Research Methodology – Unit 4

Course Code: M23DE0205 – Academic year 2024-2025, II Semester MCA (Even Semester)

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COURSE CONTENT

UNIT 1: Research and Types of research: Meaning of Research- Objectives of Research- Motivation in Research. Research methods vs Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Research Process. Criteria of good Research.

UNIT 2: Research Formulation : Defining and formulating the research problem. Selecting the problem - Necessity of defining the problem – Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs- patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis..

UNIT 4 – SYLLABUS CONTENT

UNIT 3: Data Collection and Analysis: Execution of the research – Observation and Collection of data - Methods of data collection – Modeling, Mathematical Models for research, Sampling Methods- Data Processing and Analysis strategies. Data Analysis with Statistical Packages – Hypothesis-testing, Generalization-and-Interpretation.

UNIT 4: Application of results and Ethics: Environmental impacts - Ethical issues - Ethical committees - Commercialization – Copy right – royalty - Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability.

LECTURE -1, ENVIRONMENTAL IMPACTS

Agenda

➢ Introduction

➢ Environmental Impacts

➢ Key Environmental Impacts

➢ Examples of Environmental Impacts

➢ Minimizing Environmental Impacts

ENVIRONMENTAL IMPACTS

Research activities can significantly impact the environment through resource consumption, waste generation, and pollution, encompassing various aspects from initial planning to dissemination.

Understanding and minimizing these impacts is crucial for promoting sustainable research practices and environmental stewardship

KEY ENVIRONMENTAL IMPACTS

Resource Depletion
Research often involves the use of energy, water, and materials, leading to the depletion of natural resources.

Waste Generation
Laboratory activities, including the use of single-use plastics and other materials, can contribute to significant waste generation.

Pollution
Research can lead to various forms of pollution, such as air pollution from energy consumption and water pollution from waste disposal.
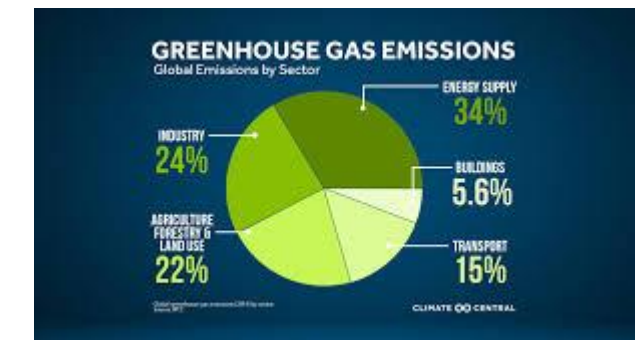
KEY ENVIRONMENTAL IMPACTS CONTD.

Ecosystem Disturbance
Fieldwork and other research activities can disturb ecosystems, impacting flora, fauna, and habitats.

Greenhouse Gas Emissions
Research activities, particularly those involving transportation and energy-intensive processes, contribute to greenhouse gas emissions.

Carbon Footprint
Research activities, including air travel to conferences and laboratory operations, can result in a substantial carbon footprint.

# EXAMPLES OF ENVIRONMENTAL IMPACTS IN RESEARCH

Laboratory Operations:
Research laboratories consume large amounts of energy, with some studies showing they can consume 5 to 10 times more energy per square meter than typical office buildings.

Single-Use Plastics:
A significant amount of single-use plastics are used in research, particularly in biological, medical, and agricultural research.

Fieldwork:
Fieldwork can involve the disturbance of ecosystems, the use of resources, and the generation of waste.
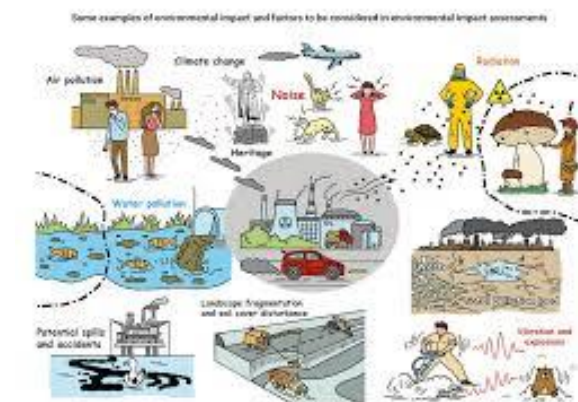
MINIMIZING ENVIRONMENTAL IMPACTS

Sustainable Practices

Reducing Resource Consumption

Reducing Emissions

Waste Management

Promoting Responsible Fieldwork

Raising Awareness

SUMMARY

➢ Unit 4 – Syllabus Content

➢ Environmental Impacts

➢ Key Environmental Impacts

➢ Examples of Environmental Impacts

➢ Minimizing Environmental Impacts

QUIZ

UNIT 4: Application of results and Ethics: Environmental impacts - Ethical issues - Ethical committees - Commercialization – Copy right – royalty - Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability.

