

(11) Plagiarism → copying someone else's work without credit.

→ cheating & unethical

→ can lead to rejection of paper / punishment

→ always write in your own words or give proper credit.

→ ex - copy-pasting from a website without citation is plagiarism.

(12) Reproducibility →

- others can do your research again & get the same results.

- shows your work is honest & clear.

- helps improve trust in your research.

- req. complete & clear reporting of methods.

- Ex - Another lab uses your steps & gets the same result = reproducibility.

(13) Accountability →

- taking responsibility for your research. researchers should be honest & ready to answer questions about their work.

- If something goes wrong, they must explain why.

- It builds trust & respect in the research field.

- Ex - If data is found false, the researcher is accountable.

(8) TRIPS - Trade Related Aspects of IPR

- International agreement about protecting IPR
- ensures that countries respect each other's patent, trademarks, etc.
- All WTO countries must follow TRIPS rules
- It helps global trade of ideas of inventions
- ex - India follows TRIPS rules to protect patents in the global market.

(9) Scholarly Publishing - IMRAD concept

1. IMRAD = Introduction, Methods, Results, and Discussion.
2. Basic format of a research paper
3. Helps make the paper easy to read & understand.
4. Widely accepted in scientific journals;
5. Ex → A medical research paper follows the IMRAD str.

(10) Citation & Ackgment

- giving credit to authors whose work you need.
- Shows respect & avoids Plagiarism

Both added at end of research paper
Ex - Citing a book like (Sharma, 2023), in

your paper.

(4) Patent law

- patent gives legal protection to an invention.
- only the patent holder has the right to make. or sell it.
- it is valid for a fixed time (usually 20 yrs.)
- after that, anyone can use the invention.
- Ex - A new mobile phone design can be patent.

(5) Commercializ.

- turning your research / invention into a product to sell.
- helps take new ideas to the market.
- can bring money & success to the inventor.
- needs planning, legal rights (like patents) & support.
- Ex - Selling a medicine you invented after clinical trials.

(6) Copyright -

- protects writing, music, sw, art, etc.
- only the creator can copy, publish / sell it.
- it is automatic once the work is created.
- others must take permis. or give credit.
- Ex - Writing a novel - you own the copyright.

(7) Royalty -

- money earned when others use your work.
- you give someone the rt. to use it legally.
- mostly used in music, books, inventions, etc.
- more they sell / use it, more you earn.
- Ex - author earns royalty every time their book is sold.

MOD- III

① Ethics - Ethical Issues in Research.

- Ethics means doing right & fair things in research.
- researcher must not lie, cheat, or harm anyone.
- ethical issues include - false data, copying / hurting people / animals.
- always take permissions before testing on people or animals.
- Ex:- Testing a medicine without informing the person is illegal.

② Ethical committees (Human & Animal)

- grps. that check if the research is safe & fair.
- human ethics committee - protect people in research (eg. in drug trials).
- Animal ethics committee - protect animals from pain or harm.
- Research can start only after committee approval.
- Ex:- Before testing a new vaccine, you need human ethical approval.

③ IPR - Intellectual Property Rights

1. protects your original work (ideas, inventions, books, songs, etc.)
2. It stops others from using your work without permission.
3. You can earn money by giving others rights to use your work.
4. IPR includes - Patents, copyrights, trademarks
5. Ex - You invented a mc - get a patent to protect it.

⑤ Data Processing & Analysis Strategies of Tools

1. After collecting, data is cleaned (remove errors or blanks).
2. Then, data is organized using tables or charts.
3. Analysis means finding patterns, trends & results.
4. Tools used: Excel, Python, SPSS, R, etc.
5. Good analysis gives clear & useful results.

⑥ Data Analysis with Statistical Package (SigmaStat, SPSS)

1. Statistical pkgs → sw that help you analyze data.
2. SigmaStat, SPSS → common tools used for analysis.
3. Help in applying formulas & making charts easily.
4. Useful for test like:- t-tests, ANOVA, correlation, etc.
5. Makes analysis faster & more accurate.

⑦ Student t-tests (in SPSS)

- T-test compares avg. of 2 grp.
- helps find if there is a real diff. b/w them.
- used when data is small / simple.
- Ex:- comparing boys' vs. girls' test scores.
- SPSS can do t-test automatically & show results.

⑧ ANOVA (Analysis of Variance)

- ↓
- compares mean of 3 / more grp.
- tells if at least one grp. is diff.
- Ex:- comparing marks of students from 3 schools.
- used when t-test is not enough
- done easily using sw like SPSS.

⑨ Hypothesis Test = guess / idea you want to test

- helps in making decision in research.
- checks if your guess is right or wrong using data.
- 2 types:- Null (no effect) Alternative (is an effect)
- use data to accept / reject the null hypothesis.

① Ethics
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MOD-II

① Aspects of Method validation

- checking if your method gives correct & consistent results.
- make sure your tools or tech. work properly.
- helps improve trust in research result
- common checkers: accuracy, repeatability, sensitivity.
- good method gives the same result when used again.

