



# Ohio Academy of Science

## VIRTUAL SCIENCE DAYS 2021

## STUDENT PARTICIPANT GUIDELINES

### Scientific Inquiry and Technological or Engineering Design Projects

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# STUDENT PARTICIPANT GUIDELINES

## Before Beginning a Research Project

Before you begin a research project for Local or District Science Day participation, the information in the following sections should be thoroughly reviewed. If you have any questions, please discuss the issue with your parent, teacher, or contact The Ohio Academy of Science **before** you begin your research project.

### 1. Become familiar with The Ohio Academy of Science and the Science Day Standards, Rules and Judging Procedures for Scientific Inquiry & Technological or Engineering Design Projects.

For additional information or questions:

- A. Contact: phone: 614-389-2182      email: [info@ohiosci.org](mailto:info@ohiosci.org)  
a. Website: <http://www.ohiosci.org>

#### B. Required Components of ALL Science Research Projects

- a. An Identified Problem or Design Statement
- b. Research Plan and Project Data Book/Notebook
- c. Detailed Research Report including an Abstract
- d. Poster Display – power point slide of in lieu of physical display in 2021
- e. Oral Presentation – youtube video project presentation in 2021

### 2. Locate a teacher or other professional that will supervise the work

Guidance by an adult professional is important in assuring that rules and special protocols are followed, and that safety in the use of equipment is maintained. Many scientific organizations, industries, as well as local schools and businesses will gladly give valuable aid if properly asked.

### 3. Review the Judging Criteria

#### A. Criteria for Individual and Team projects

*Student may earn a maximum of 10 in each criteria*

- Depth of Understanding (Knowledge Achieved)
- Experimental Design (Effective Use of Scientific Method or Technological and Engineering Design)
- Oral, Written & Visual Communication
- Originality and Creativity



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## ***Depth of Understanding (Knowledge Achieved)***

- Adequate age appropriate background research (journals, textbooks, websites, etc.) relevant to the project which provides basis for hypothesis.
- Supplements answers with relevant information reflecting knowledge gained during the project.
- Age appropriate use of terms and principles.
- Age appropriate exploration of science in subject, depth of investigation, and/or sophistication of project.

## ***Experimental Design (Effective Use of Scientific Method or Technological and Engineering Design)***

- Project addresses a clear, focused problem or question with hypothesis that is testable using scientific methods. If Meta-Analysis project, then hypothesis is testable using data from multiple peer-reviewed research papers. If Engineering Design project, addresses a clear, focused engineering design problem or need; criteria for success are identified; preliminary designs prepared; prototype is created and tested with results clearly communicated.
- Well-designed plan and data collection methodology which identifies variables and controls. Grade appropriate control of variables (Not a summary of already known science) If Engineering Design project, student identifies and applies established engineering principles in their design.
- Reproducible and sufficient data are collected, or if Meta-Analysis project, sufficient amount of scientific data is synthesized from other sources to address question/problem. Data used were collected using appropriate scientific protocols. If Engineering Design project, student used materials and processes effectively to correctly build prototype or model
- Data are properly analyzed. Appropriate graphs illustrate the data. Statistics appropriate to the age of student are correctly used. If Engineering Design project, sufficient testing of prototype or model is completed; data is properly measured, presented and analyzed.
- Valid conclusions are reached from the data obtained. Age appropriate discussion of results. Sources of error identified. If Engineering Design, prototype successfully meets criteria that were established for the project

## ***Oral, Written & Visual Communication***

- Written: Well written Research Report (includes relevant background, research question and hypothesis showing how it is related to background, experimental design and procedures, data acquisition techniques, data analysis, conclusion and bibliography). If Engineering Design project, includes clear statement of technical problem and criteria for success



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- Oral: Correct and concise explanation of project, design, and analysis. Responses reflect correct understanding of experimental results and limitations of, expansions of, and/or impact of project.
- Visual: Logical organization of material, neatly displayed, graphics and legends appropriate to project, easy to read and understand. Photos and graphics cited. Includes required information.

## ***Originality and Creativity***

- Project displays originality in concept relative to grade level (i.e. not "cookbook", not classroom lab, not a simple extension of "found" idea) New idea, concept, principle, insight or non-obvious approach; Novel association or relationship of previous knowledge, particularly rigorous and exhaustive analyses that reveals previously unknown relations, etc.
- Evidence of student's unique understanding and development of the project

## ***Teamwork (not an additional scoring section in 2021 – judges will consider member contributions in scoring the four sections previously described)***

- A team includes a maximum of 3 students. Teams which include students from different grade levels will only be eligible for special awards with criteria which all members of the team meet.
- Full names of all team members must appear on the Abstract and registration forms.
- All currently active team members must participate in the presentation 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 member of the Team is expected to:**

- Show active participation, and understanding of the entire project
- Be able to serve as the spokesperson, and participate equally in the presentation
- Be fully involved in the project
- Be able to clearly express their personal contributions to the project



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## B. Ratings for Individual and Team Projects

Superior Rating: earns 36 to 40 points

Excellent Rating: earns 24 to 35 points

Good Rating: earns 12 to 23 points

Satisfactory Rating: earns 04 to 11 points (not used at State Science Day)

## Beginning a Research Project

Now that you know what is expected and required, use the information below as you work through your research project.

