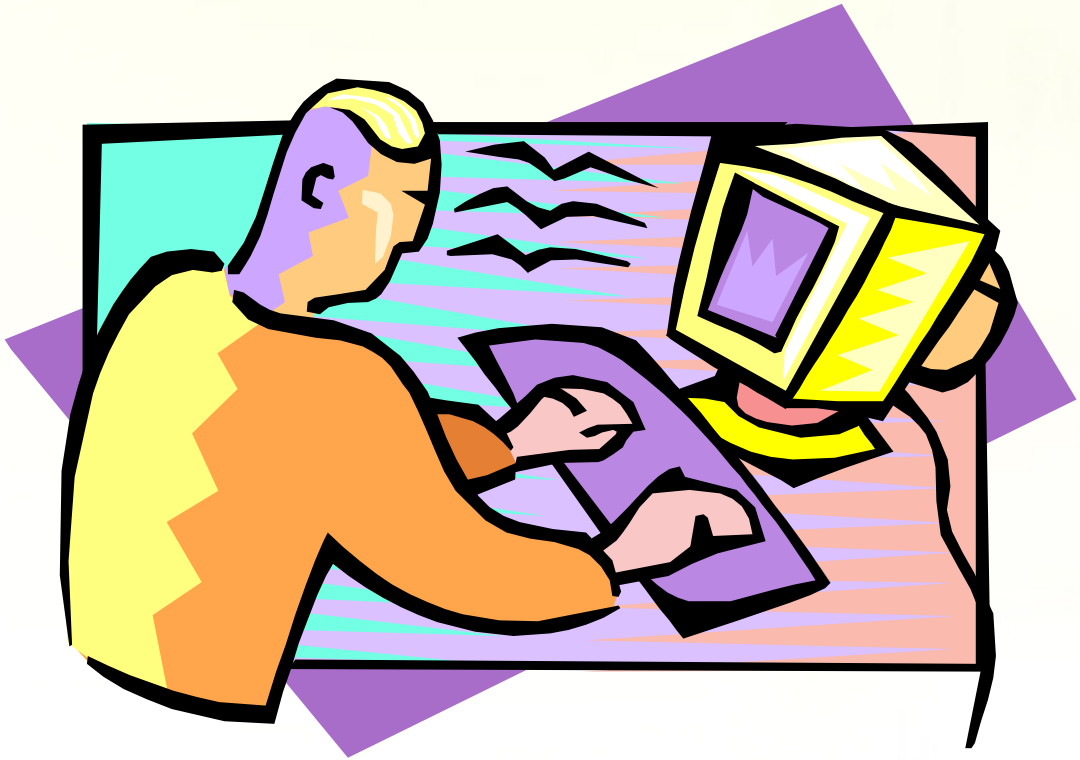
Research Report Writing



General Presentation & Format

- ALL reports should be typed
- Have a neat, clean cover
- Double-space
- Don't Mix pen and typing
- Page numbers should be centered at the BOTTOM of each page
- Follow format and sequence

Hints on Report Writing

- Wherever possible, use the first person ("I" or "we")
- Avoid long, involved sentences and overuse of polysyllabic words.
- Use the *active voice* instead of the passive voice.
- Avoid excessive use of nouns as adjectives.

Hints on Report Writing

- Don't hide your findings in noncommittal statements-*BE POSITIVE*
- Keep specialized jargon to a minimum.
  - Keep technical abbreviations and acronyms to a minimum.
- Avoid repeating facts and thoughts.
  - Be concise and succinct.

