

Лекція 6.

Тема 7. Етапи проведення наукового дослідження згідно з міжнародними вимогами

Тема 8. Особливості написання наукових статей англійською мовою

План

1. Як писати наукову статтю
2. Основні компоненти наукового дослідження, структура статті
3. Як здійснити успішне наукове дослідження
4. Анотація до наукового дослідження
5. Що потрібно зробити перед початком наукового дослідження

1. How to Write a Scientific Paper: 8 Elements by P. A. Regoniel

How do you write a scientific paper? How is it different from writing in a literary sense? What are the important elements that characterize a scientific paper? This article provides answers to these common questions posed by students when faced with the task of writing their thesis or first scientific article.

How is Scientific Writing Different from Other Types of Writing. Writing a scientific paper is unlike the kind of writing that people do when they are writing their diaries, casual blogs, or essays on whatever topics they so desire to write about. Scientific paper writing is more focused and objective oriented, that is, each statement written has an intended purpose.

In writing a scientific paper, beating around the bush is considered a definite nono. It's a technical kind of writing that has some integrated logic in it. The main intention is to make clear the subject at hand and to present, analyze, discuss and highlight the important findings.

Elements of a Scientific Paper. What is the logic behind scientific paper writing? The following elements must be present in a scientific paper:

1. *A scientific paper has a rationale.* What is a rationale? A rationale is simply your justification of the topic you chose. It explains why the research was performed in the first place. It is the very reason why you conducted the research.

You may ask yourself the following questions in order to compose the rationale:

What is the issue all about? Why is it important?

Why is there a need to conduct the study?

How should the issue be resolved?

Think broadly first then bring the issue into focus. This will be your prelude to the next step, that is, writing the goal and objectives of the scientific paper.

2. *A scientific paper has a general objective or goal and a set of objectives directed towards that goal.* If the reason for the study is well laid out, then you should be able to write the main goal and objectives of your scientific investigation. The goal provides an overview or general statement of what the research intends to achieve. The objectives should specify what are the specific items that will have to be done to meet the goal.

What is the ideal number of objectives for a research venture? Normally, two to three objectives are written in a scientific paper. These objectives must have been thoroughly met and discussed by the researcher in both the discussion and conclusions section.

Be guided that the goal broadly defines the direction of the study and brings up the main issue. The objectives provide the specific direction by which the study will have to be carried out. You will sense that you have already written the objectives correctly if you can figure out what methods will have to be done to accomplish the objectives.

3. *A scientific paper has a review of literature.*

A scientific paper always has a review of literature. Why is this required? Simply, the main reason is for you to be able to avoid duplicating the work of others and to have a good grasp of the subject you want to study.

You should avoid being guilty of reinventing the wheel. The term “reinventing the wheel” is usually used to denote doing something which has already been done. According to archaeologists, the wheel was discovered way back in 8,000 B.C. Surely, you do not want to tell everyone that the wheel should be round, unless you find, against all odds, that a triangular wheel is better than a round wheel in transporting a load.

As a researcher, you should make sure that your work is original or that which builds upon, not duplicate, what has already been discovered or done. This is why you are required to read a great deal of literature to broaden your knowledge on a particular subject you are interested in. engineer

Upon reading related literature and studies, you will find out gaps in knowledge. Gaps in knowledge are those areas which nobody ventured to find out. This is where you come in if you believe you can perform what’s necessary.

Of course, you have to assess your capacity in doing the task at hand. This is the reason why you need to have a good background knowledge of the discipline you are in. A biologist is not expected to do research fit for an engineer.

Read quick tips on how to write the literature review here.

4. *A scientific paper has a conceptual framework.*

A conceptual framework is the researcher’s guide or map in conducting the research. This framework is the culmination of the review of literature, that is, it draws out specific variables from a phenomenon, the behavior of which will be the focus of the study. For details on how the conceptual framework is arrived at, see my previous post titled How to Make a Conceptual Framework.

5. *A scientific paper has a methodology section.* The methodology section in a scientific paper describes the procedure to follow in order that the researcher will be able to adequately answer the statement of the problem or address the objectives. It explains why certain methods have to be used to provide answers to the questions posed in the early part of the scientific paper.

