



**MAPUA INSTITUTE OF TECHNOLOGY**



**SCHOOL OF CIVIL ENVIRONMENTAL  
AND GEOLOGICAL ENGINEERING**

# **A REFERENCE GUIDE FOR THESIS WRITING**

**Prepared and Compiled by:**

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**Purpose:**

**To provide a standard procedure for writing thesis/study for undergraduate CE,  
CEM, ENSE and GEO students.**

**Title of the Study (TNR, bold size 20)**

by(TNR, 14, centered)

**Firstname M. Last name1**

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**(TNR, 16, bold, centered, alphabetical)**

A Study Submitted to the School of CE – ENSE in Partial Fulfillment of the  
Requirements in the Subject (TNR, 14, centered)

**CE200L Thesis 1/ CE200-2L Thesis 2.**(TNR, 16, centered)

Mapua Institute of Technology  
Month Year (TNR, 14, centered, defense date)

## APPROVAL SHEET

This is to certify that we have supervised the preparation of and read the study prepared by **Firstname1 M. Lastname1, Firtname2 M. Lastname2, and Firstname3 M. Lastname 3** entitled **Title of the Study** and that the said study has been submitted for final examination by Oral Examination Committee.

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## **ABSTRACT (TNR 12, Bold, Centered, ALL CAPS)**

The abstract gives the reader an overview of the study, based on information from the other sections of the report. The information given in the abstract is usually the basis of many readers as to whether they will read the entire report or not. The abstract is one paragraph of about 100-200 words, single spaced. The typical information elements included in an abstract are as follows: (1) Some background or general information on the study; (2) The main topic (or purpose) of the study and its scope; (3) Some information on how the study was conducted (or the methodology used in the study); (4) The most important findings of the study; and (5) A statement of conclusion (justified based on the data presented).

**Keywords (maximum of five): keyword1, keyword2, keyword3, keyword4.** Include the keywords in the definition of terms.

## **ACKNOWLEDGEMENT (TNR 12, Bold, Centered, ALL CAPS)**

(This should be written using third person. The following is a suggestion.)

The researchers wish to express their sincerest gratitude to the following persons who unselfishly gave their invaluable assistance towards the realization of this humble piece of work.

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**TABLE OF CONTENTS (TNR 12, Bold, Centered, ALL CAPS)**

TITLE PAGE	i
APPROVAL PAGE	ii
ABSTRACT	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS	v
LIST OF TABLES	vii
LIST OF FIGURES	viii
Chapter 1: INTRODUCTION	1
Chapter 2: REVIEW OF LITERATURE	11
Related Readings	12
Related Literature	12
Related Studies	12
Synthesis and Justification	12
Chapter 3: TITLE OF A MAJOR ASPECT OF STUDY	17
Abstract	17
Introduction	21
Methodology	25
Theoretical Framework	25
Statement of the Problem (General and Specific)	32
Hypotheses	35
Significance of the Study	36
Scope and Limitations	38
Definition of Terms	40
Research Design	41
Research Setting	43
Respondents of the Study	44
Data Gathering Procedures	47

	Data Gathering Instruments	49
	Statistical Treatment	56
	Results and Discussions	63
	Conclusion	82
Chapter 4:	CONCLUSION	83
Chapter 5:	RECOMMENDATIONS	89
	REFERENCES	93
	APPENDICES	95
	Appendix A TITLE	
	Appendix B EVALUATION OF FINAL THESIS PAPER	
	Appendix C WRITING FORMAT	
	Appendix D EVALUATION FORM	
	Appendix E GRADING SYSTEM	

**LIST OF TABLES (TNR 12, Bold, Centered, ALL CAPS)**

TABLE 1.1: TITLE	36
TABLE 1.2: TITLE	37
TABLE 2.1: TITLE	55
TABLE 2.2: TITLE	67
TABLE 3.1: TITLE	75
TABLE 3.2: TITLE	87
TABLE 3.3: TITLE	89
TABLE 3.4: TITLE	92

(Note: Group the tables per chapter, as shown above)

**LIST OF FIGURES (TNR 12, Bold, Centered, ALL CAPS)**

FIGURE 1.1: TITLE	16
FIGURE 1.2: TITLE	23
FIGURE 2.1: TITLE	35
FIGURE 2.2: TITLE	37
FIGURE 2.3: TITLE	54
FIGURE 3.1: TITLE	65
FIGURE 3.2: TITLE	76
FIGURE 3.3: TITLE	77
FIGURE 3.4: TITLE	78
FIGURE 3.5: TITLE	79
FIGURE 3.6: TITLE	80
FIGURE 3.7: TITLE	81
FIGURE 3.8: TITLE	82
FIGURE 3.9: TITLE	83
FIGURE 3.10: TITLE	84
FIGURE 3.11: TITLE	

(Note: Group the figures per Chapter, as shown above. Graphs and Pictures are considered Figures)

## **Chapter 1**

### **INTRODUCTION**

The introduction gives an overview of the thesis / practicum or research report, giving the reader background or basis of the problem to be reported.

It can be divided into six parts. In Part 1 (the setting or context or frame of reference) are general statement(s) about a field of research that provide the reader with a preview of the problem to be reported.

In Part 2 (the review of previous research), the contextual setting of frame of reference described in Part 1 is continued by giving more statements about the general aspects of the problem already investigated by other researchers.

In Part 3 (the gap of missing information) are statement(s) that indicate the need for the study or the need for more investigation.

In Part 4 (the statement of purpose) are very specific statement(s) pertaining to the objective(s) of the study.

In Part 5 (the statement of value) are statement(s) that give the significance of carrying out the study.

And in Part 6 (the scope and delimitation), it is indicated what the study covers and what it does not or fails to cover.

NOTE: The introduction is written continuously paragraph by paragraph, i.e., without any heading.

## **Chapter 2**

### **REVIEW OF LITERATURE**

The review of literature is basically an organized collection of citations to other studies (but NOT or MERE listing of previous studies), which are related or somewhat related to your own specific research problem.

It serves three important functions: (1) It continues the process started in the introduction of giving the readers background information needed to understand your study; (2) It assures the readers that you are knowledgeable about the significant research that has been done in your area of investigation; and (3) It establishes your study as one link in a chain of research that is developing and enlarging knowledge in your field of research interest.

The role of literature review is as follows: (1) It will increase your confidence in your topic as a result of the time, effort, and resources you invested in studying your research problem; (2) It can give you new ideas and approaches that may not have occurred to you; (3) It can inform you about other researchers doing work in your area of study – individuals whom you may choose to contact for advice or feedback; (4) It can show you how others have tackled methodological and design issues in studies similar to your own; (5) It can lead you to sources of data that you may not have known existed; (6) It can orient you to measurement tools that other researchers have developed and used effectively; (7) It can reveal methods dealing with problem situations that may be similar to difficulties you are having; and (8) It can help you get meaning out of your data or make sense of your findings and, eventually, help you tie your results to the work of previous researchers.

The goal of the literature review is to document any existing studies done with respect to the problem that the researcher is dealing with. There are so many ways of doing literature review; some of these include self-study review, context review, historical review, theoretical review, methodological review and integrated review. The more comprehensive and exhaustive is the review, is the greater the confidence of the readers on the competence of the researcher and on the quality of hi/her work. The other important objective of literature review is to prove a solid foundation in formulating the theoretical framework of the study.

#### Related Readings

- Legal basis of the study
- Direct/indirect implications to the government thrusts
- Laws and department directives such as circulars, orders, memoranda

#### Related Literature (foreign and local)

- Sources are taken from the books, journals, magazines, internet
- Arranged by topic order
- Segregate it into foreign and local

#### Related Studies (foreign and local)

- Published and unpublished research studies
- Segregate into foreign and local

#### Synthesis and Justification

- Justification of the present study
- Bearing of related studies upon the present study
- Differences of the present study with the past studies

## Chapter 3

(STAND ALONE CHAPTER)

### TITLE OF A MAJOR ASPECT OF THE STUDY

#### **Abstract**

An abstract is a brief and concise descriptive summary of the statement of the problem, hypotheses, research design, determination of sample size, sampling design and technique, the subjects, the research instrument, validation of the research instrument, data gathering procedure, data processing method, statistical treatment, findings, conclusions, and recommendations.