### 4. Generate ideas involving various Scientific Inquiry and Technological or Engineering design projects

Inquiry projects shall have a hypothesis; technological and engineering design projects shall have a design statement with measurable criteria for success. 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 conditions), 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 a prototype, for example, comes to meeting the design criteria. A prototype developed for an engineering and technological design project must achieve stated design objectives and satisfy specified constraints. Generally, the results of an engineering and 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.

### 5. Determine multiple Resources to enhance research

The quantity and quality of the references are reviewed during Science Days by the Judges. Your resources help to demonstrate the scope and depth of the literature search. Consult a Research Librarian to assist in locating more scholarly and reliable reference



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materials. Science Journals, and other periodicals may have more current articles relating to your topic to give additional background information. It is essential to give proper documentation both in the text and in the listing of References at the end of your Research Paper, for all text information, photos, or graphs, taken from an author's work.

## 6. State a Problem or Question or a Design Statement to solve

Scientific Inquiry projects require the identification of a problem or question and a proposed hypothesis that might offer a solution to the problem or answer the question. Generally, the results derived from experimentation validates or invalidates the stated hypothesis. Engineering and technological design projects require a problem or needs statement and a design statement that identifies limiting factors and criteria for success. Generally, the results of an Engineering and Technological Design project will describe the extent to which the prototype met the design criteria.

## 7. Read background information regarding proposed topic

- A knowledgeable background of the topic is necessary to formulate a hypothesis or design statement or to develop a prototype.
- Students considering the use of vertebrate animals should review **OAS 6**
- Note taking of relevant material is necessary for use in the required Research Report **OAS 2**
- Your literature review should include a variety of reliable and scholarly resources

## 8. The Importance of Documentation

Science Projects are required to have three forms of documentation. The Research Plan **OAS 1**, the Research Report **OAS 2**, and the Project Data Book/notebook **OAS 3**.

### **Project Data Book/Notebook REQUIRED**

Research projects require written documentation from the very beginning of the project starting with gathering ideas for the project, locating references, resources, and the design statement or hypotheses and problems to be investigated. The information the student records in the bound notebook will be used to write the Research Plan for the project. Record the date on each page each time you add any notes to the Project Data Book/ notebook. Detailed notes are essential during the process of setting up the experiment, the conditions, variables, observations, measurements, calculations, graphing results, discussion of the conclusions and implications. Also include other records such as photographs, and discussion notes from your meetings with an advisor, teacher, or mentor.

See <http://www.sciencebuddies.org/mentoring/project-laboratory-notebook.pdf>



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**Patents** also require documentation. Keeping a good Project Data Book/ research notebook is extremely important for students and for professional scientists especially if they ever apply for a patent. Record any original thoughts, concepts or procedures in the bound notebook, with numbered pages. Sign and date those pages and have an adult witness sign and date the page(s) to attest to the event. Use or disclosure of this written record may be required if a patent is applied for and may help assure the claim of originality.

## 9. State Hypothesis or Design Statement considering variables and testable applications

With the problem or question in mind, the student uses the knowledge gained through searching the literature, taking notes, and building a background of information to formulate a hypothesis or design statement. The hypothesis or design statement needs to state precisely what will be tested. The statement also will guide the investigation to answer the questions. Students should consider realistic implementation of the experiment or prototype design. The statistical treatment should be considered simultaneously. Answer questions, such as how will the data be analyzed and evaluated? The validity of the experiment should be addressed---did the experiment test the stated hypothesis? Or was the prototype tested appropriately? Did the prototype meet the design criteria?

Choosing the appropriate variables, the experimental groups, the controls, the limiting factors and/or criteria for success are extremely important. After you have an understanding and sufficient information to set up your investigation, be sure to consult with your teacher or advisor concerning your selection of variables and testable applications.

### **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. Sampling of subjects is of utmost importance. Students doing behavioral studies using vertebrates, should learn what the minimum number of subjects is needed for adequate sampling. In project abstracts and reports always state the number of trials or the population samples as (N=number). Consult with an advisor, mentor, science or mathematics teacher, or someone familiar with statistics for further information.

## 10. Complete a Research Plan OAS 1 (Required)

All students who participate in Science Days sponsored by The Ohio Academy of Science, are required to complete a Research Plan before beginning their experimentation or research trials. Modifications in the plan are permitted during the process of research.



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The modifications must be prepared and dated as a Research Plan. If the modifications involve new protocols that must be approved before experimentation, the Modified Research Plan 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.

## 11. Complete Experimentation or Design Testing

All information regarding project designs and experimentation shall be recorded in a Project Data Book/Notebook **OAS 3**. *It is important to include every model or design or experiment attempted, regardless of the outcome or use.* A discussion of the variables, experimental groups, limiting factors and conditions should also be included in the Project Data Book/notebook. Many trials and designs are often necessary to obtain the desired process. Mention all of them detailing both quantitative and qualitative observations. Problem solving is a major part of acquiring the needed outcome. Discussion of all the trials, or the different designs or models attempted in your Project Data Book will reflect well and be an asset to your project.

