Abstract Guidelines and Examples

General questions to be addressed in the abstract section

1. **Why it was done and what is the problem being addressed?**
These two concepts can be grouped together into one brief statement summarizing why the experiment was performed in the first place. What was the question that the experiment was addressing? An abstract should contain a statement of the original problem. It is the reason behind why an experiment is being conducted. This description should not include many details, rather it should be a simple statement. It can even be stated in one or two sentences at the most.

2. **What did you do?**
This part of the abstract states what was done to try to answer the question proposed. It should in no way be very detailed. It contains a brief outline of what was done, highlighting only crucial steps. It is the materials and methods section of your abstract, but it is only one or two sentences in length. It is a description of *how* you decided to approach the problem.

3. **What did you find out?**
In other words, what did all of your hard work and preparation tell you about the question you set out to answer. This description contains only the crucial results obtained. The crucial results are those that are necessary to answer your original question posed and without which, the experiment would have been useless. The results should be stated briefly as facts and should not be explained; they should only be stated. This style of writing is very similar to the results section of your paper, but it highlights only pertinent results used to draw conclusions. An average length for this “what did you find out” section is two or three sentences at the most. This number can vary however, depending on the complexity of the experiment, and so these length guides are just that, guides, not rules.

4. **Conclusions?**
This is the end of your abstract, the part that directly hinges on the results obtained. This is the "so what" part of your experiment. "So what" refers to what the results mean in the long run. You need not include how you drew your conclusions, only the final conclusion. The conclusions should directly follow the results so the reader knows what results led to what conclusions and should be stated briefly and succinctly. You do not need to explain how you reached the conclusion from the results obtained, only the end conclusions. After you have stated the conclusions, the abstract is complete.

Below are two examples of the same abstract, sample one is an example of a badly written abstract, while sample two is an example of a well-written abstract. Underlined words correspond to explanations describing why the sentences in which they are contained are good or bad in the context of an abstract (see below for explanations).

Sample 1: This experiment will determine what will make enzymes effective and what will make them ineffective. We tested different samples of enzymes in a spectrophotometer and recorded their absorption rates. Six samples were placed in the spectrophotometer but two contained no enzyme; these acted as blanks for the other samples. The four remaining samples contained Catecholase ranging from 0.5 ml to 1.75 m. The second half of the experiment contained four test tubes with a constant amount of Catecholase, but the pH levels ranged from four to eight. It was found that if the enzyme was present in large amounts, then the absorption rate was high, and if the pH level ranged from 6 to eight then the absorption rate was high. Therefore it can be said that enzymes work well in neutral pH levels and in large amounts.

Sample 2: This experiment was performed to determine the factors that positively influence enzyme reaction rates in cellular activities since some enzymes seem to be more effective than others. Catecholase enzyme activity was measured through its absorption rate in a spectrophotometer, using light with a wavelength of 540 nm. Absorbance rates in samples with varying enzyme concentrations and a constant pH of 7 were compared with samples with constant enzyme concentration and varying pH levels. The samples with the highest enzyme concentration had the greatest absorption rate of 95 percent compared to the sample with the lowest concentration and an absorption rate of 24 percent. This suggests that a higher concentration of enzymes leads to a greater product production rate. The samples with a pH between six and eight had the greatest absorption rate of 70 percent compared to an absorption rate of 15 percent with a pH of 4; this suggests that Catecholase is most effective in a neutral pH ranging from six to eight.

Explanations of Underlined Terms

Ineffective: This sentence is in the present tense and should be switched to the past tense. In addition to tense problems, the sentence does not tell the reader much about what is meant by the term “effective”. What exactly is an effective enzyme? The author needs to be specific and try to avoid generic terms such as effective. Also, the author never states why the experiment is being conducted. Why is enzyme effectiveness so important? What makes it important enough to be studied?

Rates: This sentence is addressing what was done, yet it barely conveys any information. The author states that different samples of enzymes were tested, but mentions nothing about the contents of the samples. Was the same enzyme used in every sample? What was in each sample, and what varied in each sample? Also, what does absorption have to do with enzyme activity? This correlation needs to be explained to the

reader. One last detail that should be included is the wavelength of light that was used in the spectrophotometer. Did it remain constant or was it a variable as well?

