HAWAII AND PACIFIC JSHS

JUNIOR SCIENCE AND HUMANITIES SYMPOSIUM

2024 Student/Teacher Handbook

A Program of the Hawai‘i Academy of Science

Sponsored by the Tri-Services Research Offices of the U.S. Army, Navy and Air Force

Important Notes for Teachers & Students

- Please be advised that only students that submit original experimental research papers will be eligible to participate.
- Students selected to participate will be contacted in mid-December. Participants selected as Semi-Finalists will be notified shortly thereafter.
- The number of Semi-Finalists chosen is dependent upon the number of applicants accepted into the Symposium.
- No team projects.
- You may continue to collect data up until your presentation, however, you may not change your project from your submitted research paper.
- Students that are temporarily residing and attending a school in the Hawaii/Pacific region, may participate in the Hawaii JSHS, however, students must be a citizen or permanent resident of the United States or U.S. territory in order to advance to the National JSHS.

<u>If you are selected to participate:</u>

- We are aware that presentation day at the Symposium occasionally coincides with other activities, tests and deadlines. Attendees must participate in all activities of the Symposium. If you have any testing conflicts, please contact our office.
- Please dress professionally while attending the Symposium.
- If an outdoor activity is scheduled, participants will be informed prior to the Symposium.

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The Handbook will be reviewed annually and revised as it is necessary.

About the Hawai‘i and Pacific Junior Science and Humanities Symposium and the National JSHS

The Hawai‘i and Pacific Junior Science and Humanities Symposium (Hawaii JSHS), formerly known as the Pacific Symposium for Science and Sustainability (PS3), provides a unique educational experience by bringing students from Hawai‘i and other Pacific Islands together to explore their common interest in the sciences.

The Symposium is patterned after professional conferences and includes field trips and social events along with the presentation of papers. Participants across all Hawaiian islands and Pacific territories are encouraged to apply. Proceedings from the Symposium will be published online.

The Hawaii JSHS serves as a regional competition for students to advance to the National Junior Science and Humanities Symposium (NJSHS). Regional and National JSHS programs are sponsored by the United States Departments of the Army, Navy, Air Force, and the Department of Defense, and administered by the National Science Teachers Association (NSTA). The top three regional finalists will receive scholarships. And the top five regional finalists will receive all expense-paid trips to the National JSHS in the Spring. The top two finalists will give oral presentations and the other three finalists will give poster presentations. At the national JSHS, students will have the opportunity to win significant scholarships.

Guidelines for Participation

All students in grades 9–12 in any public, private, or home school in Hawai‘i, American Samoa, Micronesia, and Guam are eligible to apply to the Hawaii JSHS. Students must also be a citizen or permanent resident of the United States or U.S. territory in order to advance to the National JSHS. No team projects are allowed. All papers submitted for the Symposium will be reviewed before acceptance.

Students may present a paper on work done as part of a class project (for “extra credit”) or as a science fair or summer research project. Invitations to participate in the Symposium will be issued after the paper review. You may continue to collect data up until regional symposium, however, you may not change your project from the paper that was submitted.

Participation in the Symposium offer many benefits to the student including:

- a means to integrate student learning in science, social studies and language arts.
- an opportunity to receive guidance from a scientist or expert on a topic chosen by the student.
- experience in communicating scientifically on paper and through public speaking to peers and professionals.
- a chance to participate in a scientific conference, engage in team-building activities with their peers, and have their work published.

Types of Papers

There are two main types of papers at the Symposium, original experimental research and library research.

What is an Original Experimental Research Paper?

This is a written report describing original research results from an experimental project conducted by the reporting individual. The paper should rely on previously published literature primarily for background and comparative purposes. A research project begins as a question and involves actual experimentation to gather data that will help answer the question. A research project is an investigation in which a hypothesis is formed, experiments are designed and conducted, data are recorded, and conclusions are drawn.

A research project may also be a field study or an engineering project. A field study involves monitoring some aspect of the environment, such as types of birds in the Kawainui Marsh. Engineering projects include designing, building and testing a device.

Only students with original experimental research papers are eligible to participate in the Hawaii JSHS competition.

What is a Library Research Paper?