## 12. Collect and Organize Data

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 (3) or more times and then 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 your results. Consult your Mathematics or Science Teacher to provide you with an appropriate statistical method.

## 13. Analyze Data and Prepare Graphs

- Record all data, graphs, drawings, designs, models, etc. in your Project Data Book/Notebook.
- Interpret the data in a written account
- Prepare appropriate graphing type to illustrate the data
- Analyze the data to identify patterns and verify findings
- Review various types of graphics available to represent your data

## After Experimentation and Data Analysis

Congratulations! The most difficult part might be behind you, but the following section is just as important as conducting experiments. It is critical that your work is presented clearly for judges so they can recognize the amount of work you put into your project. Make sure you approach the Research Report and Oral Presentation with the same level of detail that you gave your science!



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Please note that the ISEF Ethics Statement on **OAS 7** is required to be signed by both student and parent. This statement is included on the applications for both District and State Science Day.

## 14. Prepare Final Research Report (Required)

Each project must include a Research Report, **OAS 2**, covering in detail all of the work, references consulted, and acknowledgement of assistance received.

- **STUDENTS COMPLETING STEM RESEARCH PROJECTS** for Local, District, and State science days shall write reports with **section headings** in the order below. Guidance publications of The Ohio Academy of Science should always include the section headings and definition text, unless space does not permit including both. Other Academy pre-college student programs, such as Believe in Ohio, may have specific format or style variations that must be followed, but should endeavor to match the following as closely as possible.
- **Title.** A title should be as descriptive and succinct as possible, especially for field-based studies. Avoid “cute” or “trick” titles. Stick to the science.
- **Author names.** Include author names and affiliations and designate corresponding author by providing complete mailing information, phone number and email address.
- **Include date.** Use this format: day month year (e.g., 25 August 2020).
- **\*Abstract.** Within 250 or fewer words, using simple, declarative sentences, state the contents of the paper including the study’s purpose, question or hypothesis, engineering design, methods, results, and conclusions or significant new understandings.
- **Key Words for Indexing.** Provide 3 to 5 terms (metadata) for indexing the submission. Separate terms with semicolons (term1; term2; term3). **Not required for pre-college students unless they submit a manuscript to *The Ohio Journal of Science*.**
- **Running head.** State 3 to 5 words, primarily from the first few words of the title, which will be used at the top of the printed page in the final layout. **Not required for pre-college students unless they submit a manuscript to *The Ohio Journal of Science*.**
- **Introduction.** Describe the knowledge and cite the literature that gave rise to the project’s objective, goal, problem, question examined by, or the hypothesis or engineering design posed for the research.
- **Methods and Materials.** Describe the research design, the methods and materials used in the research (subjects, their selection, equipment, laboratory, or field procedures), and how the findings were analyzed.
- **Results.** The text of the results should be a descriptive narrative of the main findings. This section should not list tabulated data in text form. Parenthetically include references to figures and data tables. Indicate (n=x) the number of trials, samples tested, or subjects surveyed. Here or in the Discussion section, use the term “significant” only if the results of a statistical test are reported.
- **Discussion.** Compare and contrast the data collected with that previously reported in the literature. State the extent to which the results answer the research question or support the hypothesis. Include conclusions or significant new understandings. Briefly describe



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the limits of the study and suggest or describe additional research needed only if you can be exceedingly explicit.

- **Acknowledgments.** Recognize colleagues, mentors or institutions that provided financial or other support for the research or preparation of the manuscript.
- **Literature Cited or References.** Arrange references to scientific literature cited in the text alphabetically by last name of first author. There must be a 1:1 concordance between in-text (name-year) citations and the list of references. Do not include references that are not cited in the text.
- **Terms to avoid.** “Works Cited” and “Bibliography” are terms that derive from the Modern Language Association writing style but should not be used in STEM research reports. Use Literature Cited or References and include ONLY sources with in-text citations. A bibliography in science usually contains hundreds or thousands of references and is not an appropriate report heading or substitute for Literature Cited or References.
- **Footnotes**—permitted in both fiction and non-fiction writing—are generally not used in scientific reports except to clarify possible questions within data tables, noted by asterisks, daggers, or other symbols to avoid confusion with numerical data tables.

## Abstracts (OAS 4) REQUIRED

Abstracts should provide only information essential to understand the project’s basic points and importance. Omit needless words, especially adjectives and adverbs that have no statistical reference or validity. Further information can be found in **OAS 4**.