Methodology is different from methods because methodology refers to researcher’s justification or reason behind using a specific method. The methodology varies between disciplines and it also provides information on whether the study will be qualitative or quantitative in nature. Methods, on the other hand, refers to the specific things the researcher will do to undertake the study such as interview or focus group discussion.

There are many methodologies used in research and this will be discussed in another article. The common ones encountered are descriptive and correlation methodologies. Descriptive research, as the root word “describe” indicates, are those which refer to studies of existing phenomena, focusing mainly on description of what is there while correlation studies involve relating variables with each other in trying to determine causality or effect.

6. *A scientific paper has a results and discussion section.*

The results and discussion section is that part of the scientific paper where you present your findings, the analysis that you did which includes both subjective and objective analysis, and interpretation of the findings in the light of other findings in other literature.

Subjective analysis deals more with the researcher’s judgment or expert opinion on the matter studied while objective analysis is data driven, that is, statistical analysis is used to reveal trends. Many researchers combine both approaches to see the issue in different perspectives.

7. *A scientific paper has a conclusion and recommendations section.*

At the end of the results and discussion section, the researcher must make his conclusion or conclusions based on the hypothesis of the study. He may either confirm or refute the hypothesis drawn out after presenting the conceptual framework. The conclusion is just a brief restatement of the whole paper, that is, those things discussed in the methods as well as the findings.

8. *A scientific paper validates its arguments using a set of reference materials.* As standard practice, of course the scientific paper should cite the references or literature review examined in the conduct of the study. Make sure that whatever you cite in your research paper is backed up by your reference material. Be meticulous enough to do so, as those who would like to cross-reference your research paper will be looking for this. There is no hard rule on the number of references to write here but some scientific journals prescribe a limit, say a maximum of 30. You should refer to the requirements set forth in the specific journal where you intend to publish your scientific paper.

2. Components of a Research Paper

In this segment, the key components of a quality research paper will be identified and discussed.

Learning Objectives.

Identify the components of a research paper.

Analyze the components of a research paper.

Understanding Scholarly Journal Articles

Once a researcher goes through the process of conducting a research project, it is critical that he or she shares their findings with others through submission of the work to a scholarly journal. The following video, “Understanding Scholarly Journal Articles”, provides an introduction to the process of writing a journal article for submission. The video discusses the purpose of publication, how scholarly journals differ from other publications, the steps in the publication process, the parts of basic journal article, and tips on writing.

Structure of a Research Paper

While academic disciplines vary on the exact format and style of journal articles in their field, most articles contain similar content and are divided in parts that typically follow the same logical flow. Following is a list of the parts commonly found in research articles: Title; Abstract; Introduction; Literature Review; Methods; Results; Discussion/Conclusion; References/Bibliography.

Research papers are organized so that the information flow resembles an hourglass in that it goes from general to specific and then back to general again. The introduction and literature review sections will introduce the problem and provide general information. The methods and results will provide specific, detailed information about this research project and the discussion/conclusion will discuss the findings in a larger context. The following section will describe each of these parts in more detail. Additional information can be found in the Resources section of this module and in the Suggested Readings.

Title. The title should be specific and indicate the problem the research project addresses using keywords that will be helpful in literature reviews in the future.

Abstract. The abstract is used by readers to quickly review the overall content of the paper. Journals typically place strict word limits on abstracts, such as 200 words, making them a challenge to write. The abstract should provide a complete synopsis of the research paper and should introduce the topic and the specific research question, provide a statement regarding methodology and should provide a general statement about the results and the findings. Because it is really a summary of the entire research paper, it is often written last.

Introduction. The introduction begins by introducing the broad overall topic and providing basic background information. It then narrows down to the specific research question relating to this topic. It provides the purpose and focus for the rest of the paper and sets up the justification for the research.

Literature Review. The purpose of the literature review is to describe past important research and relate it specifically to the research problem. It should be a synthesis of the previous literature and the new idea being researched. The review should examine the major theories related to the topic to date and their contributors. It should include all relevant findings from credible sources, such as academic books and peer-reviewed journal articles.