ABSTRACT

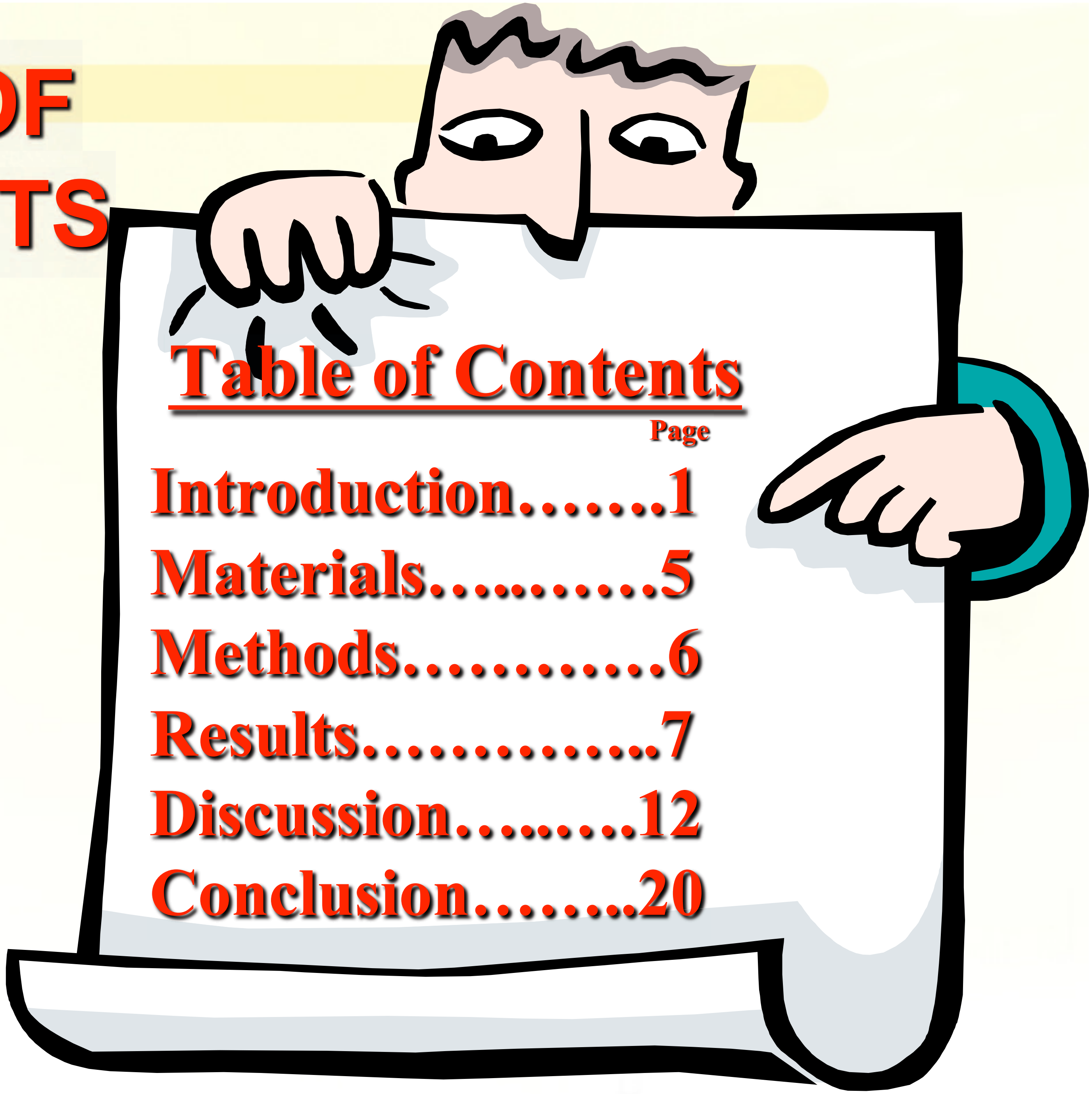
- **Brief, ONE PAGE MAX**
  - ***Writing a clear, concise abstract is an art!***

- **Summary*, including the nutshell of your results and conclusions.***
- **Include the *dates and location***
- **Write the abstract *last* - no page #**
- ***Must match the rest of your findings***

TITLE PAGE

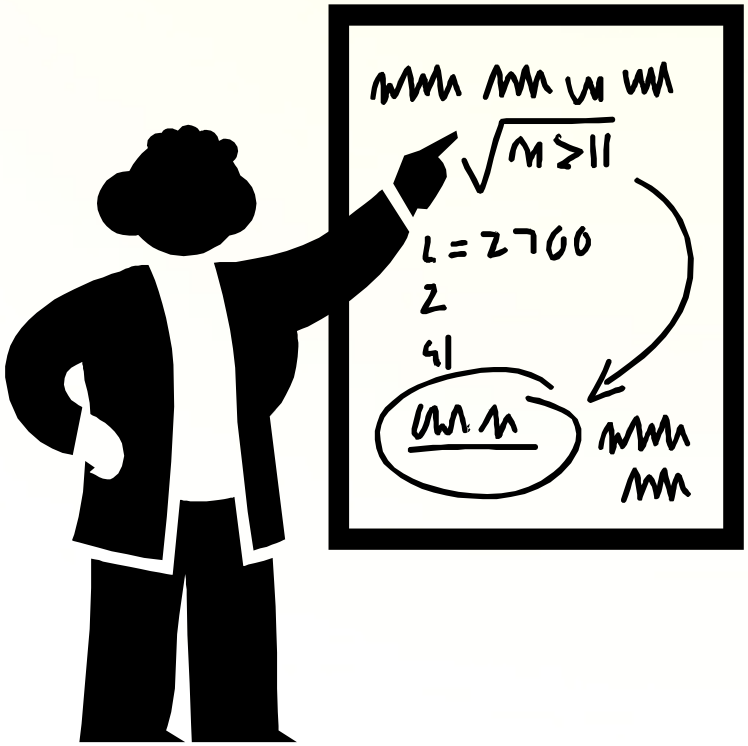

Name of Project
Your Name
Date
Course
Instructor
School
City & State

TABLE OF CONTENTS



INTRODUCTION

- ***This part of the paper presents the background, justification, and relevance of your study***



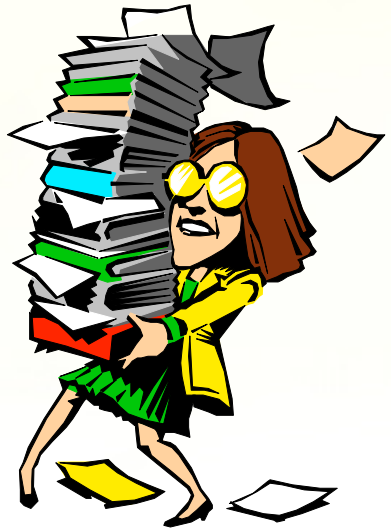
INTRODUCTION

- State the problem and objectives
- Hypothesis (if applicable) to be tested
- Brief background, with cited review of literature
- Relate the problem and significance to the discipline

INTRODUCTION

- ***Use a wide variety of sources***, from research journals to books, to DVDs to the Internet.
- Include at least one print source
- **Condense** the information you've found.