### Adapted from

<https://static1.squarespace.com/static/545d32b5e4b0719cb5aae580/t/5d8002dbf4ff1d21e7f321d2/1568670427939/How+to+prepare+abstract.pdf>

**AN ABSTRACT MUST BE PREPARED** for STEM student project reports. An abstract is a concise summary of the educational, scientific, engineering, or technological research contents of the paper, and not merely a general description of what the paper is about. Tell what the specific facts are, not what they are going to be when you talk. Avoid personal pronouns. Quality abstracts are highly structured and contain all the following elements: (1) background or introduction including goals, objectives, purpose, problem and hypothesis, (2) methods and materials, (3) results, data or observations, and (4) discussion or conclusion(s). Phrases like “will discuss, will review, will talk about, or will present” are unacceptable in an abstract. All important facts should be stated with brevity, but not such sparing use of words as to leave ambiguity. Abstracts should be 250 words or fewer. Tables and graphs should not be included. New techniques or new apparatus and their functions should be mentioned. New constants, critical data or formulae should be included. Names of new species should not be listed in the abstract but use full scientific names for all organisms. Use the term “significant” only if you state the statistical test(s) used. Always define the sample(s), population, or trials (n=?). NEVER use the phrase “Results show” without first stating the results. The value of abstracts is real and considerable, not only for those in attendance, but also for others unable to



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attend. The first author of multi-authored abstracts must obtain permission from all authors to submit the content of the abstract.

Abstracts shall be **informative** and not indicative. See Section 6 from:

[https://groups.niso.org/apps/group\\_public/download.php/14601/Z39-14-1997\\_r2015.pdf](https://groups.niso.org/apps/group_public/download.php/14601/Z39-14-1997_r2015.pdf)

***Any form of plagiarism is cause for disqualification***

## 15. Outline the Oral Presentation

The student is expected to give a clear and concise oral presentation of their project, to answer questions, and to define any terms used. This brief presentation should completely summarize the project. The quality and quantity of knowledge attained by the student will be evaluated by this Oral Presentation. Students should not memorize a formal speech. An outline (notecards) that lists the variables, procedures, data collection, results, conclusions, references, and implications of the entire project may assist the student during the presentation.

## 16. Expectations of Virtual Poster Display

***Displays at District and State Science Day***

### ***A. Display Components:***

- For 2021, a power point slide with appropriate information (including graphs, data tables, drawings, sketches, diagrams, or photographs), A physical tri-fold project poster is not required.
- Required Documentation of the project:
  - Research Plan and Protocols
  - Research Report
  - Use **Appendix OAS 5** for identifying photograph sources

**Equipment or materials used, or developed, as part of this project may be displayed in the project presentation video if:**

- 1. It fits within the display dimensions described in SD Standards Section III, part g. ; and**
- 2. It is not listed in SSD Standards Section III, parts h and j “items NOT ALLOWED at Project Display”; and**
- 3. It meets Safety Regulations found in SSD Standards Section III, part j.**

**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.**



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## ***B. Table-Top Display***

Does not apply to Virtual Science Days

## ***C. Use of Kits***

Although the use of a “kit” model is discouraged, such models may be used if they make a definite contribution to the research approach. Models made by students are preferred, since they have a much greater instructional value and demonstrate that the participant has had a proportional gain in knowledge.

## ***D. Equipment***

Use commercial equipment especially when it would be impossible to conduct the research without it. However, if such equipment is used, the participant must be prepared to describe its operation, function, and the reason(s) for its use.

## ***E. Safe Project Displays***

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

## ***F. Computer Simulation***

Does not apply to Virtual Science Days

## **17. Review of Appendices**

Students are encouraged to read and review all Appendices included at the end of this text. These supplements have been created to help students to understand and to meet the required elements of Science Day Projects sponsored by The Ohio Academy of Science. **Appendix 1 through 7** focus on the required elements needed for all student participants in District or State Science Days. Appendix 8 and 9 are Student Check Lists to assist students throughout the process. **Appendix 8** is a Timeline Guide and Check List approach to completing the entire Science Project process, and **Appendix 9** is a Check List to be used by the student at the completion of the project to assure adherence to rules and procedures. **Appendix 10** and **11** should be reviewed.



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## Student Appendices Include:

**OAS 1 Research Plan Format**

**OAS 2 Research Report**

**OAS 3 Project Data Book/Notebook**

**OAS 4 Writing an Abstract**

**OAS 5 Photographic/Graphics Source Identification**

**OAS 6 Human Informed Consent Form**

**OAS 7 ISEF Ethics Statement**

**OAS 8 Student Timeline Guide and Check List**

**OAS 9 Student Check List at Completion of Research Project**

**OAS 10 Harassment Policy & Procedure**

**OAS 11 Accommodation of Students with Disabilities at State Science Day**



# OAS Appendices

## Appendix: OAS 1

### **Required Research Plan**

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 plan 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, the modified plan 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 Research Plan shall include:**

1. Name and Address of each student involved in the research:
  2. Teacher and/or Research Supervisor:
  3. Project is New \_\_\_\_\_ Project is a Continuation \_\_\_\_\_
  4. Project Location: (where the work will be completed: home, school, lab or other institution)
  5. Project Title:
  6. Project Research Question or Problem:
  7. Project Hypothesis or Technical Design Statement:
  8. Experimental Methods or Procedures:
  9. List 5 major references specifically applicable to the proposed research:
  10. If the proposed research involves vertebrate animals, the research plan must also:
    - A) Provide a detailed justification for their use
    - B) Discuss non-vertebrate alternative
    - C) Give an additional animal care reference for the species being used
-



