

Unit – 5 Research Methodologies

* Research Institutes in India

1. Haffkine Institute for Training, Research and Testing

Acharya Donde Marg,
Parel, Mumbai 400 012

Research Areas: Allergy and immunology, diagnostics, genetic engineering, bio-organics and high-tech reagents.

2. Tata Institute of Fundamental Research

Homi Bhabha Road, Mumbai 400 005,

Research Areas: All areas of basic sciences – Biology, chemistry, math and physics.

3. Indian Institute of Science

Indian Institute of Science, Bangalore 560 012, Karnataka

Research Areas: Biophysics & biochemistry, molecular biology, genetics & evolution, biomedicines & biotechnology.

4. National Centre for Biological Science

GKVK, Bellary Road,

Research Areas: Engineering: Biochemical engineering & biotechnology.
International Centre for Genetic Engineering and Biotechnology

5. Indian Institute of Science Education and Research–Bhopal

Govindpura, Bhopal – 23

Research Areas: All areas of basic sciences – Biology, chemistry, math and physics

6. Institute of Life Sciences

Bhubaneswar 751 023, Orissa

Research Areas: Cancer, malaria, age diseases, stress biology, ecophysiology, plant molecular physiology, filariasis, tuberculosis, bio-perspicitive, agricultural biotechnology, bio-informatics.

7. Institute of Microbial Technology

Sector 39–A, Chandigarh 160 036

Research Areas: Molecular biology and microbial genetics, animal cell/tissue culture and protein engineering.

8. Indian Institute of Technology Madras

Chennai 600 036, Tamil Nadu

Research Areas: Engineering: Biotechnology.

9. Institute of Genomics and Integrative Biology

Delhi University Campus, Mall Road, Delhi 110 007

Research Areas: Allergy and immunology, diagnostics, genetic engineering, bio-organics and high-tech reagents.

10. Indian Institute of Technology Delhi

Hauz Khas, New Delhi 110 016

Research Areas: Engineering: Biochemical engineering & biotechnology, International Centre for Genetic Engineering and Biotechnology

11. National Institute of Immunology

Aruna Asaf Ali Marg, New Delhi 110 067

Research Areas: Gene regulation, immunity & infection, molecular design, reproduction & development.

12. Indian Institute of Technology Guwahati

North Guwahati, Guwahati 781 039, Assam

Research Areas: Engineering: Biotechnology.

13. Centre for Cellular & Molecular Biology

Uppal Road, Hyderabad 500 007, Andhra Pradesh

Research Areas: Biophysics & biochemistry, molecular biology, genetics & evolution, biomedicines & biotechnology.

14. Centre for DNA Fingerprinting and Diagnostics

CDFD, Bldg. 7, Gruhakalpa, 5-4-399/B, Nampally, Hyderabad - 500 001.

Research Areas: Automated genome analysis, bacterial genetics, cancer biology, cell biology & gene expression, computational biology, computational & functional genomics, immunology, mammalian genetics, molecular genetics, molecular oncology, molecular virology, structural biology, transcription, developmental neuroscience and drosophila genetics.

15. Regional Research Laboratory

Canal Road, Jammu 130 001, Jammu & Kashmir

Research Areas: Natural products & organic chemistry, improvement & cultivation of medicinal and aromatic plants, post harvest technology and applied microbiology & mutation genetics.

16. Indian Institute of Technology Kanpur

GT Road, Kalyanpur, Kanpur 208 016, Uttar Pradesh

Research Areas: Engineering: Biological sciences & bioengineering.

17. Bose Institute

93/1, Acharya Prafulla Chandra Road, Kolkata 700 009, West Bengal

Research Areas: Bioinformatics & computational biology, structure and functional dynamics of biomolecules, drug modeling, molecular genetics of microbes, transgenic plants etc.

18. Indian Institute of Science Education and Research –Kolkata

Mohanpur, Nadia, West Bengal

Research Areas: All areas of basic sciences – Biology, chemistry, math and physics

19. Agharkar Research Institute

G.G. Agarkar Road, Pune 411 004, Maharashtra

Research Areas: Animal sciences, microbial sciences, plant sciences.

20. Indian Institute of Science Education and Research–Pune

Research Areas: All areas of basic sciences – Biology, chemistry, math and physics.

21. National Chemical Laboratory

Dr. Homi Bhabha Road, Pune 411 008, Maharashtra

Research Areas: biotechnology, biochemistry.

22. National Centre for Cell Sciences

NCCS Complex, Ganeshkhind, Pune 411 007, Maharashtra

Research Areas: Cell biology, molecular biology, immunology, parasitology, hybridoma technology, tissue banking & tissue engineering, regenerative biology, virology (HIV), cancer biology, diabetes, cryobiology transplantation, gene therapy.

23. National Institute of Virology

Pune.

Research Areas: immunology, parasitology, hybridoma technology, tissue banking & tissue engineering, regenerative biology, virology (HIV),

24. Indian Institute of Technology Roorkee

Roorkee 247 667, Uttaranchal

Research Areas: Engineering: Biotechnology.

25. Rajiv Gandhi Centre for Biotechnology

Thycaud P.O., Thiruvananthapuram 695 , Kerala

Research Areas: Disease biology and molecular medicine, Plant biotechnology

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RESEARCH PROJECTS: MAJOR AND MINOR

INTRODUCTION

The University Grants Commission strives to promote teaching and research in emerging areas in Humanities, Social Sciences, Languages, Literature, Pure sciences, Engineering & Technology, Pharmacy, Medical, Agricultural Sciences etc. The emphasis would be supporting such areas that cut across disciplines and subjects such as health, gerontology, environment, biotechnology, nanotechnology, stress management, WTO and its impact on economy, history of science, Asian philosophy and many other areas as would be identified by subject experts.

There are disciplines such as defence and strategic studies which include national security affairs, insurance and banking, economics and world trade which in a true sense are multidisciplinary in nature, cutting across disciplines of sciences, humanities and social science, and are of importance in a rapidly changing global scenario. These and allied disciplines need to be studied and researched in a more organized manner. Institutionalization of such activities is a need of the present times.

OBJECTIVES

- To promote excellence in research in higher education by supporting research programmes of University and College teachers in various disciplines.
- Traditionally, universities have been the centres of research. Although, the Government has a network of science and technology laboratories for research and development, the major base of researchers in science and technology remains with the universities. Therefore, university and college teachers need to be supported to meet this requirement.
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NATURE OF ASSISTANCE:

The quantum of assistance for a research project will be as under:

- Major Research Project in Sciences including Engineering & Technology, Medical, Pharmacy Agriculture etc. - Rs. 12 lacs.

- Minor Research Project – **Sciences - Rs. 2 lac.**

The Commission will provide financial support for the items like Equipment, Books and Journals, Research Personnel (Post-Doctoral Fellow, Project Associate or Project Fellow), Hiring Services, Contingency, Chemicals and Consumables, Travel and Field work and any special requirements. However, Assistance towards research personnel will not be provided in Minor Research Project.

Equipment

The equipment grant may be used to procure essential equipments needed for the proposed research work.

Books and Journals

The Books and Journals acquired by the Principal Investigator under a Major or Minor Research Project must be deposited to either the depart library or the central library at the end of the project. They should become institutional property.

Research Personnel

The UGC may approve and provide assistance to engage following research staff during the tenure of the project. The Research Personnel shall not accept or hold any other appointment paid or otherwise or receive any emoluments, salary, stipend etc. from any other source during the tenure. They shall do whole time work with the Principal Investigator on the research project.

(i) Post Doctoral Fellow

A candidate below the age of 45 years, who has doctorate degree and published research work to his/her credit in the related field, may be engaged as Post Doctoral Fellow. The emoluments for Post Doctoral Fellow will be Rs. 12,000/- p.m. (fixed) + HRA.

(ii) Project Associate

NET-JRF / Lecturership and SLET qualified candidate may be appointed as Project Associate. Ph.D/M.Phil Degree holders, M.E., M.Tech. and M.Pharm qualified candidates may also be appointed as Project Associate. The candidate should be below the age of 40 years at the time of appointment.

The emoluments would be Rs. 10,000/- p.m. + HRA.

(iii) Project Fellow

Project Fellow may be appointed with a consolidated salary of Rs. 8000/- p.m. + HRA. The person to be considered for appointment as Project Fellow must have second class master degree with a minimum of 55% marks (50% in case of SC/ST/PH) or M.Phil in the subject concerned or a related subject. The candidates possessing B.E./B.Tech. Degree and M.B.B.S. degree are also eligible to be appointed as Project Fellow in Engineering &

Technology and Medical subject respectively. The candidate to be appointed as Project Fellows should be below the age of 40 years at the time of appointment.

HRA

Suitable hostel type accommodation may be provided for Post-Doctoral Fellow/Project Associate/Project Fellow failing which they are eligible for HRA as per rules of the University/Institution. Post-Doctoral Fellow/Project Associate/Project Fellow who has been provided accommodation in a hostel recognized/maintained by the Institution may be reimbursed the hostel fee.

Contingency

The admissible contingency grant may be utilized on spares for apparatus, photo-stat copies and microfilms, typing, stationary, postage, telephone calls, internet, fax, computation and printing needed in connection with the project.

Special Needs : Assistance may be provided for any other special requirement in connection with the project which is not covered under any other 'Head' of assistance under the scheme.

Chemicals and Consumable

The meeting expenditure on chemicals, glassware and other consumable items.

(h) Travel and Field Work

Modalities for the utilization of research funds under the head of Travel/Field Work

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- **Preparation of research scheme proposals, formats.**

UNIVERSITY GRANTS COMMISSION FORMAT FOR SUBMISSION OF PROPOSAL FOR MAJOR RESEARCH PROJECT

PART – A

1. Broad Subject
2. Area of Specialization
3. Duration

4. Principal Investigator
 - i. Name:
 - ii. Sex: M/F
 - iii. Date of Birth:
 - iv. Category: (GEN/SC/ST/OBC)
 - v. Qualification:

vi. Designation:
 vii. Address:
 Office:
 Residence:
 Email:

5. Co – Investigator(s):

i. Name:
 ii. Sex: M/F
 iii. Date of Birth:
 iv. Category: (GEN/SC/ST/OBC)
 v. Qualification:
 vi. Designation:
 vii. Address:
 Office :
 Residence :

6. In case of a retired teacher, please give the following information:

i. Date of Superannuation:
 ii. Age at the time of Superannuation:
 iii. Whether employed or not

7. Name of the Institution where the project will be undertaken:

a. Department:
 b. University/College:
 c. Whether the institute is located in rural/backward area:
 (Please mention the name of affiliating University in case of college)

8. Whether the University/College/Institution is approved under Section 2 (f) and 12 (B) of the UGC Act?

Yes/No

9. Teaching and Research Experience of Principal Investigator

a. Teaching experience:
 b. Research experience:
 c. Year of award of Doctoral degree :
 d. Title of thesis for doctoral degree:
 e. Publication:

i. Papers Published : Accepted :
 Communicated :

ii. Books Published : Accepted :
 Communicated :

(Please enclose the list of papers and books published and/or accepted during last five years)