Paraphrase, not plagiarize



Citations

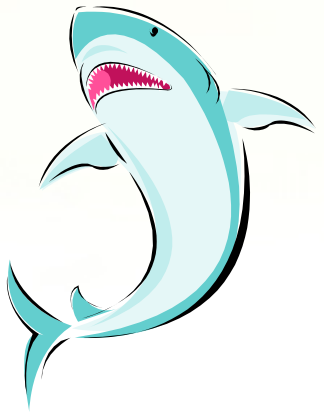
- **Information learned from outside sources needs to be "cited" in the Introduction - like writing footnotes, only easier.**

Citations

- **RULE 1** Cite all sources that refer to information on your species, experiment, or study site.
- **RULE 2** Cite all sources that back up your conclusions.
- **RULE 3** Cite anything that brings in a fact not directly taken from your own observations.
- **RULE 4** ***WHEN IN DOUBT, CITE!***

Example of Proper Citing

White sharks are known to be man eaters (Halstead, 2008). They are the only shark that regularly preys on marine mammals for food. Some scientists believe that great whites attack humans by mistake: the silhouette of a surfer paddling on a surfboard may be mistaken for a seal sunning on the surface (Ellis, ed., 2011).



Variations In Citations

- **One Author:** (Bronowski, 2003)
- **Two Authors:** (Walker and Maben, 2005)
- **Three or More Authors:**
  (Cochran, Wiles, and Manack, 2011)
- **No Authors:** (Insects of Guam, 2010)
- **Only an Editor:** (Ellis, ed., 2011)
- **Citing Experts You Have Spoken To:**
  (Collins, pers. commun.)

Materials And Methods

- ***Materials*** ***(in narrative form)***
  - **Describe EXACTLY what you used to do your research**
    - **(Ti-83 calculator, x-rays, snap-trap)**

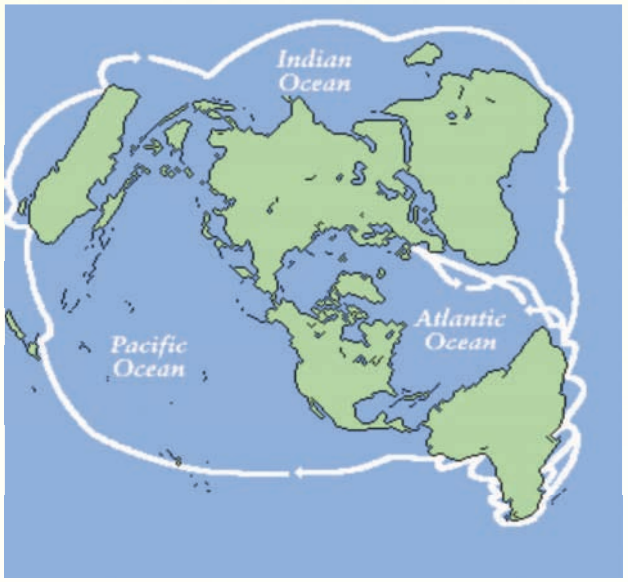
Materials And Methods

- ***Methods*** **(Procedure)**
  - **Sampling dates**
  - **Locations**
  - **Methods used**

- **Concise, but detailed enough that a reader could duplicate your investigation**

Materials And Methods

- Standard procedure descriptions should be kept extremely concise.
- Including properly-labeled diagrams or photographs of any



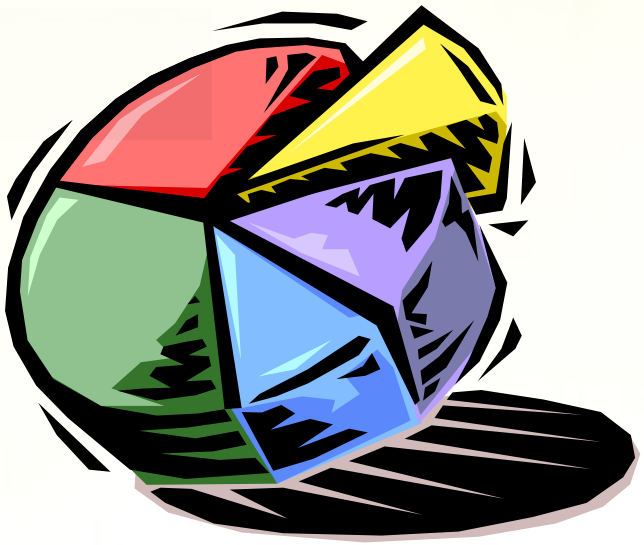
- In a field study, a site description is *required*, complete with site maps.

