Project Abstracts

Teaching Student Researchers How to Write Award Winning Abstracts!

Adapted from UNM STEM Education Outreach Programs Teacher Professional Development Workshops materials and the Abstract Writing Process presentation created by John Cole (Intel ISEF Display & Safety Chairperson).
PROJECT ABSTRACTS
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Adapted from UNM STEM Education Outreach Programs Teacher Professional Development Workshops materials & the Abstract Writing Process presentation created by John Cole (Intel ISEF Display & Safety Chairperson) & available on the SSP website under the Resources for Students, Teachers & Affiliated Fair Personnel section at:
http://www.societyforscience.org/isef/document
What Is An Abstract?

• An abstract is 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.
• An abstract is NOT a reiteration of the entire research plan!!
• An abstract is a self-contained statement that must make sense all by itself.

A Good Abstract...

• Uses complete but concise sentences & is in the 3rd person.
• Uses present tense for the existing body of facts.
• Uses past tense for the completed research.
A Good Abstract...

- Defines specialized terminology and abbreviations.
- Is 50 to 250 words long.
- Is typed neatly, single spaced.

ISEF Abstract Rules

- Intel ISEF rules require each Finalist to write an abstract of no more than 250 words to be displayed with the project.

- An abstract gives the essence of the project in a brief but complete form to judges and the public viewing the Finalist’s project.

- Once approved, SRC provides the Finalist with two embossed copies of the abstract, one to display vertically at the project and the other to make copies to handout to judges and the public on visitors’ day.
**ISEF Abstract Rules**

- The abstract must focus on the current year's research and give only minimal reference to previous work.

- Details and discussions should not be included in the abstract, but may be put in the longer, written research paper (if required), or given on the project exhibit board.

- Finalists at the Intel ISEF are required to use the on-line system for submitting their abstract. Regional and local fairs use the Official Abstract Form (not necessary for most local fairs).

- In addition, abstracts must not include acknowledgments (such as referencing mentor or university laboratory).

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**The 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.
Developing a Good Abstract

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.

Here's an example...

### Project Prospectus

<table>
<thead>
<tr>
<th>Possible Title:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
</tr>
<tr>
<td>School:</td>
</tr>
</tbody>
</table>

**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?
What’s In A Good Abstract?

1. Write a sentence making broad statement about the topic of research.
2. Write the next sentence or two focusing more narrowly on the particular intent of the research.
3. Write several sentences indicating the problem to be solved and the hypothesis that was posed.

4. Write a very brief statement to describe the methodology employed. *(This may be omitted if space or time is short).*
5. Write several concise statements indicating which variables were explored and compared and if the data obtained supported the hypothesis. These sentences summarize the results and discussion sections of the research paper.
What’s In A Good Abstract?

6. Write a sentence that gives the conclusion(s) of the research work and a statement of the direction for future research.

7. Count the number of words for the sentences you just wrote. If you need to, edit your sentences to bring your abstract within the required 50-250 word count.

What’s In A Good Abstract?

8. Put all previous sentences in paragraph form.

9. Be sure to check your spelling AND grammar. Remember, you may soon have judges reading your work!!
Sample Abstract Template

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 the 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.
Explanation of the Parts

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.

• 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.
Effects of Marine Engine Exhaust Water on Algae
Mary E. Jones
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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.

Conclusions and recommendations 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.

Writing & 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.

Revision Techniques

• 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.
Revision Techniques

- 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.

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USE OF REGRESSION ANALYSES TO BUILD ECOLOGICAL MODELS OF POISON DART FROGS IN THEIR NATIVE HABITATS

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All over the world frogs are dying off at an alarming rate due to pollution, global warming, deforestation, Chytrid fungus, and habitat destruction. Any conservation efforts must take into account ecological variables important for frog survival. The purpose of the current study is to model the ecological complexity of Dendrobates pumilio, Dendrobates auratus, and other diurnal frogs in the lowlands of Costa Rica for purposes of conservation. Dendrobates pumilio, D. auratus, and other diurnal frogs were censused at Estacion Biologica El Zota in the summer of 2009. Biotic and abiotic factors thought to contribute to frog presence were measured. These factors were: microclimate (temperature and RH) and biodiversity (prey, predators, buttresses, nursery plants, other animals, leaf litter depth, tree diameter, and habitat). Results of Student t-tests showed that D. auratus and D. pumilio could be found in areas of significantly different temperature and relative humidity. Weak correlations were found between frog presence and a composite score for biodiversity. Correlations between biotic and abiotic factors were low; but showed important relationships within the ecosystem. Binary logistic regression analyses were run on all frog data revealing one partial model (other diurnal frogs) and one successful model (D. pumilio). Predictors for the D. pumilio model are mean leaf litter, edge and riverine habitats, percent cover, presence of other diurnal frogs, and buttresses. The model for other diurnal frogs showed that habitat and presence of other frogs were the principal predictors of frog presence; but for mathematical reasons did not get included in the model. These models can be used to target sites preferred by frogs for conservation efforts.
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*.

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Period Analysis of Cataclysmic Variable X10 and Its Implications on the Origin of Low States

Cataclysmic variables are binary systems, each consisting of a white dwarf (the primary) and a low mass star (the secondary). Usually, matter flows from the secondary onto the primary, producing X-rays upon impact. However, previous observations have indicated that certain cataclysmic variables frequently exhibit low states – a dramatic decrease in mass transfer (and thus X-ray production) for an extended period of time. Low states can last up to several years, and this phenomenon is currently not well understood. This research is primarily focused on creating a model to elucidate the origin of low states using data gathered from X10, a magnetic cataclysmic variable that experienced a low state in year 2005. The model proposed in this study attributes low states to the magnetic interactions between the secondary’s stars and the primary, and its predictions on which systems should exhibit low states and which ones should not have all been confirmed by past observations.
The string topology BV algebra, Hochschild cohomology and the Goldman bracket on surfaces

This project provides an algebraic description of the string topology Batalin-Vilkovisky algebra for a large class of manifolds. Such a description previously existed only for spheres and projective spaces. The homology $H(LX)$ of the space of free loops of a closed oriented smooth manifold $X$ has a rich algebraic structure called string topology, discovered by Chas and Sullivan in 1999. In particular, $H(LX)$ is a Batalin-Vilkovisky (BV) algebra. However this structure is hard to compute in algebraic terms.

This project studies string topology in the case when the manifold $X$ is aspherical. In this case the Hochschild cohomology Gerstenhaber algebra $HH(A)$ of the group algebra $A$ of the fundamental group of $X$ has a BV structure. My main result is a theorem establishing a natural isomorphism between the Hochschild cohomology BV algebra $HH(A)$ and the string topology BV algebra $H(LX)$. In particular, for a closed oriented surface $X$ of hyperbolic type this gives a complete description of the BV algebra operations on $H(LX)$ and $HH(A)$ terms of the Goldman bracket of loops on $X$.

There are several conjectures connecting the string topology BV algebra with algebraic structures on the Hochschild cohomology of algebras related to the manifold $X$. My theorem is the first such hypothesis that has been proven. The proof is based on a combination of topological and algebraic constructions allowing to compute and compare multiplications and BV operators on both $H(LX)$ and $HH(A)$.

How Would You Revise This?

**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.