Methods. The methods section will describe the research design and methodology used to complete the study. The general rule of thumb is that readers should be provided with enough detail to replicate the study.

Results. In this section, the results of the analysis are presented. How the results are presented will depend upon whether the research study was quantitative or qualitative in nature. This section should focus only on results that are directly related to the research or the problem. Graphs and tables should only be used when there is too much data to efficiently include it within the text. This section should present the results, but not discuss their significance.

Discussion/Conclusion. This section should be a discussion of the results and the implications on the field, as well as other fields. The hypothesis should be answered and validated by the interpretation of the results. This section should also

discuss how the results relate to previous research mentioned in the literature review, any cautions about the findings, and potential for future research.

References/Bibliography. The research paper is not complete without the list of references. This section should be an alphabetized list of all the academic sources of information utilized in the paper. The format of the references will match the format and style used in the paper. Common formats include APA, MLA, Harvard and so forth.

3. How to Conduct a Successful Scientific Research?

United Nations Educational, Scientific and Cultural Organization (UNESCO) defines research as systematic and creative actions taken to increase knowledge about humans, culture, and society and to apply it in new areas of interest. Scientific research is the research performed by applying systematic and constructed scientific methods to obtain, analyze, and interpret data.

Scientific research is the neutral, systematic, planned, and multiple-step process that uses previously discovered facts to advance knowledge that does not exist in the literature. It can be classified as observational or experimental with respect to data collection techniques, descriptive or analytical with respect to causality, and prospective, retrospective, or cross-sectional with respect to time.

All scientific investigations start with a specific research question and the formulation of a hypothesis to answer this question. Hypothesis should be clear, specific, and directly aim to answer the research question. A strong and testable hypothesis is the fundamental part of the scientific research. The next step is testing the hypothesis using scientific method to approve or disapprove it.

Scientific method should be neutral, objective, rational, and as a result, should be able to approve or disapprove the hypothesis. The research plan should include the procedure to obtain data and evaluate the variables. It should ensure that analyzable data are obtained. It should also include plans on the statistical analysis to be performed. The number of subjects and controls needed to get valid statistical results should be calculated, and data should be obtained in appropriate numbers and methods. The researcher should be continuously observing and recording all data obtained.

Data should be analyzed with the most appropriate statistical methods and be rearranged to make more sense if needed. Unfortunately, results obtained via analyses are not always sufficiently clear. Multiple reevaluations of data, review of the literature, and interpretation of results in light of previous research are required. Only after the completion of these stages can a research be written and presented to the scientific society. A well-conducted and precisely written research should always be open to scientific criticism. It should also be kept in mind that research should be in line with ethical rules all through its stages.

Actually, international economy research has been developing rapidly, possibly even more than any other economic field, thus reflecting the utilization of new research methods and advanced treatment technologies. Nevertheless, basic research principles and ethical considerations keep their importance.

Ethics are standards used to differentiate acceptable and unacceptable behavior. Adhering to ethical standards in scientific research is noteworthy because of many different reasons. First, these standards promote the aims of research, such as knowledge, truth, and avoidance of error. For example, prohibitions against fabricating, falsifying, or misrepresenting research data promote truth and minimize error. In addition, ethical standards promote values that are essential to collaborative work, such as trust, accountability, mutual respect, and fairness. Many ethical standards in research, such as guidelines for authorship, copyright and patenting policies, datasharing policies, and confidentiality rules in peer review, are designed to protect intellectual property interests while encouraging collaboration. Many ethical standards such as policies on research misconduct and conflicts of interest are necessary to ensure that researchers can be held accountable to the public. Last but not the least, ethical standards of research promote a variety of other important moral and social values, such as social responsibility, human rights, animal welfare, compliance with the law, and public health and safety. In conclusion, for the good of science and humanity, research has the inevitable responsibility of precisely transferring the knowledge to new generations.

