

Mastering the Abstract Writing Process

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What Is an Abstract?

- A brief, written explanation of the research project, consisting of a succinct description of the project's purpose, the procedures followed, the data collected, and the conclusions reached.
- A clear and simple summary statement of the main points of the experiment
- A self-contained statement that must make sense all by itself.

Review of Abstract's Purpose

- Provides SRC a quick study of your project as it is an overview of the purpose, means, and result of research.
- Helps judges (both special and category) discern quickly whether the project qualifies for specific awards and whether the research is significant in its specific area.
- Informs visitors to ISEF (students, teachers, and the public at large) of the nature of the research.

Steps in Developing Abstract

1. Begin with a *Research Project Prospectus* to outline the research project. A prospectus helps the researcher identify the nature and scope of the investigation, research methods, and anticipated conclusions and/or applications. An example of such a prospectus follows:

Sample Research Project Prospectus

Possible Title:

Name:

School:

Purpose of project / experiment

In a sentence of 25 words or fewer, explain the reason for your research project or a hypothesis you have selected to test.

Methods of research

Explain in a sentence or two how you plan to research your topic. What methods will you use? What resources will you need?

Data/Observations

Determine what data do you need to collect and what difficulties you may encounter as you research.

Conclusions/Applications

Explain in a sentence or two what results you anticipate your research will produce. What conclusions or applications do you hope to be able to explain?

2. Once the research is completed and you are ready to show your project, use an Abstract Template to write a draft of the abstract. The following example was created using a table format in a Word document.

Sample Abstract Template

Title
Name
School

Purpose of project / experiment:

- An introductory statement of the reason for investigating the topic of the project.
- A statement of the problem or hypothesis being studied.

Summarize procedures, emphasizing the key points or steps:

- A summarization of the key points and an overview of how the investigation was conducted.
- Omit details about the materials used unless it greatly influenced the procedure or had to be developed to do the investigation.
- An abstract should only include procedures done by the student. Work done by a mentor (such as surgical procedures) or work done prior to student involvement must not be included.

Detail succinctly observations/data/results:

- This section should provide key results that lead directly to the conclusions you have drawn.
- It should not give too many details about the results nor include charts or graphs.

State conclusions/applications.

Explanation of Parts

Purpose of the Experiment

- An introductory statement of the reason for investigating the topic of the project.
- A statement of the problem or hypothesis being studied.

Procedures Used

- A summarization of the key points and an overview of how the investigation was conducted.
- An abstract does not give details about the materials used unless it greatly influenced the procedure or had to be developed to do the investigation.
- An abstract should only include procedures done by the student. Work done by a mentor (such as surgical procedures) or work done prior to student involvement must not be included.

Observation/Data/Results

- This section should provide key results that lead directly to the conclusions you have drawn.
- It should not give too many details about the results nor include tables or graphs.

Conclusions

- Conclusions from the investigation should be described briefly.
- The summary paragraph should reflect on the process and possibly state some applications and extensions of the investigation.
- An abstract does not include a bibliography unless specifically required by your local fair. The Intel ISEF requires the bibliography as part of the research plan to be provided on Form 1A.

3. Revise and edit the abstract in the template. Once you have filled in each section, you can easily copy and paste the final version into the abstract form online. Such a procedure avoids the need to retype the entire abstract, thereby reducing the chance of errors in the final version.

Sample Abstract

Effects of Marine Engine Exhaust Water on Algae

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This project in its present form is the result of bioassay experimentation on the effects of two-cycle marine engine exhaust water on certain green algae. The initial idea was to determine the toxicity of outboard engine lubricant. Some success with lubricants eventually led to the formulation of "synthetic" exhaust water which, in turn, led to the use of actual two-cycle engine exhaust water as the test substance.

Toxicity was determined by means of the standard bottle or "batch" bioassay technique. *Scenedesmus quadricauda* and *Ankistrodesmus* sp. were used as the test organisms. Toxicity was measured in terms of a decrease in the maximum standing crop. The effective concentration - 50% (EC 50) for *Scenedesmus quadricauda* was found to be 3.75% exhaust water; for *Ankistrodesmus* sp. 3.1% exhaust water using the bottle technique.

Anomalies in growth curves raised the suspicion that evaporation was affecting the results; therefore, a flow-through system was improvised utilizing the characteristics of a device called a Biomonitor. Use of the Biomonitor lessened the influence of evaporation, and the EC 50 was found to be 1.4% exhaust water using *Ankistrodesmus* sp. as the test organism. Mixed populations of various algae gave an EC 50 of 1.28% exhaust water.

The contributions of this project are twofold. First, the toxicity of two-cycle marine engine exhaust was found to be considerably greater than reported in the literature (1.4% vs. 4.2%). Secondly, the benefits of a flow-through bioassay technique utilizing the Biomonitor was demonstrated.

Purpose

Methods

Data

Observations

Conclusions

Applications

Other Examples

Persistent Global Activation of the *Aplysia* Serotonergic System After Sensitizing Stimuli

The marine mollusk *Aplysia* responds to noxious stimulation with a stereotyped arousal reaction that includes escape locomotion, increased heart rate and sensitization of defensive reflexes. Although previous studies have shown that serotonin (5-HT) is important for most of these behavioral responses, it is still unclear how the 5-HT system is activated in response to noxious stimuli. To address this question, I used a specific staining of the 5-HT neurons in the living central nervous system (CNS) that allowed me to (1) systematically record their electrical activity following a noxious stimulus, and (2) trace their projections using the neuronal tracer Neurobiotin. I found that in response to tail-nerve shock, a procedure known to mimic a noxious tail stimulus, the vast majority of 5-HT neurons increased their firing rate for several minutes and became more excitable. 5-HT neurons were found to project toward various peripheral targets such as the gill, heart, body wall, tail, siphon, head, and tentacles as well as to other ganglia in the CNS. This study shows that the *Aplysia* 5-HT system is globally and persistently activated after a noxious stimulus. Such an activation might serve to synchronize the different aspects of the arousal reaction in *Aplysia*.

Writing and Revising Tips

Simply put, the style of an abstract should always be declarative not discursive.

- Emphasize these aspects: purpose (hypothesis), methods, scope, results, conclusions, and recommendations
- Focus only on the current year's research when it is a continuation project.
- Exclude any of the mentor or supervisor's work
- Omit details and discussions
- Use the past tense to describe (*However, where appropriate use active verbs rather than passive verbs.*)
- Use short sentences, but vary sentence structure.
- Use complete sentences (*Do not abbreviate by omitting articles or other small words in order to save space.*)
- Avoid jargon
- Use appropriate scientific language
- Use concise syntax
- Use correct spelling, grammar, and punctuation

Revision Techniques

- Addition – adding a word, phrase, or sentence

Original: This project is an experimentation of the effects of two-cycle marine engine exhaust water on certain algae.

Revised: This project is a bioassay experimentation of the effects of two-cycle marine engine exhaust water on certain green algae.

- Deletion – deleting a word, phrase, or sentence

Original: The researcher has developed an original code required for successful implementation of the environment reconstruction application.

*Revised: The researcher **developed** an original code required for successful implementation of the environment reconstruction application.*

- **Substitution – substituting one word, phrase, or sentence for another**

Original: In the beginning, the idea was to determine the toxicity of outboard engine lubricant.

*Revised: The **initial** idea was to determine the toxicity of outboard engine lubricant.*

- **Transposition – moving words, phrases, or sentences to another position**

Original: Using optical fibers as light guides, a system was created with light guided from a light source to an integrating chamber, reflected and guided back to a digital camera.

*Revised: A system **using optical fibers as light guides** was created with light guided from a light source to an integrating chamber, reflected, and then guided back to a digital camera.*

- **Combination** – combining sentences and/or paragraphs, which usually results in the use of multiple revision techniques and a considerable shortening of the passage.

Original: The project was started with an investigation of methods in use today and possible alternatives. Two alternative methods that seemed to be promising were chosen — the first method is to kill bacteria with pulsing high voltage, and the second is boiling with high efficient heat exchanging.

*Revised: The project **investigated** two alternative methods in use today: **1) killing** bacteria with pulsing high voltage; **2) boiling bacteria with a high efficient heat exchange.***

Quiz: What techniques are used in revising this passage?

Original:

- **The purpose of my project** is to find the connection between the ratio of radii of an ellipse and **its** mechanical advantage on specified angle of rotation intervals.

Revision:

- This project examined the connection between the ratio of radii of an ellipse and the mechanical advantage of a specified angle of rotation intervals.