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Organizing with Headings

Headings are the titles and subtitles inserted in a text to divide up the sections. A title or subtitle is usually a noun phrase or a verbal phrase; it is not a complete sentence. Headings are used in formal papers, in many kinds of studies, and in grant proposals.

Why do you need headings?

Headings demarcate discrete sections of a paper; from a writer's standpoint, they divide the paper into separate writing tasks. Rather than waking up one morning with the prospect of having to write an extensive formal paper or proposal, you can, instead, work on separate sections at different times. When all the parts are assembled, you will have a complete first draft in hand. Start organizing your writing and your thinking in a way that will accommodate headings.

Not only do headings organize the writing task for the writer, they also organize material for the reader. Scientists and researchers must remain current in their fields. Because they devote much time to reading *broadly*, they may not always have time to read *intensively*. Headings direct the reader to the places in which he or she is most interested. For example, a scientist may find a "Results" or "Methods" section more pertinent than an introduction because, having knowledge of the field, that reader would not be attracted to a description of the general context. That reader may have already read the literature or may have written some of the articles surveyed in the literature search. A reader in the management category of audience, lacking expertise or interest in hard science, may turn directly to "Recommendations." Because the manager is less concerned with the *what, how, why* and is more interested in the *application* of that information, that section will be more pertinent.

If you extracted all your headings from the body of a report or a proposal, you would compile the Table of Contents for your report.

Generate headings for a paper or a proposal from the situation to which it responds. For instance, a progress report, which explains changes that

have occurred over time, would employ categories like "Past Work," "Present Work," "Future Plans" (or "Work Accomplished" and "Work in Progress"). A proposal, which requests funding, staff, or other support, would employ categories like "Project Description," "Specific Aims," "Significance," among others. The common headings for scientific papers that report results are "Introduction," "Materials and Methods," "Results," and "Discussion." Journals and granting agencies will specify the headings in their directions.

The following discussion will deal with three subdivisions of headings. If you ever write a long or a very detailed report, you may need to come up with more than three levels. It is acceptable to generate more levels as long as your manner of notation is consistent.

Kinds of Headings

First-Level Headings

First-level headings divide your report into the major sections. In a scientific paper, they correspond to the Introduction, Materials and Methods, Results, and Discussion sections. First-level headings are written in *all capital* letters. Do not mix caps (capital letters) with quotation marks or with underlining. First-level headings are *centered.* (Some journals observe a different convention for first-level headings, placing them flush-left. Adhere to the conventions of the journal or discipline for which you write.) Place the major heading two spaces above the following text and/or three spaces below the preceding text.

Note: For short papers, you can leave out the "Introduction" heading. It is understood that the title takes the place or fulfills the purpose of "Introduction."

Second-Level Headings

Second-level headings show subdivisions within a major section. Your introduction, for instance, may include subdivisions like "Previous Research," "Scope of the Study," "Limitations to the Study," "Purpose of the study," and so on. To write second-level headings, use a *combination of lowercase and capital letters.* Unless the conventions of your field specify differently, capitalize the key words in the title. This heading is *flush left.* It may be typographically set apart by bold or underlining.

Start the text on the *next line* and *indent* the first line. The second-level heading is placed two spaces below the preceding text and two spaces above the following text.

Third-Level Headings

Sometimes subdivisions within a subdivision need to be indicated. Third-level headings show this type of subdivision. For example, under [first-level] "Materials and Methods," within the subdivision "Subjects" [second-level heading], might be found a third level heading—the specific subjects, for instance. Third-level headings resemble second-level headings with the exception that third-level headings are *indented.*

If further subdivisions are needed, a fourth-level heading could be used: Indent the heading five spaces from the left margin. Put a period after the heading, then begin the text two spaces after the period, on the same line.

Headings and Outlines

If you remember your high school experience in making outlines, you will see that the headings take the form of a traditional outline without the numbers and letters; the outline and headings are structurally alike.

Below is a sample outline using numbers and letters to show the structure and hierarchy of topics.

