Scientific Papers

New model for lab reports

Announcements

- Class Book Debate – Tuesday night, 7:30 PM, C-106 Holmes

Microsoft Office

- MSU Computer Store
- Office 2003 PRO WIN, MEDIA &LICENSE, ACADEMIC STUDENT SELECT
- $60.00

Lab Reports

- Lab Reports are similar to what scientists publish in research journals
- Follow format of scientific papers

Key Parts

- Introduction
- Methods
- Results
- Discussion
- Tables and Figures
- Literature Cited
- Abstract

Introduction

- Description of the general question and background
- Description of current project's scope and general methods
- Hypothesis / hypotheses and predictions
Hypothesis
- Plural is hypotheses
- Tested and supported, not proved!
- I tested the hypothesis that smaller computer monitors are harder to use.
- I tested the hypothesis that smaller computer monitors are harder to use by comparing readability tests on a 15 inch and 17 inch monitor.

Null Hypothesis
- States that there is no difference (between observed and expected, if there had been no effect)
- H₀: "There will be no difference in readability between 15" and 17" monitors."
- H₁: "There will be no relationship between processor speed and startup time, indicated by a line with a slope of 0."
- DO NOT INCLUDE NULL HYPOTHESIS IN PAPER

Hypothesis Testing
- Statistical Tests are how scientists decide if data support their hypothesis (NOT PROVE their hypothesis)
- Four major statistical tests: T-test, X² Test, Regression, ANOVA

Hypothesis
- Processor speed has an effect on the performance of the computer.
- Null Hypothesis
  - H₀: Processor speed has NO EFFECT on the performance of a computer.

Hypothesis Testing
- Hypothesis testing is using statistical values to determine whether the Null Hypothesis is correct
- Common Statistical Tests for Hypotheses: t-Test, ANOVA, Regression, X² (Chi – Square)

Statistical Tests and Probability
- Statistical tests give a value
- That value can be related to a probability
- Probability is likelihood that NULL hypothesis is correct given the data you have
- If P < 0.05 (1/20), then you conclude NULL hypothesis is FALSE
**T-Test**

- Compares differences between two means

- Formula: \( T = \frac{(\bar{x}_1 - \bar{x}_2)}{SEM} \)
  - SEM is Standard Error of Mean [SD/\(\sqrt{N-1}\)]

- T Values: Difference between mean in comparison to the amount of spread in your data

**T-Values**

- If \( T > 2.5 \) or 3.0, difference is usually significant (this depends on your sample sizes)

**Hypotheses for current study**

- What were we testing?
- How did certain characteristics affect computer performance.

**Use of Tests**

- \( t \)-Test: Comparing two means
- ANOVA: Comparing multiple means
- Regression: Looking for a slope in line
- Chi-Square: Looking at distribution patterns

**Hypotheses**

- The startup speed of a computer is determined by processor speed.
- The startup speed of a computer is determined by the amount of RAM.
- The stability of a computer is affected by its operating system.

**Methods**

- Explain what steps were taken in collecting data and why
- Use past tense
- Use active voice
- “I entered data into a form,” not “The data were entered into a form.”
Results

- Present general trends without comment, bias or interpretation
- Present all relevant results, even those that do not support the hypotheses
- If statistics are used, report statistical value and probability in parentheses
- Refer to tables and figures
  - "Startup speed decreased as processors speed increased (Figure 1)."
  - "Most computer used a version of Windows (Table 1)."

Discussion

- Discuss the results and whether they support the hypotheses
- Discuss relevance to work by others
- Avoid redundancy with results
- End with a summary of the significance of your work – a conclusion paragraph

Tables and Figures

- Each table and figure has a name, e.g. Table 1, Table 2, ... and Figure 1, Figure 2, ...
- Tables are data tables
- Figures are graph, maps, photos, drawings, etc.
- Can be pasted into MS Word document from Excel
- Each should have a Caption, e.g. a description of what the table or figure represents

Captions

- Captions are descriptions of the table or figure, include details necessary to understand the item
- Tables: Caption above
- Figures: Caption below

Example

![Example Image](image.png)

Figure 1. Amount of RAM in MB vs. average startup time for 45 computers with Windows XP operating system. Trendline shows a negative relationship.

Literature Cited

- Provide details of any citations in paper
- Format varies from field to field and journal to journal
- Only list resources cited in paper, not general references
- Follow format in Guidelines for Writing Scientific Papers used in LBS 158H
Abstract

- First page of paper after title page
- Summary of entire paper, starting with introduction and going to discussion.
- Includes:
  - Purpose of Study
  - Brief statement of methods
  - Brief statement of results
  - Brief statement of discussion and conclusion

Title Page

- Title of project
- Your name
- Course number
- Date

Putting it all together

- Title Page
- Abstract Page
- Body: Introduction – Methods – Results – Discussion
  - Tables and figures can be embedded or at end of body
- Literature Cited starts on new page

Scientific Paper Assignment

- Due next Friday (February 27)