Good Relationship

HOW ARE YOU

Not / Bad Relationship

W H O ARE YOU

LECTURE -2, ETHICAL ISSUES

RECAP

- ➤ Unit 4 – Syllabus Content
- ➤ Environmental Impacts
- ➤ Key Environmental Impacts
- ➤ Examples of Environmental Impacts
- ➤ Minimizing Environmental Impacts

OBJECTIVE

- ➤ Ethical Issues

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ETHICAL ISSUES

Informed Consent:
Participants must be fully informed about the purpose, process, risks, and benefits of the research.
Obtain voluntary consent without coercion, ensuring participants understand they can withdraw at any time.

Privacy and Confidentiality:
Safeguard participants' personal information and ensure anonymity where applicable.
Use data only for the stated research purpose and protect it from unauthorized access.

Avoidance of Harm:
Ensure that research activities do not cause physical, psychological, social, or economic harm to participants or communities.
Assess risks and implement measures to minimize potential negative impacts.

ETHICAL ISSUES CONTD.

Honesty and Integrity:
Present data and findings truthfully, avoiding fabrication, falsification, or misrepresentation.
Acknowledge all contributions and sources appropriately.

Non-Exploitation:
Avoid exploiting participants, particularly vulnerable populations, for personal or institutional gain.
Ensure equitable sharing of benefits resulting from the research.

Fairness in Participant Selection:
Select participants equitably, avoiding biases or discrimination based on gender, ethnicity, socio-economic status, etc.
Ensure that no group is disproportionately burdened or excluded from the benefits of the research.

ETHICAL ISSUES CONTD.

Plagiarism:
Acknowledge the intellectual property of others and avoid using their work without proper citation.
Adhere to academic honesty in writing and reporting.

Conflict of Interest:
Disclose any personal or financial interests that could influence the research process or outcomes.
Avoid situations where the researcher's interests conflict with ethical obligations.

Transparency in Reporting:
Report findings comprehensively, including limitations and contradictory results.
Avoid selective reporting or overstating conclusions.

ETHICAL ISSUES CONTD.

Compliance with Legal and Ethical Standards:
Adhere to institutional and national guidelines for ethical research.
Obtain necessary approvals from ethics review boards or committees before conducting the study.

Environmental Responsibility:
Consider the environmental impact of research activities and minimize harm to ecosystems.
Use sustainable practices during data collection and experimentation.

Cultural Sensitivity:
Respect cultural norms and values when engaging with participants from diverse backgrounds.
Avoid imposing external viewpoints or misrepresenting cultural practices.

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ETHICAL ISSUES CONTD.

Beneficence and Social Responsibility:
Strive to produce research that benefits society and contributes positively to knowledge or practice.
Avoid research that could have harmful societal implications or perpetuate inequality.

Accountability and Oversight:
Be accountable for all aspects of the research process, including data collection, analysis, and application.
Ensure proper documentation to facilitate scrutiny and validation.

SUMMARY

➢ Ethical Issues

PROBLEM FOR PRACTICE

UNIT 4: Application of results and Ethics: Environmental impacts - Ethical issues - Ethical committees - Commercialization – Copy right – royalty - Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability.

LECTURE -3, ETHICAL COMMITTEES

RECAP

OBJECTIVE

➢ Ethical Issues

➢ Ethical Committees

ETHICAL COMMITTEES

Definition and Role:

Ethical committees (or Ethics review boards) are formal groups responsible for reviewing research proposals to ensure compliance with ethical standards.

They safeguard the rights, well-being, and dignity of participants.

Need for Ethical Committees:

Required for studies involving human participants, animals, or sensitive subjects.

Ensure researchers adhere to legal and institutional ethical guidelines.