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PART – B

Proposed Research Work

1. (i) Project Title
 - (ii) Introduction
 - Origin of the research problem
 - Interdisciplinary relevance
 - Review of Research and Development in the Subject:
 - International status
 - National Status
 - Significance of the study
 - Its potential contribution to knowledge in the field of social relevance or national importance.
 - (iii) Objectives
 - (iv) Methodology
 - (v) Year wise Plan of work and targets to be achieve.
 - (vi) Details of collaboration, if any intended

2. Financial Assistance required

Item Estimated Expenditure

- i. Research Personnel (Anyone of the following)
 - a. Post-Doctoral Fellow @ Rs.12,000/- p.m. + HRA
 - b. Project Associate @ 10,000/- p.m. + HRA
 - c. Project Fellow @ Rs. 8000/- p.m. + HRA
- ii. Hiring Services
- iii. Field Work and Travel
- iv. Chemicals and glassware
- v. Contingency (including special needs)
- vi. Honorarium to retired teacher
@ Rs. 12,000/- p.m.
- vii. Books and Journals
- viii. Equipment, if needed
(please specify name and approx. cost along with the quotation)

Total:

3. Whether the teacher has received support for the research project from the UGC under Major, Minor, scheme of support for research or from any agency? If so, please indicate:
 - a. Name of the agency from which the assistance was approved
 - b. Sanction letter No. and date under which the assistance was approved
 - c. Amount approved and utilized
 - d. Title of the project for which assistance was approved
 - e. In case the project was completed, whether the work on the project has been published
 - f. If the candidate was working for the doctoral degree, whether the thesis was submitted and accepted by the University for the award of degree.
(A summary of the report/thesis in about 1,000 words may please be attached with the application)
 - g. If the project has not been completed, please state the reasons

4. (a) Details of the project/scheme completed or ongoing with the P.I

- (a) Details of the project/scheme completed or ongoing with the P.I

Name of agency	Year started	Year completed	Equipment /Infrastructural facilities obtained	Total

(b) Institutional and Departmental facilities available for the proposed work:

Equipment:

Other Infrastructural facilities :

5. Any other information which the investigator may like to give in support of this proposal which may be helpful in evaluating.

To certify that:

- a) The University/College/Institute is approved under Section 2(f) and 12(b) of the UGC Act and is fit to receive grants from the UGC.
- b) General physical facilities, such as furniture/space etc., are available in the Department/College.
- c) I/we shall abide by the rules governing the scheme in case assistance is provided to me/us from the UGC for the above project.
- d) I/we shall complete the project within the stipulated period. If I/we fail to do so and if the UGC is not satisfied with the progress of the research project, the Commission may terminate the project immediately and ask for the refund of the amount received by me/us.
- e) The above Research Project is not funded by any other agency.

Name and Signature

(a) Principal Investigator

(b) Co- Investigator

(i)

(ii)

(c) Registrar/Principal (Signature with Seal)

**UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110 002.**

**Annual/Final Report of the work done on the Major/Minor Research Project.
(Report to be submitted within 6 weeks after completion of each year)**

1. Project report No. 1st

/2nd
 /3rd
 /Final _____

2. UGC Reference No. _____

3. Period of report: from _____ to _____

4. Title of research project _____

5. (a) Name of the Principal Investigator _____

(b) Deptt. and University/College where work has progressed _____

6. Effective date of starting of the project _____

7. Grant approved and expenditure incurred during the period of the report:

a. Total amount approved Rs. _____

b. Total expenditure Rs. _____

c. Report of the work done: (Please attach a separate sheet)

i. Brief objective of the project _____

ii. Work done so far and results achieved and publications, if any, resulting from the work (Give details of the papers and names of the journals in which it has been published or accepted for publication)

iii. Has the progress been according to original plan of work and towards achieving the objective. if not, state reasons

iv. Please indicate the difficulties, if any, experienced in implementing the project _____

v. If project has not been completed, please indicate the approximate time by which it is likely to be completed. A summary of the work done for the period (Annual basis) may please be sent to the Commission on a separate sheet _____

vi. If the project has been completed, please enclose a summary of the findings of the study. Two bound copies of the final report of work done may also be sent to the Commission

vii. Any other information which would help in evaluation of work done on the project. At the completion of the project, the first report should indicate the output, such as (a) Manpower trained (b) Ph. D. awarded (c) Publication of results (d) other impact, if any

SIGNATURE OF THE PRINCIPAL INVESTIGATOR

SIGNATURE OF THE COINVESTIGATOR

REGISTRAR/PRINCIPAL

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**UNIVERSITY GRANTS COMMISSION
 BAHADUR SHAH ZAFAR MARG
 NEW DELHI – 110 002**

Utilization certificate

Certified that the grant of Rs. _____ (Rupees _____ only) received from the University Grants Commission under the scheme of support for Major Research Project entitled _____ vide UGC letter No. F. _____ dated _____ has been fully utilized for the purpose for which it was sanctioned and in accordance with the terms and conditions laid down by the University Grants Commission.

SIGNATURE OF THE PRINCIPAL INVESTIGATOR

SIGNATURE OF THE COINVESTIGATOR

REGISTRAR/PRINCIPAL STAUTORY

AUDITOR

- **Funding agencies for Major and Minor Research Projects**

1. **University Grants Commission**

Contact Address

The Secretary, University Grants Commission, Bahadur Shah Zafar Marg
New Delhi – 110002, Tel. No: (011) 23234019, 23236350, Fax. No.: (011) 23239659
Website: www.ugc.ac.in

- (2) **All India Council for Technical Education (AICTE)**

I. Introduction

The All India Council for Technical Education (AICTE) has been performing its regulatory, planning and promotional functions through its Bureaus, namely: Administration; Finance; Planning and Coordination; Under Graduate Studies; Post Graduate Education and Research; Faculty Development; Quality Assurance; and Research and Institutional Development Bureaus; and through its Regional Offices located in various parts of the country.

Contact Address:

Adviser-II, RID Bureau, All India Council for Technical Education
NBCC Building, East Wing, 4th Floor, Pragati Vihar, Bhisham Pitamah Marg, New Delhi – 110 003, Telefax No: (011) 24369632,
E-mail: rid@aicte.ernet.in, Website: www.aicte.ernet.in

- (3) **Council of Scientific and Industrial Research (CSIR)**

I. Introduction

The major functions of CSIR include promotion, guidance and coordination of scientific and industrial research in India; establishment or development of and assistance to existing special institutions or departments for scientific study of problems affecting particular industries and trades; award of fellowship; utilization of Council's R&D results for industrial development; collection and dissemination of S&T information; and technology generation, absorption and transfer.

The Human Resource Development (HRD) Group of Council of Scientific & Industrial Research (CSIR) has a mandate to develop and nurture S&T manpower at the national level. It also promotes, guides and co-ordinates scientific & industrial research through research grants to Scientists/Professors working in Universities/R&D Institutes of Higher learning.

Contact Address:

The Head, Human Resource Development Group
 Council of Scientific and Industrial Research,
 CSIR Complex, Library Avenue, Pusa
 New Delhi – 110 012, Tel. Nos: (011) 25748632, 25721585
 Fax. No: (011) 25840887, 25860595,
 E-mail: csircx@nda.vsnl.net.in,
 Website: <http://csirhrdg.res.in>

(4) Department of Biotechnology (DBT)

I. Introduction

The setting up of a separate Department of Biotechnology (DBT), under the Ministry of Science and Technology in 1986 gave a new impetus to the development of the field of modern biology and biotechnology in India. In more than a decade of its existence, the department has promoted and accelerated the pace of development of biotechnology in the country. Through several R&D projects, demonstrations and creation of infrastructural facilities a clear visible impact of this field has been seen. The department has made significant achievements in the growth and application of biotechnology in the broad areas of agriculture, health care, animal sciences, environment, and industry.

II. Name of scheme(s)

- Agriculture
- Bioinformatics
- Biotech Product and Process Development
- Basic Research
- Human Resource Development
- Infrastructure Facilities
- International Cooperation
- Medical Biotechnology
- Bioresources
- Plant Biotechnology
- Societal Developments

III. Areas of research support

- Animal Biotechnology
- Aquaculture and Marine biotechnology
- Basic Research in Biotechnology
- Biofuels
- Bioinformatics
- Biological Control of Plants pests, diseases and weeds
- Bioprospecting and Molecular Taxonomy
- Biotech process engineering and industrial biotechnology
- Biotechnology of Medicinal and Aromatics plants
- Biotechnology of Silkworms and host-plants
- Crop Biotechnology
- Environment & Conservation Biotechnology
- Food Biotechnology
- Medical Biotechnology (Vaccines, Diagnostics, Drug Development, Human Genetics & Genome Analysis, Seri Biotechnology, Stem Cell Biotechnology)
- Microbial Biotechnology
- Plant tissue Culture
- Human Resource Development
- Nano Biotechnology
- Women Biotechnology & Programme for Rural Areas and SC/ST population
- Jai Vigyan National S&T Missions
- Patent Facilitation

Contact Address:

Scientist In-charge, Project Registry Cell , Department of Biotechnology
Block 2, 7th Floor, C.G.O. Complex, Lodi Road ,New Delhi – 110 003
Website: www.dbtindia.gov.in, www.btisnet.gov.in,
www.dbtindia.gov.in/organistion/nodal.htm

(5) Department of Science and Technology (DST)

I. Introduction

The Department of Science & Technology plays a pivotal role in promotion of Science & Technology in the country. Science & Technology Policy-2003 states that “Special emphasis will be placed on equity in development, so that the benefits of technological growth reach the majority of the population, particularly the disadvantaged sections, leading to an improved quality of life for every citizen of the country.”

The Department has wide ranging activities ranging from promoting high end basic research and development of cutting edge technologies on one hand to service the technological requirements of the common man through development of appropriate skills and technologies on the other.

The Department supports research through a wide variety of schemes specifically carved out to meet the requirements of different sections of the scientific and engineering community.

Contact Address:

Department of Science & Technology ,Technology Bhawan,
New Mehrauli Road ,New Delhi – 110 016 ,Telefax No: (011) 26963695

E-mail: venkatesh@nic.in ,Website: www.serc-dst.org

(6) Department of Scientific and Industrial Research (DSIR)

I. Introduction

The Department of Scientific and Industrial Research (DSIR) is a part of the Ministry of Science and Technology, which was announced through a Presidential Notification, dated January 4, 1985. The Department of Scientific and Industrial Research (DSIR) has a mandate to carry out the activities relating to indigenous technology promotion, development, utilization and transfer.

The Technology Promotion, Development and Utilization (TPDU) Programmes are directed towards meeting the specific needs of industry and are of particular relevance in the present context. Programmes and activities under the scheme are centered around promoting industrial R&D, development and commercialization of technologies, acquisition, management and export of technologies, promotion of consultancy capabilities, etc.

