Written and Oral Communication

Written and Oral Communication

The net result of any experimentation and measurements is to convey the facts from the investigator's mind to that of interested readers (6).

Hence, good communication abilities, both written and oral, are paramount and are probably the most important part of the investigations.

Most of the time, the ability to communicate effectively both in written form and oral form will determine the level of promotion of an individual.

Written and Oral Communication

Good writing and good speaking abilities are very important and are a lifetime endeavor. We never reach perfection as long as we live.

We will consider two forms of communication

- **Written**
- **Oral**

A. Written Reports

1. **Generally speaking, we consider only three types of written reports.**

   These are:

   - **Research**
   - **Memo**
   - **Letter**

- **We will review the Research Report in detail**
- **since it is the type of report that is used in large research studies. Other reports forms are condensed aspects of a detailed Research Report.**

A. Written Reports

As previously discussed, a research report is a very detailed, lengthy report on an investigation.

A memo report is less detailed than a research report but has sufficient detail for the reader, generally your immediate supervisor.

A letter report usually is an executive summary of the study and gives the reader the key significant facts, results, conclusions and recommendations. It is written for leaders of the organization who do not have the time, nor is it necessary for them, to get into many of the details. They simply need an overview to be able to make the necessary decisions, which is their responsibility.

A. Written Reports

- **Often, " ... the real ability of a technical man remains unrecognized because the results of his work are poorly presented."**

- **Rhodes, F. H., "Technical Report Writing“, McGraw-Hill book Co. Inc., New York, N. Y., 1941.**

A. Written Reports

2. **The purpose of a written report is to convey a set of facts from the mind of the writer to that of the reader. The report must be written with:**
    - **Clarity**
    - **Precision**
    - **And Completeness.**

A. Written Reports

The literary prose used in ordinary, non-technical writing is:

- **Effective without being precise,**
- **Suggests rather than defines, and**
- **Implies rather than states.**

4. **Technical prose, on the other hand, must focus on:**
   - **Essentials**
   - **Being very clear and definite.**

A. Written Reports

For technical prose,

- **The writer must understand the material that he/she is trying to present.**
- **The material must be complete and organized.**
- **The results must be presented in logical order, for example**
  - **Experimental method**
  - **Experimental results**
  - **Conclusions**

A. Written Reports

- **The report must be written in good language (English in the U.S.) and must have good sentence structure.**
- **Good formatting with proper paragraphing is essential.**
- **The report must be complete yet it must be <u>concise</u> because a concise report is easier to follow.**

A. Written Reports

5. **The requirements of a good report are:**
   - **Clearness**
   - **Completeness**
   - **Proper organization of material**
   - **Correctness of presentation**

A. Written Reports

5. **The steps in report writing are:**
   - **Collect data**
   - **Assemble data**
   - **Analyze data**
   - **Outline the report**

     The organization and order in which various topics are to be discussed with:
     - **Divisions**
     - **Subdivisions**

A. Written Reports

- **It is very important to first prepare a detailed outline of what is to be discussed prior to any writing.**

- **This outline is essentially the objectives section of the report and this objectives section of the report can be used as a guide to structuring the entire report.**

- **When the report has been written in this manner, it will be complete.**

A. Written Reports

7. **After the report is written,**

   Ask yourself,

   1. **Is the discussion clear?**
   2. **Is the discussion complete?**
   3. **Is the material logically arranged?**
   4. **Have all unnecessary words and statements been eliminated?**
   5. **Are there any errors in grammar?**

8. **All tables and graphs should be near the point of discussion not all in the back of the report.**

A. Written Reports

- 9 **Correct styles, conventions and correct usage of words is essential.**

  - **Technical reports are usually written in the impersonal style. For Example,**

    Do not write:

  - **I opened the valve.**
  - **We measured the distillate flow.**

    Instead write:

    The valve was opened.
    The distillate flow was measured.

A. Written Reports

Sentences should be properly structured.

A good sentence length averages about 17 words because short sentences are to choppy and long sentences are hard to follow.

Example:

A vertical kettle was used. It was cylindrical and made of steel. The kettle was three feet in diameter. It was six feet high. Both the top and the bottom were dished. It was provided with a steam jacket.

This paragraph can be better stated in one sentence.

The kettle was a vertical, steam jacketed, steel cylinder, three feet in diameter and six feet high, with dished heads.

A. Written Reports

11. **The selection of words is very important. For example, the word obtained is used as:**

    - **Temperatures are obtained.**
    - **Samples are obtained.**

The word <u>obtained</u> is used instead of the following words

Collected, drawn, taken, removed, read, computed, calculated, estimated, derived, or measured.

The word *undoubtedly* means certainly. Therefore, do not use *probably* when you mean undoubtedly.

A. Written Reports

Colloquial expressions are never used.

For example, to write, "the agreement is not too good", is a colloquial usage.

It is better to write,

"The agreement is rather poor."

The use of symbols instead of words is to be avoided.

Hence, do not say the dV/dt's vary as the 0.51 of the ΔP's

But rather say the volumetric rate of flow varies as the 0.51 power of the difference in pressure.

1. The Research Report

THE FORMAL REPORT SHOULD CONTAIN THE FOLLOWING SECTIONS:

Binder:

NJIT standard laboratory binder with the appropriate information on it. This will include such items as date, title, group number, section, etc.

Title page:

List proper title, authors, department, institution, location, and date.

Table of Contents:

This section should contain a listing of all the sections in the report with the page designation.

The Research Report

Abstract

This section is sometimes called the executive summary and is written for distribution to persons who are only interested in a simple digest of the work done.

This section is the most important part of the report for your manager, and should be informative and indicative of all the work you have done.

The Research Report

Your abstract should tell the reader the following:

1. **What you did during the experimentation.**
2. **What your results are.**
3. **What your conclusions are.**
4. **What your recommendations are.**

For examples of written abstracts, refer to Chemical Abstracts, Journals, or Handbooks for Reporting Information.

The Research Report

- **Introduction**
- **This section relates the applicability of the experimental problem being studied to "real world" engineering problems. This is usually a paragraph length statement. In the Introduction to the report, tell the reader**

1. **What the subject of the report is?**
2. **What is the importance of this subject to your field of study?**
3. **What is the reason for making this study?**
4. **What are some previous industrial uses and applications of this subject?**
5. **How will the data obtained in this study be used?**

In most cases, the most expedient place to get the above introductory material is in the first paragraphs of the subject in any textbook or related publication.

The Research Report

- **Objectives**
- **Sometimes this section is entitled, "The Purpose of the Experiment", but, in any case, it is an itemization which spells out the reasons why this study was undertaken.**
- **This section contains the necessary items that were the basis of the experimentation.**
- **Once written properly, this section serves as a guide to structuring the remaining sections of the report and insures a complete analysis of the study.**

The Research Report

- **The Objectives section is simply presented**
  - **Objectives**
    - **The Objectives of this study are**
      - **1.**
      - **2.**
      - **3.**

The Research Report

- **Theory**

- **This section discusses the theoretical aspects of the problem analysis and should be presented in and integrated qualitative-quantitative fashion.**

- **The theory portion of the report should only present the necessary points and equations pertinent to the subject experiment.**

The Research Report

- **Description of the experimental apparatus**
- **The report should contain a neat sketch of the apparatus and a detailed discussion of any special features of the equipment. All key dimensions and equipment numbers should be included.**
- **Experimental Procedure**
- **A brief description of the procedure used in obtaining the desired experimental data. In addition, this portion of the report should refer to the sketch of the apparatus given in the previous section.**

The Research Report

- **Experimental Data**
  - **Experimental data are presented in tables, charts, etc. Tables and graphs must be complete and detailed.**

B. ***Tables in a Report or Laboratory Notebook***

Each table should be numbered, have a title and show all units.

