به نام خدا

درس سمینار کارشناسی ارشد

آشنایی با ساختار متون دانشگاهی

احمدرضا تابش

دانشکده مهندسی برق و کامپیوتر

دانشگاه صنعتی اصفهان

رئوس مطالب

۱ – مقدمه:

پیشنهادیه تحقیق (پروپزال)، پایان نامه و رساله، مقاله علمی-پژوهشی

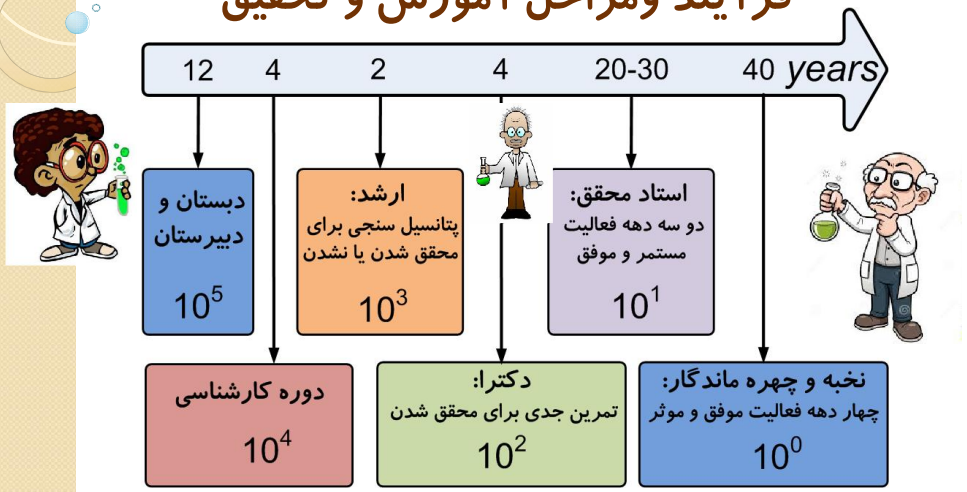
۲-چگونه و چه موقع پیشنهادیه بنویسیم؟

۳- چگونه پایان نامه بنویسم؟

۴- چگونه مقاله بنویسیم؟

مقدمه

فرآیند ومراحل آموزش و تحقیق



مقدمه

کارشناسی ارشد (دو سال)
آیا ژن تحقیق داریم یا خیر؟

پروپزال: پیشنهاد مکتوب در مورد موضوع و مساله تحقیق و با بیان هدف و انگیزه و زمانبدی انجام کار.
ارزیابی: توسط تحصیلات تکمیلی دانشکده

پایان نامه (رساله): گزارش علمی از کار انجام شده در راستای دستیابی به اهداف مشخص موضوع تحقیق در پیشنهادیه.
ارزیابی: توسط کمیته داوران دانشکده با نمره

مقاله: ارائه نتایج کار اصیل(دارای نوآوری) به جامعه علمی متخصص در زمینه موضوع تحقیق.
ارزیابی: توسط متخصصین بین المللی (رد یا قبول)

مقدمه

نحوه نگارش و ارائه مطالب در یک زمینه پژوهشی ماهیتاً بر مبنای سبک و سلیقه یک متخصص (استاد راهنما) در آن زمینه است ولی با رعایت نُرم جامعه دانشگاهی.

معیارها

- شیوه نامه تحصیلات تکمیلی (دستورالعمل ژورنال)
- سبک و سلیقه استاد راهنما
- نرم (هنجار) جامعه علمی

سوال: اولویت این معیارها در نگارش پایان نامه و نگارش مقاله علمی پژوهشی چگونه است؟

چه موقع می توان پیشنهادیه نوشت؟

جواب کوتاه: وقتی در زمینه موضوع تحقیق تا حدودی مسلط شدید!