# OAS Appendices

## Appendix: OAS 2

### **Required Research Report**

The Research Report includes:

1. An Abstract

A maximum of 250 words that summarizes the investigation, the methods and results. (OAS 4)

2. A Search of the Literature

Use various forms of resources to gather background information on the topic, the possible variables, the sampling possibilities, the models, the designs, etc. This is the information that will be used in the student's Oral Presentation to provide Judges with evidence of in-depth knowledge acquired. Use articles from STEM (Science, Technology, Engineering and Mathematics) periodicals, and other reliable and scholarly references. Discuss the topic with Research Librarians at the school or local library. They will provide the name and location of current reference material that will address your topic.

3. Scientific Methodology—Technical Discussion

- the problem or question
- the hypothesis or design statement
- the methods, procedures, and materials used
- the data collected
- the analysis of data
- the significance of the results
- the conclusions or generalizations
- the questions or statements for further study



## OAS Appendices

4. A Title Page, a Table of Contents Page , and a listing of Resources and References documented in a standard format
5. Visual Graphics to assist in the explanation of the data collected such as tables, diagrams, maps, photographs, graphs, etc.

### **Other points to remember during the preparation of the Research Paper**

- Designate a note taking system---it's essential
- Use detailed titles and labels on all of the graphics
- Do not use first or second person pronouns (I, me, my or you) within the paper. If the paper has a personal/reflection section I and me are allowed
- Document everything
- Use quotation marks, and correct citations within the paper, as well as, at the end in the list of references.
- anyone should be able to replicate the experiment using the procedures, methods and materials described in the research paper
- Continually write explanations and observations in the Project Data book/Notebook during the entire project. Often these comments become significant and can be used in the Research Report when summarizing and analyzing data.
- Graphics and diagrams should be included within the paper, not just stacked at the end.
- Cite any patterns or trends in the investigation
- Mention all reasons that supported or did not support the hypothesis or design statement.
- All figures, diagrams, tables used in the Research Paper must be mentioned in sentences within the writing.
- All sources cited in parenthesis ( ) in the paper must have a corresponding entry in the Reference Listing.



## OAS Appendices

### Additional Instructions for Required Research Report

**STUDENTS COMPLETING STEM RESEARCH PROJECTS** for Local, District, and State science days shall write reports with **section headings** in the order below. Guidance publications of The Ohio Academy of Science should always include the section headings and definition text, unless space does not permit including both. Other Academy pre-college student programs, such as Believe in Ohio, may have specific format or style variations that must be followed, but should endeavor to match the following as closely as possible.

**Title.** A title should be as descriptive and succinct as possible, especially for field-based studies. Avoid “cute” or “trick” titles. Stick to the science.

**Author names.** Include author names and affiliations and designate corresponding author by providing complete mailing information, phone number and email address.

**Include date.** Use this format: day month year (e.g., 25 August 2020).

**\*Abstract.** Within 250 or fewer words, using simple, declarative sentences, state the contents of the paper including the study’s purpose, question or hypothesis, engineering design, methods, results, and conclusions or significant new understandings.

**Key Words for Indexing.** Provide 3 to 5 terms (metadata) for indexing the submission. Separate terms with semicolons (term1; term2; term3). **Not required for pre-college students unless they submit a manuscript to *The Ohio Journal of Science*.**

**Running head.** State 3 to 5 words, primarily from the first few words of the title, which will be used at the top of the printed page in the final layout. **Not required for pre-college students unless they submit a manuscript to *The Ohio Journal of Science*.**

**Introduction.** Describe the knowledge and cite the literature that gave rise to the project’s objective, goal, problem, question examined by, or the hypothesis or engineering design posed for the research.

**Methods and Materials.** Describe the research design, the methods and materials used in the research (subjects, their selection, equipment, laboratory, or field procedures), and how the findings were analyzed.

**Results.** The text of the results should be a descriptive narrative of the main findings. This section should not list tabulated data in text form. Parenthetically include references to figures and data tables. Indicate (n=x) the number of trials, samples tested, or subjects surveyed. Here or in the Discussion section, use the term “significant” only if the results of a statistical test are reported.

**Discussion.** Compare and contrast the data collected with that previously reported in the literature. State the extent to which the results answer the research question or support the hypothesis. Include conclusions or significant new understandings. Briefly describe the limits of the study and suggest or describe additional research needed only if you can be exceedingly explicit.

**Acknowledgments.** Recognize colleagues, mentors or institutions that provided financial or other support for the research or preparation of the manuscript.

**Literature Cited or References.** Arrange references to scientific literature cited in the text alphabetically by last name of first author. There must be a 1:1 concordance between in-text (name-year) citations and the list of references. Do not include references that are not cited in the text.