For example, in economic-medical research, all clinical investigations are obliged to comply with some ethical principles. These principles could be summarized as respect to humans, respect to the society, benefit, harmlessness, autonomy, and justice. Respect to humans indicates that all humans have the right to refuse to participate in an investigation or to withdraw their consent any time without any repercussions. Respect to society indicates that clinical research should seek answers to scientific questions using scientific methods and should benefit the society. Benefit indicates that research outcomes are supposed to provide solutions to a health problem. Harmlessness describes all necessary precautions that are taken to protect volunteers from potential harm. Autonomy indicates that participating in research is voluntary and with freewill. Justice indicates that subject selection is based on justice and special care is taken for special groups that could be easily traumatized.

But as for psychiatric studies, if the patient is not capable of giving consent, the relatives have the right to consent on behalf of the patient. This is based on the idea of providing benefit to the patient with discovery of new treatment methods via research. However, the relatives' consent rights are under debate from an ethical point of view. On the other hand, research on those patients aim to directly get new knowledge about them, and it looks like an inevitable necessity. The only precaution that could be taken to overcome this ambivalence has been the scrupulous audit of the Research Ethic Committees. Still, there are many examples that show that this method is not always able to prevent patient abuse. Therefore, it is difficult to claim autonomy when psychiatric patients are studied, and psychiatric patients are considered among patients to require special care.

4. How to Write an Abstract for Your Thesis or Dissertation

What is an Abstract?

The abstract is an important component of your thesis. Presented at the beginning of the thesis, it is likely the first substantive description of your work read

by an external examiner. You should view it as an opportunity to set accurate expectations.

The abstract is a summary of the whole thesis. It presents all the major elements of your work in a highly condensed form. An abstract often functions, together with the thesis title, as a stand-alone text. Abstracts appear, absent the full text of the thesis, in bibliographic indexes such as PsycInfo. They may also be presented in announcements of the thesis examination. Most readers who encounter your abstract in a bibliographic database or receive an email announcing your research presentation will never retrieve the full text or attend the presentation.

An abstract is not merely an introduction in the sense of a preface, preamble, or advance organizer that prepares the reader for the thesis. In addition to that function, it must be capable of substituting for the whole thesis when there is insufficient time and space for the full text.

Size and Structure.

Currently, the maximum sizes for abstracts submitted to Canada's National Archive are 150 words (Masters thesis) and 350 words (Doctoral dissertation). To preserve visual coherence, you may wish to limit the abstract for your doctoral dissertation to one double-spaced page, about 280 words.

The structure of the abstract should mirror the structure of the whole thesis, and should represent all its major elements.

For example, if your thesis has five chapters (introduction, literature review, methodology, results, conclusion), there should be one or more sentences assigned to summarize each chapter.

Clearly Specify Your Research Questions.

As in the thesis itself, your research questions are critical in ensuring that the abstract is coherent and logically structured. They form the skeleton to which other elements adhere.

They should be presented near the beginning of the abstract. There is only room for one to three questions. If there are more than three major research questions in your thesis, you should consider restructuring them by reducing some to subsidiary status.

Don't Forget the Results.

The most common error in abstracts is failure to present results.

The primary function of your thesis (and by extension your abstract) is not to tell readers what you did, it is to tell them what you discovered. Other information, such as the account of your research methods, is needed mainly to back the claims you make about your results.

Approximately the last half of the abstract should be dedicated to summarizing and interpreting your results.

5. Six things to do before writing your manuscript by Angel Borja

1. Think about why you want to publish your work – and whether it's publishable.

Writing a paper starts well in advance of the actual writing. In fact, you must to think about why you want to publish your work at the beginning of your research, when

you question your hypothesis. You need to check then if the hypothesis and the survey/experiment design are publishable. Ask yourself:

Have I done something new and interesting?

Is there anything challenging in my work?

Is my work related directly to a current hot topic?

Have I provided solutions to some difficult problems?

If all answers are “yes”, then you can start preparations for your manuscript. If any of the responses are “no”, you can probably submit your paper to a local journal or one with lower Impact Factor.

When responding to these questions, you should keep in mind that reviewers are using questionnaires in which they must respond to questions such as:

Does the paper contain sufficient new material?

Is the topic within the scope of the journal?

Is it presented concisely and well organized?

Are the methods and experiments presented in the way that they can be replicated again?

Are the results presented adequately?

Is the discussion relevant, concise and well documented?

Are the conclusions supported by the data presented?