علائم تسلط بر موضوع

- شناخت کلی موضوع و آشنایی با چالشهای اصلی آن
- تمرکز بر روی یک مساله خاص
- تسلط بر راه حل های ارائه شده برای مساله و اطلاع از محدودیت های راه حل های موجود.

الگوریتم مسلط شدن:

۱- انتخاب یک زمینه پژوهشی مناسب از طریق جمع آوری داده ها	جمع آوری داده ها Data
۲- مطالعه، مطالعه و مطالعه برای کسب اطلاعات در مورد موضوع (مقالات مروری) مطالعه ۲۰ تا ۳۰ مقاله جدید، اصیل و مرتبط	معنی دار کردن داده ها (کسب اطلاعات) Information
۳- انتخاب یک مساله مشخص، تمرکز بر چالش ها و راه حلها و محدودیتهای آنها، بررسی جزئیات برای تسلط بیشتر.	کاربردی کردن اطلاعات (کسب دانش) knowledge
۴- مرتب کردن ذهن درباره موضوع، تعریف مساله تحقیق و اهداف مشخص در راستای حل آن برای غلبه بر محدویتهای روشهای موجود.	بکارگیری دانش در راستای اهداف مشخص(خرد) Wisdom

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مسلط شدیم چگونه پیشنهادیه بنویسیم؟

۱- انتخاب عنوان جامع و مانع
(معمولا ۹ تا ۱۱ کلمه اصلی داشته باشد مناسب است).

۲-شروع با مقدمه و پیش زمینه کلی از موضوع، تمرکز تدریجی روی چالشها در یک زمینه خاص از موضوع، ارائه یک صورت مساله مشخص به عنوان مساله تحقیق، بیان انگیزه (ضرورت) و اهداف مشخص تحقیق (با در نظر گرفتن محدودیت زمان یکسال)

۳- ارائه راهبرد حل مساله (منظور ارائه روش حل دقیق نیست)، بیان نتایج احتمالی قابل انتظار، بیان روش ارزیابی راهکار های احتمالی، بیان منابع لازم برای بررسی و ارزیابی روش.

۴- فازبندی مراحل تحقیق، ارائه زمانبدی و در نهایت ارائه مراجع اصیل و جدید مرتبط با موضوع تحقیق در انتهای پیشنهادیه.

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مقدمات لازم برای نوشتن پایان نامه

چه موقع می توان شروع به نوشتن پایان نامه نمود؟

۱- روش یا راهکار مشخصی برای حل مساله تحقیق ارائه کرده باشیم.

۲- روش و راهکارها به صورت مناسبی ارزیابی شده باشند.

۳- نتایج ارزیابی معتبر و قابل ارائه به جامعه علمی متخصص در موضوع باشد.

۴- تصویر کلی از روش پیشنهادی، نحوه ارزیابی و نتایج داشته باشیم.

۵-فهرست اولیه مطالب الزاما تا سطح۲ و ترجیحا تا سطح ۳ طراحی شده باشد.

ساختار پایان نامه

۱- عنوان (۹ تا ۱۱ کلمه) و فهرست مطالب (معمولا تا سطح ۳)

۲- چکیده و کلمات کلیدی : (چکیده پایان نامه معمولا ۲ پاراگراف ۲۵۰ کلمه ای)

۳-فصل اول: مقدمه (بیان ساده: دانشجوی کارشناسی باید آنرا کامل بفهمد)

۴-فصول میانی مربوط به مقدمات فنی و تخصصی- روش ها و مواد لازم

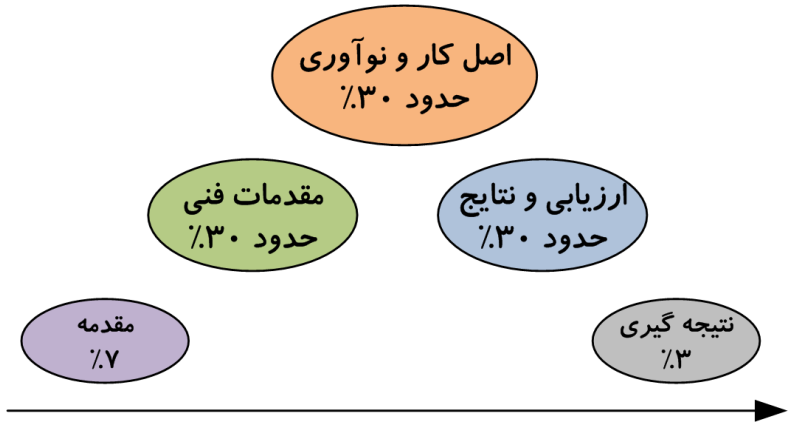
۵-فصول میانی مربوط به ارزیابی روشهای ارائه شده، نتایج ارزیابی و بحث آن

۶-فصل آخر: نتیجه گیری و پیشنهادات (بیان ساده قابل فهم برای همه)

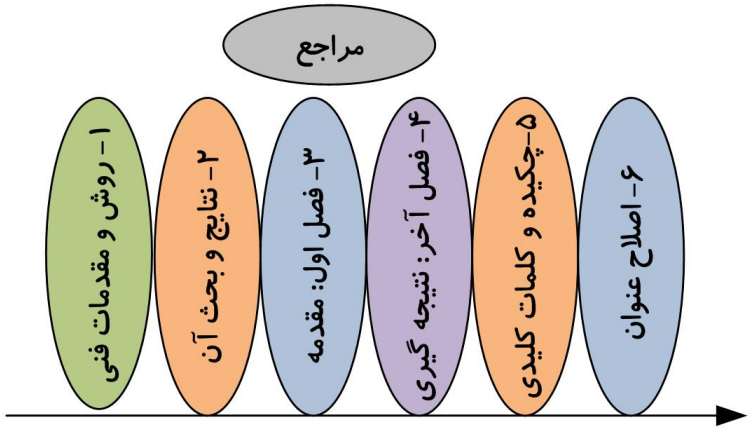
۷-مراجع و پیوست ها.

نُرم: بین ۵ تا ۷ فصل، حدود ۹۰ تا ۱۱۰ صفحه، با حدود ۳۰ تا ۵۰ مرجع.

توازن در ساختار پایان نامه



ترتیب زمانی نوشتن فصول پایان نامه



نحوه نگارش فصول میانی

در بخش روش ها و نوآوری ها:

۱- بیان روش ارائه شده برای حل مساله تحقیق به صورت دقیق و قابل تکرار
۲- لزوما همه روشهای موفق و ناموفق گزارش داده نمی شوند (فقط موفق ها)
۳-توضیحات مفصل، اثبات های ریاضی فرعی، مشخصات سیستم در پیوست ها

در بخش بیان نتایج و بحث آن:

۱- چگونه روش پیشنهادی ارزیابی شد و نتایج آن چه بود؟
۲- ارائه بحث و تحلیل نتایج اصلی (مهم ترین بخش کار همینجاست)
۳-فقط آزمایش های مفید و مرتبط بیان می شود .

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نحوه نگارش فصل مقدمه (بسیار مهم)

چهار زیر بخش اصلی فصل مقدمه:

۱-۱ پیش زمینه و صورت مساله تحقیق (حدود یک تا دو صفحه)

۱-۲-انگیزه و اهداف (حدود نیم تا یک صفحه)

۱-۳ مرور کارهای مرتبط (حداقل حدود ۲ تا ۳ صفحه)

۱-۴ بیان ساختار پایان نامه (حداکثر یک صفحه هر فصل در یک پاراگراف)

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نحوه نگارش فصل نتیجه گیری

حدود دو تا سه صفحه شامل مطالب زیر:

۱- مرور مختصر و سریع اهداف و نحوه دستیابی به آنها

۲-بیان خلاصه کار انجام شده (با بیان ساده و کمتر اصطلاحات تخصصی)

۳-بیان خلاصه نتایج ارزیابی روش ارائه شده و بحث آن

۴-ارائه پیشنهادات برای ادامه کار

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نحوه نگارش چکیده

چکیده مقاله مشابه مقدمه ولی بدون پیش زمینه (۲۰۰ کلمه)

۱- در این مقاله چه کار کرده ایم (بیان روش)؟

۲- نحوه ارزیابی چگونه است و چه نتایجی بدست آورده ایم؟

۳-مزایا و محدودیت ها چیست؟

۴- چرا این کار انجام شده و به چه درد می خورد؟

چکیده پایان نامه معمولا یک پاراگراف اضافه تر در مورد پیش زمینه موضوع دارد (حدود ۵۰۰ کلمه)

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نحوه نگارش مقاله علمی پژوهشی

نوشتن مقاله فقط وقتی نوآوری قابل در کار وجود دارد!

ساختار مشابه با پایان نامه (ولی در فضای محدودتر)

مراحل:

۱- تهیه فهرست مطالب تا سطح ۳ و ویرایش آن (حدود ۱ هفته)

۲-نوشتن پیش نویس مقاله بدون وقفه برای ویرایش (حدود ۱۰ روز)

۳-استراحت برای تبدیل از به مود منتقد سخت گیر (حدود چند روز)

۴- شروع مرحله وقت گیر و نفس گیر ویرایش (حدود ۳ تا ۴ ماه!!!)

حدود ۷ تا ۱۵ مرحله ویرایش لازم است!!!!

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پنج مرحله اصلی ویرایش مقاله

مرحله ۱: خواندن مقاله از دید داور و بررسی کمبودها (برای اضافه کردن) و مشخص کردن مطالب اضافی برای حذف.

مرحله ۲: شفاف نوشتن متن و حذف نقاط مبهم.

مرحله ۳: اصلاح متن و متوازن سازی از لحاظ محتوی بخش های مختلف.

مرحله ۴: خلاصه کردن مطالب مقاله.

مرحله ۵: بررسی از لحاظ املا و ساختار گرامری.

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Guidelines for Writing Research Proposal, Thesis, and Papers

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Disclaimer: Please note that this manuscript is NOT an official reference for academic writing.

Contents

1 Introduction

1.1 Research Proposal

A *research proposal* states the research problem that you are going to work on, motivations for working on the problem, a review of related works (literature survey), and a time-line for the research work. A good proposal presents a road map of the research to be done. It will be evaluated with the graduate office to approve continuation of your work and to help monitor/guarantee the quality of the graduate program at the department level.

1.2 Dissertation and Thesis

A *dissertation* is long and detailed essay to present findings of firsthand original research (often used as a requirement of a Ph.D program). A *thesis* is a detailed report (usually 100+ pages) on what you have preformed during your research. A master thesis does not necessarily include an outstanding original findings, however, it should at least try to show some signs of novelty. Both dissertation and thesis should clearly explain what you have achieved during your research works. Research dissertations and theses will be evaluated within a department and for dissertations often confirmation of an external appraiser is also required.

1.3 Academic Paper

An **academic paper** presents the essence of your *original* finding and achievements in the field of your research. A graduate student can start writing of a research paper during the graduate program or extract the paper from his/her qualified research thesis. A research paper will be peer reviewed and evaluated (nation- or world-wide) and it will not be necessarily accepted for publishing!

2 Writing of a Research Proposal

2.1 When to begin writing of a proposal?

Before proceeding for writing a research proposal, the student should acquaint himself/herself with the field of research by reading and reviewing the related literature.

$\Rightarrow$ Read and read to become *"ready"* to begin research! A few signs that show someone is *ready* to write a proposal are:

- Familiarizing with the subject and its challenges;
- Focusing on a specific problem;
- Learning about the existing solutions/strategies for that specific problem;
- Evaluating the existing methods by listing the advantages/limititations of each method.

▶ Practical Steps:

1. Select a subject, read "Review" and "Survey" papers about the subject to gain *information* about the subject.
2. Select a specific problem and focus on that by reading relevant literatures. Try to understand the main challenges and suggested solutions for them. Try to enhance your *knowledge* about the problem and the subject of research.
3. Follow details of a few solutions/strategies in depth which help you to know about recent achievement about the problem (solutions and their limitations).
4. Consolidation: Draw a big picture of the problem and organize it in your mind based on what you have read. Perform a new search and review literatures as an expert in the field. Try to prepare the layout of your proposal.

2.2 Structure of a Proposal

Essential components of a research proposal are: Problem Statement, Motivation, Objectives, Solution Strategy, Verification and Evaluation Methods, Required Resources, Time-line of your work, and References. Also, the proposal needs an introduction to provide required background and a literature review which can be embedded in the introduction or presented in a separated section.

▶ Practical Steps:

1. **Title:**
   Select a title that clearly describe your research topic and the solution approach for that. A "good" title states a specific subject, the scope (limitations) of the work and solution strategy. Examples:

   "Modelling and Analysis of Wind Energy Systems in Power Systems"
   → Not acceptable as it is vague, and general.

   "Small-signal Modelling and Analysis of Grid-connected Wind Farms"
   → More Specific, provide scope but say nothing about solution strategy.

   "Frequency Response Analysis of Induction Machine-based Grid-connected Wind Farms"
   → States a specific problem. Scope of the work and solution strategy are also stated.

   Hint: a good title often includes not more than 9 to 11 technical words.

2.3 "Introduction" or "Problem Statement, Motivation, and Objectives"

A neat and concise introduction simply begins with a background to broadly introduce the subject of research work. Then, by stating the challenges, it narrows down to an specific problem (Problem Statement). Needs and justifications for doing research on the stated problem should also be stated (Motivation). The introduction of proposal can be ended by

listing a few specific objectives which are achievable in a limited time (*e.g.* 1 year in a M.Sc. program).

A review of related works (Literature Survey) can be stated in the introduction or it can be presented in an individual subsection. Literature review includes but not limited to recent (past three to five years) and original (journal and/or referred conference) publications.

2.4 Solution Strategy, Evaluation Method, and Required Resources

In a research proposal, it is not expected that a solution to the research problem is provided. However, a strategy for solution and a method for evaluation of the solution-to-be-proposed should be provided. The evaluation method (specially in experimental works) may need facilities and infrastructures. Since any proposed solution to a problem needs to be verified, it is necessary to consider availability of required resources for a solution strategy in the proposal.

▶ Practical Steps:

(a) Based on the knowledge that you gained and mastery that you obtained about the subject, try to suggest a solution strategy that partially covers limitations of other available solutions to a problem. Such a solution will ideally lead to present original research work that can be published. Presenting an original work may not be expected from all MSc level student, however, this should not reduce the quality of MSc thesis to an elaborated report such as a BSc project or technical report.

(b) Try to describe the expected results based on the suggested solution strategy. It is useful to discuss the advantages (benefits) and limitations (drawbacks) of suggested solution compared to the available solution(s).

(c) Describe a method for validating and verification of your solution. State the required resources that you will need during your work and make sure that the required resources will be available.

2.5 Milestones and Time-line of the Research Work

Real research projects are virtually endless and there will be always a room for improving the solution to a problem. However, in real life, the time constraints should be considered as a mandatory part of the research. As a graduate-level student, the MSc/PhD program will confine students to be graduated within a certain time interval. In industry, the limitation of financial resources and deadlines will force a researcher to determine *priorities* and to complete the research work *on time*.

▶ Practical Steps:

(a) Determine the main phases of your research work and list the main steps (Milestones) for performing the research. Reviewing of similar research papers in the field of the work can provide some clues about the main steps of the research.

(b) Estimate the time that you need for each step and summarize the time lines of the steps in a table to be attached in the proposal.

2.6 References

The reference section is the last part of a research proposal which should include a list of *recent* and *original* papers related to the field research. Web-sites and other type of references can also be listed in the reference section. The reference list should be completed during performing the research. Using reference management software tools such as EndNote, JabRef, and Refworks can organize the references and save times in writing of thesis and research papers.

3 Writing a Thesis

Thesis is a detailed report on a research work that starts with statement of a problem, describes solution methods, evaluates the methods based on test results, and finally concludes the whole research work. There is enough room to explain details of each section, however, a good thesis is a neat and concise one. A research thesis should not be a detailed manuscript as a textbook, however, adequate information must be presented about materials/methods and tests so that one can re-produce the results which discussed within the thesis.

3.1 When to begin writing a thesis

Writing a thesis requires a detailed layout (plan) that include chapters, sections, and subsections of the thesis. Layout is a first version of table-of-content which should be carefully created before writing. Writing of the thesis will be more efficient and less stressful if it is performed throughout the research.

▶ Practical Steps:

1. Use the proposal to create first layout of your thesis.
2. Revise the layout as the work is progressing.
3. Finalize the layout as soon as acceptable test results will be obtained.
4. Start writing of material/methods and results throughout the research and leave the introduction and conclusion sections for the last stages.

3.2 Structure of Thesis

Academic thesis includes title, abstract, introduction, materials and method, results, conclusion, and references. Often the order of writing is: i) Materials/Methods; ii) Results and Discussions; iii) Introduction and Conclusion; iv) References; v) Abstract; and vi) Title (if it needs to be changed).

▶ Practical Steps:

1. **Materials and Methods:**

(a) This part of thesis (one chapter or more) should present the solution strategy and explain how it solves the problem. Details of the method (and material which used) must be accurately explained such that it will repeatable for others.

(b) Often a researcher tried several different methods before coming up with final method and solution. Only the final and useful methods are of interest and there is no need to report on the full history of your research.

(c) Details of computer codes, test system data, and so on can be moved into appendices to make the text of thesis easy-to-read.

2. **Results and Discussion:**

(a) The results and discussion (one chapter or more) verify the validity of the proposed method and determine its limitations. The experiment or test system should be accurately explained including all assumptions.

(b) A researcher likely run several tests to obtain useful and tangible results. There is no need to present a report on all tests. Only useful ones should be stated in an organized manner.

(c) Only the most significant and relevant tests should be presented. Auxiliary tests and extra data should be omitted to avoid confusing a reader.

3. **Introduction**
Introduction is the first chapter of a thesis which includes background, problem statement, objectives, motivation, a summary of the proposed solution and results. Literature survey can be presented as an individual section or it can be embedded within the background and problem statements.

(a) The introduction usually begins with a brief background about the subject of the research. Literature survey in this part can be presented as a brief history of the subject or it can be a review of recent and relevant publications to the main subject of the research.

(b) The introduction gradually narrows down to a specific problem which is the main subject of thesis. Various aspects and main challenges of the problem should be explained in a fair manner. An important part of the literature review can be put here to explain past solutions to the problem and compare adavantages/limitions of existing methods.

(c) Thesis objectives and solution methods which will be addressed in the thesis should be briefly explained. Motivation for dealing with this problem and justifications for selection of the proposed methods should also be stated.

(d) An outline of thesis will be presented in the last section of the introduction. This outline section briefly reviews the method and verification and test results.

4. **Conclusion:**
Conclusion is the last chapter of a thesis which usually starts with re-stating the objectives of the thesis in brief. Then, a summary of the proposed method should be technically presented followed by a summary of the main results and findings of the work. Then, an statement that rationally explain benefits and applications of this research should be stated. The conclusion chapter of thesis usually includes a section for suggested research topics and future works along this research.

5. **Abstract and Title:**
   Abstract and Title of a thesis are often available to public via internet. The abstract includes an essence of these in two or three short paragraphs. Abstract is similar to the introduction of thesis, however, it usually explains the background of the subject in brief or even removes the background. An abstract usually starts with a description of the proposed method followed by results and finding. Then, advantages and limitations of the method will be explained and finally it will end with the motivations and usefulness (potential applications) of the thesis.

   Title of a thesis should describe the content of the thesis. Since the content of the thesis could be different from what was mentioned in the research proposal, the selected title for the thesis in the proposal should be modified after completing the thesis if it is necessary.

4 Writing a Research Paper

An original paper represents a summary of original contributions of a research work. A paper can be submitted for publication before writing the thesis or it can be extracted from a thesis. A submitted paper will be peer reviewed, that means reviewers who are experts in the field of the specific research subject, will carefully read and judge about the originality, correctness, and structure of the paper. If the paper submitted before completing the thesis, the feedback and comments of reviewers can significantly improve the quality of research and thesis. The structure of a paper is similar to a thesis: Title, Abstract, Introduction, Materials/Methods, Experimental Results (Verification), Discussions, Conclusion, and References. However, several revising steps should be performed to be able to present an original research work as a qualified paper.

▶ Practical Steps:

4.1 Planing and Outline

Before writing a paper and based on the subject of research, one should select the most relevant journal and review the interests of its readers. Then, an outline of a paper should be created to suitably address the requirements of the journal. Outlining is an iterative and time consuming procedure for organizing thoughts about how to present findings of a research work. Creating a suitable outline is the first step of writing a paper.

4.2 Writing the Draft

It is nearly impossible to perfectly write a paper in a single round even if a perfect outline is available. Revising while writing the first draft is not an efficient method and it is often much efficient to complete a rough draft of paper without interruptions due to revising.

4.3 Break

After preparing the first draft, it is essential to give a break between writing and revising. Break between writing and revising should last until the author becomes objective to be able to fairly criticize his/her work.

4.4 Revising: Five Major Steps

Revising the paper is the key point for preparing a well-written and qualified paper. Revising requires patience since its procedure encompasses several iterative steps. The revising procedure includes the following five major steps (each step may need to be iterated several times).

1. **Revising the Content Based on Readers' Needs**
   The paper should mainly address the information that a reader needs to know rather than the information that the author would like to present. Therefore, in the first revision the author should revise the manuscript based on two criterion: i) Adding subjects that a reader is seeking for, and ii) Removing the extra information which are not necessary to a reader.

2. **Strive for Clarity and Remove Ambiguities**
   The author should read the paper from readers view and try to determine ambiguous phrases within the paper. Then, revise the paper to remove ambiguities and increase its clarity. Several iterations in revising may be required at this step.

3. **Revising for Correctness and Coherence**
   In the third step of the revising procedure, the author should read the paper sentence by sentence to find mistakes and correct them. Coherence between sentences and paragraphs should be also examined in this step and following steps of revising.

4. **Revising for Brevity**
   Avoiding wordiness by removing unnecessary words and phrases will enhance the quality of the paper. This will help to highlights the main contribution of the paper and lead to an easy-to-read paper. Usually the length of a paper can be reduced up to 25% following a careful revising for brevity.

5. **Polishing the Paper**
   This is the last step of revising in which the style of writing will be improved. This step may include several readings and modifications which requires patience of the author.

References

[1] H. J. Tichy, "Effective Writing for Engineers, Managers, Scientists," *2nd Ed., Wiley-Interscience Publication, 1988.*

[2] E. Fisher, D. Holtom, "Enjoy Writing Your Science Thesis or Dissertation!: A Step by Step Guide to Planning and Writing Dissertations and Theses for Undergraduate and Graduate Science Students," *Imperial College Press (September 1999).*