Composition of Ethical Committees:

Typically include multidisciplinary members such as scientists, ethicists, legal experts, and laypersons.

Diversity in the committee ensures a balanced review of ethical concerns from multiple perspectives.

ETHICAL COMMITTEES CONTD.

Functions of Ethical Committees:

Review research proposals to identify ethical risks.

Approve or reject studies based on compliance with ethical principles like informed consent, confidentiality, and non-maleficence.

Monitor ongoing research to ensure adherence to approved protocols.

Focus Areas in Review:

Assessment of risks versus benefits of the research.

Verification of informed consent processes.

Protection of vulnerable populations (e.g., children, marginalized groups).

Anonymity and data protection strategies.

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ETHICAL COMMITTEES CONTD.

Mandatory Approvals:
Certain types of research (e.g., clinical trials, studies involving biological samples) cannot proceed without ethical committee approval.
Regulatory authorities often require ethical clearance before granting funding or publication.

Addressing Conflicts of Interest:
Ethical committees help identify and mitigate conflicts of interest that may bias research outcomes.
Ensure researchers disclose any financial or personal interests.

Ethics Training and Guidance:
Provide education to researchers on ethical principles and their application.
Offer advisory services for complex ethical dilemmas during the research process.

ETHICAL COMMITTEES CONTD.

Accountability:
Ethical committees ensure that researchers are accountable for the ethical conduct of their studies.
Maintain records of reviews, approvals, and any amendments to research protocols.

Promoting Ethical Culture:
Foster a culture of integrity and responsibility in research institutions.

SUMMARY

> Ethical Committees

QUIZ

UNIT 4: Application of results and Ethics: Environmental impacts - Ethical issues - Ethical committees - Commercialization – Copy right – royalty - Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability.

LECTURE -4, COMMERCIALIZATION, COPY RIGHT

RECAP

➢ Ethical Committees

OBJECTIVE

➢ Commercialization

➢ Copy right

➢ Rights of Copyright holders

➢ During of Copyright

COMMERCIALIZATION

Commercialization is a stage where research outputs are transformed into marketable products, services, or processes.

Commercialization begins when research yields a useful, unique product or process that someone familiar with the field could use, make, and/or sell.

The goal of commercialization is to bridge the gap between scientific discovery and real-world applications, often with the aim of generating economic, social, or environmental benefits.

COMMERCIALIZATION CONTD.

Here's an overview of commercialization in the context of research methodology:

1. **The Process of Commercialization in Research**

Commercialization is often a multi-step process involving various stages, from the initial research concept to the final product reaching the market. This includes:

a. Idea Generation and Research Development

1. **Basic Research**: The process begins with basic or applied research, where scientific discoveries or technological innovations are made. Researchers explore unexplored concepts, generate new hypotheses, and develop new methods or products.

2. **Technology Readiness**: As the research progresses, the technology or innovation becomes more refined. Researchers or research institutions assess its potential for real-world application. This might involve testing prototypes, identifying potential markets, and exploring its commercial viability.

COMMERCIALIZATION CONTD.

b. Proof of Concept and Prototype Development

1. **Proof of Concept (PoC)**: This stage verifies whether the idea is feasible and whether it has practical potential in the market. For example, an academic study could prove that a new drug works in a lab but requires testing in real-world conditions.

2. **Prototype Development**: For technology-based research, the next step involves creating a working prototype or a model that demonstrates the feasibility of the research output. This phase may involve technical trials, patents, or market testing.

COMMERCIALIZATION CONTD.

c. Intellectual Property Protection

1. **Patent Filing**: One of the first steps in commercialization is protecting intellectual property (IP). Researchers or research institutions file patents to protect their innovations before commercialization to prevent competitors from copying or stealing the idea.

2. **Licensing**: Researchers can license their IP to companies or individuals who want to develop it further, making it available for market production.

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COMMERCIALIZATION CONTD.

d. Industry Collaboration and Partnerships

1. **Industry Partnerships**: Researchers often partner with industries or businesses that can scale the research output into a product or service. These collaborations could be in the form of joint ventures, funding agreements, or strategic partnerships.

2. **Technology Transfer Offices (TTOs)**: Many universities and research institutions have dedicated offices for technology transfer. These offices help researchers license their inventions, connect with potential investors, and bridge the gap between academia and the marketplace.