The abstract gives the reader a panoramic view of the research paper, thesis, and dissertation, hence, the reader has to decide whether to read the whole research paper or not because of an abstract.

This section follows the format in writing the paper. It has to be double space, times new roman and font 12.

#### **Introduction**

This section is the introduction for the title of a major aspect of your study. It follows the same format as the introduction to your study as a whole.

This part consists of the rationale or the introductory discussion of the problem to give the reader a panoramic view of the study. It discusses the events, conditions, situations and developments that lead the researcher to select the topic and the research problems(s). The more concise and focused the introduction part the better. Remember

that the main goal of the rationale is merely to introduce your topic and to set the stage to formulating your research problem.

## **Methodology**

This chapter describes the procedural steps used in conducting the study and the materials or any equipment used at each step. It includes all mathematical treatment of data as well as equations or models used. It is useful to readers who want to know how the methodology of your study may have influenced your results. The procedure should be stated in as much detail as possible so that readers who are interested in replicating or extending your study could follow the steps as they read your work. Schematic diagram (properly labeled and numbered) must accompany the text whenever possible.

## **Theoretical/Conceptual Framework**

Theoretical Framework (Discussion of Theories):

Foundation and structure upon, or around, which research study will be developed. It also defines the relationships of all the variables pertinent to the study. Explains the theory underlying these relationships and describes the nature and direction of these relationships. Explains the nature, causes and dynamics of the problems being investigated.

Ways of formulating a theoretical framework:

- Copying existing frameworks and apply it to the situation being studied
- Adopt a framework that closely responds to the objectives the study, modify it and improve on it so that it appropriately responds to the research problem
- Build an entirely new framework on a subject not yet being explored. There are existing models for building a theoretical framework. These models include inductive-theory building, deductive-theory building, functional-theory building and model based theory building

Conceptual Framework (Model):

Operationalizes the theoretical framework of the study. It is formalized diagrammatic representation showing the relationships of the variables indicated in the theoretical framework. It translates theory into reality through the application of some qualitative and quantitative analysis.

Another purpose of the conceptual model is to guide the researcher in formulating the researcher design and procedures of the study.

It also provides the following:

- the basis for identifying and defining the kind of data to be gathered
- the target respondents
- the instruments to be used in the gathering of the data
- other sources of data and methods of analysis.

### **Statement of the Problem**

The research problem is an intellectual stimulus that calls for an organized response in the form of scientific inquiry. It is the main concern and focus on the investigation. To pass as a research problem, the problem must be identifiable and observable in real-life situations. In other words, the researcher can study the problem empirically.

The research problem is categorized into general and specific problems. The general problem merely relates the title of the study. The specific problems lay down the various components of the general problem.

#### Criterion for a Research Problem

1. It should express a relationship between two or more variables
2. It should be stated clearly, usually in question form
3. It should be feasible to carry out such operations or activities

Examples of General Problems:

- Does organizational climate affect student behavior?
- Is leadership related to school effectiveness?
- Does job satisfaction influence teacher effectiveness?
- Is there a relationship between development orientation and administrative performance?

Example of Specific Problems (do not show a relation of two or more variables)

- What is the profile of the respondents?
- What is the extent of participation of the teachers in the decision making process?
- What is the level of teachers performance

Problems that should be avoided:

1. Those that deal with ethical or moral questions
  - Is there a relationship between premarital sex and performance in the class?
  - Do parents marital relationship affect students performance in class?
2. Questions that do not require mental struggle.
  - How many students are enrolled?
  - How many faculty members wear eyeglasses?
3. Questions whose answers are already known or available, or can be answered by yes or no. This does not need interpreted.
  - Are you offering medical courses?

- Do you accept handicapped students?
- 4. Metaphysical questions where it is impossible to collect publicly verifiable data and information in order to answer question.
  - Is there a God?
  - Do you believe in ghosts?

### **Hypothesis**

It is a potential solution to a problem. It is a tentative construct or assumption which will be proved or disproved later according to the evidence. Often it is expressed as the null hypothesis.

Note: A research study may or may not have a hypothesis:

### **Significance of the Study**

This is a statement on the importance of the study in relation, for example, your school, community, society, industry or to the development of the present stock of knowledge.

- Why are you undertaking this study
- Are the problems raised in the study timely and relevant
- Is the study priority concern as far as the school/organization is concerned
- Will the findings and recommendations of the study help improve existing programs, approaches, methodologies, procedures as well as the learning absorption of students and the teaching competency of the faculty members

May include the following:

- Contributions in relation to solving the problem and need
- Bridging the knowledge gap
- Improving social, economic and health conditions
- Enriching research instruments and methods
- Supporting government thrusts

The importance of the study must contain explanations or discussions of the following:

1. The rationale, timeliness, and/or relevance of the study
2. Possible solution to existing problems or improvements to unsatisfactory conditions.
3. Who are to be benefited and how they are going to be benefited.
4. Possible contribution to the fund of knowledge
5. Possible implications

## **Scope and Limitations**

Limitations of the study include the weaknesses of the study beyond the control of the research and the constraints that have direct bearing on the result of the study which includes the following:

- Coverage of the study area
- The subjects or respondents
- The research instruments
- The researcher's resources (money and materials)
- The duration of the study or time constraints

Guidelines in writing the scope and limitations:

1. A brief statement of the general purpose of the study.
2. The subject matter and topics studied and discussed
3. The locale of the study, where the data were gathered or the entity to which the data belong.
4. The population or universe from which the respondents were selected
5. The period of the study

## **Definition of Terms**

Consists of the definition of the terms that will be frequently used in the study. It has to be specific, definite, and focused. One word or concept may have diverse meanings and definitions depending on the author's point of view as used in the researcher's study.

Guidelines in defining terms:

1. Only terms, words, or phrases, which have special unique meanings in the study are defined.
2. Terms should be defined operationally, how they are used in the study.
3. The researcher may develop his own definition from the characteristics of the term defined.
4. Definition may be taken from encyclopedias, books, magazines and newspaper articles, dictionaries, and other publications but the researcher must acknowledge his sources (conceptual or theoretical definitions).
5. Definitions should be brief, clear, and unequivocal as possible.
6. Acronyms should always be spelled out fully especially if it is not commonly known or if it is used for the first time.

## **Research Design**

This contains the detailed plan of action on how the research will be conducted. This is also the expanded discussion of the theoretical and conceptual framework. The research design is a detailed explanation of the steps that will be used in the conduct of the study. This can be best represented using a flowchart.

## **Kinds of Research**

1. **Pure Research** – also called fundamental, basic or university research, involves developing and testing theories that are intellectually stimulating to the researcher.
2. **Applied Research** – addresses practical problems. The purpose is to solve a problem existing currently in the work setting.

## **Types of Research:**

1. Evaluation Research – most appropriate for assessing educational programs, curricula, course materials, teaching instruments, methods and process of teaching and learning outcomes. Below are the different models for evaluation:
  - Objective-based model
  - Tyler’s Model
  - Provus’ Discrepancy Evaluation Model
  - Input-output Model
  - Stufflebeam’s Context-Input-Process-Product Model
  - Stake/Glass Model
  - Scriven’s Formative and Summative Evaluation Model
2. **Descriptive Research**- tells what happened, the purpose is to merely learn more about the subject or topic, it describes a phenomenon.
3. **Case-Study Research** – examines several features of a few cases over duration of time. The purpose is to look for patterns across individuals, groups, movements or institutions
4. **Survey Research** – asks people questions in a written questionnaire or during an interview.
5. **Content-Analytical Research**- gathers and analyzes the content of a text or document
6. **Action Research** – seeks to empower those who are being studied, allows the respondent to participate in the research process.
7. **Historical-Comparative Research** – examines aspects of social life in the past, focus on one or more historical period, compare different cultures, or mix historical periods and cultures.

## **Research Designs:**

1. Experimental Research – investigates causal relationships and manipulates/controls conditions or variables.
  - a. Pre-experimental research design – lacks random assignment to the program group and the control group.
  - b. Randomized or true experimental design –subjects are randomly assigned to program and control groups
  - c. Quasi-experimental design – which employs multiple measures or a control group without randomly assigning participants to a group
2. Non-experimental research – investigates causal relationships, but does not manipulate conditions or variables. It examines data to determine relative

incidence, distribution and relationships of sociological or psychological variables.