Eight: This description is too long and detailed to be in an abstract; it sounds as though it was pulled from the methods and materials section of the paper. The amounts of enzyme do not need to be stated, nor do the pH levels. The number of samples tested do not need to be included either; it is just extraneous information that is not crucial to understanding the experiment as a whole. The information contained in this sentence can be pulled out and rearranged to say that some samples had a constant pH and varying enzyme concentrations and other samples had constant enzyme concentrations and varying pH levels. With the controls and the variables stated, the results highlights can then be presented.

High: This description is just too general, although it conveys the right information. When stating results it is okay to use actual numbers. Instead of stating that the absorption rate was high, specify how high in comparison to samples with low absorption rates.

Amounts: An experiment is never final, nor is it ever positive. Always avoid saying that the results you obtained are correct or definite. Instead just say that the data supported or did not support your hypothesis.

Others: This sentence is clear and concise, telling the reader why the experiment was carried out. It postulates the question of why some enzymes are more effective than others and it explains that the experiment was set up to determine what causes these differences.

540 nm: This sentence introduces the specific enzyme being studied and how it was studied. The light wavelength used in the spectrophotometer was also specified, telling the reader that wavelength was not one of the variables manipulated in the experiment.

Levels: This sentence defines what was done without going into great detail. The controls and the variables are stated clearly and succinctly so the reader knows what factors are being tested to determine enzyme productivity.

Clear summary: These two sentences combine the results with the conclusion, which helps make the conclusions drawn from the results very clear to the reader. The author also stated concrete numbers in the results so the reader is aware of just how much the absorption rates changed in each sample.

A Poorly Written Abstract

Article Title: Elements of an Optimal Experience

Authors: Shall remain unnamed ☺

Abstract

This paper presents and assesses a framework for an engineering capstone design program. We explain how student preparation, project selection, and instructor mentorship are the three key elements that must be addressed before the capstone experience is ready for the students. Next, we describe a way to administer and execute the capstone design experience including design workshops and lead engineers. We describe the importance in assessing the capstone design experience and report recent assessment results of our framework. We comment specifically on what students thought were the most important aspects of their experience in engineering capstone design and provide quantitative insight into what parts of the framework are most important.

Critique:

(1) This abstract begins well with a concise statement of the objectives of the paper, but then wanders from good technical writing style from there.

(2) The abstract is written in the first person (e.g. "We explain…", "We discuss…", "We comment…", etc.).

(3) No results are presented. This poorly written abstract describes only the organization of the paper.

Example:

"Next, we describe… We comment specifically on what students thought were the most important aspects of their experience in engineering capstone design…"

Instead, the abstract should summarize the actual results and how they were obtained.

Example:

"A statistical analysis was performed on answers to survey questions posed to students enrolled in a capstone design course at the University of Research. The analysis showed that students thought the most important aspects of their experience in engineering capstone design were quality of the instructor and quantity of student/instructor interaction time."

A Well Written Abstract

Article Title: Women Engineers in Kuwait: Perception of Gender Bias

Authors: P.A. Koushi, H.A. Al-Sanad, and A.M. Larkin of Kuwait University

Abstract

The greatest obstacle to the development of policies for the curtailment of gender bias is lack of information on the scope and effects of the problem. This study represents an attempt to quantify attitudes toward gender bias among profession women engineers working in the State of Kuwait. The major findings that emerged were as follows: a) Since 1970, Kuwait has witnessed an enormous growth rate in the participation of women in higher education. b) With respect to the job-related factors of salary scale, professional treatment, responsibility, benefits, and vacation, a clear majority (68%) of the professional Kuwaiti women engineers surveyed expressed a feeling of equality with or even superiority to their male counterparts. c) The one job-related factor in which significant gender bias was found to be in operation was that of promotion to upper management positions. In this criterion, the women engineers surveyed felt "less than equal" to their male colleagues.

Critique:

(1) This abstract begins with a succinct statement of the problem and the objective of the paper.

(2) Overall results are clearly presented.