Materials And Methods

- **Computer software** should be fully cited, including the version used.
- **Statistics** used to analyze your data should be included and cited.

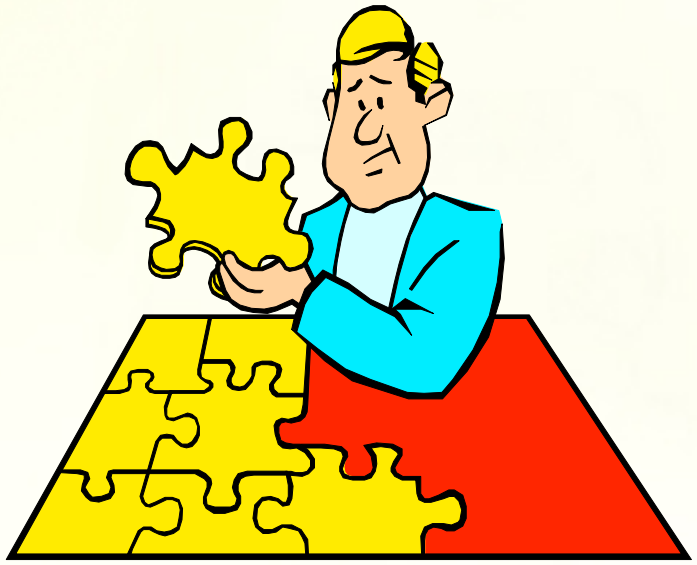
RESULTS

- Contains a description and interpretation of the data
- Include qualitative observations you made during the study.
  - NOT just a data summarization
  - NOT just pages of tables and figures...



RESULTS

- Tell the reader **exactly what you found**
  - What patterns
  - Trends
  - Relationships observed



- **Photos, graphs, or diagrams** that visually describe your results.

RESULTS

- **Label** graphs & tables correctly

Table 2. The number of brine shrimp found in sections of tubing after the shrimp were exposed to changes in light, pH, or temperature, on October 2, 2004 at Fremont HS.

VARIABLES I	SECTION 1	SECTION 2	SECTION 3	SECTION 4
CONTROL	24	30	18	25
LIGHT	1 0 (light)	13	40	26 (dark)
pH	8 (acid++)	3 (acid-)	52 (base+)	3 (base ++)
TEMP	13 (hot)	24 (warm)	38 (cool)	21 (cold)