Research Methodology:

1. Qualitative Research – data are words, it is exploratory
2. Quantitative Research – data are numbers

Validity and Reliability of the Study:

1. Validity – the strength of the conclusions, inferences or propositions, refers to the truthfulness of the study
  - Content Validity – can be checked by asking experts in the field
  - Criterion Validity – concern only when the investigator is examining how well the instrument measures some psychological construct
  - Conclusion Validity – relates to the statistical power of the study and the first type of validity to deal with in conducting any study
2. Reliability – refers to the consistency of the measurement or the degree to which an instrument measures the same way each time it is used under the same condition with the same subjects, it also means the repeatability of the measurement.
  - Testing and re-testing
  - Comparing opinions of two or more observers
  - Checking for internal consistency and giving two equivalent forms of research instruments

### **Research Setting**

This part contains literally the place where the study was conducted. A brief discussion of the environment and why the place was chosen should also be included.

### **Respondents of the Study**

Before the collection of data starts in any project, the proportion of the population to be studied must have been determined already and the computation of the sample must have been finished. So what the researcher has to do here is to write about the complete procedure he used in determining the sample. Among the things that he should explain are:

1. The size of the population
2. The study population
3. The margin of error and the proportion of the study population used
4. The type of technique of sampling used
5. the actual computation of the sample
6. the sample

The researcher must explain very clearly how he selected his sample. He must be able to show that his sample is representative of the population by showing that he used appropriate technique of sampling. This is very important because if it appears that his

sample is not representative, his findings and conclusions will be faulty and hence, not valid or reliable (Calderon, 1993).

The subject or the respondents of the study may be person or documents. The document can be a book, a historical record, an article or speech, work of art, symbols and the like. As subjects of research, “persons” are the individual human beings from whom the researcher gathers the data and information needed to respond to the problems raised in the study. In actual research, persons can refer to faculty members, students, public officials, or even the entire population.

When the subject of research involves dealing with thousands or millions of individuals, the researcher may have to employ sampling method. There are two types of sampling: random and non-random sampling.

Random sampling can be:

1. simple random sampling – gives every member of the population an equal chance of being selected. Selection may be done by using the random number table found in many basic texts in statistics sampling.
2. Systematic random sampling – includes only every  $k^{\text{th}}$  (e.g. every fifth ) person in the list.
3. Stratified random sampling – divides the total population into grouped or strata based on some characteristics, e.g. income, education, etc. A separate simple random sample from each group is then selected.
4. Cluster random sampling – divided the total population into clusters (e.g., all public elementary schools in NCR). Then, if you want only 20 schools, a simple or systematic random sampling can then be applied.

Non-random sampling can be purposive, i.e., dependent on the purpose of the study – often based on the research problems. It “selects information-rich cases for in-depth study”.

Patton (1990) discusses 16 different types of purposeful sampling. These are:

1. extreme and deviant case
2. intensity
3. maximum variation
4. homogenous
5. typical case
6. stratified
7. critical case
8. snowball or chain
9. criterion
10. theory-based or operational construct
11. confirming and disconfirming cases
12. opportunistic
13. random purposeful
14. sampling politically important cases

15. convenience
16. combinations or mixed purposeful

How do we estimate the sample? Slovins (1995) gives the following formula for estimating the sample size:

$$n = N / (1 + Ne^2)$$

Where n = required sample size  
N = total population  
e = standard error of estimate

Mugo (1997) says that sample size can be determined by various constraints, e.g., available funding.

### **Data Gathering Procedure/ Experimental Stage**

This contains a simple discussion as to how the data will be gathered. This can be best presented using a flowchart or any diagram to represent the various steps undertaken.

### **Data Gathering Instruments**

Data are what research is searching for and which are subjected to analysis, statistical procedures, and interpretations so that inferences, principles, or generalizations are drawn.

#### Selecting the Method of Collecting Data

There are several ways of collecting data among which are the following:

##### A. Clerical tools

1. The questionnaire method
2. The interview method
3. The empirical observation method
4. The registration method
5. The testing method
6. The experimental method
7. The library method

##### B. Mechanical Devices: Camera, Counters, Microscopes, thermometers, cameras, etc.

The choice of the method depends upon some factors such as the nature of the problem, the population or universe under the study, the cost of the survey, and the time factor.

Instruments or tools for gathering data in research are of two categories or kinds: (Treece and Treece,)

1. *Mechanical devices.* Mechanical devices includes almost all tools (such as microscopes, telescopes, thermometers, rulers, and monitors) used in the physical sciences. In the social sciences and nursing, mechanical devices include such equipments as tape recorders, cameras, film and videotape. In addition, included also are the laboratory tools and equipment used in experimental research in the chemical and biological sciences, as well as in industry and agriculture.
2. Clerical tools. Clerical tools are used when the researcher studies people and gather data on the feelings, emotions, attitudes, and judgments of the subjects. Some examples of clerical tools are: filed records, histories, case studies, questionnaires, and interview schedule.

Among the characteristics of a research instrument are the following: (Calderon, 1993)

1. The instrument must be valid and reliable. An instrument is valid if it collects data which are intended for it to collect and long enough to be able to collect adequate information to complete the study or investigation. It is reliable if it is administered to the same subject twice without any practice it also gives the same result or measure.
2. It must be based upon the conceptual framework or what the researcher wants to find out. A conceptual framework is the researcher's idea or expectation of what a situation should be but he is not proving his idea or expectation to be true. He is only finding out if it is true or not.
3. It must gather data suitable for and relevant to the research topic. Data foreign or extraneous to the study or topic should not be gathered by the instrument. For instance, if the topic is about teaching science, the instrument should gather data only about the teaching of science and not for teaching English.
4. It must gather data that would test the hypotheses or answer the questions under investigation. Testing a hypothesis is merely finding out whether it is true or not based upon the data gathered. If the information gathered reveals that the hypothesis is true, then it is accepted, otherwise it is rejected. In studies where there are no expressed hypotheses, but only specific questions are used, the data that should be gathered are those that would answer the questions. For example, if the question asked is "How qualified are the teachers handling science subjects?", only the data that deal with the degrees earned by the teachers, their fields of specialization, their eligibilities, seminars and special trainings attended, and the level of their mastery of the subject matter should be collected. These data will answer the question whether the teachers are qualified or not to teach science.

5. It should be free from all kinds of bias. It should not suggest. What should be the replies. Here is an example of a biased question. "Are you using Hapee toothpaste? If not, what brand of toothpaste are you using?" this is biased because the mere mention of the word "Hapee" is already a suggestion. To remove the bias the question should be "What brand of toothpaste are you using?"
6. It must contain only questions or items that are unequivocal. An equivocal question admits only one interpretation. Here is an example of an equivocal question: "Are you employed or not?" this is Also called a double barreled question: Actually, these are two questions rolled into one. The first question is "Are you employed?" the second question is "Are you not employed?" the original question is answerable by "yes" or "no" but the "yes" or "no" should be qualified. The answer should be either "Yes, I am employed" or "no, I am not employed". "Are you employed?" is a sample of an equivocal question. The respondent may give only the month and the day of the month, or he may give only the month and the day of the month, or he may only give only the year, or he may give the whole and the exact data. To make the question unequivocal, ask for the exact datum needed, then ask "In what year you born?" if the complete birth is needed, then state "Give the complete data of your birth."
7. It must contain clear and definite directions to accomplish it. Poor direction: "Please accomplish the questionnaire." The respondent does not exactly know what to do whether to write his replies in word, in numbers, or in other symbols. Better. This is a multiple response questionnaire. Please read each question carefully and then put a check mark before the item or items following which you think will best answer the question."
8. If the instrument is a mechanical device, it must be of the best or latest model. If is a microscope or a camera, or a tape recorder, it must be of the latest model so that it will gather accurate and reliable data.
9. It must be accompanied by a good cover letter. A good cover letter in the form of a request should be made as cordially and politely as possible to make the instrument more acceptable to the respondents.
10. It must be accompanied, if possible, by a letter of recommendation from a sponsor. A letter of recommendation from a sponsor, one who has some influence over the respondents, may be secured and made to accompany the instrument to facilitate its administration or to insure its accomplishments and return.

## Statistical Treatment

The last part of this chapter usually describes the statistical treatment of the data. The kind of statistical treatment depends upon the nature of the problem, especially the specific problems, and the nature of the data gathered. The explicit hypotheses particularly determined the kind of statistics to be used.