## OAS Appendices

### Terms to avoid

“Works Cited” and “Bibliography” are terms that derive from the Modern Language Association writing style but should not be used in STEM research reports. Use Literature Cited or References and include ONLY sources with in-text citations. A bibliography in science usually contains hundreds or thousands of references and is not an appropriate report heading or substitute for Literature Cited or References.

**Footnotes**—permitted in both fiction and non-fiction writing—are generally not used in scientific reports except to clarify possible questions within data tables, noted by asterisks, daggers, or other symbols to avoid confusion with numerical data tables.



# OAS Appendices

## Appendix: OAS 3

### **Required Project Data Book**

Students will need project data book (logbook or journal) to record all aspects of their research project beginning with the background information, and the formulation of the design statement or hypotheses. The notebook may be of many different types and sizes. Choose one that is appropriate for you and your project. The purpose of the notebook is to have one place to record data, procedures, thoughts, and graphics and to keep the sections of the project organized.

The Project Data Book/Notebook should include:

- Methods, Materials, and Procedures used;
- Qualitative and Quantitative Data collected;
- Independent and Dependent Variables,
- Samples, Trials, Models, Designs
- Results
- Possible Conclusions
- Other essential information
- Comments
- Explanations
- Questions for Future Study

Notes:

- An 8 ½ X 11 inch notebook will accommodate printed graphics, diagrams and computer print outs that may need to be taped or glued into the notebook.



## OAS Appendices

- A permanent marking pen is suggested so that the ink will not smear, and the data and wording remain as written initially. Pages should never be torn out, and correction fluid should not be used. If a mistake is made---it is suggested that a single line is drawn through the error, and the correct word or number is written next to it.
- Entries written in the Research Notebook are dated to record progress, and to maintain the order in which the content of the entry occurred.
- Teachers may request specific sections to be included within the Project Data Book: for example: Methods, Procedures, Materials, Qualitative data, Quantitative data, Correspondence, Results, and/or Conclusions. Follow the instructor's, or mentor's guidelines regarding the notebook sections.
- Hand Drawings, sketches, graphs, and photographs may also be included in the notebook. Be sure to label each entry clearly with the date and a detailed description. Specific labels, as well as the units used on data tables and other graphics should be clearly written. Photographs of human test subjects must have informed consent forms (OAS 6). Credit must be given to the source of all photographs and graphics used.



# OAS Appendices

## Appendix: OAS 4

### **Required Abstract** 250 word limit

Abstracts are often the first part of your research that is seen and will often determine whether someone continues to read your report or examines your work further.

#### **Adapted from**

<https://static1.squarespace.com/static/545d32b5e4b0719cb5aae580/t/5d8002dbf4ff1d21e7f321d2/1568670427939/How+to+prepare+abstract.pdf>

**AN ABSTRACT MUST BE PREPARED** for STEM student project reports. An abstract is a concise summary of the educational, scientific, engineering, or technological research contents of the paper, and not merely a general description of what the paper is about. Tell what the specific facts are, not what they are going to be when you talk. Avoid personal pronouns. Quality abstracts are highly structured and contain all the following elements: (1) background or introduction including goals, objectives, purpose, problem and hypothesis, (2) methods and materials, (3) results, data or observations, and (4) discussion or conclusion(s). Phrases like "will discuss, will review, will talk about, or will present" are unacceptable in an abstract. All important facts should be stated with brevity, but not such sparing use of words as to leave ambiguity. Abstracts should be 250 words or fewer. Tables and graphs should not be included. New techniques or new apparatus and their functions should be mentioned. New constants, critical data or formulae should be included. Names of new species should not be listed in the abstract but use full scientific names for all organisms. Use the term "significant" only if you state the statistical test(s) used. Always define the sample(s), population, or trials (n=?). NEVER use the phrase "Results show" without first stating the results. The value of abstracts is real and considerable, not only for those in attendance, but also for others unable to attend. The first author of multi-authored abstracts must obtain permission from all authors to submit the content of the abstract.

Abstracts shall be **informative** and not indicative. See Section 6 from:

[https://groups.niso.org/apps/group\\_public/download.php/14601/Z39-14-1997\\_r2015.pdf](https://groups.niso.org/apps/group_public/download.php/14601/Z39-14-1997_r2015.pdf)



## OAS Appendices

### Appendix: OAS 5

#### **Required Photographic/Graphics Source Identification**

Students shall complete and *post* the following 14pt type on the front of their display.

- “outside sources” below means the student did not create the graphics himself or herself. The graphics came from or were modified from computer clip art, the internet, books, journal articles or other printed or digital sources.

Photographs taken by: \_\_\_\_\_

Graphics from outside sources are from: \_\_\_\_\_

Photographic permissions were obtained and are located:

\_\_\_\_\_





## OAS Appendices

### Appendix: OAS 7

#### **Required ISEF ETHICS STATEMENT – ISEF Approval Form 1B**

The following statement is to be signed by both the student participant and parent/guardian of the participant. The signatures acknowledge that the student disclosed and cited where appropriate the specific source(s) of the idea for the project, all written reports, and Project Data Book/log book/journal, the Display and all aspects of the Project.