Effect of Lomefloxacin, Cefazolin, and Cefonicid
on Human Lymphocyte Proliferation
Fernando Thadepalli

I. INTRODUCTION
II. MATERIALS AND METHODS
  A. Antimicrobial agents
  B. Mononuclear cell separation
  C. Mitogens
  D. Mononuclear lymphocyte transformation assays
  E. Measure of [^{3}H] thymidine incorporation
III. RESULTS
  A. Effects of antibiotic addition to unstimulated and mitogen-stimulated Mononuclear lymphocytes
  B. Effect of Lomefloxacin on lymphocyte proliferation
  C. Effect of Cefazolin on cell multiplication
  D. Effect of Cefonicid on lymphocyte growth
IV. DISCUSSION
  A. Antibiotic effects on mitogen-stimulated mononuclear lymphocytes
  B. Lomefloxacin and lymphocyte proliferation
  C. Cefazolin on cell multiplication
  D. Cefonicid and lymphocyte growth

Notice that the main divisions in this paper are those of a scientific research paper. If you were to convert this outline to the text of a paper, the

phrases keyed to Roman numerals would be first-level headings, the letters second-level headings.

It is important to remember that your selection of appropriate headings draws from the nature and body of your work. While the heads for scientific papers are generally prescribed by the conventions of publication, other writing scenarios may require you to create headings that are appropriate to your work. The following example presents an outline for a collaborative student project on sports injuries to the knee. "Anatomy of the Knee," "Injuries to the Knee," and "Treatment" form the major divisions in the body of the paper.

SPORTS INJURIES TO THE KNEE[1]
Jamale Carlyle, Dustin Cisneros, Premal Patel

I. Introduction
II. Anatomy of the Knee
III. Specific Injuries
    A. Menisci Injuries
    B. Collateral Ligament
    C. Anterior Cruciate Ligament
    D. Posterior Cruciate Ligament
IV. Treatment
    A. Menisci
    B. Collateral Cruciate Ligament
    C. Anterior Cruciate Ligament
    D. Posterior Cruciate Ligament
V. Bibliography

When the outline is fleshed out with text, the bold segment (Roman numeral III) appears as follows:

SPECIFIC INJURIES
[first-level heading]

As sports and fitness activities become increasingly popular, injuries of the knee occur more frequently. The types of knee injuries vary greatly, ranging from simple contusions and muscle strain to severe injuries at the ligament and joint surfaces. With all the movements that athlete makes during the duration of a game, it is possible that the athlete can injure his or her knee in a mishap. In sports, the most common injuries are related to the knee. Because the knee is such a large joint, various other injuries interact with the knee.

Menisci Injuries [second-level heading]

The most frequently occurring injury to the knees is to the menisci. The menisci are common injuries or torn as they become trapped or pinched between the femur condyles and the tibia. The damage sustained by menisci can range from a small tear along the periphery of the cartilage to a more serious injury along the longitudinal tear resulting in a displaced

section of the cartilage. Two classic symptoms of meniscal injuries include that of clicking and locking.

Clicking [third-level heading]

Clicking is an audible or palpable sensation often caused by torn menisci fragment rubbing against the femoral condyle, while locking is the mechanical blockage of the complete range of motion.

Locking [third-level heading]

Locking is usually caused by some kind of internal derangement. The most common cause of locking of the knee results from a fragment of an injured meniscus becoming caught between the femoral condyle and the tibial plateau, thus causing restrictioning of the complete extension. These injuries are the resulting factors of the menisci being injured by all the twisting activities during weight bearing, but can also be caused by direct blows to the knee, or chronic trauma.

Collateral Ligament [second-level heading]

The collateral ligaments are most commonly injured by a blow to the lateral aspect of the knee during a sporting event. The collateral ligament injuries are classified as sprains depending on the extent of the tear. A first-degree sprain is a microscopic tear of the ligament fibers that are stretched. A second-degree sprain is also a partial tear, although the injury results in a minute loss of function. A third-degree sprain is a complete ligament tear, with the loss of joint stability. These specific injuries to the collateral ligament are usually common among young adults.

Anterior Cruciate Ligament [second-level heading]

The ACL becomes vulnerable to rupture because of its tense stretched position when the knee is rotated or hyperextended. The ACL is frequently torn in contact sports, most commonly in football. These injuries also occur in basketball and baseball when the hyperextended knee is twisted or when the player collides with another player. In football accidents, a forceful blow to the knee often completely tears the ligament. An injury such as this can be a devastating event to the athlete because of the audible pop or crack, followed by swelling of the knee, and the inability to complete the game or continue in the participation of the sport.