With the advent of the computer age, statistics is now playing a vital role in research. This is true especially in science and technological research. What functions do statistics perform in research? Some are the following (Calderon, 1993)

1. Statistical methods help the researcher in making his research design, particularly in experimental research. Statistical methods are always involved in planning a research project because in some way statistics direct the researcher how to gather his data.
2. Statistical techniques help the researcher in determining the validity and reliability of his research instruments. Data gathered with instruments that are not valid and reliable are almost useless and so the researcher must have to be sure that his instruments are valid and reliable. Statistics helps him in doing this.
3. Statistical manipulations organize raw data systematically to make the latter appropriate for study. Unorganized data cannot be studied. No inferences or deductions can be made from unorganized data. Statistics organize data systematically by ordered arrangement, ranking, score distribution, class frequency distribution or cumulative frequencies. These make the data appropriate for study.
4. Statistics are used to test the hypotheses. Statistics help the researcher determine whether his hypotheses are to be accepted or to be rejected.
5. Statistical treatments give meaning and interpretation to data. For instance, if the standard deviation of the class frequency of a group is small, we know that the group is more or less homogeneous but if it is large, the group is more or less heterogeneous.
6. Statistical procedures are indispensable in determining the levels of significance of vital statistical measures are the bases for making inferences, interpretations, conclusions or generalizations.

Some guidelines in the selection and application of statistical procedures.

The researcher must have at least a rudimentary knowledge on statistics so that he will be able to select and apply the appropriate statistical methods for his data. Some suggestions for the selection and application of statistical techniques follow:

1. First of all, the data should be organized using any or all of the following depending upon what is desired to be known or what is to be computed: talligram (tabulation table), ordered arrangement of scores, score distribution, class (grouped) frequency distribution, or scattergram.

2. When certain portions of the population based on certain variables such as age, height, income, etc. are desired to be known, frequency counts with their frequency percents may be used. For further analysis, cumulative frequencies (up and down) with their respective cumulative frequency percents (up and down) may also be utilized.

For example, a specific question is “How may the high school science teachers of Province A be described in terms of sex?” The males were counted and the females were also counted and their respective percent equivalents were computed.

3. When the typical, normal, or average is desired to be known, the measures of central tendency such as the median, the mean or the mode may be computed and used.

4. When the variables being studied are abstract or continuous such that they cannot be counted individually such as adequacy, efficiency, excellence, extent, seriousness (of problems), and the like, the weighted mean may be computed and used if the average is desired to be known. The variable is divided into categories of descending degree of quality and then each degree of quality is given a weight. For instance, the question is “How adequate are the facilities of the school?” Adequacy may be divided into five degrees of quality such as “very adequate” with a weight of 5, “adequate” with a weight of 4, “fairly adequate” with a weight of 3, “inadequate” with a weight of 2, and “very inadequate” with a weight of 1. Then the weighted mean is computed.

5. When the variability of the population is desired to be known, the measures of variability such as the range, quartile deviation, average deviation or the standard deviation may be computed and used. When the measure of variability or dispersion is small, the group is more or less homogeneous but when the measure of variability is large, the group is more or less heterogeneous.

6. When the relative placements of scores or positions are desired to be known, ranking, quartile or percentile rank may be computed or used. These measures indicate the relative positions of scores in an ordered arrangement of the scores.

7. When the significance of the trend of reaction or opinion of persons as a group toward a certain issue, situation, value or thing is desired to be known but in which there is neutral position, the chi-square of equal probability, single group, is computed and interpreted.

8. When the significance of the difference between the reactions, or opinions of two distinct groups in which there is a neutral position is desired to be known, the chi-square of equal probability, two-group, is computed and used.

For instance, a group of 50 persons, 25 males and 25 females, were asked to give their reactions to increasing the number of curricular years in the elementary school. Their reactions may be “Strongly agree”, “Agree”, “Undecided or No opinion”, “Disagree”, or “Strongly disagree”. If the persons are considered as a group, the chi-square of equal probability, single group is computed as in No. 7. However, if the significance of the difference between the reactions of the males and those of the females is to be studied, the chi-square of equal probability, two-group, is applied as in No. 8.

9. To determine how one variable varies with one another, the coefficient of correlation is computed, as for instance, how the scores of a group of students in Mathematics tests vary with the scores of the same group of students in an English test. This is also used to determine the validity of a test by correlating it with a test of known validity. When the coefficient of correlation between the two tests is known and a prediction is to be made as to what score a student gets in a second test after knowing his score in the first, the so-called regression equation is to be utilized.

10. If the significance of the difference between the perceptions of two groups about certain situation is to be studied, the computation of the difference between means is to be made. Example: Is there a significant difference between the perceptions of the teachers and those of the students about the facilities of the school? To answer this question, the significance of the difference of two means is to be used. The statistical measure computed is called  $t$ .

The  $t$  is also used to determine the usefulness of a variable to which one group called the experimental group is exposed and a second group called control group is not exposed. For instance, the question is: Does guidance improved instruction? Create two matched groups and expose one group to guidance while the control group is not exposed to guidance. At the end of the experimental period, give the same test to the two groups. Then compute the  $t$  which will show if guidance is an effective aid to construction.

11. To determine the relative effectiveness of the different ways of doing things to which different randomized groups are respectively exposed to and only a post test is given to the different groups, analysis of variance is appropriate to use. For instance, a teacher wants to find out the relative effectiveness of the following methods of communication: pure lecture, lecture-demonstration, recitation-discussion, and seminar type of instruction in science. Four groups of students are formed randomly and each assigned to one method. The four groups study the same lessons and after a certain period given the same test. By analysis of variance, the relative effectiveness

of the four methods will be revealed. If the four groups are given a pre-test and a post-test, the analysis of covariance is utilized.

12. To determine the effects of some variables upon a single variable to which they are related, partial and multiple correlations are suggested to be used. For example, the question is: Which is most related to the passing of licensing engineering examination: college achievement grades, or percentile ranks in aptitude tests, general mental ability test, vocational and professional interest inventory, or National College Entrance Examination? The process of partial and multiple correlation will reveal the pure and sole effect of each of the independent variables upon the dependent variable, the passing of the licensing examination.

13. To determine the association between two independent variables, the chi-square of independence or chi-square of multiplication may be used. The question answered by this statistical process is: Is there an association between education and leadership? Or, the level of education and the ability to acquire wealth? Or, between social ability and economic status?

Indeed, there are lots of research situations in which different statistical procedures may or can be used and if the researcher is not so sure that he is in the right path, he better consult good statistical books, or acquire the services of a good statistician plus the services of a computer especially if the statistical procedures are complex ones.

## **Results and Discussion**

This part presents the data gathered and their corresponding analysis and interpretation regarding the design, development and the qualitative and quantitative evaluation of subject concern.

Presentation is the process of organizing data into logical, sequential and meaningful categories and classifications to make them amenable to study and interpretation. Analysis and presentation put data into proper order and in categories reducing them into forms that are intelligible and interpretable so that the relationships between the research questions and their intended answers can be established. There are three ways of presenting data: textual, tabular and graphical.

### **Textual Presentation of Data:**

Textual presentation uses statements with numerical or numbers to describe data. The main aims of textual presentation are to focus attention to some important data and to supplement tabular presentation.

The disadvantage, especially if it is too long, is that it is boring to read and the reader may not even be able to grasp the quantitative relationships of the data presented. The reader may even skip some statements.

## Tabular Presentation of Data:

A statistical table or simply table is defined as a systematic arrangement of related data in which classes of numerical facts or data are given each a row and their subclasses are given each a column in order to present relationships of the sets or numerical facts or data in a definite, compact, and understandable form or forms.

The purpose is to facilitate the study and interpretation, the making of inferences and implications of the relationships of statistical data. Table construction for data presentation is a part of analysis because the data are separated and grouped according to class or category.

The advantages of the tabular over the textual presentation of data are:

1. Statistical tables are concise, and because data are systematically grouped and arranged, explanatory matter is minimal.
2. Data are more easily read, understood and compared because of their systematic and logical arrangement into rows and columns. The reader can understand and interpret a great bulk of data rapidly because he can see significant relationships of data at once.
3. Tables give the whole information even without combining numerals with textual matter. This is so because tables are so constructed that the ideas they convey can be understood even without reading their textual presentation.