**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.**

_____	_____	_____
Printed Name of Student	Signature	Date

_____	_____	_____
Printed Name of Parent/Guardian	Signature	Date



# OAS Appendices

## Appendix: OAS 8

### Student Timeline Guide and Check List

#### Completion of a Scientific Research Project

- \_\_\_\_\_ Preview Sample Projects and check several resources for project ideas
- \_\_\_\_\_ Read Ohio Academy of Science Standards
- \_\_\_\_\_ Read OAS Student Participation Guide
- \_\_\_\_\_ Consider completion date of project    DUE \_\_\_\_\_
- \_\_\_\_\_ Choose Individual or Team Project
- \_\_\_\_\_ Note the assessment criteria to be used for the project
- \_\_\_\_\_ Note all required elements and forms needed
- \_\_\_\_\_ Begin the Required Project Notebook--# pages and add dates
- \_\_\_\_\_ Write all notes, ideas, problems, procedures, etc. in the Project Data Book
- \_\_\_\_\_ Choose a Scientific Inquiry or a Technical Engineering Design Project
- \_\_\_\_\_ Identify Problems or Questions to be researched and studied
- \_\_\_\_\_ Literature Review (Note taking) using a variety of resources--- minimum 5
- \_\_\_\_\_ Identify a documentation style that will be used throughout the project
- \_\_\_\_\_ Develop a Hypothesis or Design Statement
- \_\_\_\_\_ Secure all equipment and materials needed for implementation
- \_\_\_\_\_ Designate the methods and procedures to be followed
- \_\_\_\_\_ Formulate the Required Research Plan before experimentation begins
- \_\_\_\_\_ Read all the OAS and ISEF rules and procedures before any work begins
- \_\_\_\_\_ Implement Experiment or Test Prototype
- \_\_\_\_\_ Collect, Organize and Interpret Data
- \_\_\_\_\_ Prepare appropriate Graphics of the collected Data
- \_\_\_\_\_ Reread Judging Criteria and Standards



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- \_\_\_\_\_ Complete First Draft of Research Report
- \_\_\_\_\_ Construct visuals for the Report and/or Poster Display
- \_\_\_\_\_ Arrange Photographs for Report and/or Poster Display
- \_\_\_\_\_ Write the Required Abstract
- \_\_\_\_\_ Complete Final Draft of Required Research Report
- \_\_\_\_\_ Create Oral Presentation that emphasizes Judging criteria
- \_\_\_\_\_ Complete all registration forms for entry in District and State Science Days

**Be Proud of Your Accomplishments!**



# OAS Appendices

## Appendix: OAS 9

### Student Check List at Completion of Research Project

- \_\_\_\_\_ I have completed the Required Research Plan.
- \_\_\_\_\_ I have completed the Required Research Report.
- \_\_\_\_\_ I have completed the Required Project Data Book/Notebook.
- \_\_\_\_\_ I have Checked all OAS Standards and ISEF Rules to ensure I followed all procedures and protocols.
- \_\_\_\_\_ I designed an experiment to test variables or a prototype to respond to a design statement.
- \_\_\_\_\_ I had adequate sampling and/or testing.
- \_\_\_\_\_ I listed all materials and equipment used.
- \_\_\_\_\_ I collected and organized my data.
- \_\_\_\_\_ I created graphics using the data I collected.
- \_\_\_\_\_ I wrote daily/frequently in my Project Data Book/Notebook.
- \_\_\_\_\_ I included dates, page numbers, thoughts, plans, and diagrams in my Project Data Book/Notebook.
- \_\_\_\_\_ I took photographs, or developed a flow chart, or drew diagrams of the experimentation or making of the prototype.
- \_\_\_\_\_ I reviewed the OAS Judging Criteria to make sure my project showed evidence of all criteria.
- \_\_\_\_\_ I took notes from each resource making sure that I identified the resource used for each page or card of notes.
- \_\_\_\_\_ I used a documentation style such as MLA or APA throughout my research paper.
- \_\_\_\_\_ I am able to pronounce and explain all terminology used in my reports, on my poster display and in my presentation.
- \_\_\_\_\_ I have included all important information regarding my experiment, design, model or prototype.



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\_\_\_\_\_ I have edited all of my written research reports (EXCEPT my Project Data Book/Notebook) checking for sentence structure, spelling, punctuation, and grammar.

\_\_\_\_\_ I have listed **all** of my resources both in the text and at the end of the paper.

\_\_\_\_\_ I have created all of my graphs, tables, charts, diagrams and poster display, OR if I used another source, I listed the source to give proper credit.

\_\_\_\_\_ I have developed my oral presentation with the evidence needed so that the judges will know that I am knowledgeable about my entire project.

\_\_\_\_\_ I have prepared my poster display with graphs, tables, charts and diagrams that will help me explain my project with detail.

\_\_\_\_\_ I have written the required Abstract that describes my project detailing all of the suggested sections. Copies of the Abstract will be exhibited with my project.

\_\_\_\_\_ I have used the required format of the Research Plan to be included with my applications to District and/or State Science Day.