A library research paper involves selecting a topic or a problem and doing extensive reading in books and scientific journals; then writing an organized report of your findings.

Library research papers are not eligible for participation at the Hawaii and National JSHS.

The Symposium Competition

Paper Review

All submitted papers will be initially read and critically reviewed by a group of scientists, engineers, teachers, and STEM professionals. Students that have submitted outstanding papers that comply with the regional guidelines will be invited to participate. Of those selected, 12 students will be chosen to compete as a semi-finalist. Please refer to the *Hawaii JSHS 2024 Instructions* for submission details. Reviewers will provide feedback on how to improve your scientific paper and project to help you prepare for the symposium. If they have welcomed you to contact them after the review, please feel free to do so.

Oral Presentation

All original research attendees will give an oral presentation of their project to a panel of judges. On the first day of the Hawaii JSHS, the twelve selected semi-finalists will present their work in the plenary session and non semi-finalists in concurrent sessions. Of the twelve semi-finalists, six finalists will be selected to present on the second day of the regional competition. The top five finalists will win expense-paid trips to the national JSHS.

Judging Criteria

Quality of the research and experimentation:

Problem & Hypothesis:
- Originality in identification of the problem
- Clear hypothesis
- Clarity in stating problem
- Objectives and reasons for performing the research

Relevant background information and prior research, acknowledgement of sources

Design of the investigation—the extent of student's involvement in designing the procedures.

Investigative Procedures:
- Identification of important variables; control of variables
- Lab skills and techniques
- Selection of proper equipment for research
- Quantity and quality of data generated by investigative procedures: observations, measurements, data gathering, statistical analysis
- Recognizing the limitations of the results obtained in accuracy and significance
- Interpretation of data; conclusions supported by data
- Problem solving

Overall:
- Creativity/originality
- Evidence of understanding the scientific and technical principles involved in the investigation
- Applications, next steps, or future research

Student's effort and performance:
- Duration of research and the amount of work involved
- Acknowledgment of major assistance
- Evidence of student's understanding

Quality of written report:
- Organization of the paper
- Composition (spelling, grammar, clarity of thought)
- Abstract (content, format, grammar, organization)

Quality of the oral presentation:
- Clarity in stating problem and hypothesis
- Clarity in describing design, procedures, problems, and how they were handled
- Clarity in presenting data, interpretations, and conclusions
- Overall organization
- The definition of terms when necessary
- The appropriate use of audio-visual
- Clarity of enunciation and voice projection
- Response to questions

Note: Presentation is important in the evaluation; however, content, not form, will be given the major weight.

Judging Criteria for Library Research Papers

None. Library research papers are <u>not</u> eligible for the Hawaii and National JSHS.

Rules for Experimental Research

Non-Human Vertebrate Animals

i. Only animals that are lawfully acquired shall be used in experimentation and their retention and use shall be in every case in strict compliance with state and local laws and regulations.

ii. Animals used in experimentation must receive every consideration for their bodily comfort; they must be kindly treated, properly fed, and their surroundings kept in a sanitary condition.

iii. No intrusive techniques may be used, including surgery, injections, or taking of blood. In addition, JSHS does not permit giving drugs and other chemical agents to measure their effect on animals.

iv. When animals are used by students for their education or the advancement of science, such work shall be under the direct supervision of a committee of individuals knowledgeable of applicable regulations governing the care of animals in the conduct of the project.

v. At no time should a student do harm to a vertebrate animal in the conduct of the research.

Human Subjects

i. No project may use drugs, food, or beverages in order to measure their effect on a person.

ii. Projects that involve exercise and its effect on pulse, respiration rate, blood pressure, and so on are approved if a valid normal physical examination is on file and provided the exercise is not carried to the extreme.

iii. If your research involves administration of questionnaires or surveys, a proper consent from subjects must be obtained.

iv. If your research involves human subjects and your school has no formal policy regarding such research, please contact the Hawai‘i Academy of Science.

v. No human cultures of any type - mouth, throat, skin, or otherwise will be allowed.

vi. Tissue cultures purchased from reputable biological supply houses or research facilities are suitable.

vii. The only human blood that may be used is that which is either purchased or obtained from a blood bank, hospital, or laboratory. No blood may be drawn by any person or from any person specifically for a science project. This rule does not preclude a student making use of data collected from blood tests not made exclusively for a science project. Blood may not be drawn exclusively for a science project.

viii. Experimentation involving human subjects requires direct supervision of a committee of individuals knowledgeable of applicable regulations governing the conduct of such research. Non-regulated research institutions (i.e. high schools) should establish a committee of knowledgeable teachers and other mentors to view the research plan prior to the conduct of the research.