Contact Address:

Department of Scientific & Industrial Research ,Ministry of Science & Technology
Technology Bhavan, New Mehrauli Road ,New Delhi – 110016
Tel. No : (011) 26960629 , Fax : (011) 26516078
E-mail : svr@nic.in, Website : www.dsir.gov.in

(7) Indian Council of Medical Research (ICMR)

I. Introduction

The primary aim of the ICMR is to promote research in the country in the fields of medicine, public health and allied areas. The Council promotes biomedical research in the country through intramural research (through Institutes totally funded by ICMR) and extramural research (through grants -in-aid given to projects in non-ICMR Institutes).

Contact Address:

Director General, Indian Council of Medical Research , V. Ramalingaswami Bhawan ,Post Box No. 4911, Ansari Nagar , New Delhi- 110029 ,
Tel.No: 91-11-26588895, 91-11-26588980 ,91-11-26588707, 91-11-26589794, 91-11-26589336 ,Fax: 91-11-26588662 ,E-mail: icmrhqds@sansad.nic.in ,Website: www.icmr.nic.in

(8) Ministry of Food Processing Industries (MFPI)

I. Introduction

The Ministry of Food Processing Industries (MFPI) was set up in July, 1988 to give an impetus to development of food processing industries in the country. The Ministry is concerned with formulation and implementation of the policies & plans for the food processing industries within the overall national priorities and objectives. The Ministry acts

as a catalyst for bringing in greater investment into this sector, guiding and helping the industry, encouraging exports and creating a conducive environment for healthy growth of the food processing industry.

Contact Address

The Joint Secretary , Ministry of Food Processing Industries ,Panchsheel Bhawan,
August Kranti Marg , New Delhi – 110 049 , Tel. No: (011) 26492216, 26492174
Fax. No: (011) 26493228 , E-mail: mofpi@hub.nic.in , Website: www.mofpi.nic.in

- **WRITING A SCIENTIFIC RESEARCH ARTICLE**

Scientific research articles provide a method for scientists to communicate with other scientists about the results of their research. A standard format is used for these articles, in which the author presents the research in an orderly, logical manner. This doesn't necessarily reflect the order in which you did or thought about the work. This format is:

- a. Title
- b. Authors
- c. Abstract
- d. Introduction
- e. Materials and Methods
- f. Results (with Tables and Figures)
- g. Discussion
- h. Acknowledgments
- i. Literature Cited

a. TITLE

1. Make your title specific enough to describe the contents of the paper, but not so technical that only specialists will understand. The title should be appropriate for the intended audience.
2. The title usually describes the subject matter of the article: "Effect of Smoking on Academic Performance"
3. Sometimes a title that summarizes the results is more effective: "Students Who Smoke Get Lower Grades"

b. AUTHORS

1. The person who did the work and wrote the paper is generally listed as the first author of a research paper.
2. For published articles, other people who made substantial contributions to the work are also listed as authors. Ask your mentor's permission before including his/her name as co-author.

c. ABSTRACT

1. An abstract, or summary, is published together with a research article, giving the reader a "preview" of what's to come. Such abstracts may also be published separately in bibliographical sources, such as Biological Abstracts. They allow other scientists to quickly scan the large scientific literature, and decide which articles they want to read in depth. The abstract should be a little less technical than the article itself; you don't want to dissuade your potential audience from reading your paper.
2. Your abstract should be one paragraph, of 100-250 words, which summarizes the purpose, methods, results and conclusions of the paper.
3. It is not easy to include all this information in just a few words. Start by writing a summary that includes whatever you think is important, and then gradually prune it down to size by removing unnecessary words, while still retaining the necessary concepts.
4. Don't use abbreviations or citations in the abstract. It should be able to stand alone without any footnotes.

d. INTRODUCTION

What question did you ask in your experiment? Why is it interesting? The introduction summarizes the relevant literature so that the reader will understand why you were interested in the question you asked. One to four paragraphs should be enough. End with a sentence explaining the specific question you asked in this experiment.

f. MATERIALS AND METHODS

1. How did you answer this question? There should be enough information here to allow another scientist to repeat your experiment. Look at other papers that have been published in your field to get some idea of what is included in this section.
2. If you had a complicated protocol, it may be helpful to include a diagram, table or flowchart to explain the methods you used.
3. Do not put results in this section. You may, however, include preliminary results that were used to design the main experiment that you are reporting on. ("In a preliminary

study, I observed the owls for one week, and found that 73 % of their locomotor activity occurred during the night, and so I conducted all subsequent experiments between 11 pm and 6 am.")

4. Mention relevant ethical considerations. If you used human subjects, did they consent to participate? If you used animals, what measures did you take to minimize pain?

g. RESULTS

1. This is where you present the results you've gotten. Use graphs and tables if appropriate, but also summarize your main findings in the text. Do NOT discuss the results or speculate as to why something happened; that goes in the Discussion.
2. You don't necessarily have to include all the data you've gotten during the semester. This isn't a diary.
3. Use appropriate methods of showing data. Don't try to manipulate the data to make it look like you did more than you actually did.

"The drug cured 1/3 of the infected mice, another 1/3 were not affected, and the third mouse got away."

h. TABLES AND GRAPHS

1. If you present your data in a table or graph, include a title describing what's in the table ("Enzyme activity at various temperatures", not "My results".) For graphs, you should also label the x and y axes.
2. Don't use a table or graph just to be "fancy". If you can summarize the information in one sentence, then a table or graph is not necessary.

i. DISCUSSION

1. Highlight the most significant results, but don't just repeat what you've written in the Results section. How do these results relate to the original question? Do the data support your hypothesis? Are your results consistent with what other investigators have reported? If your results were unexpected, try to explain why. Is there another way to interpret your results? What further research would be necessary to answer the questions raised by your results? How do your results fit into the big picture?
2. End with a one-sentence summary of your conclusion, emphasizing why it is relevant.

j. ACKNOWLEDGMENTS

This section is optional. You can thank those who either helped with the experiments, or made other important contributions, such as discussing the protocol, commenting on the manuscript, or buying you pizza.

k. REFERENCES (LITERATURE CITED)

There are several possible ways to organize this section. Here is one commonly used way:

1. In the text, cite the literature in the appropriate places:

Scarlet (1990) thought that the gene was present only in yeast, but it has since been identified in the platypus (Indigo and Mauve, 1994) and wombat (Magenta, et al., 1995).

2. In the References section list citations in alphabetical order.

Indigo, A. C., and Mauve, B. E. 1994. Queer place for qwerty: gene isolation from the platypus. *Science* 275, 1213-1214.

Magenta, S. T., Sepia, X., and Turquoise, U. 1995. Wombat genetics. In: *Widiculous Wombats*, Violet, Q., ed. New York: Columbia University Press. p 123-145.

Scarlet, S.L. 1990. Isolation of qwerty gene from *S. cerevisiae*. *Journal of Unusual Results* 36, 26-31.

- **Scientific "Dissertation" writing**

A dissertation (sometimes called a 'thesis') is a document that presents the author's research and findings and is submitted in support of candidature for a degree or professional qualification.

In the UK, we usually use the term thesis when we are talking about a dissertation written for Ph.D. (doctoral) or M. Phil. Level. We use 'dissertation' to refer to the research project required for an undergraduate or Masters-level degree (although it is not always required for the completion of such degrees).

In the US, the term "dissertation" usually refers to the major part of the student's total time spent (along with two or three years of classes), and may take years of full-time work to complete.

At some universities in the States, dissertation is the term for the required submission for the doctorate, and thesis refers only to the master's degree requirement. Elsewhere, the word thesis is used for both. Graduate students in many programs throughout the US are either required to write a thesis at the end of their studies or take a "thesis track" leading to graduation.

Dissertation writing guides

1. Dissertation topic
2. Dissertation proposal
3. Dissertation materials
4. Dissertation title
5. Dissertation abstract
6. Dissertation table
7. Dissertation introduction
8. Dissertation background
9. Dissertation methodology
10. Dissertation literature review
11. Dissertation evidence
12. Dissertation conclusion
13. Dissertation recommendations
14. Dissertation referencing

15. Dissertation appendix

1. Dissertation topic

Before you get to choosing a topic, you need to decide whether you're carrying out qualitative research - which is concerned with description, qualities and observation or quantitative research - which is concerned with measurements and numbers. Once you're clear on the distinction, you can start to formulate ideas for your **dissertation topic**.

Choosing an appropriate **dissertation topic** will contribute a great deal to the success and quality of your final written paper and it is therefore essential that your topic receives proper advance consideration. If you're not interested in what you are writing about, this will be apparent in your written work and will affect the quality of your paper.

A good way to come up with a **dissertation topic** is by researching the subject areas you're interested in against current news, journals for the topic area and magazines. Jot down any current issues that stand out. Is the area of research under development already? Is it in need of development? If the latter is true, this will give you plenty to write about as you'll be able to look at possible ways that this development might take place.

"A good dissertation topic concentrates on a certain problem and keeps research organized. Wandering around or trying to squeeze out more means that your dissertation topic is either too wide, or too narrow."

2. Dissertation proposal

Before you formulate a proposal, you should decide on what approach you're going to take to your chosen topic. For example, will you choose....

..to carry out a case study? This is an opportunity for one aspect to be studied in depth, within a limited time span. Your evidence needs to be collected systematically, and you will study the relationship between variables. The study is methodically planned, and will mainly be concerned with the interaction of factors and events. This approach commonly focuses on observation and interview - and often extends the results of a survey.

OR

...to perform a survey? With this approach, information is gathered and analyzed. Patterns are then extracted and comparisons made. An example would be the Census. The information is gathered from a representative selection of the population (choose carefully) to represent a sample of the population as a whole. The circumstances in which the questions are asked should be the same for every participant. The wording of the questions also needs to be carefully considered. This approach is good for the what? Where? When? How? type of questions. It does not always give the reasons for why something is the way it is.

OR

...to use the experimental style? This normally involves taking two or more groups who are exposed to different treatments. There is normally a 'control' group, who do not receive any treatment. A follow-up is then made, after the exposure to the treatments. Providing other factors are matched, the change can then be attributed to the treatment (this is known as a

causal relationship). Caution must be taken when drawing up causal relationships - they should remain tentative.

Once you've decided on how you're going to approach the topic, you need to come up with a proposal. First draw up a list of first thoughts and questions about the topic you want to look at, considering any current issues, problems you have seen and current opinion on how change should take place. Decide exactly what it is that you are trying to find out. Ask yourself: What is this research for? What is its value? What will it add to current theory or practice? Try to be as precise as possible regarding what it is you are trying to find out.

Your dissertation proposal

- Introduction to the proposed area of study
- Aims of the research project - what do you hope to achieve overall? Is there a hypothesis that needs to be answered?
- The main objectives of the research project - what do you hope to find out?
- List your methodology / methods - state why have you chosen these methods and why not other methods.
- Scope and limitations of the study - is there anything that is beyond the scope of investigation? Why? (e.g. cost/time constraints)
- Resources - what sources do you expect you will use? Where will you find your information?
- Timetable - proposed timetable for completion of each section.
- Proposed chapter headings
- References - any references used (for example, when writing the introduction)

3. Dissertation materials

One of the most valuable resources available to you is journals if you have an authentic password for journal databases. A service like infoLinX will assist you in locating journal databases that are appropriate to your subject area.

