

SCIENCE AND ENGINEERING FAIR INVESTIGATORY PROJECT PACING GUIDE

Part 1: GENERATING RESEARCH IDEAS, TOPIC SELECTION AND FORMULATING THE RESEARCH PROBLEM

Introduction - The Nature of Science

- a. What is S.T.E.M.?
- b. Safety First! (Laboratory Safety Procedures and Contract)
- c. Working like a Scientist: Scientific Attitudes
- d. Ethical Issues and Constraints

Unit 1: Generating Research Ideas, Choosing a Research Topic, Formulating the Research Problem/Question and Getting Approval

- a. Reading scientific articles (using vignettes)
- b. Observing nature
- c. Analyzing phenomena
- d. Choosing Preliminary Research Topics
- e. Science Topics for Investigation – Do's and Don'ts
- f. Topic Selection and Approval
- g. The Research Problem/Question

Part 2: REVIEW OF RELATED LITERATURE, WRITING A HYPOTHESIS AND THE RESEARCH REPORT

Unit 2: Review of Related Literature

- a. Identifying Reliable Scientific Resources
- b. Using Technology, Search Engines and Research Tools
- c. Formulating Background Research Questions
- d. Notetaking Strategies
- e. Avoiding Academic Dishonesty
- f. Citing Sources and References

Unit 3: Writing the Hypothesis and the Research Report

- a. Identifying Cause and Effect
- b. Independent vs. Dependent variables
- c. Practice Writing Hypotheses

- d. Formulate investigatory project hypothesis using “If...then...” format based on research and approved topic
- e. Writing the research report

Part 3: THE RESEARCH PLAN: VARIABLES, MATERIALS, PROCEDURES

Unit 4: Steps of the Scientific Method

- a. Variables – IV, DV, control, extraneous
- b. Safety requirements and considerations when setting up experiments
- c. Materials needed
- d. Procedures (step by step)
- e. Experimental Design Diagram (EDD)
 - Independent and Dependent Variables
 - Levels of IV
 - Number of Trials
 - Constants
 - Control (if any)

*Required Science Fair Forms

Part 4: EXPERIMENTATION AND DATA COLLECTION

Unit 5: The Experimental Set-Up

- a. Independent and Dependent Variables
- b. Levels of IV
- c. Number of Trials
- d. Constants
- e. Experimental subjects (if any)

Unit 6: Data Collection

- a. Qualitative vs. Quantitative Data
- b. Recording Data and Documentation (pictures and narratives)

Part 5: EXPERIMENTAL RESULTS: DATA TABLES, GRAPHS, ANALYSIS OF DATA AND CONCLUSION

- a. Tables and Graphs
- b. Analysis of Data and Interpretation (Descriptive vs. Inferential Statistics)
- c. Conclusion

Part 6: FINAL PROJECT REPORT, SCIENCE NOTEBOOK/JOURNAL, DISPLAY BOARD AND ABSTRACT

- a. The Final Investigatory Project Report
 - Title Page
 - Table of Contents
 - Abstract
 - Review of Related Literature
 - Hypothesis
 - Variables
 - Safety Considerations/Precautions
 - Materials
 - Procedure
 - Results (tables and graphs)
 - Conclusion
 - Bibliography (works cited)
 - Pictures
- b. The Project Display Board
 - How to set up a project display board
- c. The Abstract
 - How to write an abstract