Posterior Cruciate Ligament [second-level heading]

The PCL is less prone to injury, though a portion of its fibers are utilized through all degrees of flexion of the knee. Rupture of the PCL is much less common than rupture of the ACL and usually results from a direct blow to the tibia. When the PCL is torn, the integrity of the ACL must be carefully evaluated as well. Tears of both the PCL and the ACL indicate a dislocation of the articulations between the condyles of the femur and the tibia.

Headings in Proposals

In addition to scientific papers, proposals are also organized by headings. The 1992 National Science Foundation (NSF) published grant proposal guidelines for undergraduate science programs seeking desired or necessary equipment to improve courses in science, mathematics, or engineer-

ing.[2] The proposal guidelines specified that grants be organized according to a particular outline. The format for the entire proposal was composed of six parts—a combination of written text and completed forms. That format follows:

Proposal Format for 1992 NSF equipment grant
1. Cover sheet (NSF form 1207)
2. Project Summary Form (NSF form 1295)
3. Detailed Budget (Equipment List)
4. Table of Contents
5. **Narrative** (Limited to 12 double-spaced pages)
6. Appendices

Section 5, the Narrative, was to be organized according to the following outline.

5. **Narrative**
   - A) The Current situation
   - B) The Development Plan
   - C) Equipment
     - 1) The Equipment Request
     - 2) The Equipment on Hand for the Project
     - 3) Equipment Maintenance
   - D) Faculty Expertise
   - E) Dissemination Plan
   - F) Citations

Rules for Headings

1. Check the journal specifications or any special instructions for a preferred style of headings. If no special instructions are given, adopt the form provided by this book.
2. Be consistent in the way you write and punctuate headings. Do not mix punctuation. Do not switch to all lowercased letters in first-level headings if two times out of three, you used all capitals.
3. Be consistent in the divisions and subdivisions indicated by the headings; traditionally, when you write an outline you must have a "B" if you have an "A," or you must have a "2" in the subdivision if you have a "1."
4. You can leave out the "Introduction" heading in a short report. It is understood that the title takes the place or fulfills the purpose of "Introduction."

5. The heading be accurate and complete. The phrase must indicate what the contents of the section will be.
6. Phrase headings in grammatically parallel terms.

Exercises

1. Proposal Outline

The National Science Foundation's Grant Proposal Guide (NSF 94-2, January 1994) provided the following specifications (to be met within fifteen pages) for a part of the proposal. Using a project you have in progress now (or a project you would like to do) as the basis for this question, make an outline of the way you would use those fifteen pages to meet the proposal requirements. What headings and subheadings would you generate?

> The main body of the proposal should be a clear statement of the work to be undertaken and should include: objectives for the period of the proposed work and expected significance; relation to longer term goals of the investigator's project; and relation to the present state of knowledge in the field to work in progress by the investigator under other support and to work in progress elsewhere.

2. Results and Discussion

Recall the distinction made in Chapter 1 between *what you see, what you think you see,* and *what you think it means.* In a formal scientific paper, the observations made at the conclusion of an experiment (*what you see/what you think you see*) are placed under the heading "Results" and the significance of the results (*what you think it means*) are placed under the heading "Discussion." In the follow selections taken from "Genetic Variation in the Hawaiian Species *Schiedea* and *Alsinidendron* (*Caryophyllaceae: Alsinoideae*),"[3] match the appropriate paragraphs to the "Results" and "Discussion" headings. Refer to particular words or phrases in each paragraph to support your answer.

> 1. In order to measure the amount of genetic variation, general trends in enzyme variability are noted. The percentage of monomorphic populations for all enzymes resolved is shown in Table 3. Enzymes that were scored for more than one locus (GOT and LAP) usually contained a locus that was much more variable than the other locus. These multiple locus alleles also showed the greatest range in variability. In sixteen of the twenty-one populations analyzed, the fast locus of LAP was the monomorphic, i.e., 76.2% of the populations were monomorphic at this locus. The most variable system of the nine loci surveyed was the fast locus of GOT with only 38.1% of the populations being monomorphic at this locus. The rest of the enzymes have intermediate values between these two extremes. These data show the degree of variability in the enzymes used to estimate the genetic similarity and distance values in *Schiedea.*

> 2. Overall, genetic variability of *Schiedea* is much greater than for other endemic Hawaiian species. Island populations characteristically tend to show smaller amounts of genetic diversity than mainland species due to the high probability of small population size, founder effect, and bottlenecks associated with island colonization. This phenomenon is compounded by additional founder effects as species migrate down the island chain (Witter and Carr, 1987). The great amount of diversity

in *Schiedea* may be attributed to breeding systems that promote outcrossing which is evidence by the lack of variability in autogamous hermaphroditic species. There is no significant difference in the amount of genetic diversity among the outcrossing species because they all contribute to genetic differentiation. Therefore, breeding system does play a role in varying the amount of genetic variability.