Line Graph

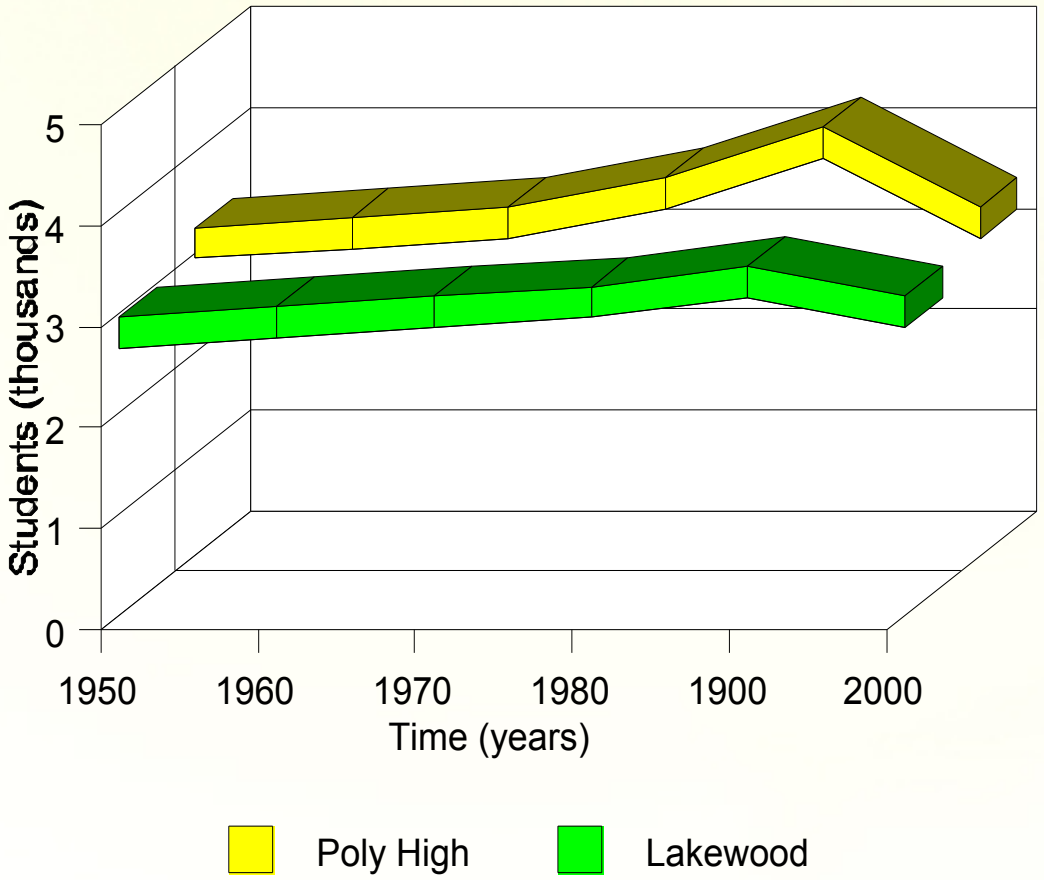


Figure 1. Number of students attending Poly High and Lakewood High since 1950.

Bar Graph

Use comparable increments

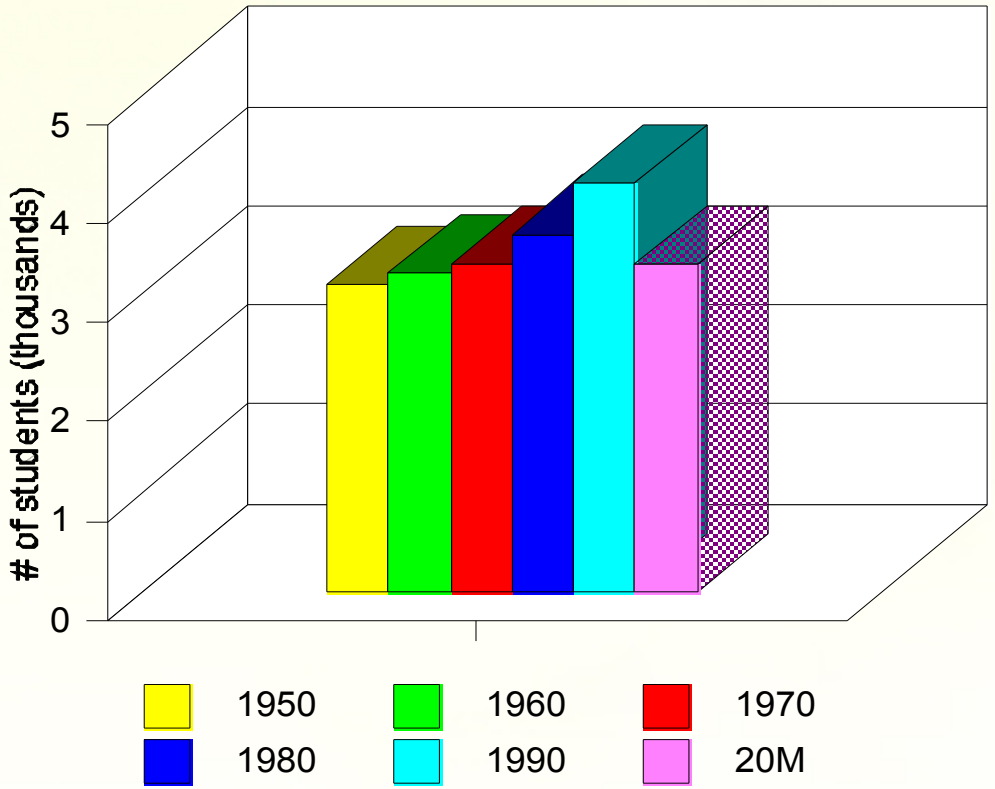


Figure 2. **Number of students attending Long Beach Polytechnic High since 1950.**