Is the language acceptable?

Are figures and tables adequate and well designed?

Are there information duplicated? Are they too many?

Are all references cited in the text included in the references list?

2. Decide what type of the manuscript to write.

You have at least three options on the type of manuscript:

Full articles, or original articles, are the most important papers. Often they are substantial completed pieces of research that are of significance as original research. Letters/rapid communications/short communications are usually published for the quick and early communication of significant and original advances. They are much shorter than full articles (usually strictly limited in size, depending on each journal). Review papers or perspectives summarize recent developments on a specific hot topic, highlighting important points that have previously been reported and introduce no new information. Normally they are submitted on invitation by the editor of the journal.

When looking at your available information, you must self-evaluate your work: Is it sufficient for a full article, or are your results so thrilling that they should be shown as soon as possible?

You should ask your supervisor (if you are a PhD student) or a colleague for advice on the manuscript type to be submitted. Remember also that sometimes outsiders – i.e., colleagues not involved in your research – can see things more clearly than you.

Whatever type of article you write, plan to submit only one manuscript, not a series of manuscripts. (Normally editors hate this practice, since they have limited space in the journals and series of manuscripts consume too many pages for a single topic or an author/group of authors)

3. Choose the target journal.

A common question is how to select the right journal for your work. Do not gamble by scattering your manuscript to many journals at the same time. Only submit once and wait for the response of the editor and the reviewers.

The most common way of selecting the right journal is to look at the articles you have consulted to prepare your manuscript. Probably most of them are concentrated in one or two journals. Read very recent publications in each candidate journal (even in press), and find out the hot topics and the types of articles accepted.

Also consider the high rejection rates of the journals (e.g., Nature, Science, The Lancet and Cell are >90 percent), and if your research is not very challenging, focus in more humble journals with lower Impact Factors. You can find a journal's Impact Factor on its webpage or via Science Gateway.

4. *Pay attention to journal requirements in the Guide for Authors.*

After selecting the journal for submission, go to the web page and download the Guide for Authors, print out it and read the guidelines again and again!

They generally include detailed editorial guidelines, submission procedures, fees for publishing open access, and copyright and ethical guidelines. You must apply the Guide for Authors to your manuscript, even the first draft, using the proper text layout, references citation, nomenclature, figures and tables, etc. Following this simple tip will save your time – and the editor's time. You must know that all editors hate wasting time on poorly prepared manuscripts. They may well think that the author shows no respect.

5. *Pay attention to the structure of the paper.*

More and more journals have new types of structure for their articles, so it's crucial to consult the Guide for Authors. However, in general, most of them follow the same structure:

A section that enables indexing and searching the topics, making the paper informative, attractive and effective. It consists of the Title, the Authors (and affiliations), the Abstract and the Keywords.

A section that includes the main text, which is usually divided into: Introduction, Methods, Results, Discussion and Conclusions.

A section that includes the Acknowledgements, References, and Supplementary Materials or annexes.

The general structure of a full article follows the IMRAD format, introduced as a standard by the American National Standards Institute in 1979, which responds to the questions below:

Introduction: What did you/others do? Why did you do it?

Methods: How did you do it?

Results: What did you find?

Discussion: What does it all mean?

I will discuss structure in more detail in a subsequent article.

6. *Understand publication ethics to avoid violations.*

One of the worst things in science is plagiarism. Plagiarism and stealing work from colleagues can lead to serious consequences, both professionally and legally. Violations include data fabrication and falsification, improper use of human subjects and animals in research, and using another author's ideas or wording without proper

attribution. It's also possible to commit ethics violations without intending to. Educational resources include the Publishing Ethics Resource Kit (PERK) from the Committee on Publication Ethics (COPE) and Elsevier's Ethics in Publication & Research website.

Closing advice. As you prepare your manuscript, there are some basic principles you should always keep in mind:

Cherish your own work – if you do not take care, why should the journal? There is no secret recipe for success – just some simple rules, dedication and hard work.

Editors and reviewers are all busy scientists, just like you. Make things easy to save them time.

Hence, if you are ready to learn more about preparing a manuscript, look for the next articles in this series and have good luck!