COMMERCIALIZATION CONTD.

e. Commercial Production and Market Launch

1. **Product Development**: At this stage, the focus shifts from research to the design and mass production of the final product. Engineers, manufacturers, and marketers collaborate to bring the product to market.

2. **Marketing Strategy**: A marketing plan is developed to introduce the product to consumers. This can include market research, promotion, distribution channels, and sales strategies.

3. **Regulatory Approval**: Depending on the type of product (e.g., medical devices, pharmaceuticals), regulatory approval (FDA, CE certification) may be required before the product can be sold commercially.

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CHALLENGES IN COMMERCIALIZATION IN RESEARCH

While the process of commercialization can offer significant benefits, there are several challenges researchers face in this transition from theory to market:

1. **Funding and Investment**: Early-stage research often requires significant investment for development, prototyping, and marketing. Finding investors who believe in the potential of the research is critical.

2. **Industry Adoption**: Even if research findings are promising, industries may be hesitant to adopt new technologies or products, especially if they require significant changes to existing systems or infrastructure.

3. **Intellectual Property Issues**: Securing patents and licenses can be complex and time-consuming. Additionally, the ownership of IP can be a point of contention between researchers, institutions, and commercial partners.

4. **Regulatory Hurdles**: Depending on the product (especially in sectors like pharmaceuticals, health, or food), navigating regulatory requirements can be lengthy and costly.

5. **Market Competition**: Even if the research leads to an innovative product, competition from established players or other emerging technologies can impact market success.

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COPY RIGHT

Copyright is a form of intellectual property law that grants the creator of original works exclusive rights to their creation, typically for a limited period, with the intent to allow them to control the use of their work and to profit from it.

Copyright protects various types of works, including literature, music, films, software, artwork, and other forms of creative expression. This legal protection helps creators safeguard their original works from unauthorized use or reproduction.

COPY RIGHT CONTD.

Some examples of works that are protected under copyright include:
- ✓ Literary works (e.g., novels, articles, poems)
- ✓ Music and sound recordings
- ✓ Motion pictures and other audiovisual works
- ✓ Software and code
- ✓ Architectural works
- ✓ Artworks and sculptures
- ✓ Photographs
- ✓ Dramatic works (e.g., plays)

RIGHTS OF COPYRIGHT HOLDERS

The owner of a copyright has the **exclusive right** to do or authorize the following activities regarding their work:

Reproduction: The right to copy the work.

Distribution: The right to sell, rent, or distribute copies of the work.

Public Performance: The right to perform or display the work publicly (e.g., a play or a film).

Public Display: The right to display the work publicly, such as showing artwork in a gallery.

Derivative Works: The right to make new works based on the original (e.g., a film adaptation of a book).

DURATION OF COPYRIGHT

The duration of copyright protection varies based on jurisdiction, but under **U.S. law**, for example, the general rules are as follows:

1. For **individual authors**, copyright lasts for the life of the author plus 70 years.

2. For **works created by multiple authors**, copyright lasts for the life of the last surviving author plus 70 years.

3. For **works created for hire**, anonymous, or pseudonymous works, copyright lasts 95 years from the date of publication or 120 years from the date of creation, whichever is shorter.

4. After the copyright expires, the work enters the **public domain**, meaning anyone can use it without permission

SUMMARY

- ➢ Commercialization
- ➢ Copyright
- ➢ Rights of Copyright holders
- ➢ During of Copyright

QUIZ

UNIT 4: Application of results and Ethics: Environmental impacts - Ethical issues - Ethical committees - Commercialization – Copy right – royalty - Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability.

LECTURE -5, ROYALTY, REPRODUCTION OF PUBLISHED MATERIAL

RECAP

- ➢ Commercialization

- ➢ Copy right

- ➢ Rights of Copyright holders

- ➢ During of Copyright

OBJECTIVE

- ➢ Royalty

- ➢ Reproduction of Published Material

ROYALTY

A **royalty** is a payment made to the owner of intellectual property (IP) for the right to use that property. These payments are typically made as a percentage of revenue or profits generated from the use of the intellectual property.

Royalties are common in various industries, including music, literature, film, patents, trademarks, and natural resources.

ROYALTY CONTD.

a. Copyright Royalties

1) Music Royalties: Musicians and songwriters receive royalties when their music is sold, streamed, broadcast, or performed. These royalties can come from music labels, streaming platforms (e.g., Spotify, Apple Music), radio stations, or live performances.