The functional parts of a statistical table are:

1. Table number. Each table should have a number, preferably in Arabic, for reference purposes. This is because only the table numbers are cited. The number is written above the title of the table. Tables are numbered consecutively throughout the thesis report.
2. Title. The title should tell about the following:
  - a. the subject matter that said table deals with;
  - b. where such subject matter is situated, or to what entity or persons it belongs, or from whom the data about such subject matter were gathered;
  - c. when data about such subject matter were gathered or the time period when such data were existent; and
  - d. sometimes how the data about such subject matter are classified.

Usually, however, only the first two elements are mentioned in the title, and occasionally only the subject matter. This is possible if the time period of the study as well as the locale and respondents are well discussed in the scope and delimitation of the study. Only the beginning letters of the important words in the title are capitalized. If the title contains more than one line, it should be written like inverted pyramid.

3. Headnote or Prefatory Note. This is written below the title and it is usually enclosed in parentheses. It explains some things in the table that are not clear.

4. Stub. The stub contains the sub head and the row labels. The sub head tells what the sub contains, the row labels. Each row label describes the data contained in that row.
5. Box head. The box head contains the master caption, the column captions, and the column subcaptions. The master caption describes the column captions and the column captions in turn describes the subcolumn captions.
6. Main body, field or text. The main body, field or text of the table contains all the quantitative and/or proportional information presented in the table in rows and in columns. Each numerical datum is entered in the cell which is the intersection of the row and the column of the datum.

Ruling is done in a table to emphasize or make clear relationships. There are no fixed standard rules to following ruling and spacing tables. Emphasis and clarity are the determining factors. However, the following guidelines are generally followed in the construction of tables for a thesis report.

1. The table number is not separated by line from the title. It is written single space above the title.
2. The title is separated from the rest of the table by a double line placed two spaces below the lowest line of the title.
3. The stub, master caption, captions, subcaptions, and totals are separated from one another by vertical and horizontal lines.
4. The rows and the columns are not separated by lines. Major groups however, are separated by single lines. For purposes of clarity, rows are separated by a double space and the columns are separated by as wide a space is possible.
5. Both ends of the table are ruled.
6. There is always a line, either single or double, at the bottom of the table.

There should always unity in a table. To achieve this, presenting too many ideas in a single table should be avoided. One subject matter is enough, one that can be divided into categories which in turn can be divided into common classifications.

Textual presentation of tabular data.

Generally, there should be textual presentation of a table which precedes the table or the table may be placed within the textual presentation. The table and its textual presentation should be placed as near as possible to each other. Textual presentation is mixing words with numbers in statements.

There are two ways of making a textual presentation of a table:

1. All the items in the table are textually presented. This manner enables the reader to comprehend the totality of the data even without consulting the table. This is alright if the data are not so many. However, if the data are so numerous, reading becomes boring and the reader may even skip some of the items.

2. Only the highlights or important parts of the data are textually presented.

The basic principles that should be remembered in the textual presentation of a table are:

1. The textual presentation of a table should be as complete as possible so that the ideas conveyed in the table are understood even without referring to the table itself.
2. Textual presentation is generally followed by interpretation, inference or implication. This is done after the data from the table have been textually presented.
3. Findings in the present study should be compared with the findings of other studies as presented in the related literature and studies. This enables the researcher to make some generalizations if there are enough data to support such generalizations.

**Findings.** Findings are the original data, quantitative or otherwise, derived or taken from the original sources and which are results of questionnaires, interviews, experiments, tests, observations and other data gathering instruments. Data presented in the tables and their textual presentations are examples of findings. Findings do not directly answer the specific questions asked at the beginning of the investigation or the explicit hypothesis but the findings provide the bases for the making the answers. Hence, the main functions of the findings are to provide bases for making the conclusions.

**Implication, inference, interpretation.** These three items are synonymous if not exactly the same in meaning. They are used interchangeably. Each is a statement or statements of possible meaning probable causes and effects of a situation and condition as revealed by the findings plus a veiled suggestion to continue the situation if it is good or to adopt some remedial measures to eradicate or minimize its bad effects. Those who are to be benefited and those who are going to suffer the bad effects should also be mentioned.

Implication, inference, or interpretation has its least four elements, namely, condition, cause, effect, and continuance or remedial measure.

- 1) Statement of the condition or situation. The condition or situation is stated based upon the findings, whether satisfactory or unsatisfactory.
- 2) Probable cause of the condition. Usually, also every condition has a cause but, there must also be a logical and valid relationship between the condition and its cause.
- 3) Probable effects of the condition. Usually, also every condition has an effect, either bad or good. However, there must also be a logical and valid relationship between the condition and its effect and this must be clearly be given.

- 4) A veiled suggestion for continuance or remedial measure, if the possible effect is bad. If the effect of the condition is good, then there must be a hint for the continuance of the existence of the condition. However, if the effect is deleterious there must be some suggestions for the adoption of measures aimed at minimizing the harmful effects.

### Graphical Presentation of Data

A graph is a chart representing the quantitative variations or changes of a variable itself, or quantitative changes of a variable in comparison with those of another variable or variables in pictorial or diagrammatic form.

The quantitative variations or changes in the data may refer to their qualitative, geographical, or chronological attributes. For instance, if the number of teachers teaching science in the high schools of Province A is graphed according to their degrees, the graphing is qualitative; if their number is graphed according to their assignments in the towns where the high schools are located, the graphing is geographical; and if their number is graphed according to the school year, the graphing is chronological.

**Purpose of graphing.** The purpose of graphing is to present the variations, changes, and relationships of data in a most attractive, appealing, effective and convincing way.

**Advantages of the graphic method.** (Bacani, et al., pp. 54-55) According to Bacani, et al. the following are the advantages of the graphical method:

1. It attracts attention more effectively than do tables, and, therefore, is less likely to be overlooked. Readers may skip tables but pause to look at charts.
2. The use of colors and pictorial diagrams makes a list of figures in business reports meaningful. (Also in thesis reports).
3. It gives a comprehensive view of quantitative data. The wandering of a line exerts a more powerful effect in the reader's mind than tabulated data. It shows what is happening and what is likely to take place.
4. Graphs enable the busy executive of a business concern to grasp the essential facts quickly and without much trouble. Any relation not seen from the figures themselves is easily discovered from the graph. Illustrations, including attractive charts and graphs, are now considered by most businessmen as indispensable accompaniment to good business reports.
5. Their general usefulness lies in simplicity they add to the presentation of numerical data.

Limitations of graphs. (Bacani) If there are advantages there are also disadvantages of the graph. Some of these are:

1. Graphs do not show as much information at a time as do tables.
2. Graphs do not show data as accurately as the tables do.
3. Charts require more skill, more time, and more expense to prepare than tables.
4. Graphs cannot be quoted in the same way as tabulated data.
5. Graphs can be made only after the data have been tabulated.

Types of graphs or charts. Graphs may be classified into the following types:

1. Bar graphs
  - a. Single vertical bar graph
  - b. Single horizontal bar graph
  - c. Grouped or multiple or composite bar graph
  - d. Duo-directional or bilateral bar graph
  - e. Subdivided or component bar graph
  - f. Histogram
2. Linear graphs
  - a. Time series or chronological line chart
  - b. Composite line chart
  - c. Frequency polygon
  - d. Ogive
  - e. Band chart
3. Hundred per cent graphs or charts
  - a. Subdivided bar or rectangular bar graph
  - b. Circle or pie graph
4. Pictograms
5. Statistical maps
6. Ratio charts

### Implications of the Findings

It is the general practice of thesis writers to discuss the summary of the implications of their findings at the end of Chapter 3 or elsewhere in the thesis. From observations, it appears that as far as research reporting is concerned, an implication consists of at least five elements, namely:

1. *The existence of a condition.* This condition is a finding discovered in the research. The condition may be favorable or unfavorable. If it is favorable, it is a strength of the subject studied. If it is unfavorable, it is a weakness of the subject. For instance, in the study of the teaching of science in the high schools of Province A, it is discovered that the majority of the science teachers are not qualified to teach science. This findings is an unfavorable one and it is a weakness in the teaching of science.
2. *The probable cause of the condition.* If there is a condition there must be a cause and there must be a logical relationship between the condition and the cause,

otherwise the cause may not be a valid one. In the example above, the logical cause of the lack of enough qualified teachers to handle science subjects is that either the people responsible for recruiting teachers were not careful enough in the selection of teachers or there are not enough qualified applicants for the positions of science teachers, or both.