Pie Graph

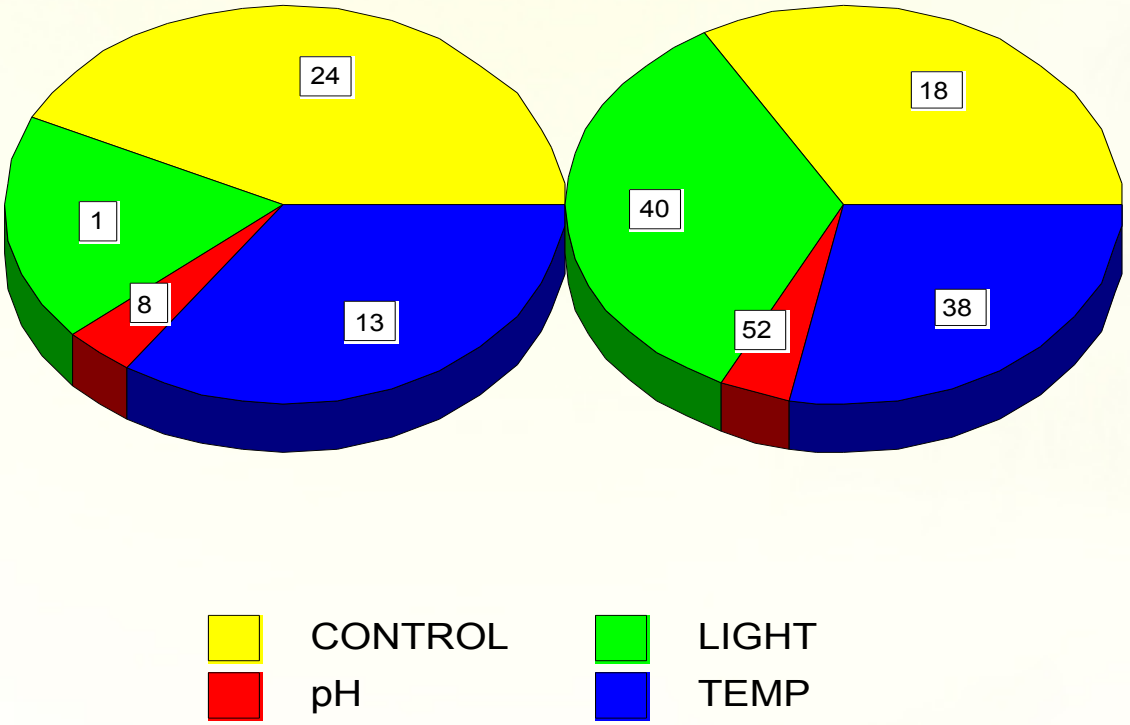
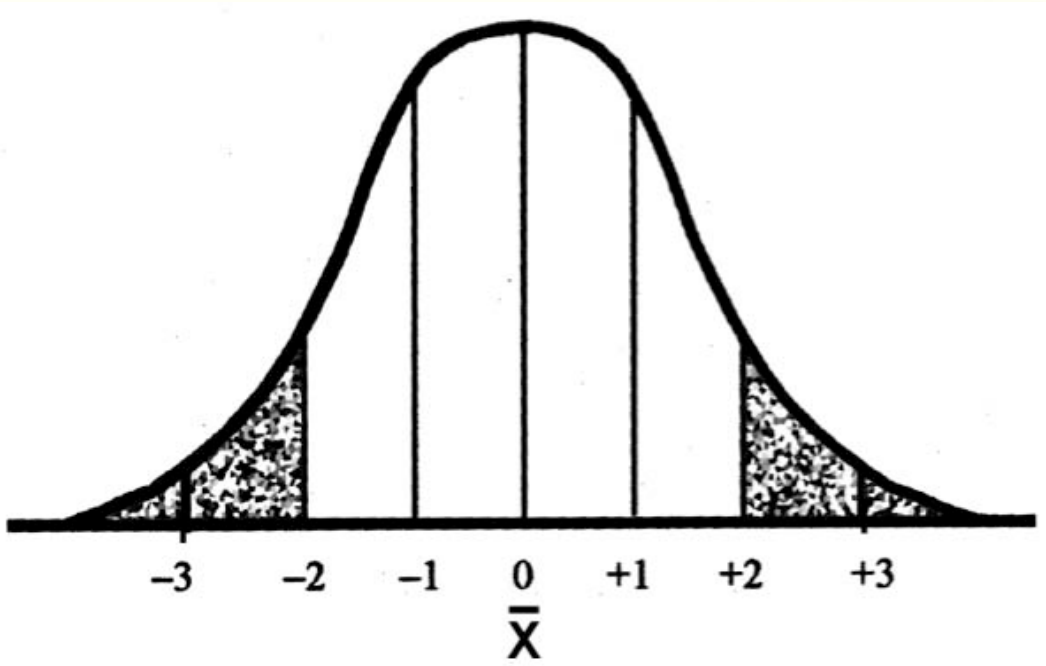


Figure 3. **The number of brine shrimp found in sections of tubing after the shrimp were exposed to changes in light, pH, or temperature, on 10/2/2003 at Cabrillo HS.**

Perform Comparative Tests

- Use computer software or calculator programs to look for **statistically significant differences** between data from experimental and control groups



Perform Comparative Tests

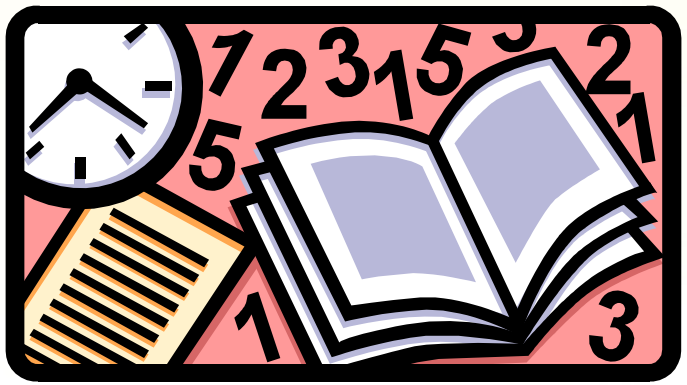
- **Standard Deviation**
  - Deviation of data ***from their mean.***
- **T-test**
  - For data sets that follow normal distribution
- **Chi Square**
  - Comparing data in % form in 2+ categories
- **Diversity Indices**
  - Compares species diversity and dominance between different communities
- **Mann-Whitney U test**
  - Differences in two sets of data by examining a sample of data from each population.

DISCUSSION

- **Results should be interpreted, critically evaluated, and compared to other reports.**
  - **The results section presents the *"news,"***
  - **The discussion section contains the *"editorial."***

Analyze The Results

- **Interpret statistics properly**
  - ***DON'T*** **make broad statements from small samples**
  - **Use P ≤ .05 that differences have occurred from chance alone**



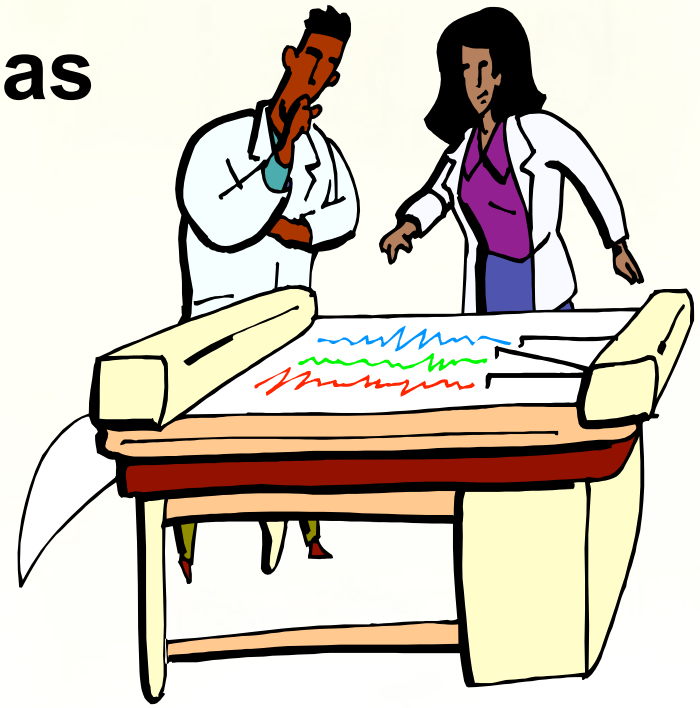
Analyze The Results

- **Examine the amount and possible sources of variability in your data, including experimental error.**

Analyze The Results

- **Examine your results for bias and evaluate its effect.**

- **Look at your data from as many points of view as possible**



Analyze The Results

- ***Do not make generalized statements that are not based on***
  - ***Your data***
  - ***Known facts***
  - ***Reason***

Analyze The Results

- **Relate your findings to other studies**
  - ***Cite those studies***
- **Remember that LEARNING, not the confirmation of your hypothesis, is your goal.**

CONCLUSION

* ***Can be included WITHIN the Discussion…***

- **A brief summary of your findings**
  - **Follow with a set of clear statements you believe explain your results.**

Was your hypothesis valid or invalid?

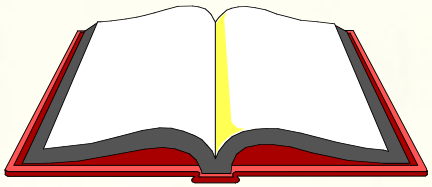
References

- ***References you used and referred to in your paper***
- **Alphabetical Order by author**
- **Several papers by the same author:**
  - **List most recent first**
  - **Indent 2nd & succeeding**

Books

One Author

Bronowski, J. 2010. The Ascent of Man. Little & Brown, Inc., Boston, 376 pp. *(total # of pages only)*



By Editor

Ellis, R. (ed.) 2011. Sharks. New York: Wiley, 256 pp.

2 Authors - Local Agency

Walker, R. G., and A. Maben. 2005. The Feeding Ecology of Bats. CA DFG. 44 pp.

Magazines & Scientific Journals

3 Authors, Journal Article

Cochran, J. A., Wiles, G. and J. Manack. 2011. Money, Banking, and the Economy. Fortune 34 (4): 47-55.

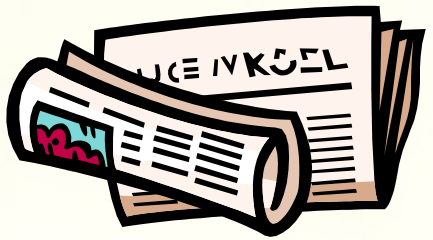
NO author, Scientific Bulletin

Insects of Guam. 2010. Bernice P. Bishop Museum, Honolulu Bull. 172.

Newspaper & Encyclopedias

Newspaper

Kristof, N. D. 3 Jan 2005. Oil Futures Plunge on OPEC Doubt. New York Times, DI-3.



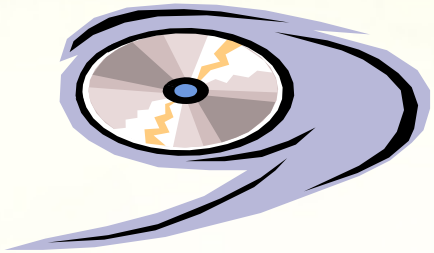
Article Within Encyclopedia

Halstead, B. 2008. Poisonous & Dangerous Marine Animals. Pp. 105-115 in Encyclopedia Britannica Vol. 93 (C. Brown, ed.), Academic Press, New York.

Non-print Sources

Film

Redford, Robert, dir. 1980. *Ordinary People.* With Mary Tyler Moore and Donald Sutherland. Paramount Studios, Hollywood.



Software

Bill Nye: Greatest Discoveries in Biology. 2005. Discovery School.com. DVD.

Non-print Sources

Internet

How to Produce Award-winning Science Projects. 2010. Nat. Assoc. of Biology Teachers Bulletin Board, @NABT.edu.

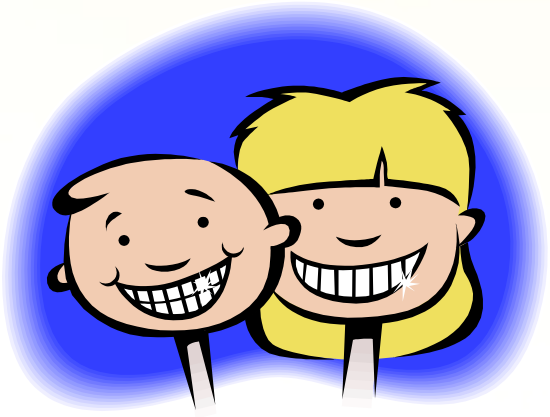
"Personal Communications" with an Expert

- ***(in person, on the phone, in letters or on the Internet)***

Collins, Dr. Charles 2009. Prof. of Biology, CSU Long Beach, CA.

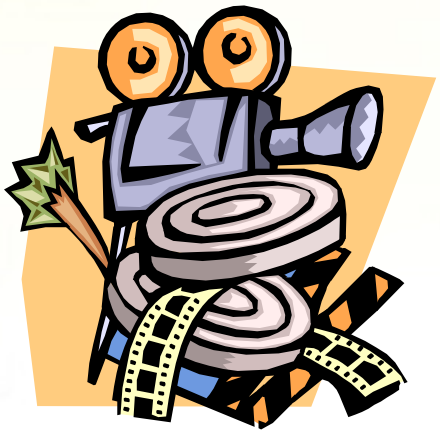
ACKNOWLEDGEMENTS

- ***Acknowledgements for Senior Projects cannot be on the display board!***
- **Identify the major people who gave you assistance**
- **Give them the thanks they deserve**



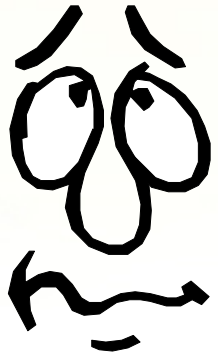
APPENDICES

- **Additional pictures and/or material you wish to include**
- **Make sure any appendices *are listed in the table of contents***
- **DON'T stuff this section unnecessarily** ☐ ***it will not win you points…***



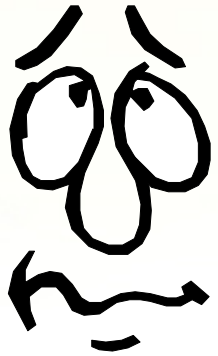
Common Problems

- **Failure to use**, evaluate, and interpret your data is the most common problem students have in report writing.
- **Ignoring results** because they differ from textbook generalizations.
- Bringing too much **irrelevant information** into reports.



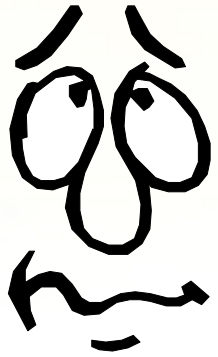
Common Problems

- Making small differences seem important.
- Discarding data because of variability and biases.
- Improperly labeled and cited figures and tables.



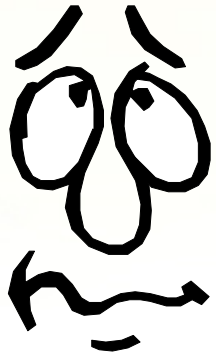
Common Problems

- **Inserting figures without identifying their contents or purpose**
- **Failing to number and place each figure close to where it is referred to in the text.**
- **Not working over the data to seek patterns and trends before preparing figures and tables.**



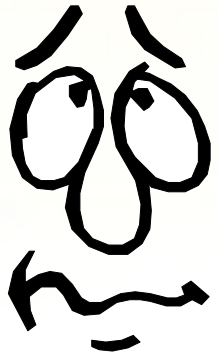
Common Problems

- ***Forcing a preconceived conclusion on the data.***
- ***"Fudging" your data: it is dishonest and unacceptable and* considered scientific misconduct.**
- ***Padding your report with excessive though honest numbers that serve no useful function.***



Common Problems

- **Not documenting ideas and conclusions with data, literature, and sound reasoning.**
- **Not relating your results and conclusions to accepted principles and concepts.**



Designed by

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Former AP Science Coach, LACOE

for the

Los Angeles County Science Fair

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