2) Book Royalties: Authors receive royalties from book sales. This could be based on the number of copies sold or digital downloads.

b. Patent Royalties

When someone invents a new product or process and patents it, they can license the patent to other companies or individuals. In return, the licensee (the person or company using the patent) pays royalties to the patent holder, typically as a percentage of the product's sales.

ROYALTY CONTD.

c. Trademark Royalties

Companies that own a trademark (such as a logo or brand name) can license it to others, allowing them to use the brand or logo on products. In return, the trademark owner receives royalties based on the sales generated from that licensed use.

d. Mineral or Resource Royalties

In the context of natural resources, landowners or governments often receive royalties from companies that extract minerals, oil, or gas. These royalties are typically paid as a percentage of the revenue from the extraction of the resource.

e. Franchise Royalties

Franchise owners typically pay royalties to the parent company (franchisor) for the right to operate under the franchisor's brand. These royalties are often based on a percentage of the franchisee's sales revenue.

ROYALTY CONTD.

1. **Percentage-Based Royalties**: This is the most common form of royalty payment. The percentage is agreed upon in advance by both parties (licensor and licensee). For instance, an author might receive 10% of the book's retail price, or a musician might receive 12% of the revenue from music sales or streaming.

2. **Flat Fee Royalties**: In some cases, royalties can be a flat fee instead of a percentage of sales. For example, a software company may charge a fixed annual royalty fee for using its software.

3. **Upfront Payment vs. Ongoing Royalties**: Sometimes, licensors receive an upfront payment as a lump sum, followed by ongoing royalty payments. Other times, royalties are paid only after a product is sold or used in the market.

4. **Royalty Period**: Royalties are usually paid over a specific period, such as annually or quarterly. The royalty agreement should define the payment schedule.

REPRODUCTION OF PUBLISHED MATERIAL

The **reproduction of published material** refers to the process of copying, reproducing, or distributing content that has already been published, such as articles, books, music, software, images, or any other form of intellectual property.

This practice is common in academic, commercial, and creative industries but is subject to legal regulations, primarily governed by **copyright law**.

KEY ASPECTS OF REPRODUCING PUBLISHED MATERIAL

1.Copyright Law and Reproduction
Copyright protection gives the creator of original works exclusive rights to their work, including the right to reproduce the work.
Reproduction rights allow the copyright holder to control who can make copies of their work and under what circumstances.
Reproducing published material **without permission** from the copyright holder or without meeting certain legal exceptions (such as fair use or fair dealing) constitutes **copyright infringement**.
Methods of Reproduction can take many forms, including:
Physical Reproduction: Making copies of physical works, like books, music, or artwork (e.g., photocopying a book, pressing vinyl records).
Digital Reproduction: Copying or downloading content from digital sources, such as websites, e-books, or music files (e.g., downloading an MP3 file or copying a PDF).
Reproduction for Distribution: Copying the material for resale, sharing, or public distribution, such as printing a large number of books for sale.

EDUCATIONAL AND RESEARCH REPRODUCTION

Education Exception: Educational institutions may reproduce materials for classroom use under specific exemptions, such as copying a portion of a book for study, without needing permission.

Research Purposes: Researchers can often reproduce portions of published material for analysis, comparison, or inclusion in a scholarly work (e.g., quoting parts of a journal article in a thesis), as long as it's done within the scope of fair use or fair dealing.

SUMMARY

➤ Royalty

➤ Reproduction of Published Material

➤ Key Aspects of Reproducing Published Material

➤ Educational and Research Reproduction

PROBLEM FOR PRACTICE

UNIT 4: Application of results and Ethics: Environmental impacts - Ethical issues - Ethical committees - Commercialization – Copy right – royalty - Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability.

LECTURE -6, PLAGIARISM, CITATION & ACKNOWLEDGEMENT

RECAP

- Royalty

- Reproduction of Published Material

- Key Aspects of Reproducing Published Material

- Educational and Research Reproduction

OBJECTIVE

- Plagiarism

- Types of Plagiarism

- Citation

- Acknowledgement

PLAGIARISM IN RESEARCH

Plagiarism in research refers to the act of using someone else's ideas, work, or intellectual property without proper attribution, presenting it as one's own.

