

Littleton High School
SCIENTIFIC EXPERIMENTAL DESIGN RUBRIC (EDR)

Feedback is provided for each component (a,b,c...) according to the following scheme:

- 3 The requirement is fulfilled in entirety
- 2 The requirement is partially fulfilled
- 1 The requirement is minimally addressed
- 0 The requirement is missing

ABSTRACT An abstract is a brief explanation of an experiment. Although it is the first section read it is the last section written as it summarizes everything from the purpose of the experiment through the conclusion. After reading an abstract the reader understands what was investigated, how the experiment was designed, what results were obtained and what conclusion was drawn.

The abstract includes:

- a. a clear and focused purpose
- b. a brief summary of the method of data collection
- c. a summary of the significant results
- d. the conclusion drawn from the results

BACKGROUND INFORMATION The background information provides sufficient content to the reader so they can understand the purpose of the experiment, the relevant science content, and a summary of the experimental design. The writer must research the background information and properly cite (APA documentation) all sources used. A brief summary of the purpose and the experimental design should be included at the end.

The background information includes:

- a. a general overview of the topic of study that introduces the main idea (first paragraph)
- b. clear, focused, accurate and detailed information sufficient to understand the science investigated during the study that is supported with a reliable source (middle paragraph)
- c. proper citations of the source using a () reference
- d. a brief summary of the purpose and method for data collection (final paragraph)
- e. a reference section with sources cited in complete APA format

PROBLEM STATEMENT A problem statement describes what is being investigated and identifies variables and conditions being held constant. The purpose, variables, and constants are addressed in the following order.

The problem statement includes

- a. an accurately stated purpose of the experiment
- b. accurately identified independent and dependent variables
- c. accurately identified conditions that must be held constant

HYPOTHESIS : A hypothesis **uses scientific principles and/or prior knowledge** to predict the outcome of how the independent variable will affect the dependent variable. The expected outcome reflects the purpose of the investigation and is clearly stated.

The hypothesis includes:

- a. a statement of the effect the independent variable have on the dependent variable(s)
- b. an explanation of why the independent variable affects the dependent variable(s) in this way based on scientific principles
- c. support for the scientific explanation from a reliable source
- d. parenthetic reference and APA works cited for the reliable source

DESIGN The design of the experiment provides a plan to investigate the problem and test the predictions made in the hypothesis. It should include enough detail so that the experiment is reproducible. The experimental set-up and measurement techniques must be described.

The design includes the following sections:

- a. MATERIALS
 - a list of all equipment and materials
 - relevant sizes, quantities, and/or concentrations
- b. SAFETY GUIDELINES
 - identification of potential hazards in using equipment/materials
- c. DIAGRAM
 - illustration of equipment set up with appropriate labels
- d. PROCEDURE
 - directions in logical and numbered steps
 - detailed instructions for collection of **both** qualitative and quantitative data
 - instructions for how identified conditions are kept constant
 - instruction for multiple trials
 - instructions to test control when appropriate

RESULTS The results of an experiment are presented in neat, well-organized tables including observations and measurements.

The data tables include:

- a title that states the independent and dependent variables
- labeled columns and rows including **metric units**
- all qualitative and quantitative data based on instructions in procedure
- correct uncertainty for measurements

DATA PROCESSING AND PRESENTATION Relationships between variables are displayed on graphs and data are processed using calculations to help the scientist use the data to construct meaning in evaluating the hypothesis.

- a. For each type of calculation:
 - the calculations performed are useful for evaluating data
 - a title indicates what is being calculated
 - the word formula used is shown
 - all work is shown
 - the calculation is performed accurately
 - each number includes an appropriate metric unit
 - the appropriate number of significant figures is represented in the answer
- b. For every graph:
 - the title includes independent and dependent variables and reflects the relationship
 - the axes are labeled and include correct metric units
 - the dependent variable is placed on the y-axis and independent variable is placed on the x-axis
 - the scale of numbers on each axis is consistent and reasonable
 - data is plotted accurately
 - an appropriate graphing style is used
 - at least 2/3 of grid is used

CONCLUSION AND EVALUATION Patterns and relationships are identified using raw and/or processed data. A conclusion explains the relationships and evaluates the hypothesis using scientific principles. The evaluation discusses the effect of error, the level of confidence, and the validity of the study.

- a. The conclusion includes:
 - a restatement of the purpose (NOT problem statement) and hypothesis
 - a statement of the relationship between variables with experimental data as evidence
 - If a hypothesis is written, the results are compared to the stated hypothesis supporting or rejecting the hypothesis
 - accepted scientific laws, theories, and/ or principles used to explain what happened
 - a parenthetic reference for the source providing law, theory, or principle
 - a comparison between results and published/ accepted values
 - a parenthetic reference for the source providing accepted values
- b. The evaluation of the experiment includes:
 - logical sources of error (excluding human error)
 - an explanation of the effect of the error on experimental results
 - an explanation of the validity of the experimental results based on error analysis
- c. Modifications for the experiment include:
 - improvements to the procedure based on identified errors
 - suggestions for further study on this topic with an explanation
- d. The reference section includes:
 - sources that are cited in complete APA format

REFERENCE SECTION The reference section includes proper documentation of the sources used as evidence to support ideas. Information used within the body of paragraphs needs a parenthetical reference in the paragraph. Every source referenced in parentheses should appear in the works cited section at the end of the report.

References to outside sources include:

- a parenthetical reference according to APA formatting (author last name, year of publication) is included within the text of the report at the end of the citation
- a complete list of all sources used in the text, using full APA documentation, in a Works Cited section

SIX TRAIT WRITING EXPECTATIONS

ORGANIZATION	VOICE	WORD CHOICE	SENTENCE FLUENCY	CONVENTIONS
<ul style="list-style-type: none"> a. Clear intro, body, and satisfying conclusion b. Thoughtful transitions clearly show how ideas are connected c. Sequencing is logical and effective 	<ul style="list-style-type: none"> a. Tone furthers purpose and appeals to audience b. Appropriately individual and expressive 	<ul style="list-style-type: none"> a. Words and specific and accurate b. Language and phrasing is natural, effective, and appropriate 	<ul style="list-style-type: none"> a. Sentence construction produces natural flow and rhythm 	<ul style="list-style-type: none"> a. Grammar and usage are correct and contribute to clarity and style b. All outside sources used are properly cited. See Writers Inc or library website for APA documentation