Here are some top journal databases:

LexisNexis Executive

The news coverage offered by LexisNexis Executive is impressive with approximately 12,000 publications from national & local newspapers, press releases, transcripts of tv broadcasts, newswires, statistical bulletins, magazines and trade journals

Blackwell-Synergy

Over 1 million articles in Business, Economics, Finance, Accounting, Construction, Engineering, Computing, Technology, Health Sciences, Humanities, Law, Criminology, Life and Physical Sciences, Mathematics and Statistics, Medicine, Social and Behavioural Sciences, The Arts, Veterinary Medicine, Animal Sciences, Agriculture and Aquaculture.

Oxford Journals Digital Archive

Oxford Journals has recently undertaken a digitization project to make over 165 years of valuable research available online. Subjects include Humanities, Law, Life Sciences,

Maths, Physical Sciences, Medicine and Social Sciences. Content from 1849-1995, over 3 million article pages and 142 journals.

Sage Journals Online

SAGE Publications publishes over 470 journals in Business, Humanities, Social Sciences, and Science, Technology and Medicine.

Science Direct

ScienceDirect offers more than a quarter of the world's scientific, medical and technical information online. It has over 2,000 peer-reviewed journals * Hundreds of book series, handbooks and reference works.

EBSCO

EBSCO host Electronic Journals Service (EJS) is your gateway to thousands of e-journals containing millions of articles from hundreds of different publishers, all at one web site.

Ingenta

On-line articles from 4500 journals in all fields and abstracts from 20000 journals. Free access to bibliography so really useful to use to snowball reading even if you don't have Athens access.

MetaPress

MetaPress covers over 1,750 journal titles and 50 newsletters and book series. Subjects covered by MetaPress include: business, computing, economics, engineering, finance, languages, law, linguistics, management, medical sciences, politics, psychology and sociology.

4. Dissertation title

The dissertation title page shows the title of the dissertation and the author

The usual guidelines for your title page will be something like these:

At the top of the title page within the advised margins, give the **title** and any **sub-title** of the dissertation, followed by the **volume number**, if more than one. **The full name of the author** should be in the centre of the page. At the bottom centre of the page should be the words "A dissertation submitted to the University of Bristol in accordance with the requirements of the degree of MSc in Information and Library Management in the Faculty of Social Sciences". The words "Graduate School of Education" and the month and year of submission should also appear. The word count (of the text only, not appendices) should be typed at the bottom right hand side of the page.

Here's a sample title page for you to follow - obviously this is to be used as an example only. Please use the appropriate degree and wording for your thesis/dissertation!

AN EXPERIMENTAL STUDY OF THE VIBRATION, NOISE, AND DRAG OF A
CYLINDER ROTATING IN WATER AND CERTAIN POLYMER SOLUTIONS

BY JOHN CAMERON BRADY

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN
MECHANICAL ENGINEERING AND APPLIED MECHANICS

UNIVERSITY OF RHODE ISLAND 2003

Other guidance on dissertation presentation

It is highly likely that your individual institution will have very specific criteria as to how your paper should be presented. We have included here some of the typical criteria that are required.

Paper and Text

The dissertation must be printed or typed on A4 size white bond paper within 70 g/m² to 100 g/m²). Dot matrix printers should not be used for the final reproduction of the dissertation. Paper of a larger size up to A3 may be used for maps, plans, diagrams and illustrative material forming part of the dissertation. The pages should be numbered consecutively. The preferred position for the page number is typed at the bottom centre of the page. The text should be in double or 1.5 line spacing in a font Times New Roman size 12. Headings should be in a font size no larger than 14. Quotations and footnotes can be in single spacing in a font size between 8 and 10 inclusive. Pages may be single-sided or double-sided.

Margins

Margins at the binding left hand side should be not less than 40mm. Top, bottom and side margins should be not less than 15mm.

Additional materials

Appended computer disks should be of 3.25 inch size and IBM-compatible and there should be a declaration in the dissertation of the programming language used and the size of the file. Similarly any videotape appendices should be of VHS tapes using the PAL system, the British (and University) standard as distinct from the standard used in the USA and Japan. Good quality photocopies (black and white or coloured) and good quality photographs (black and white or coloured) can be used.

Preliminary pages

The five preliminary pages of dissertations must be: Title Page, Abstract, Dedication and acknowledgements, Author's Declaration, Table of Contents. These, unlike the text, should be single-sided.

Abstract

A summary of not more than 300 words, which must fit on to one side of an A4 page, should be placed immediately after the title page. This can be typed in single spacing in a font size 12 Times New Roman.

Dedication and acknowledgements

Are at the discretion of the author.

Author's declaration

A signed declaration is required stating how far the work contained in the dissertation is the candidate's own work and how far it has been conducted in collaboration with, or with the assistance of, others. An example is given below:

AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the Regulations of the University. The work is original except where indicated by special reference in the text and no part of the dissertation has been submitted for any other degree. Any views expressed in the dissertation are those of the author and in no way represent those of the University. The dissertation has not been presented to any other University for examination either in the India or overseas.

SIGNED:

DATE:.....

Table of contents, list of tables and illustrative material

The table of contents must list in sequence, with page numbers: all chapters, sections and subsections; the list of references; the bibliography; list of abbreviations; and any appendices. The list of tables and illustrations must follow the table of contents, and should list, with page numbers, all the tables, photographs, coloured photocopies, diagrams, etc., in the order in which they appear in the text.

5. Dissertation abstract

The **abstract** is a summary, usually of approximately 150-300 words, of what the reader can expect to find in the dissertation. Be concise and don't reference or use quotes in this part.

Your dissertation abstract is a highly condensed version of a longer piece of writing that highlights the major points covered. The abstract concisely describes the content and scope of the writing and reviews the contents in abbreviated form.

There are two **types of abstracts** typically used:

1. Descriptive Abstracts

These tell readers what information the dissertation contains, and include the purpose, methods, and scope of the report, article, or paper. A descriptive abstract will not provide results, conclusions, or recommendations, and is usually shorter than an informative abstract - usually under 100 words. Its purpose is to merely introduce the subject to reader, who must then read the dissertation to find out your results, conclusions, or recommendations.

2. Informative Abstracts

These communicate specific information from the dissertation, including the purpose, methods, and scope of the report, article, or paper. They provide the dissertation results, conclusions, and recommendations. They are short but not as short as a descriptive abstract - usually anything from a paragraph to a page or two, depending upon the length of the original work being abstracted. In any case, informative abstracts make up 10% or less of the length of the original piece. The informative abstract allows your reader to decide whether they want to read the dissertation.

Abstracts are often used where a paper is entered into a journal database. The key words that you choose for your abstract assist your paper to be identified using electronic information retrieval systems. Titles and abstracts are filed electronically, and key words are put in electronic storage. When people search for information, they enter key words related to the subject, and the computer prints out the titles of articles, papers, and reports containing those key words.

A good abstract will use one or more well developed paragraphs, which are unified, coherent, concise, and able to stand alone. It will use an introduction/body/conclusion structure which presents the dissertation's purpose, results, conclusions, and recommendations in that order. It will follow strictly the chronology of the dissertation and provide logical connections (or transitions) between the information included. A good abstract will add no new information, but simply summarize the dissertation. It will be understandable to a wide audience.

Top dissertation abstract writing tips

To write an effective abstract, follow these steps:

Reread the dissertation you have written with the goal of abstracting in mind. Look specifically for these main parts of the dissertation: purpose, methods, scope, results, conclusions, and recommendations.

Use the headings, outline heads, and table of contents as a guide to writing your abstract. If you're writing an abstract about another person's dissertation, the introduction and the summary are good places to begin. These areas generally cover what the dissertation emphasizes.

After you've finished rereading the dissertation, write a rough draft without looking back at what you're abstracting. Don't merely copy key sentences from the dissertation: you'll put in too much or too little information. You should not rely on the way material was phrased in the dissertation - you need to summarize information in a new way. Revise your rough draft to correct weaknesses in organization, improve transitions from point to point and drop unnecessary information.

Be sure to fix errors in grammar, spelling, and punctuation. It's a good idea to print out your final work in order to read it again to catch any glitches that you find.

6. Dissertation table

The **table of contents** is an index of everything in the **dissertation** - it should not include the title and contents page!

A **table of contents**, TOC for short, lists in order the varying chapters of your dissertation all the way through to the bibliography and appendices. This allows the reader of the document to easily cross reference and pin-point specific areas of information. Any tables, illustrations, diagrams and so on, follow the TOC and should also be listed with their respective page numbers and be ordered in the way that they appear in your dissertation.

7. Dissertation introduction

Your introduction is a summary of 100 - 200 words, stating what the objectives are/what you are going to write about. Many students confuse this section with the background/history sections but generally they will be expected to be kept separate.

Top Dissertation Introduction Tips

A good formula for your introduction is to put the issue in context as concisely as possible. Answer the question: why do this study? Why now? Why here? Why me? State the aims of the study.

Chapter one is very important and is possibly best compiled by answering a series of questions as follows.

- Is there a problem?
- What is it?
- Why does it need to be solved?
- What is your hypothesis (hunch)?
- Who will benefit from your investigation?
- In what sense will they benefit?
- In what sense will my contribution add to what is already known?
- How in general terms are you going to solve the problem, e.g., collect data, analyse data?
- By what methods? E.g., a case study approach.
- What are the constraints or limitations of the study?

A good way to end the **introduction** is to state the **dissertation** objectives. Don't forget that this is a **SHORT** intro for your reader to the subject, to put the issue in context. The background and history will be dealt with elsewhere.

8. Dissertation Background

The Dissertation Background is a section written with the assumption that the reader knows nothing, and it should therefore give them a full account of what they need to know to appreciate the issues at stake.

The background and history section of your dissertation highlights the empirical foundations of the topic that you have chosen. This section of your dissertation is deceptively straightforward - it is tempting to write 'all you know' about a subject without selecting

carefully the details that the reader NEEDS to know to be able to appreciate your arguments later on.

The purpose of a background/history section is to give the reader the relevant facts about your chosen dissertation topic so that they understand the material or case that you will write about later and how it links to your theoretical question. This section must not, however, simply provide the general context, but must direct the readers' attention to the empirical details through which your research topic and questions are lived and made relevant. As such, they must not just fill in details of the place or topic you are researching, but implicitly illustrate the need for and importance of your research.

9. Dissertation Methodology

The methodology states what you are going to do and how you plan on doing it. The methodology should be approximately 200 - 300 words

What belongs in the "methods" section of a paper? This depends on the type of dissertation but here is the general content:

- a. Information to allow the reader to assess the believability of your results. You need to explain HOW you are going to carry out your research and WHY you have chosen the method that you chose. WHY not other methods? WHY will this method produce the best results?
- b. Information needed by another researcher to replicate your research, if applicable.
- c. Description of your materials, procedure, theory. This is especially important for scientific papers. For other papers, you should be explaining things like, WHERE are you going to find materials to analyze? WHY are you going to look there? WHERE else COULD you find materials to analyze (perhaps you're not going to look there - why not?)
- d. Calculations, technique, procedure, equipment, and calibration plots, where applicable.
- e. Limitations, assumptions, and range of validity. What limitations are there on your research and your method? Is there simply too much material to look at? How and why did you choose the method of limiting your data or resources to certain information?

10. Dissertation Literature Review

The Dissertation Literature Review is a review of relevant theory and the most recent published information on the issue.

A **literature review** is an account of what has been published on a topic by accredited scholars and researchers.

In writing the literature review for your dissertation, your purpose is to convey to your reader what knowledge and ideas have been established on a topic, and what their strengths and weaknesses are? As a piece of writing, the literature review must be defined by a guiding concept (e.g., your dissertation research objective, the problem or issue you are discussing or your argumentative thesis). It is not just a descriptive list of the material available, or a set of summaries.

Besides enlarging your knowledge about the topic, writing a literature review lets you gain and demonstrate skills in two areas:

1. **information seeking:** the ability to scan the literature efficiently, using manual or computerized methods, to identify a set of useful articles and books
2. **critical appraisal:** the ability to apply principles of analysis to identify unbiased and valid studies.

A literature review must do these things:

- a. be organized around and related directly to the thesis or research question you are developing
- b. synthesize results into a summary of what is and is not known
- c. identify areas of controversy in the literature
- d. formulate questions that need further research

Top dissertation literature review tips

Some questions to ask yourself before including material:

- a. What is the specific thesis, problem, or research question that my literature review helps to define?
- b. What type of literature review am I conducting? Am I looking at issues of theory? Methodology? Policy? Quantitative research (e.g. on the effectiveness of a new procedure)? Qualitative research (e.g., studies)?
- c. What is the scope of my literature review? What types of publications am I using (e.g., journals, books, government documents, popular media)? What discipline am I working in (e.g., nursing psychology, sociology, and medicine)?
- d. How good was my information seeking? Has my search been wide enough to ensure I've found all the relevant material? Has it been narrow enough to exclude irrelevant material? Is the number of sources I've used appropriate for the length of my paper?
- e. Have I critically analyzed the literature I use? Do I follow through a set of concepts and questions, comparing items to each other in the ways they deal with them? Instead of just listing and summarizing items, do I assess them, discussing strengths and weaknesses?
- f. Have I cited and discussed studies contrary to my perspective?
- g. Will the reader find my literature review relevant, appropriate, and useful?

11. Dissertation Evidence

Your dissertation evidence is what you have discovered and what you have concluded from it.

This is the main body of your dissertation. It might be divided into chapters and you might not call it evidence. What it contains are the facts, evidence, analysis, evaluation and discussion.

The evidence referred to may comprise evidence from published texts - for example if you are exploring the literary texts of a particular writer - or it may consist of primary data gathered by your own, first-hand research - for example a sociological study of attitudes to gender roles based on research methods such as interviews and questionnaires.

The arguments that you present must be underpinned throughout by awareness of theory - your argument should be placed within the context of existing theory relevant to the subject. It has to be presented in a professionally finished manner. Your tutors should give

you precise details about the format, layout and stylistic requirements of your assignment. Make sure that you know exactly what these are.

Top dissertation evidence tips

- Although you will extensively analyse other material that is available in your chosen area of research, when writing an academic paper, the main voice should be your own and it should be clear what you are trying to demonstrate.
- You will strengthen your argument by referring to the ideas and findings of others - and by contrasting your ideas with others.
- By interpreting other people's work and using it in your own way you can indicate the significance of these ideas to your own argument.
- By commenting on or evaluating the work of others you demonstrate your own understanding of the topic you are investigating and indicate how your contribution to the debate fits in.

Be sure that your reader can CLEARLY see which words are your own and which belong to others.

12. Dissertation Conclusion

The conclusion states what you have discovered and what you have concluded from it. You should not be presenting new ideas or new sources in the conclusion.

The conclusion summarizes the results of a dissertation and contains the final deductions you have made from your research. Your dissertation conclusion should contain a concise and clear description of the results of the conducted research.

The conclusion should be written after the main body of the paper has been finished, and the dissertation question has been dealt with entirely by you, the writer. It does not contain any additional or new information or material - it is a summary of what you have found and the main points you have made.

The conclusion offers the opportunity to review your work as a whole, to identify the points of comparison and contrast the various texts you have examined, and to show that, in the process of your study, you have developed a more precise, critical understanding of the way they deal with your topic. This is also an appropriate place for you to point to the limitations of small-scale research of this kind and to indicate possible avenues for researchers to address the issues in the future.

Remember - the conclusion DOES NOT contain new issues not explored elsewhere or new material. It is there to conclude and draw together what you have discovered, not to add to it.

13. Dissertation Recommendations

Your dissertation recommendations should emerge from the conclusion, suggest what is to be done, who is to do it and how/when it is to be done, and be justified based on findings, not just the opinion of the writer.

Recommendations cover two key aspects. They may suggest action which could be taken right now in relation to a particular issue or topic. In addition, or alternatively, they may suggest that further research and work is necessary to be able to take appropriate action.

Key recommendations contents:

- Remedial action to solve the problem.
- Further research to fill in gaps in our understanding.
- Directions for future investigations on this or related topics.

14. Dissertation Referencing

You need to reference all of your sources for your dissertation properly.

Before we talk about **referencing**, let's talk plagiarism. To "plagiarise", according to the dictionary, means

- a. To steal and pass off (the ideas or words of another) as one's own
- b. To use (another's production) without crediting the source
- c. To commit literary theft
- d. To present as new and original an idea or product derived from an existing source.

In other words, plagiarism is an act of fraud. It involves both stealing someone else's work and lying about it afterward. But can words and ideas really be stolen? According to the law, the answer is yes. The expression of original ideas is considered intellectual property, and is protected by copyright laws, just like original inventions. Almost all forms of expression fall under copyright protection as long as they are recorded in some way (such as a book or a computer file).

All of the following are considered plagiarism:

- turning in someone else's work as your own
- copying words or ideas from someone else without giving credit
- failing to put a quotation in quotation marks
- giving incorrect information about the source of a quotation
- changing words but copying the sentence structure of a source without giving credit
- copying so many words or ideas from a source that it makes up the majority of your work, whether you give credit or not.

15. Dissertation Appendix

The appendix (appendices = plural) contains any graphs or diagrams you have used when writing your dissertation.

Appendices are used when the incorporation of material in the body of the work would make it poorly structured or too long and detailed. It may be desirable to include a particular appendix because it represents helpful, supporting or essential material that would otherwise clutter, break up or be distracting to the text. Where a source is referred to many times (such as statistics, a chart or graph) in your work, including that source as an appendix will allow people to refer to it as they are reading your work.

Appendices may therefore include some of the following:

- supporting evidence
- contributory facts
- specialised data - raw data will appear in the appendix, summarised data will appear in the

body of the text

- technical figures, tables or descriptions
- detailed description of research instruments
- maps
- questionnaires (although questionnaire results appear in the body of the text)

The body of the text must be complete without the appendices, and it must contain all information including tables, diagrams and results necessary to answer the question or support the thesis. Appendices are not included in the word count.

Appendices must be referred to in the body of the text, for example, 'details of the questionnaire are given in Appendix A

The heading should be:

- APPENDIX or Appendix, followed by a letter or number
e.g. APPENDIX A
- It should be centred and in bold.
- Each appendix must begin on a new page.
- Appendices must be listed in the table of contents (if used).
- The page number(s) of the appendix/ appendices will follow on from the body of the text.
- Appendices may precede or follow the reference list.

Every university has different guidance as to how they require appendices to be formatted, so you should check with your learning institution before deciding on the final format for the appendices to your dissertation.

Scientific writing

Choose a category for the paper

Pick the category which most closely describes your paper. We understand that some papers can fit into more than one category but it is necessary to assign your paper to one of the categories – these are listed and will be searchable within the database:

- **Research paper.** This category covers papers which report on any type of research undertaken by the author(s). The research may involve the construction or testing of a model or framework, action research, testing of data, market research or surveys, empirical, scientific or clinical research.

- **Viewpoint.** Any paper, where content is dependent on the author's opinion and interpretation, should be included in this category; this also includes journalistic pieces.
- **Technical paper.** Describes and evaluates technical products, processes or services.
- **Conceptual paper.** These papers will not be based on research but will develop hypotheses. The papers are likely to be discursive and will cover philosophical discussions and comparative studies of others' work and thinking.
- **Case study.** Case studies describe actual interventions or experiences within organizations. They may well be subjective and will not generally report on research. A description of a legal case or a hypothetical case study used as a teaching exercise would also fit into this category.
- **Literature review.** It is expected that all types of paper cite any relevant literature so this category should only be used if the main purpose of the paper is to annotate and/or critique the literature in a particular subject area. It may be a selective bibliography providing advice on information sources or it may be comprehensive in that the paper's aim is to cover the main contributors to the development of a topic and explore their different views.
- **General review.** This category covers those papers which provide an overview or historical examination of some concept, technique or phenomenon. The papers are likely to be more descriptive or instructional ("how to" papers) than discursive.

What is a review of literature?

The format of a review of literature may vary from discipline to discipline and from assignment to assignment.

A review may be a self-contained unit -- an end in itself -- or a preface to and rationale for engaging in primary research. A review is a required part of grant and research proposals and often a chapter in theses and dissertations.

Generally, the purpose of a review is to analyze critically a segment of a published body of knowledge through summary, classification, and comparison of prior research studies, reviews of literature, and theoretical articles.

Danielle Steel says, "A bad review is like baking a cake with all the best ingredients and having someone sit on it." Only good reviews reveal the students' knowledge about a particular topic. Moreover, only good reviews can give a clear idea of the recent advancement in a particular topic.

Writing a scientific review involves analyzing the results from existing original scientific literature papers to make a sound argument about a particular topic. Writing a scientific review is compulsory for every student at some stage of his/her degree course.

When you are asked to write a critical review of a book or article, you will need to identify, summarize, and evaluate the ideas and information the author has presented. In other words, you will be examining another person's thoughts on a topic from your point of view.

Writing the introduction

In the introduction, you should:

- Define or identify the general topic, issue, or area of concern, thus providing an appropriate context for reviewing the literature.
- Point out overall trends in what has been published about the topic; or conflicts in theory, methodology, evidence, and conclusions; or gaps in research and scholarship; or a single problem or new perspective of immediate interest.
- Establish the writer's reason (point of view) for reviewing the literature; explain the criteria to be used in analyzing and comparing literature and the organization of the review (sequence); and, when necessary, state why certain literature is or is not included (scope).

Writing the body

In the body, you should:

- Group research studies and other types of literature (reviews, theoretical articles, case studies, etc.) according to common denominators such as qualitative versus quantitative approaches, conclusions of authors, specific purpose or objective, chronology, etc.
- Summarize individual studies or articles with as much or as little detail as each merits according to its comparative importance in the literature, remembering that space (length) denotes significance.
- Provide the reader with strong "umbrella" sentences at beginnings of paragraphs, "signposts" throughout, and brief "so what" summary sentences at intermediate points in the review to aid in understanding comparisons and analyses.

Writing the conclusion

In the conclusion, you should:

- Summarize major contributions of significant studies and articles to the body of knowledge under review, maintaining the focus established in the introduction.
- Evaluate the current "state of the art" for the body of knowledge reviewed, pointing out major methodological flaws or gaps in research, inconsistencies in theory and findings, and areas or issues pertinent to future study.
- Conclude by providing some insight into the relationship between the central topic of the literature review and a larger area of study such as a discipline, a scientific endeavor, or a profession.

Writing a scientific review: Valuable tips

Students can consider the following tips while writing a scientific review paper. When writing a scientific review, students must:

- Recognize the existing original scientific literatures relevant to a particular topic they have decided.
- Collect many original or primary sources.
- Analyze the existing scientific literature papers.

- Write the scientific review in the prescribe format and framework. Decide the framework based on the results of the literature papers and the interesting aspects that can be analyzed in future.
- Develop a strong argument or hypothesis about the topic that becomes a highlight of the review paper. The argument must be strong and effective with evidences to support it.

Writing a scientific review: General format

Scientific reviews must not include abstract section and methods / materials section. When writing a scientific review, students should take care to include the following four sections:

- Introduction
- Review body
- Conclusion and suggestions
- Literature cited

Scientific Writing of Abstracts

An *abstract* is a specific kind of a summary included with various kinds of scientific publications.

During peer review, the title and abstract are used when we invite reviewers. Invited reviewers are asked to decide whether they wish to review the manuscript on the basis of the title and abstract alone.

If and when the manuscript is published, more people will read the title and the abstract than the whole article. In fact, many people will only read the title and abstract, and may only try to read them once. It is thus important to catch the reader's attention by making the title and abstract as concise, accurate, and readable as possible.

Titles: The key to ensuring your article will be found

The title is an essential way to bring the article to potential readers' attention, especially in those cases where the database being searched does not include the abstract of the article. The title must therefore be as accurate, informative and complete as possible.

The abstract must outline the most important aspects of the study while providing only a limited amount of detail on its background, methodology and results. Authors need to critically assess the different aspects of the manuscript and choose those that are sufficiently important to deserve inclusion in the abstract.

How do abstracts differ from other summaries?

There are a lot of different ways to summarize a scientific article or other document. The title itself is sort of a one-line summary. An outline is also a summary. An “executive summary” is often a statement of the basic idea in simple terms.

An abstract has certain features that set it aside from these.

- It is always short.
- It is always written as a single paragraph (even though many abstracts strain the textbook definition of a paragraph).
- It is written for the same audience as the article, so it uses the same level of technical language.
- It always summarizes the major points of the results.
- It ordinarily summarizes the major points of the materials and methods, and of the discussion.
- In most disciplines, it never includes bibliographic citations.

When are abstracts used?

An abstract is an ordinary part of a research article in a journal; only a small percentage of journals do not require them. Abstracts are also usual for review articles. There are other places where abstracts are used, as well:

- for chapters in a book, especially if each chapter has a different author
- in library reference tools, such as *Biological Abstracts*, even if the article being indexed lacked an abstract (people are hired to write abstracts for these)
- for presentations at scientific meetings (often the “published abstract” is the only written record of such a presentation)

How are abstracts written?

The more familiar you are with the contents of an article, the easier it is to write an abstract. If you wrote the article yourself, you obviously know what is in it, but professional abstract writers routinely make abstracts of articles they haven’t written, and you can, too. The first step is to identify the major point or points of the article. Sometimes it helps to make an outline, but that is not always necessary. When you have written down the main points, then look to see what information is crucial to lead up to those points. The research methods might be important if they are new or unusual, but if they are standard, they only need to be referred to briefly. Next, write down the conclusions that are drawn from the main points. When you are done, you will have something like this:

1. introductory statement, including statement of the problem to be addressed (sometimes not needed)
2. research methodology (described at length only if it is unusual)
3. results or other main points (absolutely essential)
4. concluding statement, telling what the results mean

Yes, this is sort of a “mini-outline”. Next, you turn it into a paragraph. Scientists have grappled for years over the appropriate way to talk about discoveries: should it be “we measured ion concentration in the blood” or “ion concentration in the blood was measured”? The first example is in the *active voice* and the second example is in the *passive voice*; modern scientific style prefers the active voice. Abstracts are often an exception, but only if the passive voice reduces the total number of letters and words. With abstracts, the bottom line is brevity: They should be as short as possible and still include the important information.

Synopsis writing

Synopsis writing is an important step in a research project. A good synopsis will give maximum information in minimum words. A well-conceived synopsis will go a long way in convincing the reviewer about the ability of the researcher to conduct the project. In cases of need for financial assistance, the request will be considered favorably. Thus, all research workers should make efforts to prepare a well-structured synopsis.

A protocol or a synopsis of a research project is a document submitted to an authority or an institution for the purpose of

1. Ethical clearance
2. Formal registration to universities for the award of a degree or doctorate
3. Peer review
4. Financial assistance from organizations like ICMR, DST, NACO, DGHS, and MHRD

Synopsis is the gist of your planned project submitted for approval from competent authorities. It gives a panoramic view of your research for quick analysis by the reviewers.

Thus, a protocol or a synopsis forms an integral part of a research project or a thesis. Many universities have made it mandatory for the postgraduate degree student to prepare a thesis as a part of their postgraduate training. A good knowledge about how a protocol or a synopsis is written is imperative to all people involved in medical research.

Literally, protocol (Greek word, protokollon - first page) means a format procedure for carrying out a scientific research. Synopsis (Greek word, sun - together, opsis - seeing) means brief summary of something. Frequently, both the terms are used as synonyms but the term 'synopsis' is used more often.

A synopsis should be constructed in a manner that facilitates the reviewer to understand the research project at a glance. It should be brief but precise. A synopsis can be structured in the following manner:

1. Title
2. Statement of the problem and hypothesis
3. Aims and objectives
4. Review of literature
5. Research methodology
6. References
7. Official requirements

Title

The title of the research project should be brief but informative; sensationalization of the title is best avoided. It should neither be too short nor too long. Any name of the institution, the number of cases to be studied should not be included. The hypothesis to be studied can be included.

Examples:

- a. "Study of ectopic pregnancy"

This was a title chosen for university registration. The title is too short. It does not state the problem or the hypothesis and is least informative. More meaningful title shall be, "Study of ectopic pregnancy in relation to morbidity, mortality, and intervention in a referral hospital".

b. "A novel sustained release matrix based on biodegradable poly (esteramides) and, impregnated with bacteriophages and an antibiotic shows promise in management of infected venous stasis ulcer and other poorly healing wounds", (Int. J Dermat vol 8 2002). The title is long and ill conceived. It gives a confusing picture about the study problem. Such long titles are best avoided. Certain amount of sensationalization is also present by using term 'novel'. More meaningful title shall be, "Response of venous stasis ulcers and other poorly healing wounds to a biodegradable matrix impregnated with bacteriophages and an antibiotic". The other details about the new method can be mentioned while stating the problem.

c. "Fine needle aspiration, as a diagnostic tool for papulonodular skin lesions". This is an acceptable, informative, and precise title. It states the hypothesis correctly.

Statement of the problem or hypothesis

The problem being studied should be mentioned in precise and clear terms. Understanding the problem aids the researcher in constructing the research proposal. It also allows the person to formulate the hypothesis. The problem under study should be relevant to the present. A brief account of its utility at the local or national level has to be discussed. The present status of the problem and the necessity for taking up the study needs to be mentioned.

Hypothesis is mentioned as a tentative prediction or explanation of the relationship between two or more variables. Hypothesis should not be a haphazard guess but should reflect the knowledge, imagination, and experience of the investigator. Hypothesis can be formulated by understanding the problem, reviewing the literature on it, and considering other factors. A researcher can state the problem and the hypothesis in about 200 words covering all the aspects described above.

Aims and objectives

All research projects should have objectives and aims and every effort should be made to achieve them. The objectives and aims should be only a few (2-3). They must pertain to the study problem. Usages of terms like "first study", "the only study", etc. should be avoided.

Review of literature

Review of literature is a very important part of a research project. It achieves the following:

- a. Familiarizes the reader to the problem under study.
- b. It describes the work done by others either at local or international level on it or similar subject.
- c. It helps the researcher to understand the difficulties faced by others and the corrective steps taken or modifications made by them. The researcher can anticipate similar or additional problems during the study and review of literature helps him in anticipating them.

- d. Research methodology of the researcher can be structured and modified after reviewing the literature.
- e. The review assists in identifying various variables in the research project and conceptualizes their relationship.
- f. Review of literature in a synopsis helps the reviewer in assessing the knowledge of the researcher. The reviewer can assess the work put in by the researcher and also assists in assessing the feasibility of the study.

The review of literature in a synopsis need not be exhaustive. The relevant information should be covered in about 300 words quoting 8-10 authentic, easily retrievable references. Literature can be reviewed by using various scientific-information-gathering methods. These are journals, national or international; bulletins of organizations like WHO, CDC, and ICMR; books; computer-assisted searches like Medline and Medlar; and personal communications with other researchers. Internet provides a vast avenue for information gathering. Care must be taken to retrieve only relevant information. In this era of information technology review of literature is literally "just a click away".

Research

methodology

In a synopsis the research methodology adopted should be mentioned in about 150-200 words. The research methodology forms the core of the research project. The methodology should cover the following aspects:

- a. Study design
- b. Study settings
- c. Sampling
- d. Variables
- e. Controls
- f. Study methods - examinations or investigations
- g. Data collection
- h. Data analysis
- i. Ethical clearance

Study

design

The methodology starts with selection of study design. A single study design or a combination can be selected e.g.:

Descriptive

designs

Cross-sectional study or survey

Epidemiological description of disease occurrence

Community diagnosis

Study of natural history of a disease

Observational

analytical

designs

Prospective				study
Retrospective				study
Follow-up				study
<i>Experimental</i>				<i>designs</i>
Animal				studies
Therapeutic	clinical	trials	-	drugs
Prophylactic	clinical	trials-		vaccines
Field				trials
<i>Operational</i>				<i>designs</i>
Study				settings

A mention about the research setting should be made. This includes information about the institution, facilities available, time of study, and population of study.

Sampling

Sampling is selecting a sample of appropriate size for the study. The sample size depends on the study design. The study population can be population of cases, population of people, or population of recipients of certain treatment.

There are many methods for sampling like simple random, systemic and stratified sampling, cluster sampling, etc. Care should be taken to ensure that the sample size is adequate to produce meaningful results. The sample size should be adequate to apply all relevant tests of statistical significance. The samples should be representative of the population and should be reliable. This minimizes sampling errors.

Variables

Variables are the factors that can change. These changes can affect the outcome of a research project. Thus, it is important to identify the variables at the planning stage. They should be quantified with a measurable unit. Knowledge of the various variables in a research project will assist in refining the objectives. Usually, objectives of a research will be to see the effect of independent variables on dependent variables. There are four types of variables.

Independent variables

These are the variables that can be manipulated by the researcher and the effects of that are observed on the other variables. For example, predisposing factors, risk factors and cause.

Dependent variables

The changes occur as a result of independent variables. For example, disease and outcome.

*Intervening**variables*

These may influence the effect of independent variables on the dependent variables. For example, while studying the response of HIV-AIDS to HAART the outcome may be influenced by the presence of antitubercular drugs.

*Background**variables*

These are changes that are relevant in the groups or population under study. These need to be included in the study. For example, age, sex, and ethnic origin.

Controls

Control groups increase the validity of the research project. They usually consist of units of same population but differ in some respects. Controls are not necessary for all research projects. As far as possible they should be used in all analytical studies, drug trials, and intervention programs.

Study**methods**

Here the researcher will have to describe the method of data collection, which may be in the form of:

1. Questionnaire
2. Interviews
3. Medical examination
4. Laboratory investigations
5. Screening procedures

A sample of the proforma should be prepared and attached. The possible cost involved and any financial assistance received must be mentioned.

Data collection

A brief note on how data are collected should be included. The information should be about:

1. The organizational setup
2. Training to data collecting team
3. Logistic support
4. Plans for collaboration with other organization should be included

Data analysis

Data analysis is an important part of a research project. A good analysis leads to good results. The plans for data analysis should be mentioned under the following heads Statistical methods, Computer program used, and Data sorting method. A general statement "appropriate statistical methods will be used." must be avoided.

Ethical clearance

Wherever necessary, ethical committee clearance from the institute should be obtained. The certificate must be attached. Ethical clearance is required in all human and animal studies.

References

All references quoted in review of literature and anywhere else in the synopsis should be listed here. There are two styles for writing references, Vancouver style and Harvard style. Vancouver style is easy to follow as it depends on the numbers as quoted in text.

Official requirements

A synopsis is incomplete if it does not contain the following information:

1. Name of the researcher and designation
2. Name and designation of the guide
3. Name and designation of head of department\institution
4. Name of the institution
5. Signatures of all with official seal

Reports communicate information which has been compiled as a result of research and analysis of data and of issues. Reports can cover a wide range of topics, but usually focus on transmitting information with a clear purpose, to a specific audience. Good reports are documents that are accurate, objective and complete. They should also be well-written, clearly structured and expressed in a way that holds the reader's attention and meets their expectations. The true value of the research may be assessed through a report.

Often reports are structured in a way that reflects the information finding process and the writing up of the findings: that is, summary of the contents, introduction or background, methods, results, discussion, conclusion and/or recommendations. The inclusion of recommendations is one reason why reports are a common form of writing in industry, as the informed recommendations are useful for decision making.

The scope and style of reports varies widely. It depends on three key factors: the report's intended audience, the report's purpose and the type of information to be communicated; for example, technical reports communicate technical information, so the degree of technicality in the report will depend on the reader's familiarity and understanding of technical concepts.

† Technical and Business disciplines with an applied focus such as Engineering, Information Technology, Commerce, Accounting and Finance, will set report writing assignments that simulate the process of report writing in industry. Assignments are set in the form of a problem or a case study. The students research the problem, and present the results of the research in a report format to an imaginary client.

† Field reports are common in disciplines such as Law, Industrial Relations, Psychology, Nursing, History and Education. These types of reports require the student to analyse his or her observations of phenomena or events in the real world in light of theories studied in the

course. Examples of field reports are a Court observation report, an observation report of a child or a patient for Developmental psychology or Nursing, a History site report, and a teaching observation report for Education.

† Scientific reports (also called laboratory reports) are another kind of report. They are common in all the Sciences and Social Sciences. These reports use a standard scientific report format describing methods, results and conclusions to report upon an empirical investigation. A more detailed and extensive type of this report is the research project report for fourth year honours students or research students involved in postgraduate studies.

technical reports

technical reports are used to communicate technical information. This information assists in decision making: for example, in the purchase of equipment, or finding solutions to technical problems. An important consideration when preparing technical reports is the audience and purpose of the report: for example, to brief managers, to provide technical background information for lay people associated with the project, or to make recommendations to technical supervisors. These factors determine the degree of technicality of the language and concepts involved.

At university, technical report writing is a frequently used assignment format in faculties of engineering and in the applied sciences. This is because the assignment tasks require students to draw theory and real world situations together, and to present the information in a structured and accessible format; for example, engineering students may be asked to solve a design problem or investigate and evaluate the solutions to an environmental problem while Information Technology students might be asked to develop a program or an information management plan for a specific issue or company or to evaluate recent developments in the telecommunications industry. Learning how to report on technical information to others is an important component of technical studies.

The information provided in reports needs to be easy to find, and written in such a way that the marker / reader / client can understand it. Reports utilise headings to divide information into sections. The headings help the reader to locate relevant information quickly. Below are some guidelines for structuring your report.

The structure of a report and the purpose and contents of each section is shown below.

TITLE PAGE

report title
your name
submission date

EXECUTIVE SUMMARY

overview of subject matter
methods of analysis
findings

recommendations

<u>TABLE OF CONTENTS</u>	list of numbered sections in report and their page numbers
<u>INTRODUCTION</u>	terms of reference outline of report's structure
<u>BODY</u>	headings and sub-headings which reflect the contents of each section
<u>CONCLUSION</u>	states the major inferences that can be drawn from the discussion
<u>RECOMMENDATIONS</u>	indicates any further work that needs to be done or identifies the alternative you think best solves or improves the problem
<u>REFERENCE LIST</u>	list of reference material consulted during research for report
<u>APPENDIX</u>	information that supports your analysis but is not essential to its explanation

Title page

The title of the report should tell the reader exactly what the report is about; for example,

The sleepsuit: The design and evaluation of an innovative new sleeping bag

The feasibility of adopting the RX 90 in-flight entertainment system for the Qantas international fleet.

On this page also include any relevant details about your name, course and assignment as required by your subject.

Abstract or Executive Summary

The abstract or executive summary provides a summary of the report's essential information, is usually about 100 to 200 words in length and is usually presented on a separate page. The abstract / executive summary should summarise:

- † the background to the problem
- † the purpose of the report
- † the goal of the work reported on / the scientific or commercial objective
- † brief details of the approach, procedure and/or methods
- † important results and/or findings
- † Conclusion(s)
- † Recommendations

Table of Contents

In a report longer than several pages a table of contents should be included as it assists the reader to locate information quickly. It also gives the reader a schematic overview of the structure and contents of the report.

A table of contents should include all section headings and subheadings:

- † worded exactly as they appear in the report
- † numbered exactly as they appear in the report (For more information on numbering systems used in report writing, [click here](#).)
- † with their page numbers location.

The table of contents should be on its own page.

As well as a table of contents, you may wish to include:

List of Figures (optional, separate page)

This list is used mainly for reports containing numerous figures. It includes the figure number, caption and page number, ordered as they appear in the text.

List of Tables (optional, separate page)

This list is used mainly for reports containing numerous tables. It includes the table number, caption and page number, ordered as they appear in the text.

List of appendices (optional, separate page)

This list is used mainly for reports containing numerous appendices. It includes the appendix letter (each separate appendix should be lettered i.e. Appendix A, Appendix B, etc.), its title and page number, ordered as they appear at the end of the report.

Nomenclature (optional)

Where symbols are used extensively, a list of symbols and definitions should appear at the beginning of the report. If there is no list, symbols should be defined in the text when first used.

Introduction

This section gives the reader the necessary background information. Depending on the type of project/report, the Introduction can include:

- † statement of the problem/s;
- † description of main aim/s, objective/s and scope (the parameters) of the report;
- † review of previous work/research in this area and identification of the relationship between this research and the current project (i.e. you need to identify the importance of the current project for scientific knowledge or commercial operations);
- † an overview of the report's sections and their relationship to the research problem;
- † explanations of terminology if necessary;
- † method(s) of approach;
- † indications of scope and limitations of the study;
- † outline of material presented in rest of report.

While there will be some duplication in the contents of the executive summary and the introduction, the purpose of the executive summary is to provide a summary of the findings of each section of the report. The purpose of the introduction, however, is to outline what the report will cover and how these issues address the research problem.

Body of the report

The body section expands and develops the material in a logical and coherent manner, reflecting the structure outlined in the Introduction. It contains a description of the findings and a discussion of them. It should also relate the findings to any theory of relevance. The following questions are examples of some of the types of questions the body of your report should seek to answer:

- † What were the most significant findings or factors involved in topic/ the problem?
- † Did the findings support the theory?
- † Have you found some disagreement with the theory?
- † Did you uncover any unexpected or new issues that need to be considered?

This section is usually the longest part of the report so the material must be presented logically to make it is easy to read. The particular headings you use to organise the information in the body of your report and to make it logical will depend on the purpose of the report you are preparing. You should make sure the headings and sub-headings you choose are informative.

Research type reports may include sections such as:

- † theory/modelling,

- † methods and materials used,
- † results/comparisons with theory and/or previous work,
- † discussion and analysis of material

For more information on the structure of research reports, go to the [scientific report section](#) in the **UniLearning** website.

Design or feasibility type projects/reports may include sections such as:

- † problem identification
- † alternative solutions
- † analysis and evaluation of alternatives.

Conclusion

The conclusion summarises the major inferences that can be drawn from the information presented in the report. It answers the questions raised by the original research problem or stated purpose of the report (Blake & Bly, 1993) and states the conclusions reached; it also attempts to show ‘what it all means’: the significance of the findings reported and their impact (Weaver & Weaver, 1977).

The conclusion/s presented in a report must be related to, resulting from and justifiable by the material which appears in the report. The conclusion must not introduce any new material. It should report on all the conclusions that the evidence dictates as it is NOT the job of a conclusion to “gloss over conclusions that are puzzling, unpleasant, incomplete or don’t seem to fit into your scheme” (Weaver & Weaver, 1977: 98). Doing this would indicate writer bias and mean your conclusion may mislead the reader.

In the workplace, conclusions are quite often read by managers before the main text of the report and hence, should summarise the main points clearly. This section also may include:

- † reference to original aim(s) and objective(s) of report,
- † application(s) of results,
- † limitations and advantages of the findings,
- † objective opinion, evaluation or judgement of the evidence

Quite often the present tense is used in the conclusion; for example, “the cement tested in this project is a good candidate for the dense-phase mode of pneumatic transportation”.

The conclusions may be ordered in several ways (Weaver & Weaver, 1977). The main conclusion may be stated first and then any other conclusions in decreasing order of importance. Alternatively, it may be better to organise the conclusions in the same order as the body section was organised. Another strategy would be to present the positive conclusions together and then the negative conclusions. The organisational strategy you use may vary; the important thing is that it is logical.

The conclusion must arise from the evidence discussed in the body of the report. It should not, therefore, subjectively tell the reader what to do (Blicq, 1992; Weaver & Weaver, 1977): this job is performed by the recommendations section. (**NOTE:** Sometimes the conclusion and recommendation can be presented together in one section but they should be presented in separately labelled subsections).

Recommendations

If required, recommendations should emerge from the conclusions of the report. Recommendations tell the reader what to do: what decision to make, what course of action to take, what alternative solution is superior or what further work needs to be undertaken. Although subjective, that is the recommendations arise from your opinion and judgements, the recommendation section should never contain any new evidence and should arise from the information presented in the body and conclusion sections (Blicq, 1992: 152).

Recommendations should be feasible and appropriate to the problem; for example, their cost should be realistic to the budget and they should be ethical (Weaver & Weaver, 1977). The recommendations section provides your opinion on the course of action to be taken, you should not, therefore, hedge your bets by recommending all possible actions. Sometimes it may be the case that you recommend that no action be taken as this, in your opinion, is the best course of action to take (Weaver & Weaver, 1977).

Recommendations are written for action so they should be as concrete and specific as possible; they should read as a list of things the client should do. They can be written in prose, or can be presented as ‘bulleted’ information. Break each recommendation down into as many component parts as seems logical. Let your reader know why you are recommending an action by supplying the reasons for your decision drawn from the conclusions of the report. Include helpful and useful information in your recommendation such as how to implement the course of action suggested or other sources of information the reader may want to follow up (Weaver & Weaver, 1977).

Recommendations should usually be presented as a separate section from the conclusion but sometimes it is also appropriate to combine them as separately labelled subsections in a *Conclusion & Recommendations section*.

Reference list

It is essential to include a reference list or bibliography of the reference material you consulted during your research for the report. A **bibliography** is a list of all the reference material you consulted during your research for the report while a **reference list** is a list of all the references cited in the text of your report, listed in alphabetical order at the end of the report. Each reference in the reference list needs to contain all of the bibliographic information from a source. You should also check with your lecturer or tutor for any Faculty guidelines on referencing formats.

Throughout the text of your report you will also need to provide references when you have included an idea in your report which is not your own original idea. You don't need to reference an idea, however, if it is common knowledge (i.e. enzymes are proteins) or if it has been established by you in your experiment (i.e. in scientific reports reporting on an

experiment). A reference is the bracketed or footnoted piece of information within the text of your writing that provides an acknowledgment that you are using someone else's ideas. There are several systems of referencing such as the Harvard or author-date system, footnotes or endnotes. Different faculties, departments and even lecturers will generally have preferences about how you should reference and you should seek these out before submitting your assignment.

Appendix

Information that is not essential to explain your findings, but that supports your analysis (especially repetitive or lengthy information), validates your conclusions or pursues a related point should be placed in an appendix (plural appendices). Sometimes excerpts from this supporting information (i.e. part of the data set) will be placed in the body of the report but the complete set of information (i.e. all of the data set) will be included in the appendix. Examples of information that could be included in an appendix include figures/tables/charts/graphs of results, statistics, questionnaires, transcripts of interviews, pictures, lengthy derivations of equations, maps, drawings, letters, specification or data sheets, computer program information.

There is no limit to what can be placed in the appendix providing it is relevant and reference is made to it in the report. The appendix is not a catch net for all the semi-interesting or related information you have gathered through your research for your report: the information included in the appendix must bear directly relate to the research problem or the report's purpose. It must be a useful tool for the reader (Weaver & Weaver, 1977).

Each separate appendix should be lettered (Appendix A, Appendix B, Appendix B1, Appendix B2, Appendix C, etc). The order they are presented in is dictated by the order they are mentioned in the text of the report. It is essential to refer to each appendix within the text of the report; for example,

For the manufacturer's specification, see Appendix B

or

Appendix C contains the YoY shareholder account growth rates. The rates are high. The increasing growth rate of accounts will significantly affect the valuation of the company.

Literature search

Literature search.

One of the core skills needed as a university student is a knowledge of how to conduct a literature search i.e. how to find scholarly material on your topic.

You will need to do a literature search in order to write a research essay, a literature review, or complete other written tasks. The relevant material may include books, journal articles (both hard copy and online), web sites, or other audio and visual work.

Accessing this wide range of material means having a thorough knowledge of library systems and how online search engines work.

In the following sections, you can read about how to start your search, evaluate the sources you find, and document these effectively.

Starting your search

The first step in undertaking a comprehensive search is to access the following resources:

- *Bibliographies and reference lists from seminal texts.* Start by following up texts mentioned in lectures, tutorials, or set readings. Set readings may be particularly helpful as they indicate many of the current literature on your topic area.
- *Library catalogues and databases.* Your library catalogue will list print references available for borrowing while multi-database tools such as SuperSearch will provide you with online access to sources. Staff at the library information desk will assist you with learning how to navigate these.
- It might be useful to learn how to use keywords and Boolean logic to search catalogues, databases, and internet search engines (see below). The library holds regular training classes in effective data searching.
- It may also be beneficial to visit the library in person and browse through the shelves where you have found key texts. Look at the preface, chapter headings, index, and bibliography of relevant material. Also browse for other authors who have published on your topic.
- *Internet search engines.* While you need to establish the credibility of the sources you find on the web, you can use internet search engines discriminately for fast and useful information. Internet search engines such as Google Scholar provide information which is more appropriate to the academic context. Ask the staff at The University of Melbourne libraries for recommendations on academic search engines.

Evaluating sources

The relevance, age, and credibility of your research material are important. Aim to find:

- books from recognised publishers,
- articles from peer-reviewed journals, and
- current information, particularly in the sciences.

Critically evaluate your material by considering the author's

- professional, cultural, and theoretical background,
- purpose and intended audience,
- approach, methodology, and sources,
- argument (or position on an issue), and
- provided evidence.

Please note that although it may be easy to obtain information on a particular topic from the web, this material is often not produced by experts and may therefore lack academic credibility.

A literature search is a search for published information using a range of sources relevant to your research project. An incomplete or ineffective search is likely to miss relevant information, resulting in the possibility that practice is based on incomplete evidence and possibly inappropriate or ineffective decisions being made. In generating new knowledge or research, a literature search is also important. A literature review will provide background and a rationale to your research, highlighting work that has already been undertaken in this field, methods that have been used and areas that remain to be considered. A search will prevent duplication of effort, ideas for how to proceed and confirm or validate the results of your study. Whether in the pursuit of evidence based practice or generating new knowledge, a literature review is an essential component and it is therefore worthwhile taking the time to plan it and understand the techniques involved.

PLANNING THE SEARCH

Searching the literature can be very time consuming and frustrating. Researchers often have problems finding relevant information or finding more information than they can manage. In recent years the rapid expansion of the Internet has resulted in increasing amounts of information being [theoretically] available on our desktops within a few clicks of the mouse. One of the keys to more successful literature searching is planning the search. Before visiting a library or sitting down at the computer to search the Internet, it is advisable to think about and consider your search. Think carefully about your search question. The more focused the search question, the easier the search. Searching on a particular question is easier than looking for a vague topic area or entering a few terms on a topic you are interested in. You may need to break down your topic area into several questions and search on each individually. Focusing the search question will be considered in greater detail later in the paper.

SOURCES OF INFORMATION

A literature review will generally include searches of a range of sources of information. Some sources are more suited to particular questions and all cover slightly different topic areas. Books Books provide useful background and overviews to topic areas. However, they can become quite dated. They may be useful in helping to focus on a topic area when embarking on a research project. Journals There are numerous journals available providing more up to date information. Journals can be peer reviewed (i.e. each article has been reviewed by experts in the field before publication) and these are often judged as higher quality. Some are evidence based, providing summaries and commentaries on research evidence. Radiography draws its professional knowledge base from an extremely wide evidence base d from physical sciences through clinical sciences to the social sciences.

Databases

Databases comprise records mainly of journal articles although some also provide details of books and reports. Databases are a good way of locating research literature, providing access to records over a wide range of years. However, they can be difficult to search. They are usually accessed via the Internet or your local library. A **database** is an organized collection of data for one or more purposes, usually in digital form. The data are typically organized to model relevant aspects of reality in a way that supports processes requiring this information. The term "database" refers both to the way its users view it, and to the logical and physical

materialization of its data, content, in files, computer memory, and computer data storage. the term database implies that the data is managed to some level of quality (measured in terms of accuracy, availability, usability, and resilience) and this in turn often implies the use of a general-purpose Database management system (DBMS). A general-purpose DBMS is typically a complex software system that meets many usage requirements, and the databases that it maintains are often large and complex. The utilization of databases is now spread to such a wide degree that virtually every technology and product relies on databases and DBMSs for its development and commercialization, or even may have such embedded in it. Also, organizations and companies, from small to large, heavily depend on databases for their operations. DBMSs are packaged as computer software products: well-known and highly utilized products include the Oracle DBMS, Access and SQL Server from Microsoft, DB2 from IBM and the Open source DBMS MySQL. Each such DBMS product currently supports many thousands of databases all over the world. The stored data in a database is not generally portable across different DBMS, but different DBMSs can inter-operate to some degree. The database research area has several notable dedicated academic journals (e.g., ACM Transactions on Database Systems-TODS, Data and Knowledge Engineering-DKE, and more) and annual conferences (e.g., ACM SIGMOD, ACM PODS, VLDB, IEEE ICDE, and more), as well as an active and quite heterogeneous (subject-wise) research community all over the world.

The Internet (World Wide Web)

The Internet is an international network of computer networks that allows access to a wealth of information from all over the world. Although there is vast potential for obtaining information via the Internet, it is unregulated and much of the information found may be unreliable. Searching (via search engines) can retrieve lots of information and it is important to appraise sites critically. A good looking web site is not an indicator of content quality. With specific search engines, you can make an accurate scientific literature search. Here are the most common engines and some suggestions for their use.

The best free engines are:

- Google Scholar

It is linked to the search engine Google; the main difference is that it only finds links to scientific publications, and not to any other website. For instance, if you look for “diamond hardness” on Google, you will find many links where they describes this property of the diamond, or links of commercial companies dealing with this, etc. If you do the same search on Google Scholar, however, you will only find links to the scientific publications and/or patents covering this aspect of diamonds.

- Scirus

It is very similar to Google Scholar, giving you links to scientific documents.

- Science Direct

It only includes the articles published by Elsevier, probably the biggest publisher of scientific journals with over 10 million articles searchable online. Its range is, therefore, more limited than other engines; it is, however, very complete for all the Elsevier journals.

Search engines subscribed by the university or college

Other scientific search engines are not free; hence, they cannot be accessed by everybody from every computer. Usually universities and colleges subscribe to the most common ones; so you can access them with the computers at the university or using the password valid for the specific university.

You have to check which of these engines are available at your university; the most common ones are Scopus and Web of Science. Normally they include almost every paper published in scientific journals.

Search engines

Academic Index:

BASE:

CiteSeerx:

Google Scholar Beta:

InfoMine

ipl2:

iSeek:

refSeek:

Vadlo:

Web, Library and Literary Tools

Digital Library of the Commons:

Directory of Open Access Journals:

ERIC:

Intute:

Open Library:

The Literary Encyclopedia

WorldCat

Archives

Archives Hub:

British Library Research Archive:

Library of Congress:

National Archives:

Professional organisations/societies Professional organisations are often providers of profession specific information and research reports that can be useful in summarising information on particular topic areas. In some cases they also provide information services for members.