Instructions for Preparation of Original Research Papers

Title:

Long enough to describe your research without any extra words (see page 9 for more help). Do not write the title as a question. Do not use abbreviations.

Abstract:

Provide a brief overview of your paper in one paragraph consisting of no more than 250 words (approx. 10-12 lines of text in Times 12-point font).

- State research problem **(introduction)**
- How the problem was studied **(explaining your methods)**
- What was found **(summarizing your results)**
- Summarize the meaning of your results **(discussion and conclusions)**

Do not include subheadings, bibliography references, figures, or tables. Do not emphasize minor details or include information or conclusions not stated in your paper. Refrain from writing in first person (e.g., "I").

Introduction

- Clearly state the problem (hypothesis) being investigated.
- Provide background information on the nature and scope of the problem.
- Review the relevant literature. Do not try to include everything you know about the topic. Cite the relevant literature sources in the text.
- Explain your purpose in investigating the problem and why it is significant.
- Correctly spell and use scientific terms and names of organisms (see page 9 for more help).

Materials and Methods

In paragraph format with complete sentences:

- Identify the important experimental variables and controls.
- Describe how you conducted your study.
- What equipment you used.
- What procedures you followed.

A numbered list of steps is not acceptable. Provide enough details so that the research can be replicated by another.

Results

Present the results of your research findings in logical order. You should not interpret the results in this section; just present the facts. Also report your findings even if they are negative.

- Use visuals (graphs, tables and/or illustrations) as appropriate.
- Maps/drawings should be clear enough to understand, blurry images are not appropriate.

- Photos may be in color or black/white.
- All charts, graphs, maps and photos should be labeled "Figures" and numbered consecutively.
- Captions should be placed below figures.
- Tables should be labeled as "Table" with a consecutive number, and titled appropriately.
- Give credit for illustrations taken from other sources.
- Three-dimensional graphs can be misleading; stick with two-dimensional graphs.

Even if your results are presented in tabular or graphic form, the important highlights should be explained in the text of your report. Tables and figures supplement or complement the text, eliminating lengthy discussions.

The results of any statistical analyses performed should also be reported and discussed in this section. Remember to explain the statistical tests used.

Discussion and Conclusions

This section is an analysis of your results. Therefore, you should interpret your results and draw conclusions. Try to build a focused discussion with reasoning and explanation rather than just regurgitating information.

- Relate your results to your original hypothesis.
- Compare your findings with existing research and show how your results and interpretations agree or disagree.
- Draw conclusions based on your data (as reported in the results).
- State the limitations which affect your results and discuss any other factors over which you had no control. Explain how these might have affected the outcome of the study.
- Finish by summarizing the most important points of your investigation.
- Suggest further experiments to continue this project.

Citations / References **(see page 9)**

- Cite references within your paper using author-date (Lee, 2000).
- List a reference in the back for each citation in the text.
- Keep your references adequate and appropriate to the topic.
- List references in alphabetical order by author's last name.
- It is recommended that your references contain at least six (6) sources.
- Your sources should not consist mainly of personal communication or internet sites. When possible find the published reference the internet site was based upon.
- References should follow the format explained on page 9.

Acknowledgments

In 2-3 sentences state:

- Where and when the research was conducted.
- The names and titles of those who provided major assistance with the study.

Tips for Writing Research Papers

1. Choosing an appropriate title.

A title is a concise identification of the main topic of the paper. It should not be too short or too long. (A two to three word title may be too short, but a 14 or 15 word title is too wordy)

For example:

"Whales" (What about whales?)
"All About Whales" (Can you really tell all about whales in ten pages?)
"The Tale of the Whale" (Too 'cutesy.' You need to be more scientific.)
"Similarities and Differences Among All Kinds of Tails in All Kinds of Whales" (Too long)
"A Comparison of the Caudal Appendages in the Marine Mammalian Order Cetacea" (Very scientific, but still too wordy.)
"Comparison of Caudal Appendages of Cetacea (Whales)" (At last we have a good title. Give the common name along with the scientific one.)

