

## IMRAD & SCIENTIFIC WRITING

### IMRAD (or I'M RAD)

Writers are usually called upon to document several types of processes. One of which observing the rigors of the scientific method (which involves deriving a hypothesis, experimenting or testing the hypothesis, and formulating a theory given the outcomes of the experimentation) is the IMRAD system or I'M RAD (as I'm "radical") system.

This simple mnemonic acronym stands for INTRODUCTION, METHODS AND MATERIALS, RESULTS, and DISCUSSION. Each heading represents a section of material which is explained in your lab documentation, scientific/technical paper, or report. When using this form, you place all the corresponding information under the corresponding heading.

So, what does each section contain?

#### INTRODUCTION

- Explains what you are researching
- Includes a pertinent review of the literature (any previous scientific/popular work on the concept).
- Make a note, oftentimes scientists will include a totally new section under the heading of

#### REVIEW OF THE LITERATURE or LITERATURE REVIEW.

- Briefly summarizes what you plan to do, how you plan to do it, and any results found (unlike a mystery novel, you provide all of the pertinent information up front, which in-turn helps another researcher to quickly determine by abstract or by introduction if the piece and its findings are useful (as opposed to reading the entire piece).
- Discusses the purpose for the research (objective and subjective)

#### METHODS and MATERIALS (a.k.a. METHODOLOGY)

- Explains in-depth the process used to conduct experimentation, observations, or other scientific method.
- Lists all materials used in the process (in some IMRAD documents, researchers even include where they purchased the material and the specific manufacturers – for example, 50ml Capacity Beaker, 10ml Graduation, 1lbs. from Henry's Hydrological Supply Company. The point is to allow another group of scientists to recreate and reassess the experiment and obtain the same findings.
- Lists all contextual information (e.g. where the experiments/observations took place, who were the subjects, and any information needed to repeat the research).
- Process steps are presented incrementally and chronologically.
- Cautions/Warnings/Notes are presented throughout, when necessary.
- In addition, some scientists like to put intermediate observations along with the process (for example: When one has accomplished task B, you will notice a pungent smell and distinct green color appearing in the beaker).
- Any mathematical equations used should be mentioned and explained in this section.
- Recognize any potential sources of error.

## RESULTS (a.k.a. DATA, FINDINGS)

- Any data, findings, equations, or other matter obtained through experimentation should be put into this section and explained thoroughly. The results section is usually the shortest or the longest section of the piece.
- Discuss any bad outcomes at length.

## DISCUSSION (a.k.a. CONCLUSION/RECOMMENDATIONS)

- This section answers the question: What do we do with the findings?
- Use this section to formulate recommendations or elaborate on further research that is needed (be specific as much as possible).
- If an experiment and results do not turn out well, it is perfectly okay to admit defeat and suggest that “although the findings do not cannot support the formulation of a theory, further research may be needed to obtain satisfactory results.” Or “further research may be needed since X and Y interfered with the outcomes of the experiment (cite significant sources of error)”
- Discuss how the research process and/or findings lead to positive/negative outcomes as related to the purpose/intent of the research.