② Observation & collection of Data

1. watching / noting down things during research
2. used to collect real-time data (behaviour, events, etc.)
3. can be direct (you see it) etc.)
indirect (you record it)
4. Data collection → getting info. from diff. sources
5. Observation gives honest & live info.

③ Methods of Data collection

1. Surveys - asking people questions (through forms or interviews)
2. Experiments - collecting data from lab tests / trials.
3. Documents / Records - using written sources or past data
4. Observation - watching events directly
5. Choose the method depending on your research goal.

④ Sampling methods:-

1. Sampling means - selecting a few people / items from a big grp. to study.
2. Random sampling - everyone has an eq. chance to be chosen.
3. Stratified sampling - divide the grp. into parts & then sample.
4. Systematic Sampling - choose every 5th / 10th item / person
5. Sampling saves time, money & effort in large studies.

- 15 Development of working hypotheses
1. hypothesis = smart guess / prediction
 2. gives direction to your study
 3. based on past research & logic
 4. must be testable by exp. or data
 5. working hypothesis may change later as you find more info.

① Agree

→ what's your hypothesis? Search & in diff. →
↳ Eng. with 2000 bcf. spent time at a
station (spend 2000 bcf. time at a station)

②

↳ 2000 bcf. of abnormally low
water levels in 2000 → 2000 bcf. water
levels in 2000 ↓ moisture - green growth

③

Working hypothesis (1)

→ Eng. with 2000 bcf. spent time at a station

→ 2000 bcf. of abnormally low water levels

- (10) Literature Review - 1^o & 2^o sources
1. 1^o sources - original work (research papers, patent)
 2. 2^o Sources - Summaries of others' work (review articles, books)
 3. 1^o → direct evidence; 2^o → based on others.
 4. use both for full understanding
 5. Start with 2^o, then go deeper into 1^o.

(11) Reviews: Monographs, Patents, Research Database.

1. Reviews - summarizes many research papers.
2. Monograph - book written on one subject.
3. Patents - protects new inventions / ideas.
4. Research DB - (e.g. Google Scholar) help find papers.
5. These sources help in deep research & idea building.

(12) Web as a Source, searching the web.

1. Internet helps find quick info., papers, data etc.
2. use trusted sites like Google Scholar, PubMed, ResearchGate.
3. use keywords to search smartly.
4. check if source is reliable & up to date
5. Avoid using random / fake websites.

(13) Critical Literature Review

1. Not just reading - but understanding & judging past work.
2. See what was good & what was missing.
3. Compare diff. studies.
4. find patterns, strength & weaknesses
5. helps build your own unique research.

(14) Identifying Gap areas from Lit. & Research DB.

1. Gap means what has not been studied yet.
2. After reading many papers, find what is missing.
3. This gap becomes your research topic.
4. Good gap is one that matters & can be solved.
5. Gap finding = smart & useful research.

(5) Criteria of Good Research

1. Should be systematic - Step by step
2. " logical & clear
3. Data should be accurate & reliable
4. Results should be useful & meaningful.
5. Should be ethical, without cheating / copying.

(6) Defining & Formulating the Research Problem

1. question - you want to solve..
2. Should be specific & clearly written
3. Formulating means shaping the problem in researchable way.
4. helps in setting direction for study
5. Good problem = clear, focused & relevant

(7) Selecting the Problem

1. choose a topic that is interesting & imp.
2. Should be researchable - You can collect & Study data
3. Should fit your time, knowledge & resources.
4. Check if others have studied it before
5. Avoid too broad or too narrow problem.

(8) Necessity of defining the Problem

1. helps in planning research better.
2. avoids confusion during study.
3. helps choose right methods & tools.
4. saves time & effort.
5. Makes research focused & goal-oriented.

(9) Imp. of Lit. Review in Defining a Prblm.

1. reading earlier research on the topic
2. helps understand what is already known.
3. Shows what prblms. still need answers.
4. avoids repeating some research
5. helps improve your own research question.

(10) Literature

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Mod - I

① Motivation and Objectives:

1. reason why we want to do the research
2. it can be to solve a prob., invent something new, or improve something.
3. Obj. → clear goals of research
4. they guide us step-by-step to reach research aim
5. Good obj. are clear, specific & achievable

② Research Methods & Methodology:

1. Tools or techn. - surveys, expt. → to collect data
2. Methodology - overall plan of how research is done.
3. Methods - part of methodology.
4. Methods - How to do
Methodology - why & what to do.
5. Methodology - explains the reason behind choosing particular methods.

③ Types of Research

1. Descriptive vs. Analytical
2. Applied vs. fundamental
3. Quantitative vs. Qualitative
4. Conceptual vs. Empirical

④ Applied & Basic Research Process

1. Applied research directly helps in solving a prob.
2. Basic (fundamental) research - adds to knowledge.
3. Applied - more action based
Basic - more idea-based
4. Both types follow steps - define prob.
collect data
analyze
result
5. basic. research leads to applied innovation.