3. *The probable effect of the condition.* Most likely, there is also a probable effect of the condition and there must be a logical relationship between the condition and its probable effect. The logical effect of the lack of enough qualified teachers to teach science is that, taking all other things equal, the science teachers in the high school of Province A are not as effective as when all the science teachers are fully qualified. It is understandable that a fully qualified science teacher has more science knowledge and skills to impart to his students than a non-qualified science teacher. Hence, the students would suffer definitely.
4. *The measure to remedy the unsatisfactory condition or to continue to strengthen the favorable one.* It is a natural reaction to institute a measure to remedy an unfavorable situation. However, if a condition is found to be a favorable one it is also a natural reaction to continue it in operation and to even further strengthen it. The logical step to take to remedy the unfavorable situation is, if it is impractical to ease out the unqualified science teachers, to enjoin or require them to improve their qualification by taking evening or summer studies in science, by attending more science seminars, or by increasing their readings in science especially being published in science journals, magazines, and other publications.
5. *The entity or area involved or affected.* In the example cited above, it is the teaching of science in the high schools of Province A that is affected. Hence, the topic for discussion should be entitled “Implications of the Findings to the Teaching of Science”. Some researchers use the title “Implications to Education” which is too broad and vague. The area directly affected by the unfavorable or favorable conditions discovered in the study should be cited more specifically.

#### Summary of Findings:

The following should be the characteristics of the summary of findings:

1. There should be a brief statement about the main purpose of the study, the population or respondents, the period of the study, method of research used, the research instrument, and the sampling design. There should be no explanations made.
2. The findings may be lumped up all together but clarity demands that each specific question under the statement of the problem must be written first to be followed by the findings that would answer it. The specific questions should follow the order they are given under the statement of the problem.

3. The findings should be textual generalizations, that is, a summary of the important data consisting of text and numbers. Every statement of fact should consist of words, numbers, or statistical measures woven into a meaningful statement. No deduction, nor inference nor interpretation should be made otherwise it will only be duplicated in the conclusion. See the example in No. 2 just above.
4. Only the important findings, the highlights of the data, should be included in the summary, especially those upon which the conclusions should be based.
5. Findings are not explained nor elaborated upon anymore. They should be stated as concisely as possible.
6. No new data should be introduced in the summary of findings.

### **Conclusions**

The following should be the characteristics of the conclusions:

- 1.) Conclusions are inferences, deductions, abstractions, implications, interpretations, general statements, and/or generalizations based upon the findings. Conclusions are the logical and valid outgrowths of the findings. They should not contain any numeral because numerals generally limit the forceful effect or impact and scope of a generalization. No conclusions should be made that are not based upon the findings.
- 2.) Conclusions should appropriately answer the specific questions raised at the beginning of the investigation in the order they are given under the statement of the problem. The study becomes almost meaningless if the questions raised are not properly answered by the conclusions.
- 3.) Conclusions should point out what were factually learned from the inquiry. However, no conclusions should be drawn from the implied or indirect effects of the findings.
- 4.) Conclusions should be formulated concisely, that is, brief and short, yet they convey all the necessary information resulting from the study as required by the specific questions.
- 5.) Without any strong evidence to the contrary, conclusions should be stated categorically. They should be worded as if they are 100 percent true and correct. They should not give any hint that the researcher has some doubts about their validity and reliability. The use of qualifiers such as probably, perhaps, may be, and the like should be avoided as much as possible.

- 6.) Conclusions should refer only to the population, area, or subject of the study.
- 7.) Conclusions should not be repetitions anywhere in the thesis. They may be recapitulations if necessary but they should be worded differently and they should convey the same information as the statements recapitulated.

## Chapter 4

### CONCLUSION

This chapter gives the overall conclusion of the study, which addresses the objective(s) of your research problem. Here, you step back and take a broad look at your findings and your study as a whole.

#### Some Dangers to avoid in Drawing up Conclusions Based on Quantitative Data

There are some pitfalls to avoid in the use of quantitative data. (Bacani, et al., pp 48-52) Researchers should not accept nor utilize quantitative data without question or analysis even if they are presented in authoritative-looking forms. This is so because in some instances quantitative data are either inaccurate or misleading either unwittingly or by design. The data should be analyzed very critically to avoid misleading interpretations and conclusions. Among the factors that researcher should guard against the following:

1. *Bias.* Business establishments, agencies, or organizations usually present or manipulate figures to their favor. For instance, an advertisement may quote statistics to show that a given product is superior to any other leading brand. We should be wary of the use of statistics in this case because of the obvious profit motive behind. An individual may also do the same. A respondent to a questionnaire or in an interview may commit the same bias to protect his own interests. Like the case of the science teachers in high schools of Province A, they may respond that the science facilities in their respective schools are adequate although they are not adequate just to protect the good names of their own schools. A respondent, if asked how many science books he has read, may say that he has read many although he has read only a few to protect his name. Hence, if there is a way of checking the veracity of presented data by investigation, observation, or otherwise, this should be done to insure the accuracy of the conclusion based upon the data under consideration.
2. *Incorrect generalization.* An incorrect generalization is made when there is a limited body of information or when the sample is not representative of the population. Take this case. The Alumni Association of a big university would like to conduct a survey to determine the average income of the alumni during their first ten years after graduation. Though the total number of returns may meet the sample size requirement, the population may not be properly represented by the actual composition of the sample. This is likely to happen because chances are that a great majority of the alumni in the high income bracket will respond readily but the great majority of those who are not doing well may ignore the survey by reason of pride. In such a case, the high income group is over represented and low income group is under represented in the sample resulting in the overestimate of

the average income of the entire alumni group. This is a result of a built-in sampling bias.

3. *Incorrect deduction.* This happens when a general rule is applied to a specific case. Suppose there is a finding that the science facilities in the high schools of Province A are inadequate. We cannot conclude at once that any particular tool or equipment is definitely inadequate. Suppose there is an oversupply of test tubes. Hence, to make the conclusion that all science equipment and tools in the high schools of Province A are inadequate is an incorrect deduction in this case.
4. *Incorrect comparison.* A basic error in statistical work is to compare two things that are not really comparable. Again, let us go to the high schools of Province A. Suppose in the survey, School C has been found to have 20 microscopes and School D has only 8. We may conclude immediately that School C is better equipped with microscopes than School D. However, upon further inquiry, School C has 1,500 students while School D has only 500 students. Hence the ratio in School C is 75 students to one microscope while in School D the ratio is 63 students to one microscope. Hence, School D is better equipped with microscopes than School C. To conclude that School C is better equipped with microscopes than School D based on the number of microscopes owned by each school is incorrect comparison.
5. *Abuse of correlation data.* A correlation study may show a high degree of association between two variables. They may move in the same direction at the same rate but it is not right to conclude at once that one is the cause of the other unless confirmed so by other studies. In no case does correlation show causal relationship. When the government increases the price of gasoline, the prices of commodities also start to rise. We cannot conclude immediately that the increase in the price of gasoline is the sole cause of the increase in the prices of commodities. There are other causes to be considered such as shortage or undersupply of the commodities, increased cost of production, panic buying, etc. To be able to make a conclusive statement as to what is or what are the real causes of the increases in prices of commodities, an intensive investigation is needed.
6. *Limited information furnished by any one ratio.* A ratio shows only a partial picture in most analytical work. Suppose the only information that we have about a certain establishment is that the ratio does not show the kinds of employees leaving and why they are leaving. We do not know whether the losses of the employees are caused by death, retirement, resignations, or dismissals. We can only surmise but we cannot conclude with definiteness that the causes of the 20% employee turnover are death, retirement, poor working conditions, poor salary, etc. Avoid as much as possible making conclusions not sufficiently and adequately supported by facts.