This unethical practice can occur in various forms, including copying text, data, images, or ideas without giving proper credit to the original author.

Plagiarism undermines the integrity of research and can have severe academic, legal, and professional consequences.

TYPES OF PLAGIARISM

1. Direct Plagiarism:

Definition: Copying someone else's work word-for-word without attribution.

Example: Copy-pasting a paragraph from a journal article into your research paper without citing the source.

2. Paraphrasing Plagiarism:

Definition: Rewriting someone else's ideas or text in your own words without proper citation.

Example: Rewriting an author's argument but failing to give credit to the original author.

3. Self-Plagiarism:

Definition: Reusing one's own previously published work without acknowledging that it has been used before, or submitting the same research or data for multiple publications.

Example: Submitting the same research paper to different journals without disclosure.

TYPES OF PLAGIARISM CONTD.

4. Mosaic Plagiarism:
Definition: Borrowing phrases or sentences from different sources and blending them into a new work without proper citation.
Example: Taking a few sentences from multiple sources and weaving them together to create a new paragraph without attribution.

5. Accidental Plagiarism:
Definition: Inadvertently failing to cite sources or improperly paraphrasing due to lack of knowledge or carelessness.

Example: Using a piece of information that you thought was common knowledge, but is actually from a specific source.

6. Image Plagiarism:
Definition: Using images, graphs, or tables created by others without permission or proper citation.

Example: Copying an image from a published article and including it in your research without giving credit.

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CITATION

In research methodology, citations and acknowledgments are important for giving credit to others and avoiding plagiarism:

It's important to cite sources correctly and to include acknowledgments in research papers to avoid plagiarism, which is considered a serious academic offense.

There are several citation styles, including APA, MLA, and the Chicago Manual of Style.

Identify the original source of ideas, information, or images used in a research paper.

Citations are included in the body of the paper as in-text citations, and a list of all sources is compiled at the end of the paper as a references or works cited list.

Citing sources helps readers evaluate the importance of the publications used, and shows how the research fits into the larger picture of scientific research.

CITATION IN RESEARCH PAPER

A citation appears in the main text of the paper. It is a way of giving credit to the information that you have specifically mentioned in your research paper by leading the reader to the original source of information.

You will need to use citation in research papers whenever you are using information to elaborate a particular concept in the paper, either in the introduction or discussion sections or as a way to support your research findings in the results section.

CITATION CONTD.

Why Are Citations Important?

1. To avoid plagiarism and unethical claims to what you haven't discovered or contributed

2. To respect the intellectual property rights of others

3. To provide evidence from the work of others and support a claim in your paper

4. To help the reader trace and track down the sources of your information

CITATION CONTD.

Some common and widely used reference styles are:

- APA (American Psychological Association) Referencing Style

- MLA (Modern Language Association) Referencing Style

- Harvard style of citation Vancouver style of citation

- Chicago/Turabian Referencing Style etc.

CITATION CONTD.

AMERICAN PSYCHOLOGICAL ASSOCIATION REFERENCING STYLE

- Author's name followed by its initials.
- Publication year.
- Title of article followed by full stop.
- Journal name in Italic form.
- Volume followed by a comma.
- Page number.

CITATION CONTD.

MODERN LANGUAGE ASSOCIATION REFERENCING STYLE

- Author's Name.
- Title of Article.
- Name of Journal.
- Volume number followed by decimal and issue no.
- Year of Publication.
- Page Numbers.
- Medium of Publication.

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Go to Se

CITATION CONTD.

HARVARD STYLE OF CITATION

- Author's name followed by its initials.
- Publication year.
- Title of article with single quotation mark followed by full stop.
- Journal name in Italic form.
- Volume followed by a comma.
- Issue number in bracket.
- Page number.

CITATION CONTD.

VANCOUVER STYLE OF CITATION

- Author's surname followed by its initials.
- Title of article followed by double quotation.
- Journal name (abbreviated).
- Date of publication followed by double quotation.
- Volume number.
- Issue number in bracket.
- Page number.

CITATION CONTD.

CHICAGO/TURABIAN REFERENCING STYLE

- Name of author.
- Article title in double quotation.
- Journal's title in Italic form.
- Volume number.
- Year of publication.
- Page number.

EXAMPLE OF A CITATION

Examples of citations differ depending on the style being used. An example of an MLA in-text citation would be (Jones 23).

