presenting that project arrives at the judging hall expecting to have the project judged, then the following procedures shall be followed:

- 1.) The Director of the Junior Academy Council (or designee) shall meet with the student (or team of students) to determine whether there appears to be a legitimate reason for the student(s) to

believe that the project was registered for State Science Day. Students shall be given the benefit of any doubt and the rationale shall be recorded in the State Science Day Report.

2.) On the recommendation of the Director of the Junior Academy (or their designee), the project shall be assigned a space, and a team of two judges shall be recruited to judge the project, according to the guidelines of the Ohio Academy of Science.

3.) The student(s) shall be informed that the judges' rating is provisional. The student(s) shall not receive the judging cards or certificate(s) at State Science Day.

4.) After State Science Day, The Ohio Academy of Science shall initiate an inquiry to determine whether the failure to have the project registered was due to an error made by The Ohio Academy of Science. In that case, and only that case, the results of the project's judging shall be considered official: the student(s) shall be sent the judging cards and certificate(s), and the results shall be included in the records of The Ohio Academy of Science.

5.) Any project that is judged provisionally according to these rules shall not be eligible for sponsored awards.

6.) A school's eligibility for The Harold C. Shaw Outstanding School Award shall be determined at State Science Day without regard to any provisionally judged project. In particular, for the purposes of a Shaw Award, a provisionally judged project shall not be included, in any fashion, in the school's total participation at State Science Day. If a school does not receive a Shaw Award on the day of State Science Day, but at least one project from that school subsequently has provisional judging made official, then that school's eligibility for a Shaw Award shall be reconsidered. If inclusion of the new official results makes the school eligible, then the school shall receive a Shaw Award.

h) Judging Ethics

Judges shall:

- **Return judging cards immediately to Science Day officials if (1) you know the student, (2) the project is out of your area of expertise, or (3) there are language issues that may impair communication.**

- **Keep in mind that the Mission of the Ohio Junior Academy of Science is to discover and foster interest in science, technology, engineering and mathematics among students in grades 5-12.**
 - Have no prior involvement with the participant or project
 - Adhere to all Ohio Academy of Science Guidelines
 - Judge students against CRITERIA not against other students
 - Listen carefully to student's complete presentation
 - Be attentive and courteous to students at all times
 - Evaluate theoretical and applied projects without bias toward either
 - Provide written, constructive criticism and suggestions for improvement
 - Seek written permission from students to photograph them
 - Not photograph students or projects during judging
 - Avoid discussion of ratings with others prior to public release