Example:

Table 1.

PRESSURE DROP IN PACKED TOWER

Column diameter, 6 inches
Packed height, 5ft
Tower packing, 1/2 inch Berl Saddles

Flow Rate of Water, lbs/ft^2·hr	Flow Rate of Air, lbs/ft^2·hr	Pressure Drop, Inches of water per foot of packing	Column Holdup, Lbs of water per foot of packing
1000	100	5	0.5
1000	300	10	1.0
1000	700	15	1.5
2000	100	15	2.0
2000	300	20	2.5
2000	700	25	3.0

The Research Report

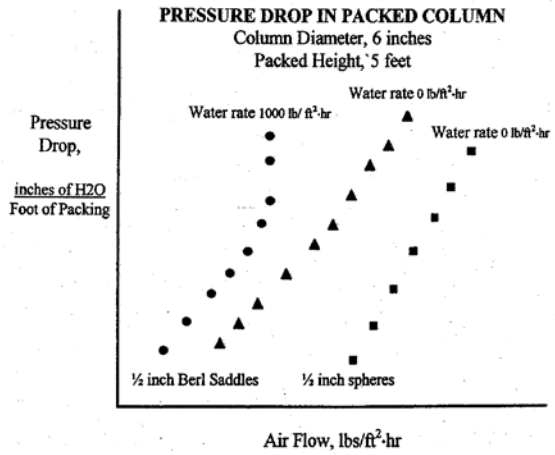
C. ***Graphs in a Report or Laboratory Notebook***

All graphs should have a Figure number, have clearly labeled coordinates and all parameters labeled.
Label symbols should be used for different parameters.

● ■ ▲ ▼ ♦ ◆

Example:

Figure 1



The Research Report

- **Discussion of results**
  - **In writing a discussion of the results of the study, refer to the detailed outline of the study that was prepared and the Objectives section. This procedure will ensure that the report is written in logical order and is complete.**
    - **First introduce a short paragraph about what was done to get the results.**
    - **Then discuss the results in logical order referring to the outline in the Objectives section. Include the conclusions made from each of the results. Discuss any errors.**

The Research Report

- **Conclusions**
- **This section of the report contains only the important qualitative statements, arrived from the analysis of the data. It should be short and should follow the outline given in the Objectives section of the report.**

- **Conclusions are presented in terse form.**
  - **The conclusions of this study are:**
    - **1.**
    - **2.**
    - **3.**

There should be no discussion of your results in this section

The Research Report

- **Recommendations**
- **In this section, you should make the recommendations you would like to report based on the results and conclusions of the study.**
  - **Recommendations are presented in terse form.**
    - **The recommendations of this study are:**

1.
2.
3.

There should be no discussion of your results in this section of the report. This section gives what you, the investigator, feel is necessary for further studies.

The Research Report

- **Bibliography**
- **The bibliography, or references section, should be clear. It is wise to check textbooks, journal articles, etc. for proper form. For example:**

  - **Book**
    - **Felder, R. M. and Rousseau, R. W., "Elementary Principles of Chemical Processes", ?Third Edition, 2005 Edition with Integrated Media and Study Tools, p. 351, John Wiley & Sons, New York, New York 2005**

The Research Report

- **Bibliography (Continued)**

  - **Journal Articles**

    - **Ronald, M. C., "Investigation of the Teaching of English in Technical Schools", J. Engineering Education, 43, L17(1941)**

  Patents

    - **Carlin, G. B. and C. U. Laytor, U. S. Patent 1,475,236 (Aug. 12, 1971}**

The Research Report

- **Nomenclature**

- **Nomenclature must be clearly defined with units.**

  - **For example:**
    - **M = mass of object, kg or lbs.**
    - **dM/dt = differential change in mass with time, kg/s or lbs/s**
    - **ΔP = change in pressure, atm**

  - **Equations in the Research Report must be properly written, $dM/dt = 4280\ \Delta P^{0.5}$**