2. Scientific Names / Terms

- Scientific names are italicized with the Genus capitalized and the species lower case, e.g. *Allium sativum*.
- Once you have given the full scientific name, you then refer to it as *A. sativum*.
- Of course, you could also call it by its common name – garlic.
- Scientific names and terms should be correctly spelled and used.

3. Citing References in the Text

Virtually all scientific papers rely to some degree on previously published work. When an idea is borrowed (whether directly or paraphrased) from another source, it must be acknowledged in the text and the origin of the information must be revealed.

The formal acknowledgment in the text is called a citation. The citation serves as a link between the text in which it appears and the formal alphabetical list at the end of the paper called References. All citations in the text must appear in the References; likewise, all references in the list must be cited in the text.

When citing in the text, the reference (author and year) should be placed naturally into the flow of the sentence.

- One author: "Pascal and co-workers (1981) first isolated a mutant..."
- Two co-authors: (Smith and Jones, 1999)
- Three or more co-authors: (Smith et al., 1997)

4. Listing References

References must contain certain minimum information. For journals, include author, year of publication, title of article, abbreviated journal name in italics, volume number, and page numbers. For books include author or editor, year of publication, book title (in italics), location of publication and publisher. For sources other than a book or journal, include enough information so that the source can be identified (see Sample References). Arrange the list alphabetically by the first author's last name.

The following style points should be observed:

- A single-author entry comes before a multi-author entry beginning with the same name.
- Works by the same person are arranged chronologically by date of publication.
- If the name of the author is unknown, list the work alphabetically by the first important word in the title.
- Titles of books and journals are italicized. Titles of articles are not italicized or enclosed in quotations.
- Locations that are well known for publishing can be listed without a state abbreviation, e.g. Chicago and New York.

Tips for Writing Research Papers (continued)

- All references are justified on the left margin. If the reference requires more than one line, the additional lines are indented 1/2".
- Double space between references.
- Periods separate major components.
- Colons separate titles from subtitles, cities from publishers, and volumes from pages.

BOOK	One Author - Day, R.A. 1994. How to write and publish a scientific paper. 4th ed. Phoenix: Oryx Press. More than one author - Woolston, D.C., P.A. Robinson, and G. Kutzbach. 1988. Effective writing strategies for engineers and scientists. Chelsea, MI: Lewis Publ.
DICTIONARY	Urdag, L., ed. 1972. Magnet. In The Random House college dictionary. New York: Random House.
ENCYCLOPEDIA	With author - Hart, L. W. 1988. Magnet and magnetism. In World Book. Vol. 13. Chicago: World Book Editor, no author - Lorimer, L.T., ed. 1993. Magnet and magnetism. In Encyclopedia Americana. Vol. 15. New York: Americana Corp.
INTERNET	Martin, Linda. 08 Nov 1997. General Information. <http:www.science.siu.edu/ijsh/info.html> Accessed 20 Nov 1997.
INTERVIEW	Barber, J. D. 8 May 1995. Interview by author. Carbondale, IL.
JOURNAL ARTICLE	One author: Clark, D. P. 1989. The fermentation pathways of Escherichia coli. FEMS Microbiol. Rev. 63:223-234. More than one author - title and subtitle: Kohara, Y., K. Akiyama, and K. Isono. 1987. The physical map of the whole E. coli chromosome: application of a new strategy for rapid analysis and sorting of a large genomic library. Cell 50: 495-508.
MAGAZINE	Cowley, G. 23 Jan 1995. HIV's raw aggression. Newsweek. 75 (4): 58.
NEWSPAPER	No author: Study finds free care used more. May 1989. APA Monitor. 14. Discontinuous pages: McDonald, K. A. 15 Dec 1995. Researchers ponder a stormy forecast. The Chronicle of Higher Education. A12, A16.
PAMPHLET	Organization as author: American Society for Microbiology. 1994. Slide and poster requirements. Pamphlet. Washington, DC: ASM.
PHONE CONVERSATION	Barber, J.D. 8 May 1995. Personal communication.

Communicating Research Results
Tips for Preparing and Making Oral Presentations

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It's useful to think of an oral presentation as a cross between a written report and a newspaper article. An oral presentation should give the most important information first, leaving the details for last (in case the audience is asleep by then). This format is called an "inverted (or upside down) pyramid." A presentation should tell a story, keeping in mind the journalist's check-list — "Who? What? When? Where? and Why?"

Who is your audience?

The only measure of a good presentation is the reaction of the audience. Will they manage to stay awake during your presentation? Two days later, will they remember anything you said? Will they be convinced?

Find out as much as you can about your audience, think carefully about their needs and preferences, and tailor your presentation to them as precisely as you can. Are they already interested in your topic? This determines what and how much you have to say to introduce your research. What do they already know about your topic and what is their general level of scientific/technical expertise? What are their attitudes/preconceptions about your topic: will they go along with whatever you say, or will you have to convince them to change their minds? What sources do they listen to: do you quote an article from Nature or from the New York Times? What state are they likely to be in: are you the last speaker on a long day's program? Do they understand English easily?

What do you want to say?

Two rules apply: (1) Your audience determines what you say and how you say it, and (2) You shouldn't say very much. Imagine you're meeting a typical member of your audience who happens to be an old friend. You sit down over lunch to tell her about your research. An outline might look something like this:

1. My research in a nutshell. Why I did it, what I did, and what I found out... all in about six sentences.
2. Why this research? What was the problem? Why was it important? What other work has been done? If another researcher or two has done important work on your problem or your methodology, you should acknowledge them.
3. Here's what I found out.
4. And here's why it's important. Want a quick trick to detect whether you've dropped out of story-telling mode? Look for sentences in the passive voice: "The sequence of amino acids 1-7 was obtained from a partial cDNA clone." Remember: a presentation is talking, not writing. No one talks like this.

How do you prepare?

There are three key ingredients for making a good presentation: preparation, preparation, preparation.

- For starters, you must know your material thoroughly, which means knowing a lot more than you actually present. Think of your presentation as the tip of an iceberg: the submerged part of the iceberg, which is the much larger part, as everything you leave out. The better you know your material, the more relaxed and confident you will feel in front of a group.
- Many good speakers write their notes on 4x6" index cards. Put one line of your outline at the top of each card, and then jot down everything you want to say in that section of your talk. If you're having trouble thinking of a good beginning, start in the middle or the end, for example, your methods or conclusions.
- Now try speaking one or two sections out loud. How long did it take? For the Symposium, you will have approximately 12 minutes to present your research. Here's a hint: a 15-minute presentation is equivalent to about six typed pages doubled spaced; a 10-minute presentation is equivalent to about four pages. Not very much, is it? Just the tip of the iceberg.
- This is not to suggest that you should type your presentation out word for word. Rather, you should write it as notes, or cues, on those index cards, just to remind yourself of the points you want to talk about.
- After practicing out loud, cross out what you didn't have time for. Leave your cards overnight and then go through them again. You'll probably think of new and better ways to get your points across, a more logical sequence for your ideas, even important points you forgot.
- Try your speech out on a teacher or friend. You're so close to your subject that you might go on and on or leave something important out (confusing!) that another person can easily spot. Be prepared to cut, cut, cut.

Preparing your audiovisuals

You will want a maximum of one overhead per minute of your talk. For a 12-minute original research presentation, your overheads might be as follows: (1) title/author, (2–3) key points (equivalent to an abstract; putting the most important information first); (4–5) background and importance of problem (introduction), (6–8) what you did (methods and materials), (8–10) what you found out (results) and (10–12) importance of your findings (discussion).

To give your presentation a polished, professional look, you should prepare all your overheads in the same style: same type fonts, same spacing, same use of color. Text should be at least 28 points in size (one-half cm high). Titles should be larger. Follow the 6 x 6 rule: a maximum of six lines per overhead and six words per line. Think in terms of a title followed by a bulleted list. Use short, active phrases only, not complete sentences—the complete story is what you say, the overhead is just for emphasis.

Each chart should make one simple point. You may use line charts for continuous data (such as time-series), but bar charts are more dramatic. Even scatter charts can tell a dramatic story: Are all points on a curve except for two outliers? Are the points all over the chart with no pattern at all? Use a maximum of four lines per line chart (three is better), six bars per bar chart (four is better). Keep labels to the minimum necessary, and keep all your charts in two dimensions (no cute, but misleading, perspective effects).

Charts are better than tables; but, if you must use a table, the 6 x 6 rule applies. A maximum of six columns and six rows. This includes the column and row with labels, so you have five columns and five rows for data.

Now you're up there

You will feel a lot more relaxed and confident in front of your audience if you figure out the logistics of your presentation before hand. Arrive early and check the podium where you will be standing (Where should you put your speaker cards?). Check the facilities for showing your overheads (Will someone else help you? Try to practice ahead of time. Where will your overheads be stacked before they are presented… and afterwards?) (Hint: You may need to go back to an overhead during the question period so don't just drop them in a heap when they come off the projector.) Check the microphone. (Hint: Be sure to wear clothes with a lapel or patch pocket in case the auditorium has clip-on microphones.)

When you come up to the podium to begin your speech, take your time. Take a few good, deep breaths, look out at the audience, and find some smiling, friendly faces. Look into their eyes and let their smiles encourage you. Tell them about your project as you would to a friend over lunch.

Then they ask questions

After your presentation, the audience will have approximately 6 minutes to ask questions. This may be the most important part of your presentation, and you should prepare for the question-and-answer period just as thoroughly as you prepare for your talk.

Have some extra points ready to bring up at this time—some of the material you cut from your speech, such as problems you encountered and how you solved them, or additional items you didn't have time to mention. You may even bring up further implications from your work and ideas as to what you would like to do next. To present additional results, have one or two extra overheads ready to show.

Above all, take your time (remember to breathe!) and don't let the questions fluster you. If someone asks a question straight from outer space, buy yourself some time while you think of a response: "That's a very interesting question. As I understand it, you are asking… [restate their question in your own words]."

Practice making a smooth transition from their question to one of the good answers you have prepared: "I don't know the answer to your question, but a related issue that we encountered was…" or "I'm so glad you asked about the methods we used for handling our cultures because we tried a second nutrient system and got some rather interesting results. As you can see from this slide, which I didn't have time to show you during my talk…" or "That's a really good question. Perhaps we can come up with an answer in the next stage of our work."

Remember, you're not expected to know all the answers. Don't be afraid to learn something from your audience. Above all, try to convey a sense of excitement about your work.

JSHS Categories of Competition

At the National JSHS, student research presentations will be organized in concurrent sessions by discipline. The organization of the sessions at the National JSHS is based upon a review of all abstracts and the area of research suggested by the student. At the Hawaii JSHS, students from various categories will present at each session.

Environmental Science
Environmental Science/Engineering: Bioremediation, Ecosystems management, Environmental Engineering, Land Resource Management, Pollution, Toxicity; Impact upon ecosystem

Biomedical Sciences / Cell and Molecular Biology
Biomedical Medicine, Microbiology, Molecular/Cellular, Genetics, Immunology, Pharmacology, Virology

Life & Behavioral Sciences
Developmental Biology, Plant Physiology, Population Genetics, General Biochemistry, Microbiology, Behavioral Sciences

Medicine & Health
Biochemistry, Bioengineering, Disease Diagnosis and Treatment, Epidemiology, Immunology, Neuroscience, Physiology, Pathology

Engineering & Technology
Aerospace, Aerodynamics, Electrical Engineering, Energy – solar, Vehicle Development, Devices, Mechanical Engineering, Robotics

Mathematics & Computer Science, Computer Engineering
Probability and Statistics, Mathematics, Computer Science – Algorithms, Databases, Networking, Computer Engineering

Physical Sciences
Astronomy, Physics – Theoretical, Physics – Solid State, Acoustics, Optics, Thermodynamics, Particle Physics, Quantum Physics, Nuclear; Internet of things – network of physical objects or “things” embedded with electronics, software, sensors, and network connectivity

Chemistry
Physical Chemistry, Materials, Alternative Fuels, Organic Chemistry, Chemical Engineering, Earth Science – Geochemistry, Energy – Alternative Fuels, Material Science

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HAWAI‘I ACADEMY OF SCIENCE

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