7. *Misleading impression concerning magnitude of base variable.* Ratios can give erroneous impressions when they are used to express relationships between two variables of small magnitudes. Take the following examples. A college announced that 75% of its graduates passed the CPA examination at a certain time. Another college also advertised that 100% of its graduates who took that same examination passed. From these announcements we may form the impression that the standard of instruction in the two colleges is high. Actually, only four graduates from the first college took the CPA licensing examinations and three happened to pass. In the second college, only one of its graduates took the same examination and he happened to pass. To avoid making false impressions by making conclusions using ratios concerning variables of very small magnitudes, use the original data because the relationship is clear even without the use of a ratio. Of the first college, we may say that three out of the four graduates who took the CPA test passed and of the second college, we may say that the one graduate who took the same test passed.

## Chapter 5

### RECOMMENDATION

This chapter indicates statements that suggest the need for further studies – what else can be done relevant to your research problem and what other related problems should be addressed.

*Guidelines in writing the recommendations.* Recommendations are appeals to the people or entities concerned to solve or help solve the problems discovered in the inquiry. They should have the following characteristics:

- 1.) As mentioned above, recommendations aim to solve or help solve problems discovered in the investigation. For instance, one problem discovered in the inquiry about the teaching of science in the high schools of Province A is the lack of adequate facilities. Hence, the recommendation is for the schools to acquire more facilities. Surely this will solve or help solve problem of lack of adequate facilities.
- 2.) No recommendations should be made for a problem, or any thing for that matter, that has not been discovered or discussed in the study. Recommendation for things not discussed in the study are irrelevant.
- 3.) There may also be recommendations for the continuance of a good practice or system, or even recommendation for its improvement. This is to insure a continuous benefit being accorded to the universe involved.
- 4.) Recommendations should aim for the ideal but they must be feasible, practical, and attainable. It is useless to recommend the impossible. This, of course, depends upon the situation. For a big university of ten thousand students, it would be easy to recommend the purchase of a generator as a safeguard against brownouts, but for a small private high school of only two hundred students, this may not be feasible.
- 5.) Recommendations should be logical and valid. If the problem is the lack of facilities, it is only logical to recommend the acquisition of the lacking facilities.

- 6.) Recommendations should be addressed to the persons, entities, agencies, or offices who or which are in a position to implement them. Example. Suppose one problem discovered is the lack of science facilities. The recommendation should be: The school principals, through the Division Superintendent, should make an urgent petition to the proper government authorities to purchase adequate science equipment for the high schools. For private schools, their petitions should be directed to their respective Boards of Trustees.
- 7.) There should be a recommendation for further research on the same topic in other places to verify, amplify, or negate the findings of the study. This is necessary so that if the findings are the same, generalizations of wider application can be formulated.

For recommending similar researches to be conducted, the recommendation should be: It is recommended that similar researches should be conducted in other places. Other provinces should also make inquiries into the status of the teaching of science in their own high schools so that if similar problems and deficiencies are found, concerted efforts may be exerted to improve science teaching in all high schools in the country.

## **REFERENCES**

Author, Title, Source (and other details), year

Author1 and Author2, Title, Source (and other details), year

Main Author et al., Title, Source (and other details), year

All references must be stated in the review of literature; no report will be accepted without the proper acknowledgement to the authors referred to in the literature review.

The format of reference for nonverbatim statements is as follows:

- a) Author stated in year that biosorption of cationic...
- b) Author stated that biosorption of cationic...(year).
- c) It has been said that biosorption of cationic...(Author, year).

Acceptable references include

- a) technical journals and periodicals
- b) books and monographs
- c) unpublished research, and
- d) dissertation and master's thesis

NOTE: Internet references should NOT be included.

Example. Silva (2000), "Design, Development and Evaluation of a Web Based Interactive Multimedia Courseware in Analytic Geometry"

Agresti, William W. *New Paradigms for Software Development*. IEEE Computer Society Press. Washington DC. 1986.

Alderman, D. I. "Evaluation of the TICCIT Computer-Assisted Instruction System in the Community College". *SIGCUE Bulletin*, 1979.

Alessi, S. M. , and Trollip, S. R. *Computer-Based Instruction: Methods and Development*. Englewood Cliffs, NJ: Prentice-Hall, 1985 - 1991.

Alviar, Fides. *CAI: The Individualization of Training*. Infotrend, 1980.

Alviar, Fides. *Computer Assisted Instruction: The Individualization of Training*. Infotrends, 1980.

Aramson, Larry. *HTML Manual of Style*. Ziff-Davis Press. Emeryville, California, 1994.

Argus-Sister W.A. *The Effect of CAI on Attitudes and Achievement of Ninth Grade Regents math Students*. Unpublished master's thesis, State University of New York, Oswego, NY, 1985.

Atkinson, Rita L. Richard Atkinson and Earnest Hilgard. *Introduction to Psychology*. National Bookstore, 1983.

Bechtol, William M. "The Role of Higher Education in Improving Basic Skills Instruction." *ERIC* - 1986.

Becker, H.J. *Computer use in United States Schools, An initial report of U.S. participation in the I.E.A. Computers in Education Survey*, John Hopkins University, New York, 1990.

Bernstein, S. *My Computer, My Teacher*. *Personal Computing*, June 1983.

Blaschke, C. L., and Sweeney, J. "Implementing Effective Educational Technology: Some Reflections." *Educational Technology*, January 1977.

**APPENDIX A**  
**TITLE**

Each of the appendices is named with a letter of the alphabet and with title. This section is single-spaced. Each appendix includes all data that you feel must be included for further details, but these data interfere with smooth discussion of results. Naming of each appendix is with the characters of the alphabet, and each should have a title.

## **APPENDIX B**

### **EVALUATION OF FINAL THESIS PAPER**

Generally, a thesis or dissertation has to be defended before a panel of examiners and then submitted to the proper authorities for acceptance as a piece of scholarly work. Hence, there should be some guidelines in evaluating a thesis or dissertation. The following are offered to be the general criteria in judging the worthiness of a thesis or dissertation:

*I. The Subject and the Problems*

1. Is the subject significant, timely, and of current issue?
2. Is it clearly delimited but big enough for making valid generalizations?
3. Is the title appropriate for the subject?
4. Are the sub problems specific, clear, and unequivocal?

*II. The Design of the Study*

1. Is the research methodology appropriate?
2. Is the design clear and in accordance with the scientific method of research?
3. Is the report prepared carefully following the acceptable format and mechanics?
4. Are the documentations adequate and properly done?

*III. The Data (Findings)*

1. Are the data adequate, valid, and reliable?
2. Are they analyzed carefully and correctly treated statistically?
3. Are they interpreted correctly and adequately?

*IV. Conclusions (Generalizations)*

1. Are the conclusions based upon the findings?
2. Do they answer the specific questions raised at the beginning of the investigation?
3. Are they logical and valid outcomes of the study?
4. Are they stated concisely and clearly and limited only to the subject of the study?

*V. Recommendations*

1. Are the recommendations based upon the findings and conclusions?
2. Are they feasible, practical, and attainable?
3. Are they action-oriented? (They recommend action to remedy unfavorable condition discovered)
4. Are they limited only to the subject of the study but recommend further research on the same subject?

## APPENDIX C WRITING FORMAT

- Margins:                    1” from the top                    1” from the bottom  
                                  1¼” from the left                    1” from the right
- Title Page

Title – font Times New Roman (TNR) size 20, boldfaced centered  
by – TNR 14, centered

Firstname M. Lastname – TNR 16, bold, centered

If Graduate Student...- TNR 14, centered

A Thesis ... Submitted to ... - TNR 14, centered

Program ... - TNR 16, centered

Mapua Institute ... - TNR 14, centered

- Chapter 1 - 5  
Titles of each chapter – TNR 12, bold, centered, ALL CAPS. THE TEXT BODY SHOULD BE WRITTEN CONTINUOUSLY TNR 12, double-spaced, paragraphs must be

- Graphs

No fill effects, no outer border, inside tick, smooth lines

No triangles or diamonds, title at the TOP of the graph

- Tables

Title on TOP, body notes following title

- Writing style

Introduction and review – past participle tense, except for generally accepted truths, which may be written in the present tense.

Methodology – future tense (if proposal) or PAST TENSE AND PASSIVE VOICE (if thesis / practicum or research report).