The Research Report

- **Appendix**
  - **Included in this section are all of the material which was used in the experiment to get your results. Include material, which may not have been obtained from your experimentation, such as calibration curves, or other data which were obtained from other sources.**
  - **In addition, computer print out or computer tables (Excel) of all data taken during the investigation, which was used to get your results that are included in the report.**

The Research Report

- **The Appendix should include the following:**

  - **1.Experimental Data: All measured raw data, tabulated numerical results (tables and graphical) obtained by experimentation but not pertinent to the study.**

  - **2. Sample Calculations: This section contains detailed calculations illustrating the calculations, which were made in converting data from raw information to desired numerical results.**

The Research Report

- **3. Tables: Any Tables of calculated values from raw data which were not included in the Discussion of Results section.**

- **4. Graphs: Any Graphs from calculated values from raw data which were not included in the Discussion of Results section.**

- **5. Computer Data: This section include the pertinent computer output information.**

The Research Report

- **Suggested Approach to Report Writing**
  - **1. Write the Introduction, Objectives, and Pertinent Theory section related to the Objectives before you perform the experiment. Include the Nomenclature and Reference section. A thorough literature search related to your topic should be made and will help greatly in writing this section of the report.**
  - **2. Perform your experiments once you have a good understanding from the above search and writing effort.**
  - **3 Write the Apparatus and Procedure Sections once you have finalized your experimental effort.**

The Research Report

- **4. Perform all sample calculations in complete detail.**

- **5. Prepare all Tables and Graphs that will be a part of your report.**

  - **The discussion section should end with a paragraph with your recommendations**

The Research Report

- **6. Write the Discussion of Results Section**
  - **The first paragraph should tell the reader what you did in your experimental study**
  - **Then you should refer to your Objectives section and for each Objective, write a paragraph giving details of the results related to that Objective and the related conclusions made.**

The Research Report

- **7. Write the Conclusions Section**
- **8. Write the Recommendations Section**
- **9. Write the Abstract**
  - **The first paragraph should tell the reader briefly what you did in your experiment**
  - **Then you should refer to your Discussion of Results Section and condense each paragraph for each of your Objectives giving your results and conclusions.**
  - **The Abstract section should end with your recommendations.**

ORAL REPORTS

- **The ability of an investigator to speak before a large or small audience is paramount.**
- **It is an invaluable asset, which the investigator must develop.**
- **This development, like writing, is a life long process of trying to achieve perfection.**
- **Every effort should be made to make each presentation better than the one just before it.**

ORAL REPORTS

- **In making an oral presentation strive to be an effective speaker.**
- **We must all remember that everyone is nervous at first.**
- **Learn very well in your mind what you will speak about during your first few minutes.**
- **After these initial key minutes, your nervousness will disappear.**
- **Do not read a presentation to your audience.**

ORAL REPORTS

- **Do not speak to the blackboard or a Power Point slide constantly.**
- **Do not focus on key people only because they are your teacher or your superior on your job.**
- **Always speak to the entire audience.**
- **Keep your speaking style conversational just like your would be talking to your best friend.**

ORAL REPORTS

- **1. Poor presentations are usually the result of :**
  - **Lack of good practice**
  - **Lack of developing the skill in speaking**
  - **The process requires a good amount of effort**

2. A good presentation can be assured if we:

Prepare good audio-visual material which is not cluttered.

Practice the presentation many times.

ORAL REPORTS

- **Overcome the first few minutes of your presentation.**
- **Speak to the audience, the entire audience, and not to just a few key people.**
- **Have your material well organized such that it is logical and easy to follow.**

ORAL REPORTS

- **3. In your presentation, tell the listeners:**
  - **The main points that you will be discussing.**
  - **Then explain each point in detail.**
  - **Finally, review and summarize the points that you had just discussed.**
- **4. In other words, you tell the listeners**
  - **What you will tell them.**
  - **Then you tell them.**
  - **Then you tell them what you told them.**