3. Scrambled Sentence Exercise

The following sentences are taken from a student-written scientific paper.[4] The headings used in this paper include "Introduction," "Materials and Methods," "Results," and "Discussion." Place each of the following statements under the appropriate heading. Generate subheadings as appropriate. Write a title.

1. Compound 1 was eluted from the column using 100% hexane. This component is colorless, does not absorb UV light, is undetectable by sight until applying the elution fraction to TLC using vanillin.

2. Zoopharmacognosy is the scientific study that describes the process by which wild animals select the use of plant-derived properties (i.e., leaves, stems, roots, resins, etc.) with medicinal properties for treatment and prevention of disease.

3. The chemistry suggests insect repellent properties.

4. Sesquiterpene lactone, similar to 8-b-asterolide, has been shown to exhibit ectoparasitic properties. Also, sesquiterpenes similar to b-slinene also have shown to possess insect repellent as well as many other biological properties.

5. Chemical analysis, both technical and analytical, has been utilized as a precursor in understanding the potential therapeutic properties of the resin.

6. The second and third major constituent eluted from the column were collected using a 40/60 hexane/chloroform solvent gradient.

7. Coatis (*Nasua Narica*) of the island of Baro Colorado have been observed utilizing a resin from the tree *Trattinnickia Aspera* as a topical agent.

8. The chemical constituents of the resin include two triterpenes, one terpene, and one sesquiterpene lactone. The chemical constituents suggest ectoparasitic repellency properties.

9. The chemistry of the resin is consistent with the plant family *Burseraceae*. Triterpenes frequently exist in the family *burseraceae*.

10. Bands of coatis approach the grooming tree and scrape the bark with their paws, releasing milky resin from the tree. The milky resin is then groomed into their furs while the brittle-older resin is disregarded.

4. Headings with Temporal Divisions

A common way to break up a text is by using an arrangement in time: past, present, future. A progress report, for instance, would make use of these headings, measuring progress by the work completed against the work remaining. Can you think of other writing genres or scenarios that might make use of this temporal division?

5. Headings with Divisions based on the Real/Ideal Division

A comparison between the ideal and the real can also be the basis of written projects. How might you use this distinction as the basis of a formal division in a scientific paper?

References

Day, Robert A. *How To Write and Publish a Scientific Paper.* ISI Press, 1979.

Lannon, John. *Technical Writing.* Little, Brown,and Company, 1979.

Pelayo, Arturo. "The Chemical Study of Resins from *Trattinickia aspera* used by Coatis for Grooming." Unpublished paper produced for Dr. Luis Villarreal's Writing 199 class. University of California, Irvine, Winter 1994.

Straub, Christina. "Genetic Variation in the Hawaiian Species *Schiedea* and *Alsinidendron* (*Caryophyllaceae: Alsinoideae*)." Unpublished paper produced for Dr. Luis Villarreal's Writing 199 class at the University of California, Irvine, Winter 1994.

Thadepalli, Fernando. "Effect of Lomefloxacin, Cefazolin, and Cefonicid on Human Lymphocyte Proliferation." Unpublished paper produced for Dr. Luis Villarreal's Writing 199 class at the University of California, Irvine, Winter 1993.

Notes

1. Collaborative student paper produced for CAMP (UCI), July 1995.
2. Instrumentation and Laboratory Improvement: Program Announcement and Guidelines, pp. 3–6. Directorate for Education and Human Resources, Division of Undergraduate Education. Closing Date: November 16, 1992. Because guidelines, specifications, and grant awards change, these instructions may be outdated. For further information about applying for actual grants, contact the NSF.
3. A paper produced by Christina Straub for Dr. Luis Villarreal's Writing 199 class at the University of California, Irvine, Winter 1994.
4. Arturo Pelayo, "The Chemical Study of Resins from *Trattinickia aspera* used by Coatis for Grooming." Unpublished paper produced for Dr. Luis Villarreal's Writing 199 class. University of California, Irvine, Winter 1994.