Result and Discussion – third person and passive voice are preferred

- Pagination:            ½” from the bottom, centered

Title page – no pagination

Approval Sheet ... List of Figures – pagination starting from ii, iii, iv

**APPENDIX D**  
**EVALUATION FORM BY M. AURELIO**

		Yes	Partly	No
	<b>Title</b>			
1	Does it contain as few words as possible (25 words or less)?			
2	Does it give indication of the contents of the paper accurately and specifically?			
3	Does it describe the subject as specifically as possible?			
4	Does it avoid abbreviations, formulas, and jargon?			
5	Does it omit the verb?			
6	Is it easy as possible to understand?			
7	Does it contain key words?			
8	Does it come with a substitute to highlight the implications of the work?			
9	Are there any unnecessary words?			
10	Does it make an allusion to a literary work?			
11	Does it involve metaphors?			
12	Is it too general?			
13	Do the most important words stand out?			
14	Are the most important words mentioned first?			
15	Are keywords mentioned?			

		Yes	Partly	No
	<b>Author/s</b>			
1	Does it include only "true" authors?			
2	Have all authors made important contributions? – collecting data or simply giving advice do not make a person an author!			
3	Has the author whose name appears first, given the most important contribution?			
4	Are there no academic degrees attached to author/s name/s?			
5	Do authors' addresses appear?			
6	Is information on the main author's addresses and contact details given?			
7	Has every author either helped to draft the article it revised important parts of it?			
8	Has every author given final approval of the version for submission?			

		Yes	Partly	No
	<b>Abstract</b>			
1	Does it come before the main text?			
2	Is it less than 250 words?			
3	Does it briefly mention the objectives and purpose of the study?			
4	Does it briefly mention materials, methods, and apparatus and their intended use?			
5	Does it concisely include new theories, terminology, interpretations, or evaluations?			
6	Does it include new terms and special abbreviations and symbols?			
7	Does it exclude tables and graphs and direct references to them?			
8	Does it exclude detailed description of the experiment, investigation, standard methods, techniques, apparatus and materials?			
9	Does it include references to the literature?			
10	Is it written in normal language?			
11	Can it stand on its own?			
12	Is it complete by itself?			
13	Does it report the main results of the research?			
14	Does it briefly mention the principal conclusions?			
15	Does it briefly state the significance of the conclusions?			
16	Does it contain keywords?			
17	Are the keywords (usually not more than 5 terms) also given separately?			

		Yes	Partly	No
	<b>Introduction</b>			
1	Is it less than 2 type-written (double-spaced) pages (A4)?			
2	Does it indicate what is of interest in the paper?			
3	Does it say why the author carried out the research?			
4	Does it give the background the reader needs to understand and judge the paper?			
5	Does it emphasize the importance of the research?			
6	Does it define the nature and extent of the problem studied?			
7	Does it introduce the discussion that follows in the rest of the paper?			
8	Does it present the general objectives of the research?			
9	Does it present the specific objectives of the research?			
10	Does it clearly state the principal theme, in relation to the hypothesis?			
11	Does it orient the present research to previous concepts and bodies of knowledge?			
12	Does it present a brief and concise review of related literature?			
13	Are these literatures relevant to the specific aims of the present research?			

		Yes	Partly	No
	<b>Materials and Methods</b>			
1	Does it clearly explain the method/s employed in the investigation?			
2	Does it explain the reason why a particular method was chosen over other methods?			
3	Does it provide information that will allow another researcher to judge the study?			
4	Does it clearly state the assumptions made?			
5	Does it explain the design or the experiment or the investigation?			
6	Does it provide information that will allow another researcher to actually repeat the investigation and test results?			
7	Are the methods followed presented in a chronological order?			
8	Does it discuss the materials used, with exact technical specifications and quantities and their sources or method of preparation?			
9	Is every step in the method used stated, including the number of replications?			
10	Does it express all quantities used in standard units?			
11	Does it mention standard methods adopted simply by name?			
12	Does it completely explain new methods adopted			
13	Does it sufficiently explain modified methods adopted?			

		Yes	Partly	No
	<b>Results</b>			
1	Are the results presented in a simple manner?			
2	Are the results presented in a clear manner?			
3	Do the results present representative data rather than repetitive data?			
4	Are large data masses reduce to means and standard deviations?			
5	Are margins of error presented?			
6	Are voluminous and repetitive data presented in tables and graphs and not in text?			
7	Are unnecessary negative data excluded?			
8	Do negative data presented significantly affect the results?			
9	Are all figures, tables, graphs referred in the text?			
10	Are all figures, tables, graphs presented clearly and worth reproducing?			
11	Are unnecessary words avoided when discussing tables, graphs, and figures?			

		Yes	Partly	No
	<b>Discussion</b>			
1	Is there no repetition of what has already been said in the review of related literature or in the results?			

2	Is there a discussion to relate the results to the questions that were set out in the Introduction section?			
3	Does the discussion deal with each of the originally stated objectives?			
4	Are there no deviations from the originally stated objectives?			
5	Is the discussion organized according to the order of the original objectives?			
6	Does it not mention for the first time observations or results that should have been mentioned in the previous sections?			
7	Are unnecessary details or repetitions from preceding sections avoided?			
8	Are relationships between the facts observed during the present investigation discussed?			
9	Are the results sufficiently interrupted?			
10	Is there a discussion to show how the results and interpretations agree, or don't agree, with previously published work?			
11	Are the conclusions sufficiently presented?			
12	Does the section serve as an introduction to the subject of each conclusion, so that no conclusion comes as a surprise?			
13	Is evidence presented for each of the conclusions discussed?			
14	Is/are the significance of the results discussed?			
15	Are theoretical implications to future work discussed?			
16	Is there a discussion on what the work was not able to achieve?			
17	Does it discuss aspects of the research that is still need to be pursued further?			
18	Does it offer suggestions and recommendations for future research?			

		Yes	Partly	No
	<b>Citations</b>			
1	Are the citations clear and complete ("author-date" format recommended)?			
2	Are all citations accounted for on the References?			
3	Is the citation style in conformity to the format required by the publisher?			

		Yes	Partly	No
	<b>References</b>			
1	Are all authors that appear in the References actually cited in the text?			
2	Are the references cited published or are available from libraries or from the author?			
3	Are the References described in detail (should at least contain as applicable: author/s' name/s, year of publication, title of paper/book, publisher, editor/s' name/s, volume number, series number, conference details, inclusive pages)?			
4	Do the references comply with the format required by the publisher?			

		Yes	Partly	No
	<b>Acknowledgement – may be due to the following:</b>			
1	institution/s or individual/s who helped significantly in the research			
2	granting agency/ies that provided funds			
3	institution/s that hosted a scholarship/fellowship			
4	laboratory/ies that supplied space or materials			
5	person/s who helped collect data			
6	person/s who processed and prepared samples			
7	laboratory equipment operators			
8	person/s who gave advise including professors, mentors, colleagues			
9	draftsmen responsible for figures, tables, charts, maps, etc.			
10	textual (typography and grammar) editors			
11	friends who provided company			
12	entities and individuals who provided inspiration!			
13	motivators			
14	reviewers			

## APPENDIX E GRADING SYSTEM

### Grading System for Directed Study:

Panel Evaluation		40%
Oral Defense	20%	
Final Paper	20%	
Teacher Evaluation		60%
Chapters 1- 5 of the Final Paper	40%	
Final Exam/Poster Presentation	10%	
Class Activities/Attendance	10%	
	<b>TOTAL</b>	<b>100%</b>
		<b>Passing 75%</b>

### GRADING SYSTEM:

1. Thesis courses will be graded as P (Pass) or F (Fail)
2. In the event that the thesis course is not finished on the term, it is enrolled, a grade of IP (In Progress) will be given. Similar to a grade of 7.00, the grade of “IP” will be replaced by the final grade (P or F) once the course is completed. The procedure followed for the completion of grades will also be followed for this situation.
3. The grade of “IP” will appear in the official records of the students every quarter until it is completed and given a final grade of “P” or “F”.
4. A grade of “IP” will be given to those who could not submit the **HARDBOUND** final copy ON TIME.

### References:

1. Handy Guide to Research – IDRS
2. MIT SPG No. ORC-12-01
3. Methods of Research and Thesis Writing – Calderon and Gonzales
4. Guidebook on Thesis Writing - De Jesus
5. Methods and Techniques of Research – Sanchez
6. Internet Resources
7. Silvas’ Dissertation
8. Methods of Research and Thesis Writing by Paler-Calmorin
9. Other books and notes in Research