\_\_\_\_\_ I have SIGNED both the Human Consent form and the ISEF Ethics Statement and sent them to the designated address for District and/or State Science Day.

\_\_\_\_\_ I will contact the Ohio Academy of Science if I have any questions or concerns.



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### Appendix: OAS 10

#### Ohio Science Day Program (State and District Science Days)

##### Science Day Standards: Harassment Policy & Procedure

Adults are expected to ensure a safe and educational venue for students by notifying Event Staff (of the respective State or District Science Day Committee) of any concerns throughout the course of the event.

##### Harassment Generally – Policy

This policy prohibits harassment of any kind against any student, volunteer, or employee by an Adult, another student, volunteer, Science Day committee member or employee, or third party for any reason including, but not limited to: age, national origin, race, color, religion, gender, gender identity, sexual orientation, marital status, disability, ancestry and/or veteran status. Harassment includes but is not limited to slurs, epithets, threats, derogatory comments, unwelcome jokes, and teasing.

Any student or other person who feels that he or she is a victim of such harassment at an Ohio Science Day program should promptly report the matter to a member of the Event Staff or a Committee member (of the respective State or District Science Day Committee) or other Adult authority who must immediately present it to the proper Science Day authority. If a Science Day employee or Adult volunteer becomes aware of such a situation, he or she is under the responsibility to report it to the proper Science Day event authority (Ohio Academy of Science-CEO or Junior Academy Council Director for State Science Day, or District Council Chair or designated council member for each respective District Science Day) Upon receipt of an allegation(s), the appropriate representative of the Host Institution will be contacted and an investigation will be initiated following the established policy & procedure of the Host Institution. All such reports will be handled as confidentially as possible. The Science Day event authority or the Host Institution, or both organizations, may take appropriate disciplinary action against any person found to have violated the harassment policy. This includes contacting appropriate law enforcement agencies if deemed necessary.

No adverse action or retaliation will be allowed to be taken against a person who reports a violation or who participates in an investigation of this policy in good faith. Knowingly false accusations are prohibited and will be treated by disciplinary action comparable to that which would be applied to actual misconduct.



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### Sexual Harassment – Policy

Sexual harassment of or by any person in attendance at any Science Day event (State or District level) is prohibited. Sexual harassment includes but is not limited to unwelcome sexual advances, requests for sexual favors, and/or verbal or physical conduct of a sexual nature including, but not limited to, drawings, pictures, jokes, teasing, or uninvited touching.

In accordance with this policy, unwelcome sexual advances, requests for sexual favors, sexual demands, or other verbal or physical conduct of a sexual nature will constitute sexual harassment when:

- The conduct has the purpose or effect of unreasonably interfering with an affected person's performance, or creating an intimidating, hostile, or offensive environment; or in third party situations, one or more individuals are reasonably offended by the sexual interaction, conduct, or communications between others.
- The conduct has the effect of creating actual, perceived, or potential conflicts of interest, favoritism, disruption, or lack of objectivity.
- 

Any student or other person who feels that he or she is a victim of sexual harassment at an Ohio Science Day program should promptly report the matter to a member of the Event Staff or a Committee member (of the respective State or District Science Day Committee) or other Adult authority who must immediately present it to the proper Science Day authority. If a Science Day employee or Adult volunteer becomes aware of such a situation, he or she is under the responsibility to report it to the proper Science Day event authority (Ohio Academy of Science-CEO or Junior Academy Council Director for State Science Day, or District Council Chair or designated council member for each respective District Science Day) Upon receipt of an allegation(s), the appropriate representative of the Host Institution will be contacted and an investigation will be initiated following the established policy & procedure of the Host Institution. All such reports will be handled as confidentially as possible. The Science Day event authority or the Host Institution, or both organizations, may take appropriate disciplinary action against any person found to have violated the harassment policy. This includes contacting appropriate law enforcement agencies if deemed necessary.

No adverse action or retaliation will be allowed to be taken against a person who reports a violation or who participates in and investigation of this policy in good faith. Knowingly false accusations are prohibited and will be treated by disciplinary action comparable to that which would be applied to actual misconduct.



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### Appendix: OAS 11

#### Accommodation of Students with Disabilities at State Science Day

When teacher, parent, or student gives advance notice of a disability which would affect the student's ability to attend or remain all day at a Science Day, without some accommodation regarding access or schedule, the event administrators should determine the exact needs of the student and identify solutions which would allow the student to present their project as best they can. This may include access to facilities for project presentation, seating if not in a wheelchair, restroom access, early judging and to be excused from staying for awards if needed. Student would still need to meet established judging criteria and earn a Superior rating to move on.

If no advance notice is given, event committee should consider options on a case by case basis, with goal to accommodate the student's needs if possible. If unable to accommodate needs, give involved parties an explanation why and provide them the opportunity to suggest other ideas or options not considered by event committee (student may have been in similar situations in the past).

OAS phone number: 614-389-2182    email: [info@ohiosci.org](mailto:info@ohiosci.org)