The same example in APA format would be (Jones, 2012, p. 23). Using Chicago Manual of Style, the citation would be in the form of a footnote or endnote and would include not only the author, date, and page number but also the title of the publication and, if appropriate, volume and issue number.

ACKNOWLEDGEMENT

Recognize the contributions of others to the research project.

Acknowledgments are listed in a separate section at the end of the paper, after the conclusion but before the references list.

Some people to thank in the acknowledgments include chairs, supervisors, funding bodies, other academics, editors, proofreaders, librarians, research assistants, study participants, family members, friends, and pets.

TYPES OF ACKNOWLEDGEMENT

Acknowledgment in a research paper can take various forms, depending on the purpose and context of the project. Here are some common types of acknowledgments:

1. Formal Acknowledgments

These are typically written in a formal tone and are used to recognize and give credit to people, organizations, or institutions that provide financial or technical support to the research project. These acknowledgments often appear at the beginning or end of the research paper and may include formal language and formatting.

2. Informal Acknowledgments

These acknowledgments are often more personal and informal in tone. They may include acknowledging friends, family members, or colleagues who provided emotional support or helped in some way during the research process.

TYPES OF ACKNOWLEDGEMENT CONTD.

3. Professional Acknowledgments

These acknowledgments are typically used in academic or professional settings and are aimed at giving credit to individuals or organizations that contributed to the research project. These acknowledgments may include thanking mentors, colleagues, research assistants, or funding agencies.

4. Collaborative Acknowledgments

These acknowledgments are used to recognize the collaborative nature of research projects. They may include acknowledging co-authors, collaborators, or other researchers who contributed to the project in some way.

ACKNOWLEDGE IN RESEARCH PAPER

1. When citing an acknowledgment in a research paper, it should be listed as a separate section at the end of the paper, following the references section. It should be titled "Acknowledgement" and be placed after the conclusion but before the reference list.

2. Acknowledgment section should not be included within the text citation or reference list. However, if a person or organization mentioned in the acknowledgment section was cited within the text, it should be included in the in-text citation and reference list.

3. It's important to make sure that acknowledgments are cited correctly in order to give credit to those who contributed to the research project. This will help to ensure academic integrity and avoid plagiarism.

EXAMPLE OF ACKNOWLEDGEMENT

Acknowledge In Research Paper: Example 1

"I would like to thank Dr. M Vinayaka Murthy. Professor, School of CSA for his invaluable guidance and support throughout this project. I am also grateful to my research assistant, XXXXX, for her technical expertise and administrative assistance. This project would not have been possible without the generous financial support of the XYZ Foundation. Lastly, I would like to acknowledge the study participants who generously shared their time and insights."

SUMMARY

- ➢ Plagiarism

- ➢ Citation

- ➢ Examples of Citation

- ➢ Acknowledgement

- ➢ Acknowledge in Research Paper

- ➢ Example of Acknowledgement

QUIZ

UNIT 4: Application of results and Ethics: Environmental impacts - Ethical issues - Ethical committees - Commercialization – Copy right – royalty - Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability.

LECTURE -7, REPRODUCIBILITY AND ACCOUNTABILITY

RECAP

- ➤ Plagiarism
- ➤ Citation
- ➤ Examples of Citation
- ➤ Acknowledgement
- ➤ Acknowledge in Research Paper
- ➤ Example of Acknowledgement

OBJECTIVE

- ➤ Reproducibility
- ➤ Challenges to Reproducibility
- ➤ Improving Reproducibility
- ➤ Accountability
- ➤ Challenges / Improving Accountability
- ➤ Difference b/w Reproducibility & Accountability

REPRODUCIBILITY

Reproducibility and **accountability** are fundamental concepts in scientific research that ensure the integrity, transparency, and reliability of findings. Both are closely connected to the scientific method and play a crucial role in the advancement of knowledge.

REPRODUCIBILITY CONTD.

Reproducibility refers to the ability of other researchers to obtain the same or similar results when they repeat an experiment or analysis using the same methodology and data. It is a cornerstone of the scientific process because it allows others to verify and confirm the validity of findings.

Why Reproducibility is Important:

1. **Validation of Results:** Reproducibility helps verify that the results are not due to random chance, errors, or biases.

2. **Building Trust:** When research can be reproduced, it builds trust in the scientific community, encouraging others to use or extend the findings.

3. **Scientific Progress:** Reproducible research serves as a reliable foundation for further studies and innovations.

4. **Detecting Errors:** Reproducibility can identify flaws in experimental design, data handling, or statistical analysis.

CHALLENGES TO REPRODUCIBILITY

1. **Lack of Transparency:** Insufficient sharing of data, methods, and code can hinder replication efforts.

2. **Complexity of Experiments:** Some experiments may be too complex or resource-intensive for researchers to replicate fully.

3. **Poor Documentation:** Inadequate reporting of protocols and procedures can prevent others from recreating the study.

4. **Statistical Power:** Research with small sample sizes or underpowered statistical tests may yield results that are difficult to reproduce.

IMPROVING REPRODUCIBILITY

1. **Open Data and Code:** Sharing datasets, raw data, and code publicly increases the chances of reproducibility.

2. **Pre-registration of Studies:** Researchers can pre-register their study design, hypotheses, and analysis plan to avoid post-hoc manipulation of results.

3. **Clear Documentation:** Detailed protocols and clear reporting practices make it easier for others to replicate research.

4. **Reproducibility Audits:** Journals and funding bodies can encourage reproducibility audits before publishing research findings.

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ACCOUNTABILITY

Accountability in research refers to the responsibility that researchers, institutions, and organizations have to ensure the ethical, accurate, and honest conduct of research. This includes being accountable for the methodologies, interpretations, and impact of research outcomes.

Why Accountability is Important:

1. **Ethical Conduct:** Researchers are responsible for conducting their work with integrity, ensuring the welfare of participants and minimizing harm.

2. **Accuracy and Integrity:** Accountability ensures that data is collected, analyzed, and presented truthfully without manipulation, falsification, or plagiarism.

3. **Public Trust:** Research funded by taxpayers or organizations relies on public trust. Researchers must justify their conclusions, especially when the results influence public policy or health decisions.

4. **Avoiding Conflicts of Interest:** Researchers need to disclose financial or personal interests that could bias the research process or outcomes.

CHALLENGES TO ACCOUNTABILITY

1. **Pressure to Publish:** The "publish or perish" culture can sometimes lead to the manipulation or omission of data to make results more favorable.

2. **Funding Bias:** Funding from organizations with vested interests in specific outcomes may influence the design or interpretation of studies.

3. **Lack of Oversight:** Insufficient oversight or peer review can allow unethical practices to go unnoticed.

4. **Reproducibility Crisis:** A lack of accountability in ensuring that research can be reproduced leads to a loss of confidence in scientific findings.

IMPROVING ACCOUNTABILITY

1. **Ethical Training:** Researchers must be trained in research ethics, ensuring they understand the importance of honesty, transparency, and fairness.

2. **Conflict of Interest Disclosure:** Researchers should disclose any financial or personal interests that may affect their research findings.

3. **Peer Review and Transparency:** The peer review process helps ensure accountability by allowing other experts to evaluate the quality and rigor of research. Open peer review and transparent methodologies further enhance accountability.

4. **Research Audits and Replication Studies:** Encouraging regular audits and replication studies can ensure that the findings stand up to scrutiny.

5. **Research Integrity Policies:** Universities and funding agencies can implement policies to promote good scientific practices, investigate misconduct, and take corrective actions when necessary.

RELATIONSHIP BETWEEN REPRODUCIBILITY AND ACCOUNTABILITY

1. **Reproducibility as a Check on Accountability:** When research findings are reproducible, it serves as a safeguard against errors, fraud, or biases in the research process.

2. **Accountability to the Public:** Researchers are accountable not only to their peers but also to the public and funding agencies. Demonstrating reproducibility is part of fulfilling this responsibility.

3. **Publications and Accountability:** When research is reproducible, researchers are more likely to be held accountable for their methods, analyses, and conclusions. This accountability encourages higher standards in the scientific community.

SUMMARY

➢ Reproducibility

➢ Challenges to Reproducibility

➢ Improving Reproducibility

➢ Accountability

➢ Challenges / Improving Accountability

➢ Difference b/w Reproducibility & Accountability

QUIZ

UNIT 4: Application of results and Ethics: Environmental impacts - Ethical issues - Ethical committees - Commercialization – Copy right – royalty - Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability.